Health Consultation

Evaluation of Airborne Dust and Site Soils at the

PACIFIC COAST PIPELINE SUPERFUND SITE
FILLMORE, VENTURA COUNTY, CALIFORNIA

APRIL 14, 2016

U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
Agency for Toxic Substances and Disease Registry
Division of Community Health Investigations
Atlanta, Georgia 30333

Health Consultation: A Note of Explanation

An ATSDR health consultation is a verbal or written response from ATSDR to a specific request for information about health risks related to a specific site, a chemical release, or the presence of hazardous material. In order to prevent or mitigate exposures, a consultation may lead to specific actions, such as restricting use of or replacing water supplies; intensifying environmental sampling; restricting site access; or removing the contaminated material.

In addition, consultations may recommend additional public health actions, such as conducting health surveillance activities to evaluate exposure or trends in adverse health outcomes; conducting biological indicators of exposure studies to assess exposure; and providing health education for health care providers and community members. This concludes the health consultation process for this site, unless additional information is obtained by ATSDR which, in the Agency's opinion, indicates a need to revise or append the conclusions previously issued.

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HEALTH CONSULTATION

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Prepared By:

U.S. Department of Health and Human Services
Agency for Toxic Substances and Disease Registry (ATSDR)
Division of Community Health Investigations
Western Branch

Foreword

Congress established the Agency for Toxic Substances and Disease Registry (ATSDR) in 1980 under the Comprehensive Environmental Response, Compensation, and Liability Act, also known as the Superfund law. This law sets aside money to identify and clean up our country's hazardous waste sites. The Environmental Protection Agency (EPA) and individual states regulate investigating and cleaning up of the sites.

After 1986, the law required ATSDR to conduct a public health assessment at each of the EPA National Priorities List (NPL) sites. The NPL contains the most serious uncontrolled or abandoned hazardous waste sites throughout the United States and its territories. The aim of ATSDR's assessments is to find out if people are being exposed to hazardous substances and, if so, whether those exposures are harmful and should be stopped or reduced. If appropriate, ATSDR also conducts public health assessments and focused health consultations when petitioned by concerned people. Environmental and health scientists from ATSDR and from the states ATSDR has cooperative agreements with conduct public health assessments. The public health assessment process allows the scientists and public health assessment partners to be flexible in how they present findings about the public health effects of hazardous waste sites. The flexible format allows health assessors to provide important public health messages to affected populations in a clear and expeditious way.

Exposure: As the first step in the assessment, ATSDR scientists review environmental information (data) to decide how much contamination is at a site, where it is, and how it could affect the health of people exposed to it. Generally, ATSDR does not collect its own environmental sampling data but reviews information provided by EPA, other government agencies, businesses, and the public. When available information is not enough to determine whether exposures could affect the health of people, the report will indicate what additional data the scientists need.

Health Effects: If the review of the environmental data shows that people have been, or may be, exposed to hazardous substances, ATSDR scientists evaluate whether these exposures may be harmful. ATSDR recognizes that children may be more vulnerable to these harmful effects because of their play activities and their growing bodies. ATSDR considers children more sensitive and vulnerable to hazardous substances unless data are available to suggest otherwise. Thus, ATSDR considers the health of the children first when evaluating the health threat to a community. The potential health effects to other high-risk groups within the community (such as the elderly, chronically ill, and people who engage in high-risk practices) also receive special attention during the evaluation.

ATSDR uses existing scientific information (which can include the results of medical, toxicologic, and epidemiologic studies and data collected in disease registries) to evaluate the possible health effects that exposures may cause. The science of environmental health is still developing, and information on the health effects of certain substances sometimes is not available.

Community: ATSDR also needs to learn what people in the area know about the site and what concerns they may have about its effects on their health. Therefore, throughout the evaluation process, ATSDR actively gathers information and comments from the people who live or work near a site, including residents of the area, civic leaders, health professionals, and community groups. To ensure that the report responds to the community's health concerns, ATSDR distributes an early version to the public for their comments. In the final version of the report, ATSDR addresses all the public comments that have been presented about the document.

Conclusions: The report presents conclusions about the public health threat, if any, posed by contamination at a site. In the public health action plan, ATSDR will recommend ways to stop or reduce exposure to the contamination. ATSDR is primarily an advisory agency, so usually these reports identify what actions are appropriate to be undertaken by EPA or other responsible parties. However, if an urgent health threat exists, ATSDR can issue a public health advisory that warns people of the risks. ATSDR also can recommend health education or pilot studies of health effects, full-scale epidemiology studies, disease registries, surveillance studies, or research on specific hazardous substances.

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Acronyms

ACCLPP	Advisory Committee on Childhood Lead Poisoning Prevention
ATSDR	Agency for Toxic Substances and Disease Registry
AOC	Area of Concern
BLL	Blood-lead Level
CARB	California Air Resources Board
CDC	Centers for Disease Control and Prevention
CREG	Cancer Risk Evaluation Guide
EBLL	Elevated Blood-lead Level
EPA	U.S. Environmental Protection Agency
GSD	Geometric Standard Deviation
IEUBK	Integrated Exposure Uptake Biokinetic model
IQ	Intelligence Quotient
mg/kg	milligrams per kilogram
mph	miles per hour
µg/L	micrograms per liter
$\mu g/m^3$	micrograms per meter cubed
NAAQS	National Ambient Air Quality Standards
NHANES	National Health and Nutrition Examination Survey
NPL	National Priorities List
PAH	Polycyclic Aromatic Hydrocarbon
PCPL	Pacific Coast Pipeline
PEL	Permissible Exposure Limit
PM	Particulate Matter
RI/FS	Remedial Investigation/Feasibility Study
RSL	Regional Screening Level
TDPI	Texaco Downstream Properties Inc.
VCAPCD	Ventura County Air Pollution Control Division

Summary

PURPOSE	The Agency for Toxic Substances and Disease Registry (ATSDR) recognizes that Fillmore residents need more information about the possibility of current and future exposures to contaminants in the soil at the Pacific Coast Pipeline (PCPL) site. The purpose of this Health Consultation is to give community members the information they need to protect their health. Its purpose also is to recommend actions that the Environmental Protection Agency (EPA) and Chevron can take at the PCPL site to protect the community's health. To achieve these purposes, ATSDR evaluated the possibility of harmful effects to residents who may have been exposed to site soil as dust in the air or to people using the site who may come in direct contact with the soil after planned redevelopment is completed.
BACKGROUND	The 56-acre PCPL site is next to the city of Fillmore and is included on EPA's National Priorities List (NPL) of polluted sites. Texaco, Inc. ("Texaco") operated the site as an oil refinery from 1928 to 1950 where they processed and stored petroleum fuel products. Some of these products contained tetraethyl lead. Texaco dumped some products into unlined disposal pits on the site. The refinery closed in 1950 but the site was used as a crude-oil pumping station until 2002. Texaco Downstream Properties Inc. (TDPI), which is owned by Chevron U.S.A., Inc. ("Chevron") currently owns the property. EPA and other organizations have been overseeing site investigation and clean-up activities of environmental waste since the 1980s. In 1986, the California Department of Health Services oversaw the removal of 38,000 tons of waste and contaminated soil from the former waste pit and small waste disposal areas (EPA 1992). Later environmental investigations showed that site soil was still contaminated. In 1992, ATSDR completed a Preliminary Health Assessment of the PCPL site that determined more data were needed to evaluate the potential for health effects from the site. In 2012, EPA asked ATSDR to complete a Health Consultation to assess if residents living near the site were being harmed by dust from the site activities and if people might be harmed by soil exposure after redevelopment. Residential areas and an elementary school are within a few hundred feet of the site boundary, and residents and groups in the community are concerned about site exposures. This Health

	Consultation report is the response to EPA's request and also addresses community concerns. Since 2011, EPA has been overseeing site activities to remove underground structures and to dig out contaminated soil from areas that could pose a health risk. In 2013, Texaco, Inc., dug out contaminated soil, disposed of it in two locations on site, and put a cap over the contaminated soil that was removed. A fence currently surrounds the site to restrict access.
OVERVIEW OF THIS HEALTH CONSULTATION	This Health Consultation focuses on dust in the air during recent clean-up activities and possible direct contact with soils at the site in the future. After reviewing initial information about the site, ATSDR focused on three contaminants of concern identified by the screening process: dust (particulate matter), lead, and polycyclic aromatic hydrocarbons (PAHs). ATSDR used air and soil data provided by EPA and Chevron, and information from community members. Conclusion 1 addresses the question: Could dust blowing into the nearby community from site clean-up activities in 2011-2013 have affected the health of nearby residents? Conclusion 2 addresses the question: Could dust blowing into the nearby community from site clean-up activities in 2011-2013 have exposed residents to lead, PAH contaminants, or both, and affected their health? Conclusion 3 addresses the question: Once redevelopment is complete, could future visitors and workers at the site be exposed to lead or PAHs at levels that could affect their health? ATSDR's conclusions are summarized in this section. They are addressed with more detailed analyses and explanations further in the report. ATSDR published a draft of this Health Consultation for public comment in 2015. ATSDR responded in Appendix J to comments it received during the public comment period and changed or added content throughout the document in response.
CONCLUSION 1	ATSDR concludes that windblown dust from the *greater geographic area (including the site)* was unlikely to affect the health of healthy community members. However, the amount of dust in the air on windy days occasionally exceeded California's 24 hour standard for dust. Long-term effects

	from these exposures are unlikely, but dust levels on these days could have increased short term risk of respiratory irritation, heart attack, and stroke for residents with pre-existing health conditions, such as asthma, chronic obstructive pulmonary disease (COPD), or emphysema. ATSDR cannot conclude how much dust can be attributed to the site.
BASIS FOR CONCLUSION 1	The amount of dust measured at the site perimeter near the neighborhood was occasionally higher than California's 24-hour standard for PM_{10} (coarse dust with particles as large as 10 micrometers [µm])[1] on windy days. However, this is a dry dusty region and, therefore, background airborne dust was a contributor to community PM (dust) levels. In 2013 the California Air Resources Board listed the South Central Coast Air Basin, including Ventura County, as a PM_{10} non-attainment area (CARB 2013). The South Central Coast Air Basin had 98 days over the 24 hour state PM_{10} standard in 2013 (CARB 2015). Background PM_{10} dust levels in this part of California exceeded the 24-hour standard 68 times during a 3-year study from 2001 to 2003. EPA and Chevron implemented a Dust Suppression and Air Monitoring Plan to control and monitor dust at the site. Dust measured[2] on the west side of the site was higher than the California 24-hour PM_{10} standard on a few occasions during the 2013 site clean-up activities. Site work was stopped on 7 days between April and November 2013 for elevated measurements. Each occasion of elevated dust is discussed in detail in this consultation. Preventing the dust from exceeding the standard levels in many cases was impossible because this area is naturally dry and windy. In addition to reviewing PM_{10} monitoring data, ATSDR used these data to estimate $PM_{2.5}$ (smaller dust particles up to 2.5 µm in diameter) levels at the site. The results, described in the Dust Monitoring Data section of this report, are consistent with Conclusion 1.
NEXT STEPS FOR CONCLUSION 1	ATSDR recommends maintaining ground cover and expanding ground cover if necessary at the site to prevent future dust releases. By 2015

[1] Ten micrometers is equal to 0.0004 inches or one-seventh the width of a human hair.
[2] This data was collected using a portable direct reading hand-held TSI DustTrak 8532 monitor for PM_{10}.

	Chevron had covered 70% of the site with seeded slopes, crushed concrete, and brick material to prevent dust releases. ATSDR also recommends following the PM-specific measures outlined in the site Dust Suppression and Air Monitoring Plan to prevent dust from moving off-site during future redevelopment work at the site. Exposed soils at the site could contribute to elevated PM levels in the area in the future. In addition, to better monitor the site's contribution to ambient PM levels, ATSDR recommends simultaneous deployment of multiple monitors to concurrently detect upwind and downwind PM when sampling air during future earth moving at the site. If community members see dust blowing off-site during future site activities, ATSDR recommends that they move away from the dust and call the posted dust complaint number to report it. Visible dust may be from sources other than the site. People with pre-existing respiratory or cardiopulmonary illness should reduce their exposures to outdoor air on poor air quality days. Local air quality information and recommendations for outdoor activities are available by entering your zip code at http://www.airnow.gov.
CONCLUSION 2	Community members were not likely to be exposed to lead or PAHs in site soil or dust from 2011 to 2013 at levels that could cause health effects.
BASIS FOR CONCLUSION 2	A fence surrounded the site during soil clean-up, restricting public access. Thus, Fillmore residents were not likely to come into direct contact with contaminants on the site by touching or accidentally eating the soil. Site dust blown into nearby areas may have contained small amounts of lead and PAHs. However, the amount of lead and PAHs in dust during the site cleanup in 2013 was not likely to cause health effects because levels were below health-based comparison values. • Weekly dust sampling and analysis confirmed that lead dust levels were lower than the National Ambient Air Quality Standard (NAAQS) of 0.15 $\mu g/m^3$ • Estimated PAH dust levels were lower than the EPA regional screening level of 0.00092 $\mu g/m^3$

NEXT STEPS FOR CONCLUSION 2	ATSDR does not expect site-related dust to be a substantial contributor to lead exposures, however, ATSDR recommends all children younger than 6 years have their blood tested for lead due to the number of homes in Fillmore that were built before the 1978 ban on lead in paint.
CONCLUSION 3	Implementing the proposed site redevelopment plans will protect site visitors and workers from harmful contact with lead and PAHs in the soil.
BASIS FOR CONCLUSION 3	In 2013-2014, Chevron completed soil clean-up[3] in accordance with EPA guidelines and completed site preparation for possible future commercial, industrial, and recreational uses. ATSDR estimated lead exposure and cancer risk from PAHs based on soil clean-up levels. The estimates show that lead and PAH remaining in surface soil onsite are not expected to be at levels high enough to cause health problems during approved future commercial, industrial, or recreational use. Redevelopment plans at the site include deed restrictions so that the site may be used only for certain commercial, industrial, or recreational purposes.
NEXT STEPS FOR CONCLUSION 3	The state of California requires people and organizations seeking to redevelop the site to follow deed restrictions. ATSDR supports these deed restrictions, which prohibit building residences, hospitals, day care centers, homes, and schools, or growing plants for human consumption on the site. ATSDR recommends site re-evaluation if the City of Fillmore considers residential development on the site. ATSDR recommends long-term maintenance of on-site consolidation areas for contaminated soil – including monitoring the protective cap and ground cover to ensure they stay intact. This will help ensure that contaminated soil will not harm people who use the site in the future. The site is safe for designated future commercial, industrial, and recreational uses as long as appropriate precautions are taken as outlined in this report. Fencing is not required at this time or for approved future uses. However, the site owner may continue to restrict site access. ATSDR recommends that community members heed warning signs and not trespass on the site.

[3] Contaminants were cleaned up to EPA's risk-based industrial/commercial standards to protect human health.

FOR MORE INFORMATION	For questions or comments, call ATSDR toll-free at 1-800-CDC-INFO and ask for information on the Pacific Coast Pipeline site.

Background

The PCPL site consists of eight parcels covering 56 acres of land owned by Texaco Downstream Properties Inc. (TDPI), which is owned by Chevron U.S.A., Inc. ("Chevron"). Five of the eight parcels are within Fillmore city limits and three parcels are outside the city limits in Ventura County. Approximately 52 of the 56 acres lie outside Fillmore city limits, but are within the City's Urban Restriction Boundary, which gives Fillmore some influence regarding the area's use.

The site was listed on the Environmental Protection Agency (EPA)'s National Priorities List (NPL) in 1989. ATSDR performed an interim preliminary public health assessment in 1992 (ATSDR 1992), but did not have data to analyze potential exposures to site soil contaminants. ATSDR recommended in 1992 using optimal dust-control measures during on-site excavation and appropriate monitoring around the work site to protect the health of nearby residents.

Texaco operated the PCPL site as a refinery from 1928 to 1950. During this time, refinery wastes were deposited into an unlined pit on the western portion of the site. Among other activities, tetraethyl lead was blended with gasoline at the site. Texaco decommissioned the site in 1950, but it continued to serve as a crude-oil pumping station until 2002. Texaco removed 38,000 tons of waste and contaminated soil from the former main waste pit and other small waste disposal areas and backfilled those areas with clean soil in 1986 (URS 2011). Texaco dismantled and removed all structures by August 2004. From 2005 to 2009, Chevron undertook a three-phased investigation of site soils with EPA-approved work plans (URS 2011). The investigation phases were:

- Phase 1–investigating soils 10 feet down around former storage tanks
- Phase 2–investigating soils 10 feet down in other areas historically used for operations
- Phase 3–addressing data gaps and assessing human health risk

In 2011, Chevron completed, and EPA approved, the Remedial Investigation/Focused Feasibility Study (RI/FS) to address the remaining site contamination. In addition to soil contamination, benzene and toluene had migrated to groundwater beneath the site and to the adjoining neighborhood. These migrating plumes had not affected local drinking-water sources (EPA 2011a).

In the summer of 2012, EPA requested that ATSDR perform a focused health consultation to assess the potential for dust exposures during clean-up activities and the potential of future soil exposures after redevelopment to affect the health of site visitors. EPA requested ATSDR's assistance in addressing community concerns about site dust exposures. Residences and a school are on the western border of the site. The San Cayetano Elementary school-yard is located within 200 feet of the PCPL fence-line.

The purpose of this document and additional outreach activities is to provide the Fillmore community with information that addresses their health concerns about potential dust and future soil exposures at the site. Inhaling dust can affect health in two ways:

(1) Physical effects: dust particles can affect the respiratory system (including the nose, throat, and various parts of the lung) depending on their size, type, and amount;
(2) Chemical effects: hazardous chemicals attached to dust particles can cause harmful health effects.

In this health consultation ATSDR evaluates the likelihood of health effects among community members from both physical and chemical aspects of exposure to dust from the PCPL site. ATSDR also addresses questions from community members about potential exposures to contaminated soil after redevelopment of the property.

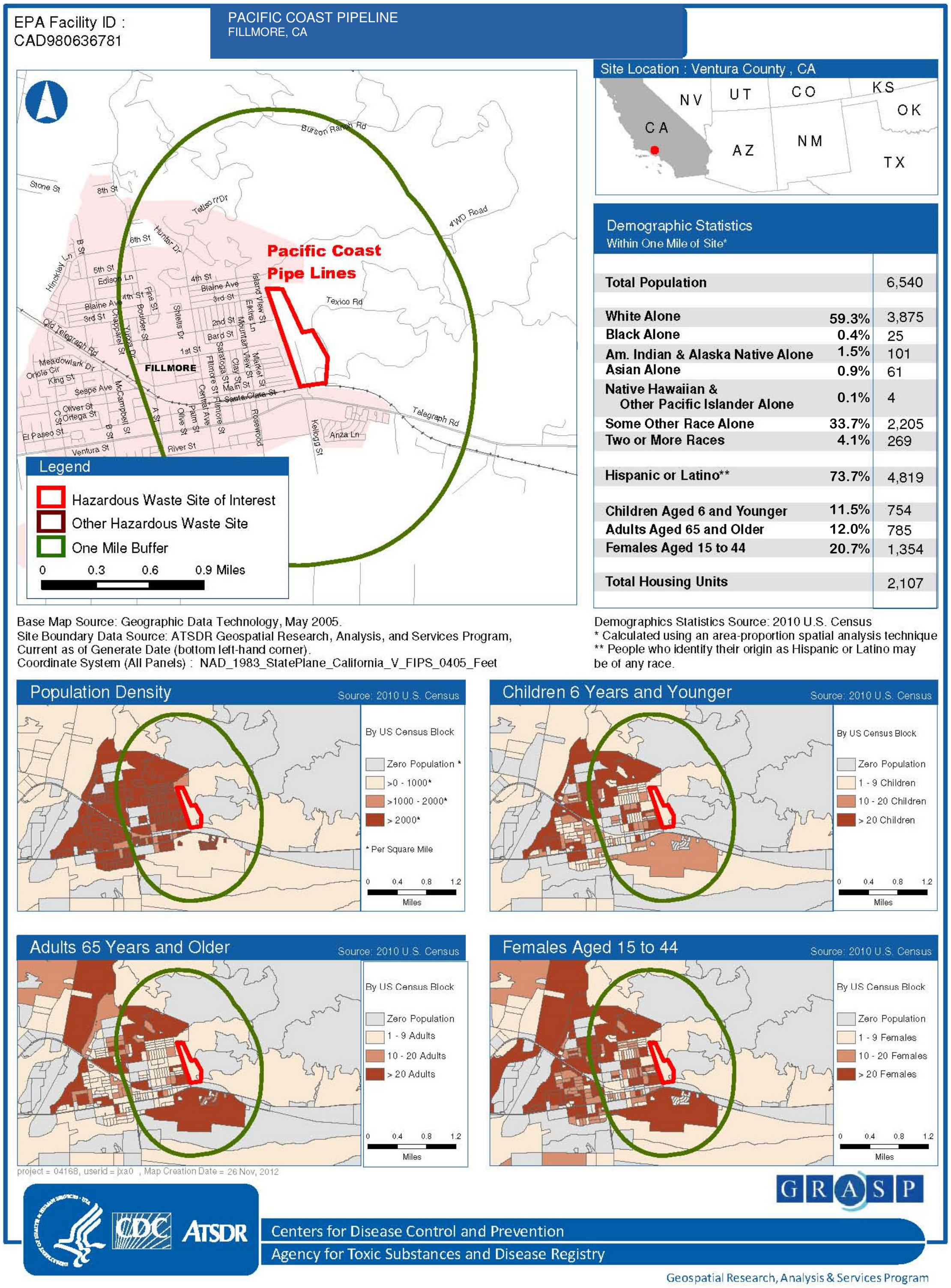
Figure 1 shows the site boundaries and demographic information about the surrounding community. According to the 2010 census, 6,540 people lived within 1 mile of the site, and approximately 74% of that population identify themselves as Latino or Hispanic. Approximately 500 students in grades K-5 attend the San Cayetano Elementary School, which is near the PCPL fence line. The student population is 88% Hispanic and 10% white. In 2011, 81% of the students were eligible for free or reduced-price lunch programs, compared with 53% of the students statewide.[4]

ATSDR staff made two trips to Fillmore in early 2013. During a January 14-15, 2013 visit, ATSDR regional staff toured the site with Chevron's project manager and met with the One Step A La Vez youth group's Superfund Committee, the Mayor of Fillmore, the Fillmore City Planning Department, and the Ventura County Public Health Department. An ATSDR representative also traveled to Fillmore to participate in a February 28, 2013 community meeting and open house organized by EPA. At the meeting, ATSDR staff answered questions from community members and gave a short presentation explaining the Agency's work at the site. Both trips provided early opportunities for ATSDR staff to learn about health concerns of community members about the site (see Community Concerns section).

ATSDR published a draft of this health consultation for public comment on May 26, 2015. The public comment period ended August 31, 2015. The comments received and ATSDR's responses are included in Appendix J. ATSDR visited Fillmore June 23-25, 2015 to meet with stakeholders and hold a public meeting about the draft health consultation. Feedback received during this trip is incorporated in this final report.

[4] San Cayetano Elementary School, http://www.education.com/schoolfinder/us/california/fillmore/san-cayetano-elementary/#students-and-teachers

Figure 1. Location and Demographics of the Pacific Coast Pipeline Superfund Site



Site Clean-up
In 2013 Chevron cleaned up on-site soil to meet EPA's risk-based standards for protecting human health (EPA 2014a; URS 2011). EPA supervised the clean-up process, during which Chevron excavated all contaminated soil and placed it in two on-site consolidation areas (**Figure 2**). Chevron placed an engineered cap over the soil in the consolidation areas. A few excavated areas were not backfilled completely with clean soil in 2013; those remaining areas were backfilled in 2014.

There are two benzene-contaminated groundwater plumes. These plumes will be cleaned up to meet EPA drinking water standards for benzene. One plume is being cleaned up in three phases, using the following methods:

- Air sparging: injecting air into the groundwater to enable naturally occurring bacteria to break down the benzene.
- Groundwater circulation: using pumps to move sulfate-rich groundwater into the benzene plume, boosting bacterial growth which will break down the benzene.
- Monitored natural attenuation: letting the natural processes that break down the benzene continue without human intervention.

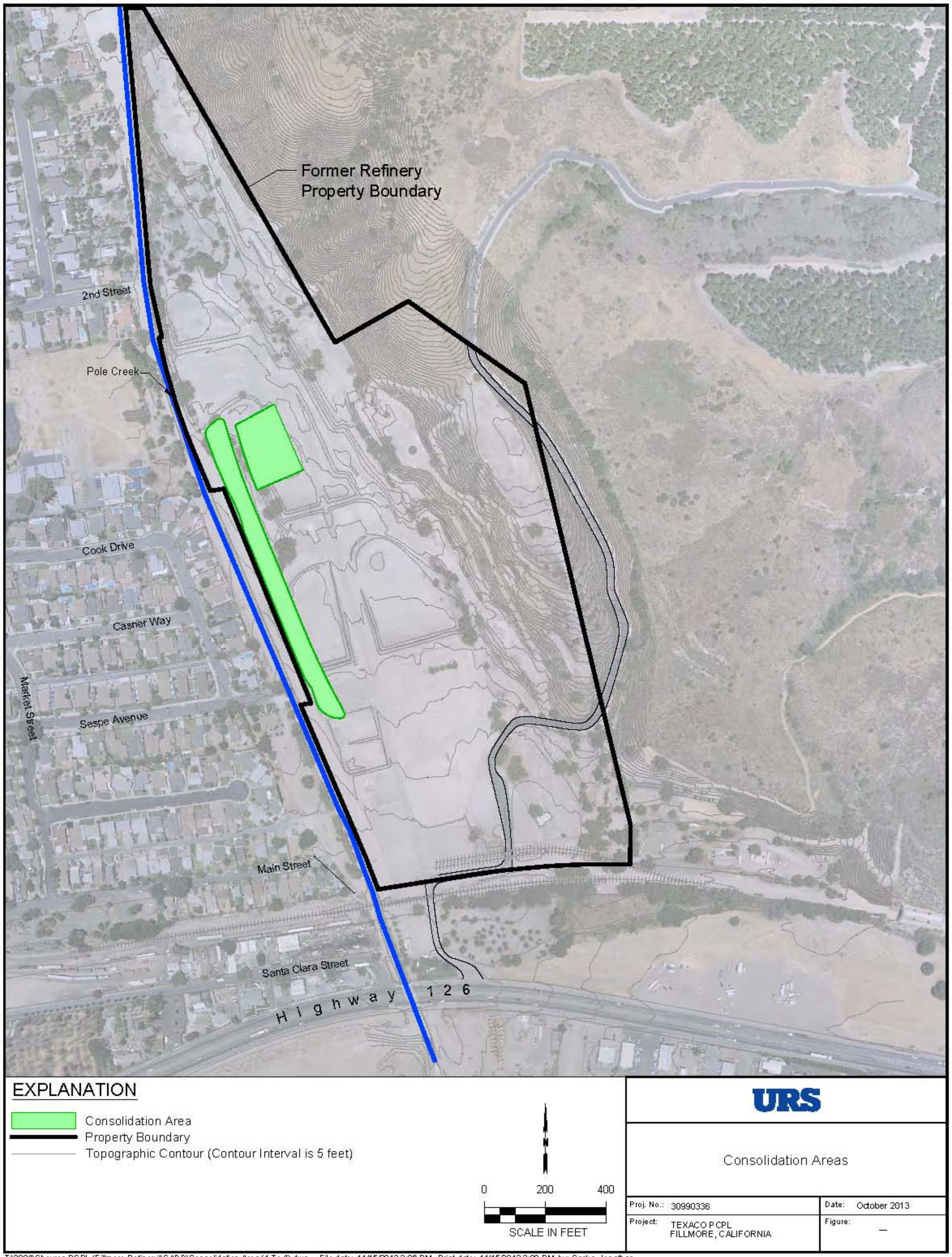
The other plume is being monitored for natural attenuation. In 2012 EPA estimated that groundwater clean-up using these strategies would be completed in about 50 years (EPA 2012a). Until remediation is complete, this water will not be used as a drinking water source (EPA 2011b).The City of Fillmore obtains all of its drinking water from groundwater in an area unaffected by the site and this drinking water is subject to all EPA standards (EPA 2011b). ATSDR is not aware of any current or projected future human contact with this contaminated groundwater.

Land Use and Reuse
EPA's Record of Decision notes that institutional controls, including a deed restriction and city zoning requirements, will limit future use of the Pacific Coast Pipeline Site to commercial and recreational uses (EPA 2011b). Further, the 2011 Remedial Investigation/Focused Feasibility Study states that residences, hospitals, day care centers, homes, or schools may not be built on the site, and plants for human consumption may not be grown on the site (URS 2011, Table 53).

Chevron has considered several redevelopment options for the site.[5] As of September 2015, Chevron was proposing to develop a commercial solar array on the flatter portion of the site, with possible open space (for passive recreation) on the hillside (Chevron 2015). Chevron has put on hold their previous proposal to develop a combination of commercial and industrial uses in the flatter area (though it is retaining plans for open space on the hill).[6] Community members interested in the redevelopment process may review Chevron's project website (www.fillmoreworks.com). Community members may also contact the City of Fillmore Planning Department (805-524-1500 x116) and Ventura County Planning Division (805-654-2488).

[5] Chevron, Fillmore Works, What's Planned: http://www.fillmoreworks.com/whats-planned/
[6] Chevron, Fillmore Works Land Revitalization Fact Sheet: http://www.fillmoreworks.com/wp-content/uploads/2013/03/2013-2-26-Fillmore-Works-Land-Revitalization-Fact-SheetEN.pdf

Figure 2. Consolidation Areas where Excavated Soil was Placed During the Clean-up



Community Concerns

ATSDR conducted several outreach activities to collect and understand the health concerns that community members believe are related to contamination at the PCPL site. ATSDR also offered members of the public an opportunity to comment on a draft of this health consultation (see Appendix J for comments received and ATSDR responses). The purpose of this section is:

1) to characterize the main exposure and related health concerns expressed by the community living near the PCPL site that ATSDR has compiled to date; and
2) to provide educational information about those exposure and health concerns.

Members of the Fillmore community expressed several concerns related to soil on the site, dust moving off site, and cancer rates in the community. These issues are addressed in this health consultation as follows.

Soil

Several community members expressed concerns about soil contamination in the neighborhood next to the site. They noted that over time, dust from the site and flooding could have carried contaminants into the neighborhood. Some people suggested that soil at residences and the San Cayetano Elementary School be tested for contaminants that have been found on site. In addition, some community members questioned whether data collected by contractors hired by Chevron, the responsible party, could be trusted.

ATSDR has reviewed information about the site-soil contamination and about how site soils could have contaminated nearby communities. Soil, dust, and meteorological data provided the basis for the public health conclusions and recommendations in this document. EPA is the regulatory authority for site sampling and characterization. Environmental samples were collected and analyzed using appropriate sampling and quality-assurance procedures according to best practices established by EPA (URS 2011, 2012, and 2013). Seven soil samples from 0.5-1.5 feet deep[7] were reviewed from west of Pole Creek to evaluate the possibility of soil contamination extending beyond the site boundary and into the neighboring residential area and schoolyard. The maximum level of lead (13 mg/kg) detected in soil-samples collected along the west side of Pole Creek was well below background for the area (URS 2007). PAHs (benzo(a)pyrene equivalents) west of Pole Creek were below ATSDR's comparison values. The summary section at the beginning of this health consultation provides conclusions from ATSDR's analysis of soil contamination.

Some community members noted that they were not aware of the Superfund site and that site security has not prevented trespassing historically. They noted that entering the site could have exposed the trespassers to contaminated soil in the past, posing health risks. For example, a community member noted that when he was a child he would retrieve balls that were thrown, kicked, or hit accidentally onto the site. ATSDR has not analyzed the possibility of past

[7] While this data is helpful for determining the extent of contamination, ATSDR prefers samples from 0-3" below ground surface to assess current exposures.

trespasser exposures to contaminants on the site. ATSDR recommends that community members observe warning signs and do not trespass on the site.

Finally, community members questioned whether the site would be safe after the 2013 soil clean-up. They expressed concern that the clean-up was being rushed, and that even after the clean-up the site would not be safe. They noted that future land use on the site would be restricted to industrial and commercial, and asked questions about why people would not be allowed to live there, if the site will be safe. ATSDR addressed this issue in Conclusion 3 of this report (see Summary section).

Dust

Community members were concerned about potential exposures to contaminants in dust from the site. People have witnessed dust blowing off site (Gazette 2012), and some people were concerned about the potential that clean-up activities would generate additional dust and affect the nearby neighborhood and school. EPA and Chevron added signs with a contact number for concerned citizens to alert site personnel of ongoing visible dust emissions leaving the site (EPA 2013a). Timely notification about dust issues assisted site personnel in taking immediate action when necessary. ATSDR addressed potential health concerns about dust exposures in Conclusions 1 and 2 of this report (see Summary section).

A resident near the site reported that dust in their backyard changed color from brown to black after the cleanup began. ATSDR cannot estimate what levels of contaminants are present in dust based on staining. However, if future sampling yields data from these yards, ATSDR is available to assist in interpreting the data for possible health concerns upon request.

Cancer

Several community members expressed concerns that site contamination has contributed to perceived high cancer rates in nearby neighborhoods. In April 2012, the Mayor of Fillmore requested that the California Cancer Registry conduct a community cancer assessment (California Cancer Registry 2013). Registry staff analyzed all cancer types combined, 14 specific cancer types with potential links to site contaminants, and childhood (younger than age 15 years) cancers from 1996 through 2009 in the census tract that included the East Fillmore population. The results, published in February 2013, did not identify a statistically significant difference in the number of new cancers in the East Fillmore population during 1996–2009 compared to the California Central Coast Cancer Registry population (California Cancer Registry 2013). The Cancer Registry presented these findings to community members at a February 28, 2013, community meeting organized by EPA. At that meeting, several community members expressed concerns about the adequacy of the analysis. Some people expressed concern that the study did not cover a longer timeframe. Registry staff explained that registry data did not include cancer cases diagnosed before 1988. Community members also noted that people who had lived in the area, but lived elsewhere when their cancer was diagnosed, were not included in the analysis. These issues of timeframe, geographical area, and locating individuals are valid. They highlight the limits of what the cancer registry can tell us. Many communities who have similar questions share these concerns.

In addition to the concerns already mentioned, some members of the community expressed concerns about issues that are beyond the scope of this health consultation (**Table 1**). ATSDR will consider addressing these issues in future investigations if there is a community member or other stakeholder request. Community members may also refer to the EPA project website (http://www.epa.gov/region09/pacificcoastpipeline) for information about many of these issues.

Table 1. Community Concerns on Issues beyond the Scope of this Health Consultation

Pathway/contaminant	Concern
Groundwater	Community members remain concerned about benzene contamination in two groundwater plumes beneath the site and nearby residences. Some residents questioned the adequacy of the current and planned groundwater monitoring system. Further, one person noted that a fault line exists near the site and expressed concern that an earthquake could change the nature of groundwater hydrology in the area, potentially putting drinking water sources at risk.
Soil Gas and Fruit Contamination	One community member expressed concerns about the potential for benzene soil gas to accumulate in the fruit of trees growing in neighborhoods next to the site. Citrus and other fruit trees are located throughout the Fillmore community.
Vapor Intrusion	An attendee at a community meeting questioned whether historic benzene soil gas concentrations could have been high enough to cause vapor to intrude into residences near the plumes.
Surface water	Some community members were concerned that surface water from the site could carry soil contaminants into Pole Creek next to the site, putting trespassers in the creek channel and people downstream at risk. They noted that new residences and a school have been built in the downstream area across Highway 126.
Odors in outdoor air	Between May and October 2013, while excavation was underway at the site, community members contacted officials (Chevron, the city, and EPA) on numerous days regarding petroleum odors coming from the site. Chevron records indicate that they responded by applying additional soil sealant and odor suppressant, and following up with the community members to address their concerns (Leslie Klinchuch, Chevron, Personal Communication, November 20, 2013). ATSDR discussed this issue with EPA and determined that naphthalene and benzo(a)pyrene were among the chemicals that may have caused the odor problems. Air-monitoring data for PAHs, including naphthalene and benzo(a)pyrene, at the site were collected to ensure the protection of workers under the Occupational Safety and Health Act, but detection limits were not sensitive enough to assess potential health risks to nearby residents. As part of the Dust Suppression and Air Monitoring Plan, EPA and Chevron evaluated how high the PAH concentration in site soil would have to be to pose a threat to residents if it became airborne. EPA and Chevron determined that all PAH on-site levels were below that limit (Holly Hadlock, EPA, Personal Communication, January 27, 2014). ATSDR conducted a similar analysis independently. More specifically, ATSDR calculated a

	rough estimate of combined cancer risk for inhaling benzo(a)pyrene and naphthalene from volatile dust emissions using the maximum soil concentrations detected on-site. Assuming exposure 24 hours per day, 5 days per week, for 8 months, the combined cancer risk was 5.7×10^{-7}. These results suggest that naphthalene and benzo(a)pyrene exposures were unlikely to increase cancer risk significantly beyond background levels, though additional data would be required to draw a clear conclusion. ATSDR information on environmental odors is available at http://www.atsdr.cdc.gov/odors/.

Environmental Contamination

Dust (PM) Data Review

Particulate matter (PM) is a term used to describe dust in the air. Dust created from vehicle traffic on unpaved roads and earth moving activities such as digging and hauling is referred to as fugitive dust. Mechanical forces such as tires moving on unpaved roads, and turbulent winds picking up PM from exposed surfaces also create fugitive dust. Wind can blow fugitive dust from the site into neighboring areas under certain conditions. This section discusses fugitive dust contamination that may have occurred during clean-up activities at the PCPL site.

PM is measured in different size fractions. These sizes are determined by the aerodynamic diameter[8] of the particle. PM_{10} refers to particles that are 10 micrometers in aerodynamic diameter or smaller, while $PM_{2.5}$ refers to particles that are 2.5 micrometers in aerodynamic diameter or smaller. These types of PM (PM_{10} and $PM_{2.5}$) are monitored frequently. Crushing, grinding, and paving asphalt often creates coarse PM_{10}. Motor-vehicle exhaust and burning wood or fossil fuels often create smaller $PM_{2.5}$ dust particles (BAAQMS 2012). The smaller the dust particle, the deeper into the lungs it can move. $PM_{2.5}$ is small enough to move from the lungs into the bloodstream (UNEP 2014).

Evaluating emissions from clean-up operations is difficult. Evaluators must consider that clean-up operations have a definite beginning and end, and that activities and emissions change during different phases of construction. Estimating area-wide emissions that are from a combination of individual on-site projects and other area sources is difficult also. Sources of fugitive dust emissions unrelated to the site may include traffic on unpaved roads, agricultural activities, and wind blowing over dry soil (CARB 2007; BAAQMD 2014). About 90% of all PM_{10} emissions are from fugitive dust sources (CARB 2007). Other than fugitive dust, sources of PM_{10} include combustion processes such as wood stoves and power generators, and vehicle exhaust (EPA 1995b). Agricultural sources and Highway 126 (i.e. E. Telegraph Rd) are near the PCPL site. While activities were ongoing at the PCPL site, the clean-up team monitored upwind and downwind air to try to account for non-site related dust (URS 2013).

[8] The *aerodynamic diameter* of a particle is the diameter of a perfect sphere that has the same motion characteristics as the real particle which is usually irregularly shaped and not a perfect sphere.

EPA developed National Ambient Air Quality Standards (NAAQS) for PM_{10} and $PM_{2.5}$. EPA reviews the standards every 5 years to ensure they protect human health and the environment, and bases them on the latest scientific evidence. EPA requires limits of 24-hour levels of $PM_{2.5}$ to 35 micrograms of dust per cubic meter of air (µg/m^3) and PM_{10} to 150 µg/m^3 (**Table 2**), and limits annual averages of $PM_{2.5}$ to 12 µg/m^3 (NAAQS 2011). California limits annual averages of PM_{10} to 20 µg/m^3 and has a more protective (stricter) 24-hour standard of 50 µg/m^3 for PM_{10} (CARB 2012).

Table 2. Regulatory Standards for Particulate Matter in Air

	$PM_{2.5}$ (Fine Particles)		**PM_{10} (Course Particles)**	
	EPA	**CA**	**EPA**	**CA**
Annual Average (µg/m^3)	12*	12‡	No value	20‡
24-Hour Average (µg/m^3)	35†	No value	150¥	50€

EPA – U.S. Environmental Protection Agency
CA – California State Air Quality Standard
µg/m^3 – micrograms per cubic meter of air
*Annual arithmetic mean, averaged over 3 years
‡ Annual arithmetic mean
† 98th percentile concentration, averaged over three-years
¥ Not to be exceeded more than once per year on average over three years
€ 24-hour arithmetic mean

Dust Control at the Site

To control PM releases, the Ventura County Air Pollution Control Division (VCAPCD 2008) enforces restrictions on fugitive dust releases by generally requiring that:

- visible dust must not pass over property lines
- the opacity (how much light it ‘blocks’) of dust must be maintained below 20%
- steps must be taken to control tracking dust out onto roadways
- specific restrictions for earth-moving, bulk-material handling, and truck hauling must be observed

The site Dust Suppression and Air Monitoring Plan specified the dust control and monitoring measures to be taken during site activities in 2013-2014 (URS 2013). These measures included:

Monitoring: PM_{10} and dust contaminants were monitored at ten stations at the site perimeter (Figure 3) at Stations 1–7 on the west (residential) side and Stations 8–10 on the east (nonresidential) side. A weather station monitored wind speed and direction, temperature, humidity, and barometric pressure at 1-minute intervals at a central location on-site.

Measurements: Airborne dust was measured using three methods:

1. Real-time PM_{10} measurements were performed periodically throughout the day at each station using a single hand-held instrument that was moved from station to station. Wind direction was recorded with each measurement.

2. A stationary beta attenuation monitor (E-BAM) located at Station 3 operated continuously from April to November 2013.
3. Stationary dust collection samples (used to determine 8-hour or 24-hour average concentrations) were collected on a filter once each week and sent to the laboratory for PM_{10}, lead, and PAH analysis.

Dust Suppression: Dust control was required at exposed areas via watering, applying an EPA-approved soil stabilizer, and applying crushed concrete or gravel; gravel was applied at the vehicle exit to minimize tracking-out issues; paved roads, parking or staging areas, and public roads at the controlled site-access point were wet swept daily; and speed limits of 10 MPH were used on unpaved roads.

Practices: Soil moving activities were stopped on high-wind days (when sustained wind speeds of 25 mph or greater were detected or expected, or when visible dust was observed at the property boundary); wattles (bulk encasements that prevent erosion) were used to protect all loose stockpiled construction materials that lay dormant for more than 14 days; mitigation activities were implemented to prevent visible dust from extending beyond the site boundary during excavation activities; and signs were posted with the project contact name and phone number and the VCAPCD phone number for dust complaints (Appendix A).

Dust Monitoring Data

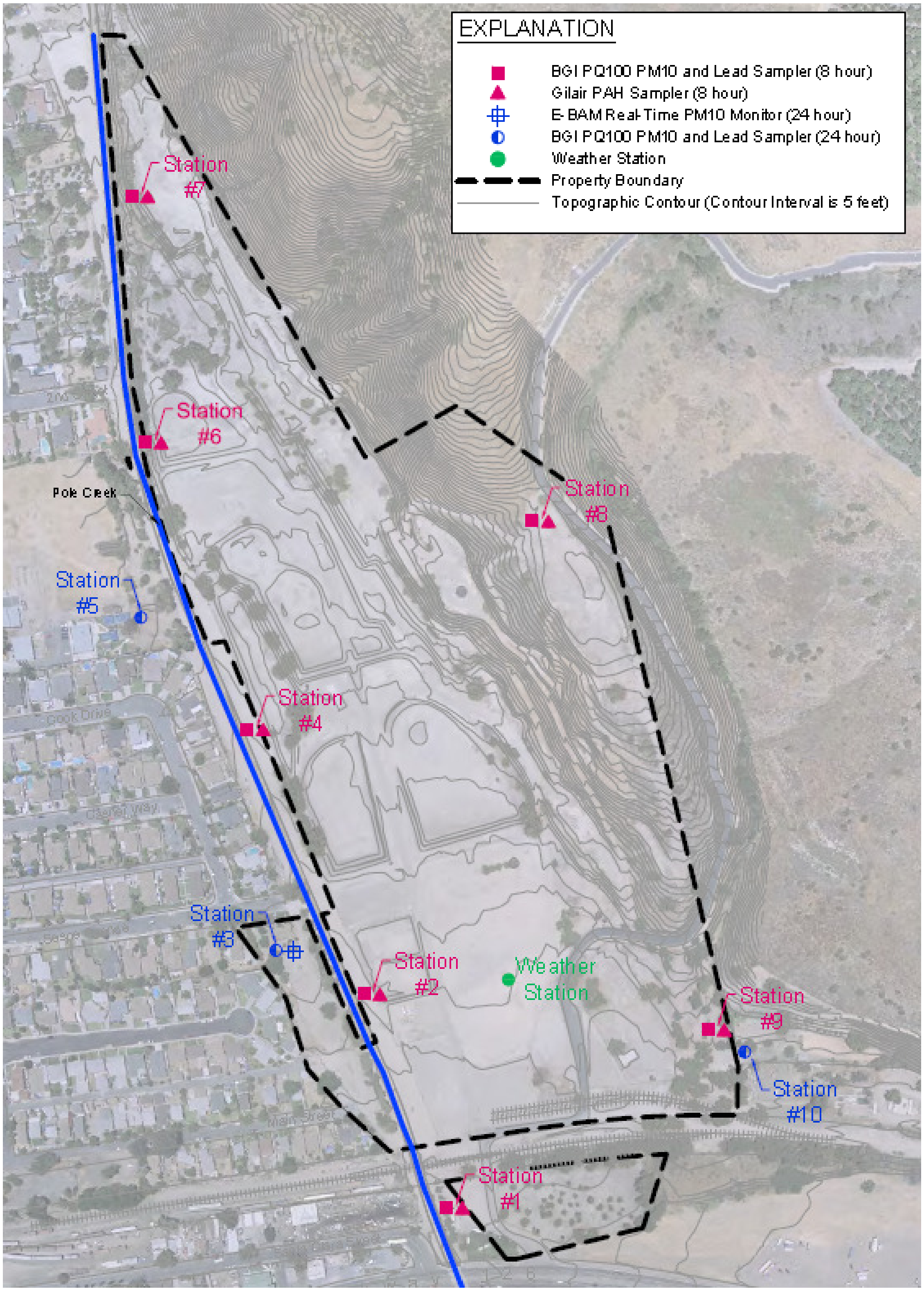
ATSDR reviewed dust-monitoring data collected by EPA and Chevron for the PCPL site from 2011 to 2013 (**Table 3**). In reviewing the 2013 data, ATSDR noted that the PM_{10} levels recorded by the real-time (hand-held) monitor were generally lower than the 8- and 24-hour average levels recorded by stationary monitors. According to Chevron, this was due to differences in the sampling methods. More specifically, there are two reasons for the differences: 1) stationary time-integrated monitoring captured short-term elevations in dust levels likely missed by the real-time hand-held monitoring (Leslie Klinchuch, Chevron, Personal Communication, October 1, 2013); and 2) a single hand-held monitor was used and moved around by an employee from station to station in 2013 thus many times the monitor was upwind of the drifting dust. The stationary beta attenuation monitor measured PM_{10} dust every 15 minutes on the southwest side of the site, but may not have measured dust migrating off-site to the north or south of its location. Real-time monitoring with the DustTrak was intended to identify immediate dust concerns at the site.

Table 3. Dust-monitoring Data Available for PCPL Site 2011–2013

Year/Months	Data Type	Data Description	Sampling Frequency of Data Analyzed	Number of monitoring stations
2011 (June–November)	DustTrak discrete, real-time[9]	Discrete PM_{10} concentrations collected with stationary monitors throughout each work day (7:00 AM – 5:00PM)	Daily averages based on samples collected every minute	7
2012 (July–December)	DustTrak discrete, real-time[10]	Discrete PM_{10} concentrations collected with stationary monitors throughout each work day (7:00 AM – 5:00 PM)	Daily averages based on samples collected every 15 minutes	9
2013 (May–November)	Averaged stationary, real-time[11]	24-hour PM_{10} concentrations collected with stationary beta attenuation monitor daily	Hourly	1 (station 3)
	Time-weighted stationary, lab analyzed[12]	24-hour time-weighted-average PM_{10} concentration collected with stationary monitor for 1 day per week[13] and analyzed in a laboratory	One sample collected over 24 hours	3 (stations 3, 5 and 10, see Figure 3)
	Time-weighted stationary, lab analyzed[12]	8-hour time-weighted-average PM_{10} concentration collected with stationary monitor 1 day per week and analyzed in a laboratory	One sample collected over 8 hours	7 (stations 1, 2, 4, 6, 7, 8, and 9, see Figure 3)
	DustTrak discrete hand-held, real time[14]	Single point-in-time (discrete) PM_{10} concentrations collected periodically with a single hand-held monitor, moved from station to station, throughout each work day (7:00 AM – 5:00 PM)	Variable	10

[9] These data were collected using a stationary TSI DustTrak 8520 monitor for $PM_{10.}$
[10] These data were collected using a stationary TSI DustTrak 8530 monitor for $PM_{10.}$
[11] These data were collected using a Met One E-BAM beta attenuation monitor for $PM_{10,}$ which measures the attenuation of beta rays by dust pulled through the sample nozzle.
[12] These data were collected using BGI PQ100 federal equivalent method samplers that collects PM_{10} by pulling air over 47 mm filters at 16.7 liters per minute. The filter is then sent to a laboratory for analysis.
[13] Samples for lab analysis were mostly collected on Tuesdays and Wednesdays, but samples were occasionally collected on Mondays and Thursdays.
[14] These data were collected using a portable direct reading hand-held TSI DustTrak 8532 monitor for $PM_{10.}$

Figure 3. Location and Type of Air Monitoring at the PCPL Site in 2013 (URS 2013)



Hourly Integrated and Averaged 24-hour Real-time Dust Monitoring Data (E-BAM)

The hourly PM_{10} measurements collected in 2013 from the E-BAM equipment and the hourly wind measurements from the weather station were analyzed. The following calendar plot[15] provides a summary of the dominant overall daily wind speed and direction in conjunction with the average PM_{10} concentrations for each day (calculated from hourly measurements; **Figure 4**). The arrows in Figure 4 indicate the direction the wind is blowing to. The data trends, such as the increase and decrease of PM_{10} and wind speed and wind direction shown in **Figure 5**, were apparent from the discrete data points collected. None of the data points were excluded as outliers. A more detailed visual analysis of the distribution of discrete sample points that went into the daily averages is presented in Appendix B. The average daily PM_{10} concentrations were higher than the CARB standard of 50 $\mu g/m^3$ on two days when the wind blew towards the residences — September 27, 2013, and October 4, 2013. A summary of the hourly PM_{10} data measurements was also calculated (**Table 4**).The highest PM_{10} concentration detected in all hourly measurements (343 $\mu g/m^3$) occurred on July 4, 2013 at 10:00 p.m. and was likely the result of fireworks.

Table 4. Statistics of PM_{10} Hourly E-BAM Measurements from All Wind Directions for May-November 2013

Statistic	PM_{10} ($\mu g/m^3$)
Minimum	0
Median	21
Average	24
Maximum	343

The 24-hour average PM_{10} was 52 $\mu g/m^3$ on September 27, 2013, and 110 $\mu g/m^3$ on October 4, 2013. **Figure 5** shows the hourly wind speed and direction and the PM_{10} concentrations measured by E-BAM on these days). Arrows indicate the direction the wind is blowing to and the number next to each arrow indicates the wind speed (mph).

$PM_{2.5}$ data were not available for ATSDR to review. However, we estimated the daily average $PM_{2.5}$ during the 2013 time-frame of the remedial activities based on measured PM_{10} data (from all sources) and on EPA studies (EPA 2014b) that found that 10% to 40% of fugitive PM_{10} tends to be $PM_{2.5}$ (Appendix C). ATSDR estimated the potential range of $PM_{2.5}$ levels assuming 10% to 40% of measured PM_{10} was $PM_{2.5}$. ATSDR found only one instance in 2013 (October 4) when the 24-hour $PM_{2.5}$ NAAQS of 35 $\mu g/m^3$ may have been exceeded (44 $\mu g/m^3$) under EPA's worst-case (40% of PM_{10} is $PM_{2.5}$) scenario (**Table 5**). All other values at the PCPL site were estimated from PM_{10} data (from all sources) to be less than that measured in Piru, California, about 5 miles east of Fillmore; the annual maximum 1-day average of $PM_{2.5}$ measurements in Piru for 2013 was 23.6 $\mu g/m^3$ (CARB 2014).

[15] The figure was generated using the Open Air calendarPlot function in R (http://www.openair-project.org/PDF/OpenAir_Manual.pdf).

Table 5. Range of Estimated $PM_{2.5}$ Daily Values Calculated from E-BAM Data for May – November 2013 Assuming 10% to 40% of PM_{10} is $PM_{2.5}$*

Type of $PM_{2.5}$ Estimate	Estimated $PM_{2.5}$ Daily Values (µg/m^3)	
	10% of PM_{10} is $PM_{2.5}$	40% of PM_{10} is $PM_{2.5}$
Minimum	0.8	3.2
Maximum	11	44[€]

* EPA studies found that 10% to 40% of fugitive PM_{10} tends to be $PM_{2.5}$ (EPA 2014b) (Appendix C).

[€] NOTE: One date, October 4, 2013, had an estimated $PM_{2.5}$ (44 µg/m^3) greater than the EPA $PM_{2.5}$ NAAQS 24-hour standard of 35 µg/m^3. Note that the standard is for the 98th percentile, averaged over 3 years. Thus, assuming this maximum $PM_{2.5}$ estimate was in the top 2% of $PM_{2.5}$ levels potentially experienced at the site over 3 years, it would not have exceeded the NAAQS.

ATSDR also estimated hourly $PM_{2.5}$ values, which are summarized in **Table 6**.The highest $PM_{2.5}$ concentration estimated in all hourly measurements (34 - 137 µg/m^3, depending on the scenario) occurred on July 4, 2013 at 10:00 p.m. and could have been the result of fireworks. More elevated $PM_{2.5}$ concentrations generally present increased risk of health effects.

Table 6. Range of Estimated $PM_{2.5}$ Hourly Values Calculated from E-BAM Data from All Wind Directions for May-November 2013 Assuming 10% to 40% of PM_{10} is $PM_{2.5}$*

Type of $PM_{2.5}$ Estimate	Estimated $PM_{2.5}$ Hourly Values (µg/m^3)	
	10% of PM_{10} is $PM_{2.5}$	40% of PM_{10} is $PM_{2.5}$
Minimum	0	0
Median	2.1	8.4
Average	2.4	9.4
Maximum	34	137

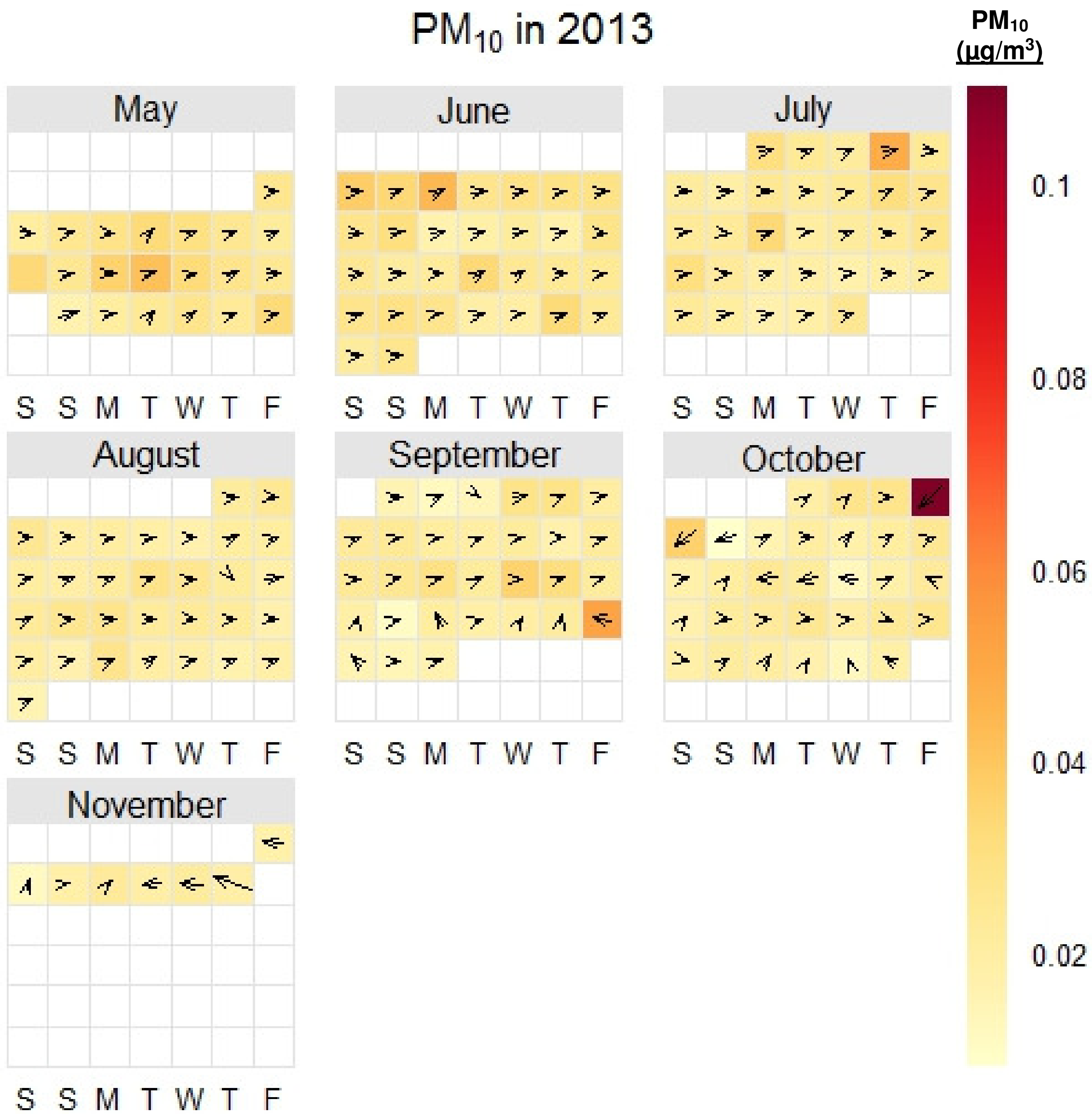
* EPA studies found that 10% to 40% of fugitive PM_{10} tends to be $PM_{2.5}$ (EPA 2014b) (Appendix C).

On September 27, 2013, PM_{10} measurements peaked at 214 µg/m^3 during the day. The highest wind speed measured during the sampling effort, 19.1 mph, occurred on this day. The winds generally blew from the site towards the residential area. Earthwork at the site shut down at 2:00 p.m. on that day due to the high winds. A smaller peak occurred at 7:00 p.m., though the winds were calm at the time. Chevron reported upwind hand-held PM_{10} measurements taken until 1:15 p.m. on that date averaged 3 µg/m^3 higher than downwind.

PM_{10} measurements began to rise at 5:00 a.m. on October 4, 2013, exceeded 100 µg/m^3 by 6:00 a.m. and ranged from 252 µg/m^3 to 289 µg/m^3 between 9:00 a.m. and 12:00 p.m. Earthwork at the site shut down at 12:00 p.m. due to the high winds. The wind and PM_{10} decreased after 6:00 p.m., though there was a short peak of 109 µg/m^3 at 9:00 p.m. The weather station showed that wind speed increased and blew from the site towards the residential area around 8:00 a.m. on October 4, 2014. Chevron reported upwind hand-held PM_{10} measurements collected until 9:32 a.m. on that date averaged 7 µg/m^3 higher than downwind.

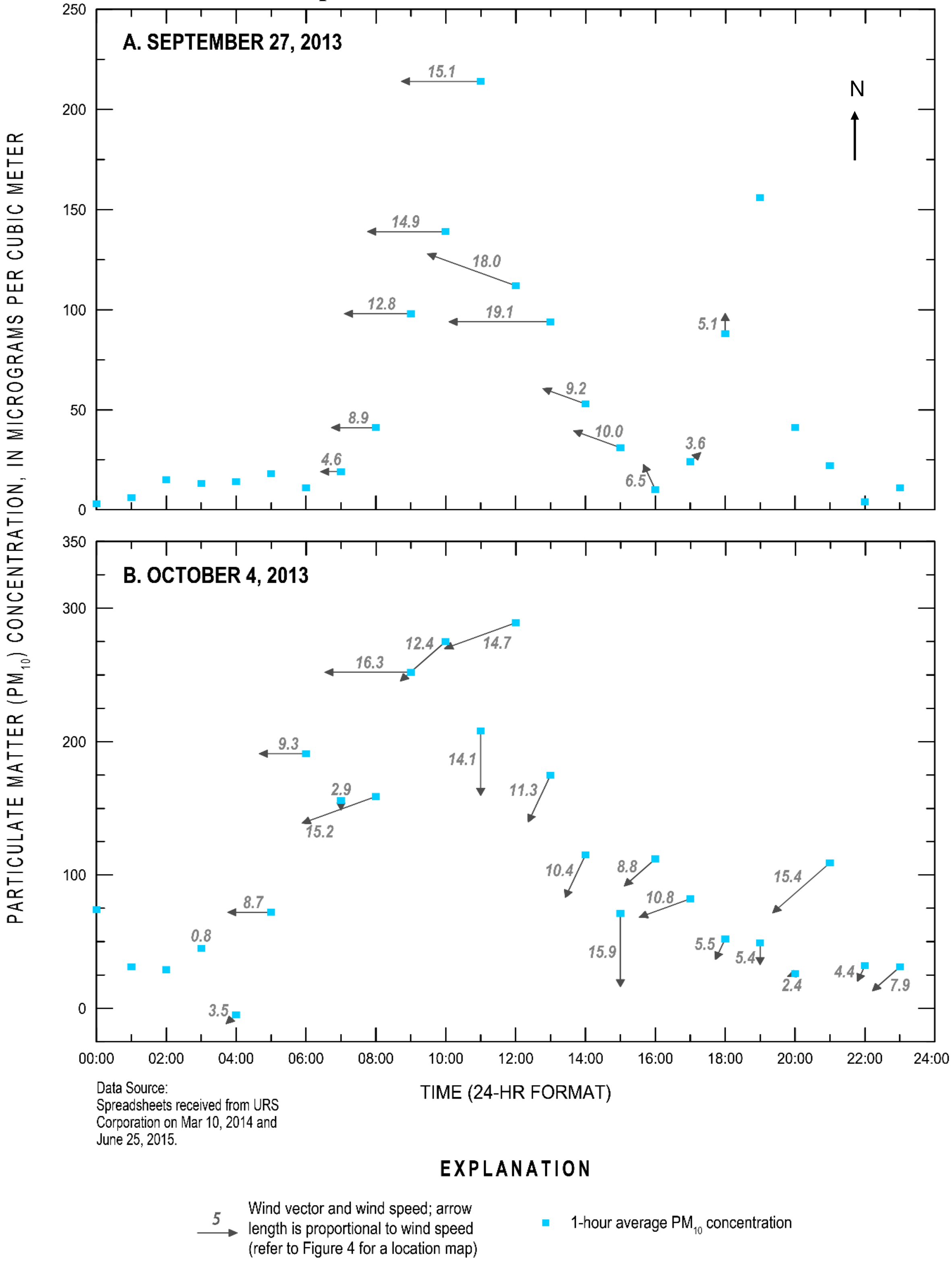
ATSDR reviewed wind data for two data gaps in the E-BAM data and found that the wind either blew from the residential area toward the site, or it blew at less than one mph during those times.

Figure 4. Summaries of PM_{10} (Daily Averages) Detected by E-BAM (Station #3) Shown with Wind Direction* and Speed€ from the Weather Monitoring Station for May to Early November 2013



*Winds blowing toward the community are indicated by arrows that point left
€ The length of the arrow indicates wind speed, i.e., longer arrows indicate higher wind speeds.

Figure 5. Wind Speed, Wind Direction, and PM_{10} for 2 Days of Elevated Dust* Detected by E-BAM Measurements in September and October 2013



* Elevated dust refers to days when the daily average PM_{10} was higher than the CARB standard of 50 µg/m^3. Arrows pointing west (left) indicate that the community was downwind of the site.

DustTrak Monitoring Data

DustTrak monitoring equipment was used in 2011, 2012, and 2013 (Table 3). The data from those instruments indicate that during 2013 site work PM_{10} levels[16] fluctuated between 1 µg/m^3 and 323 µg/m^3 on the west side of the site (closest to the Fillmore community), with most measurements falling in the 17 µg/m^3 to 44 µg/m^3 range (25th to 75th percentile). The daily average PM_{10} dust levels measured in 2011, 2012, and 2013 ranged from 26 µg/m^3 to 37 µg/m^3 during site earthmoving activities **(Figure 6)**.

On most days when the wind increased to > 10 mph across the site and toward residences (usually around mid-day), the PM_{10} levels on the upwind and downwind (residential) sides of the site were similar (**Figure 7**). At times, the PM was higher upwind than downwind. This suggests that much of the measured dust was from non-site sources and site activities did not affect the measured dust greatly.

ATSDR tried to determine whether dust from the site could have blown west into the nearby residential community. To do this, ATSDR reviewed the data for days when dust measurements on the west (residential) side of the site were elevated[17] and wind blew > 10 mph from the site towards those residences; this situation occurred on 5 days during the 6 months of earthmoving activities in 2013. A detailed evaluation of wind direction, wind speed, and hand-held dust measurements collected during each of these 5 days is shown in Appendix D. The analysis suggests that the measured dust was primarily from off-site (background) sources or if it blew from the site toward the neighborhood, high PM levels only occurred for a few minutes to a few hours of the day. However, there is uncertainty in this conclusion because the hand held instrument used to collect this data was moved from station to station and did not measure upwind and downwind dust simultaneously in 2013. The stationary beta attenuation monitor measured PM_{10} dust every 15 minutes on the southwest side of the site, but may not have measured dust migrating off-site to the north or south of its location. Exposures to the levels detected are not expected to cause any long-term health effects, although such exposure could have caused sensitive people to experience short-term effects such as breathing problems/impairment or cardiovascular problems.

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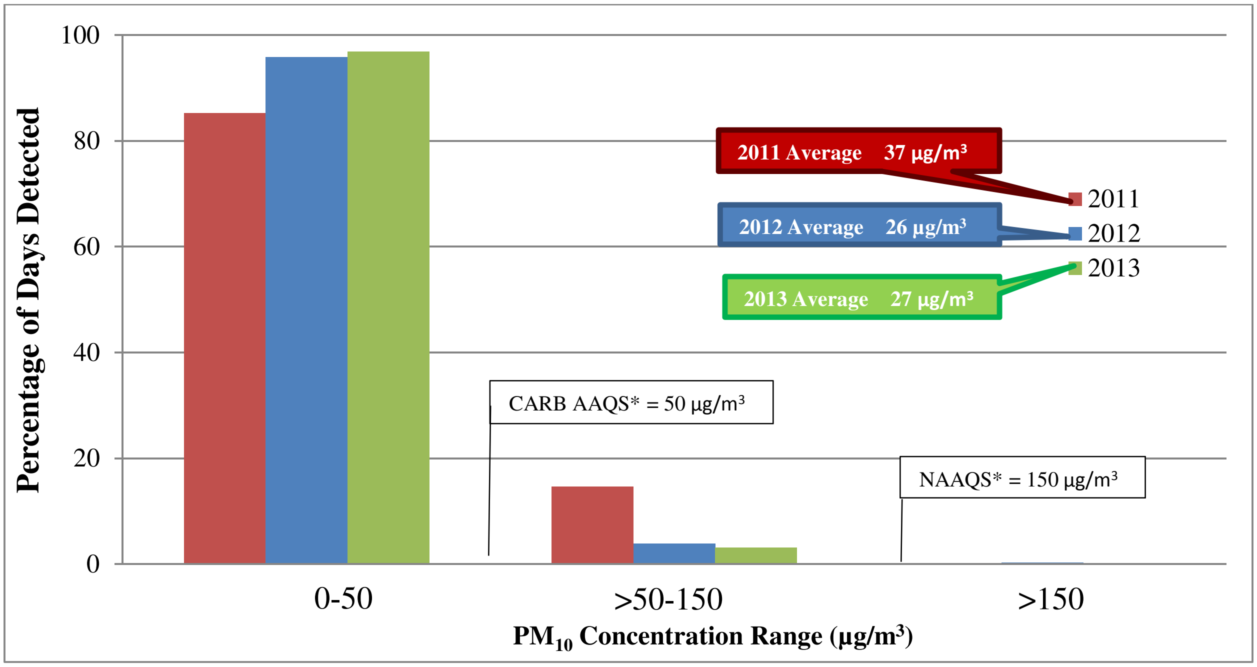
[16] Hand-held measurements occurred every few hours at each station.

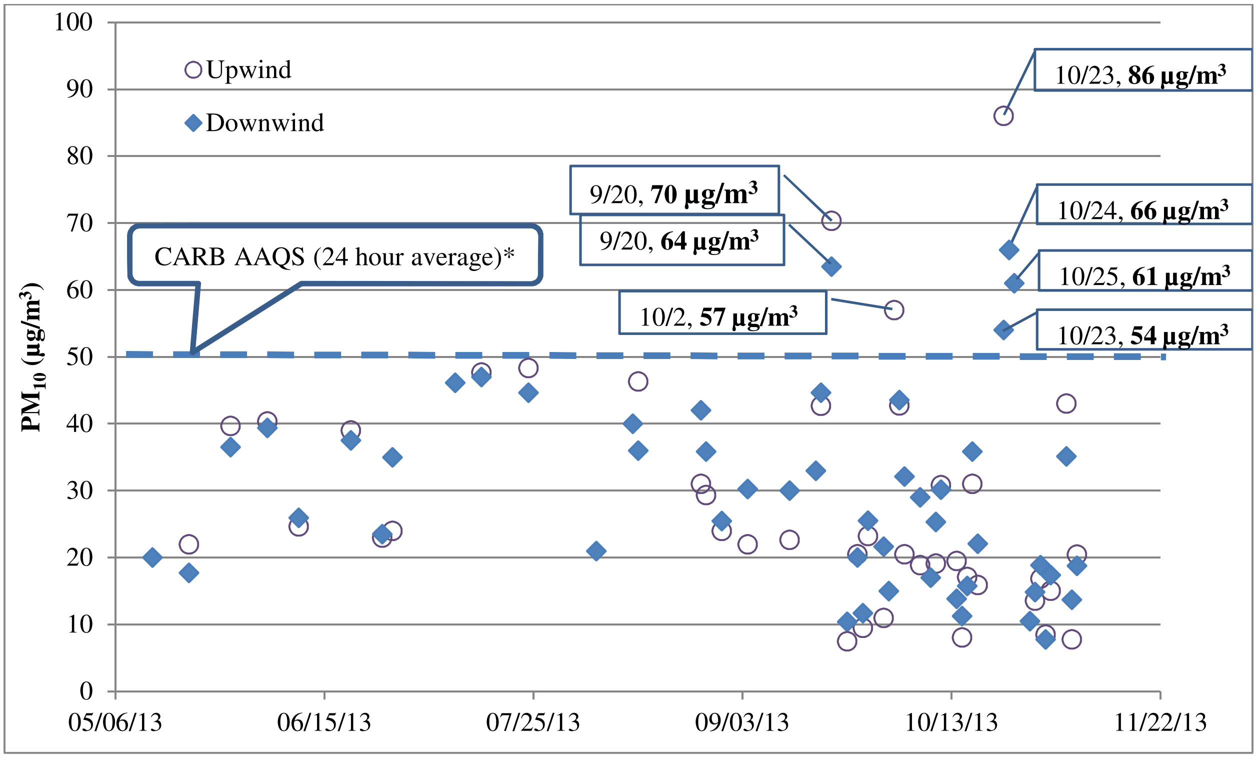
[17] Elevated dust refers to dust levels higher than 50 µg/m^3. The hand-held data were not used to enforce CARB standards, but only to guide daily site operational decisions. Additionally, the data collected were only for the part of the year while earthwork activities were underway.

Figure 6. Daily Average Airborne Concentration of PM_{10} Detected by DustTrak Monitoring at West Perimeter during Earthmoving Activities On-Site (includes all wind directions) for 2011-2013



* These daily standards provided for reference only. The DustTrak measurements are collected for less than 24-hours and inappropriate for making regulatory decisions.

Figure 7. Daily Average Airborne Dust Levels Measured Upwind and Downwind of the Site when Wind was Blowing >10 mph towards Residences (Hand-held Monitoring) for May-November 2013



* This daily standard provided for reference only. The DustTrak hand-held (mobile) measurements are collected for less than 24-hours and inappropriate for making regulatory decisions.

Time-weighted, Lab Analyzed Dust-monitoring Data (2013 only)

ATSDR reviewed the data collected using stationary air samplers that sampled at least weekly for 8- and 24-hour periods from May to November 2013. Twenty-two percent of the lab analyzed PM_{10} measurements from on-site and off-site sampling stations were higher than the CARB AAQS of 50 µg/m³ in 2013. These data indicated that periodic spikes in dust concentrations may have occurred at the site, but were usually not reflected in the hand-held measurements.

ATSDR reviewed wind data for each day that PM_{10} blew continuously from the site toward the adjacent neighborhood and was > 50 µg/m³ (five days). Detailed analysis of wind direction and wind speed with dust measurements across the site (shown in Appendix D) showed that PM_{10} exposure was a health concern on only one day, November 5, 2013. On November 5, 2013, an elevated dust level (110 µg/m³) was measured on the southern portion of the site and blew into the residential area.

The CARB AAQS standard of 50 µg/m³ applies to 24-hour averaged exposures and was most applicable when compared to off-site samples collected over 24-hour periods. The lab analyzed 2013 PM_{10} measurements for the off-site stations placed near the San Cayetano Elementary School and the Boy Scout House showed that the PM_{10} was > 50 µg/m³ on 2 days. However, on those days, May 16, 2013, and June 19, 2013, all wind direction records showed wind blowing towards the east except one: on May 16, 2013 at 12:00 pm very low wind speed (2 mph) blew toward the northwest. Thus, the majority of the PM_{10} measured at those locations, which ranged from 66 µg/m^3 to 68 µg/m^3, likely did not originate at the site. Of the seven locations of 8-hour, on-site lab analyzed measurements, 29% were higher than 50 µg/m^3. Of the three locations of 24-hour, off-site lab analyzed measurements, 6% were higher than 50 µg/m^3.

Dust-monitoring Data Discussion

As noted earlier, the PM_{10} level at the site sometimes exceeded regulatory standards. The hand-held PM_{10} levels from the upwind versus downwind perimeter stations were used to make operational decisions onsite. Agricultural activities and the natural erosion of soil by wind in dry climates such as the area surrounding the PCPL site create dust. CARB oversees dust monitoring at many locations in the state. Measured PM_{10} levels were typically more than twice the state's standard at more than half the locations monitored by CARB across the state (CARB 2007). These data suggest that regional sources likely contributed to PCPL monitoring station dust measurements that exceeded the CARB AAQS on some days during the clean-up activities.

The dust samples were collected along the periphery of the site. Most dust particles settle out of the air due to gravity over certain distances. The primary factors affecting how far dust particles will travel before they fall to the ground (and can no longer be inhaled) include:

- Particle size
- Rainfall
- Vegetative cover
- Wind breaks
- Wind

Particle Size

Generally, the smaller the particle and the higher the wind speed, the farther the particle will travel before gravity causes it to settle to the ground. With a wind speed of 10 mph, particles > 100 µm in diameter settle within 20 to 30 feet of the source, whereas particles from about 30 µm to 100 µm settle within a few hundred feet (EPA 1995a). PM_{10} and $PM_{2.5}$ are less susceptible to gravitational settling and travel farther. When PM_{10} reaches the atmosphere it can travel as much as 30 miles and $PM_{2.5}$ can migrate hundreds of miles (BAAQMD 2014). Most fugitive dust sources have a $PM_{2.5}$ to PM_{10} ratio of 0.10 (1:10) to 0.15 (1:6.7) (MRI 2006).

Rainfall

Two factors related to rainfall affect the amount of dust generated: soil-moisture content and direct removal of dust from air. Soils with moisture content less than about 8% are more likely to generate fugitive dust. More than 0.01 inch of daily rainfall decreases fugitive dust substantially (EPA 2002). Rain also actively removes PM from the air because the dust particles are absorbed into the falling rain. The Fillmore region has about 40 days per year with 0.01 inch or more of rainfall (EPA 2002). The climate is semi-arid Mediterranean and averages about 18 inches of rain each year, mostly during the winter months (URS 2011).

Vegetative Cover

Through the soil clean-up process the PCPL site had very little vegetative cover to reduce fugitive dust. Chevron used water, gravel, and an EPA-approved soil stabilizer to minimize dust releases. After completing soil clean-up, Chevron covered 70% of the site with seeded slopes, crushed concrete and brick material.[18]

Wind Breaks

Vegetation and other forms of windbreaks can slow wind speed and allow more time for dust particles to settle (Pardyjak et al. 2007). As shown in **Figure 8**, some trees and vegetation are present between the site and the neighboring community to help the dust settle. However, some areas have little to no windbreak vegetation. The thicker the trees and vegetation are, the better they work as wind stops.

Wind

Faster and more turbulent winds (those with rapid pressure and velocity change) carry particles farther than slower, milder winds. Wind turbulence (at 12 mph) causes dust emissions that pick up soil particles and carrying them a certain height and distance (EPA 1995a). Dust can also become airborne and carried in the wind when vehicle tires and earthmoving activities pulverize and abrade soil and rock.

Hourly PM_{10} data collected from May to November 2013 averaged 23 $\mu g/m^3$ when wind was less than 10 mph. Winds > 10 mph created an average PM_{10} of 45 $\mu g/m^3$, and winds > 12 mph created an average PM_{10} of 70 $\mu g/m^3$.

More than 30,000 discrete wind measurements were taken at 15 minute intervals between June and November 2011 and June and December 2012 using an on-site meteorological station. The measured period of 2013 was generally windier than that of 2011 and 2012 (**Figure 9).** Twenty-five percent of the measured wind blew towards the west (towards the residential area) and 68% of the measured wind blew towards the east in the measured period of 2011 and 2012. The wind rose in **Figure 10** shows wind direction and speed measured in 2011 and 2012. The wind rose in **Figure 11** shows wind speed and direction measurements from 2013. Overall, the wind blew more frequently from the west (away from the residential area). Though less frequent, when the winds blew from the east they tended to be stronger. The 24-hour wind speed measurements (15-minute intervals) averaged 2 mph and ranged from 0 mph to 13 mph during monitoring from June to November 2011 and June to December 2012. During the monitoring period from May to November 2013, the measurements at each station showed that the wind blew from the west (away from the residential area) 88% of the time. The clean-up period spanned the school summer break, which was also generally a low-wind period.

The average of discrete 24-hour wind speed measurements (hourly intervals) from the on-site meteorological station from May 10, 2013, to November 8, 2013, was 2.9 mph, with the maximum measured value of 19.1 mph at 1:00 p.m. on September 27, 2013, the windiest day.

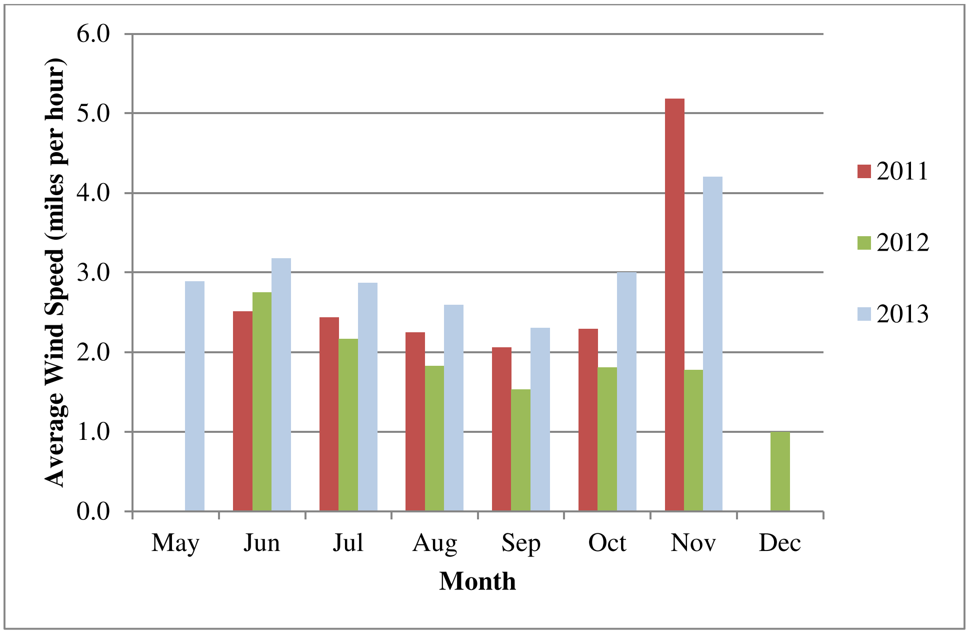
[18] See comments received in Appendix J.

Chevron's community interaction records indicated that work was stopped at the site on 7 days between April and November 2013 because of windy conditions (Leslie Klinchuch, Chevron, Personal Communication, November 20, 2013).

Figure 8. Photos Showing Windbreak Foliage between Site and Community*

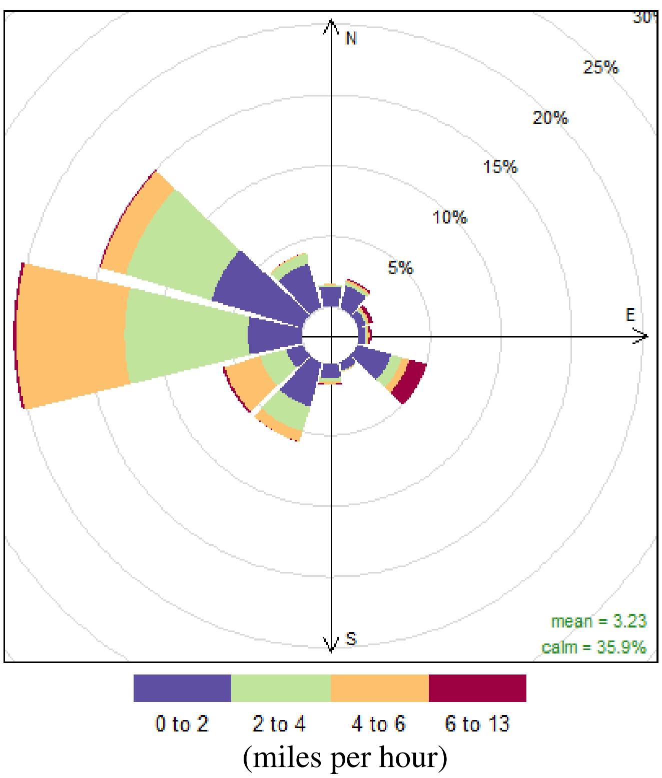
* Photos taken by ATSDR staff during site tour in January 2013. Photo A shows mixed foliage density between the site and schoolyard. Photo B shows an area of thick foliage density on the west side of the site. Photo C shows an area of mixed foliage density and a large gap in foliage on the west side of the site. Photo D shows an area with no foliage between the west side of the site and nearby homes.

Figure 9. Average Wind Speed from On-site Monitoring Stations*, 2011-2013



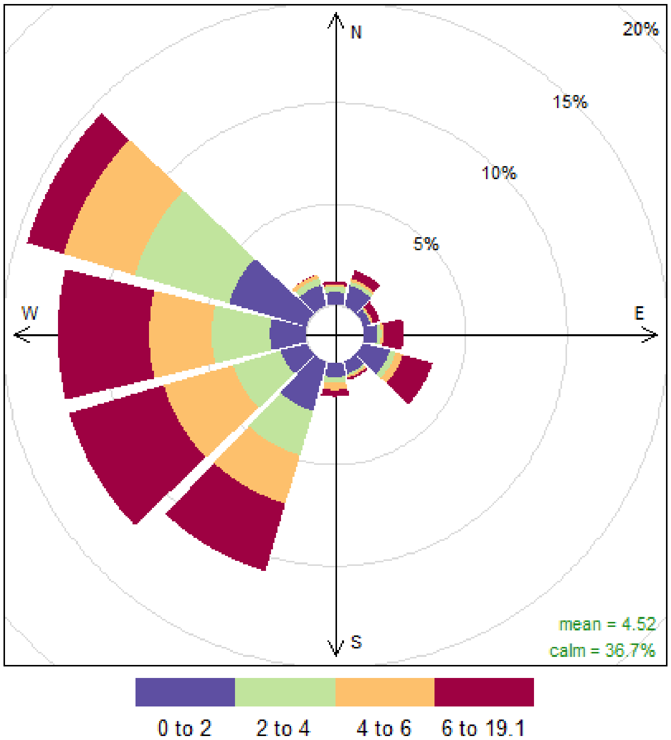
* Averages were calculated from wind speed discretely measured 24-hours a day at 15-minute intervals during 2011 and 2012 and 24-hours a day at 1 hour intervals during 2013.

Figure 10. Site Wind Rose for June to November 2011 & June to December 2012



NOTE: The length of each "spoke" indicates the frequency of wind blowing from that direction. N = 13,396 for 2011 and 17,215 for 2012

Figure 11. Site Wind Rose for March through November 2013



(miles per hour)

NOTE: The length of each "spoke" indicates the frequency of wind blowing from that direction. N=4,337

Data Review of Chemical Contamination in Soil and Dust

Chemical Contamination in Soil

The site consists of 14 areas of concern that had different historical uses or operations (**Figure 13**). The three-phased soil investigation included sampling 345 soil borings taken from 1 to 10 feet deep. Of the chemicals measured, only lead and PAHs needed further investigation to evaluate the possibility of health effects (Appendix E). The locations of elevated lead and PAHs in soil were scattered across the site and concentrations varied widely. The initial excavation locations selected by EPA and Chevron are shown in **Figure 14**. The excavators collected additional soil samples to make sure the clean-up requirements were met (EPA 2014a). Based on this sampling, additional areas to those shown in Figure 14 were excavated (EPA 2014a). **Table 7** summarizes lead and PAH levels measured in the site soil before the clean-up activities (URS 2011).

PAHs are a group of compounds that work in similar ways to affect the body. PAHs in the environment are usually a mixture of individual compounds. To evaluate the toxicity of the mixture (how poisonous it is), ATSDR compares the individual toxic compounds with the most toxic PAH, benzo(a)pyrene, to determine if the soil contains enough PAHs to increase the risk of cancer significantly for a person who may be exposed. The term for the combined level of all the PAHs is the "toxic equivalent" or "TEQ", but ATSDR uses the term "PAH mixture" for simplicity.

Figure 12. Map Showing Pacific Coast Pipeline Site Areas of Concern

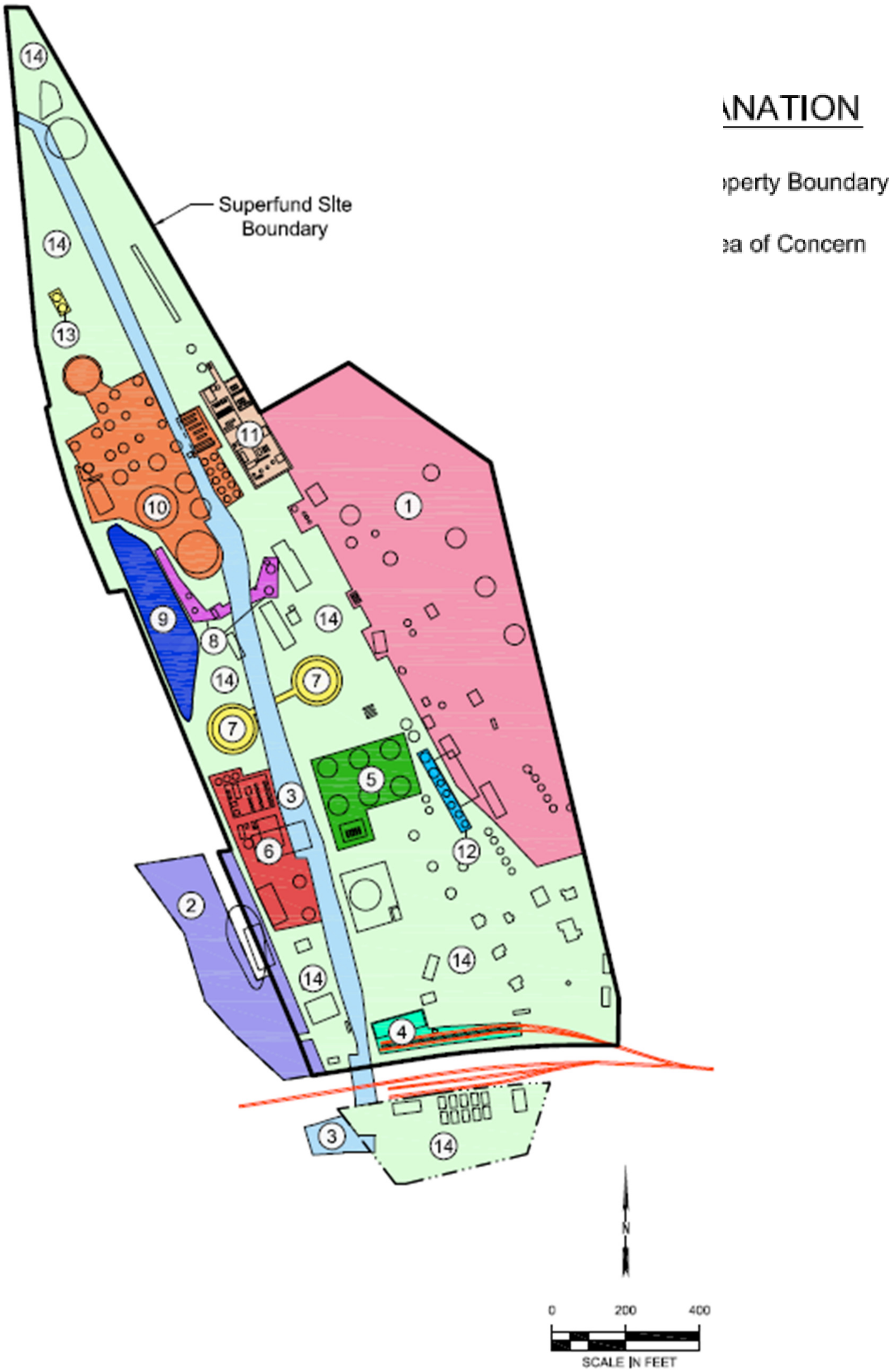
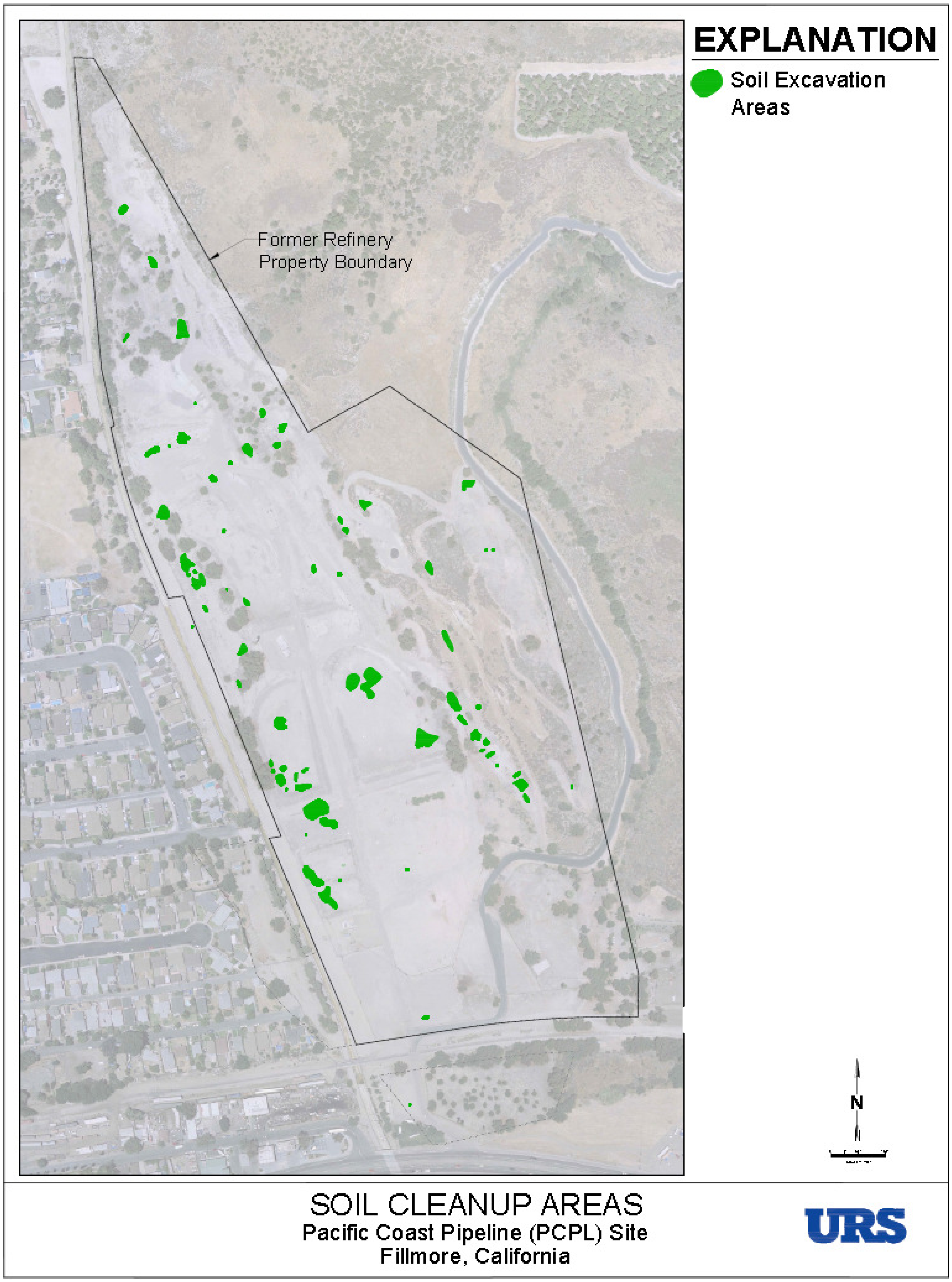


Figure 13. Lead- and PAH-Contaminated Soil Excavation Areas (Prior to Excavation)*



*Confirmation sampling during excavations resulted in more soil being excavated than originally estimated. The additional excavation areas are not shown in this figure.

Table 7. Site Soil Data (1-10 feet deep) Summary for Chemicals of Concern

Contaminant	Concentration Range (mg/kg)	Median Concentration (mg/kg)	Sitewide Average Concentrations (mg/kg)	
			Average	Upper Confidence Limit
Lead	0.086 - 34,000	8	251	606*
PAHs†	0.008 - 103	0.038	0.62	1.64€

* The upper confidence limit for lead was the 99% Chebyshev value recommended by ProUCL N=992.

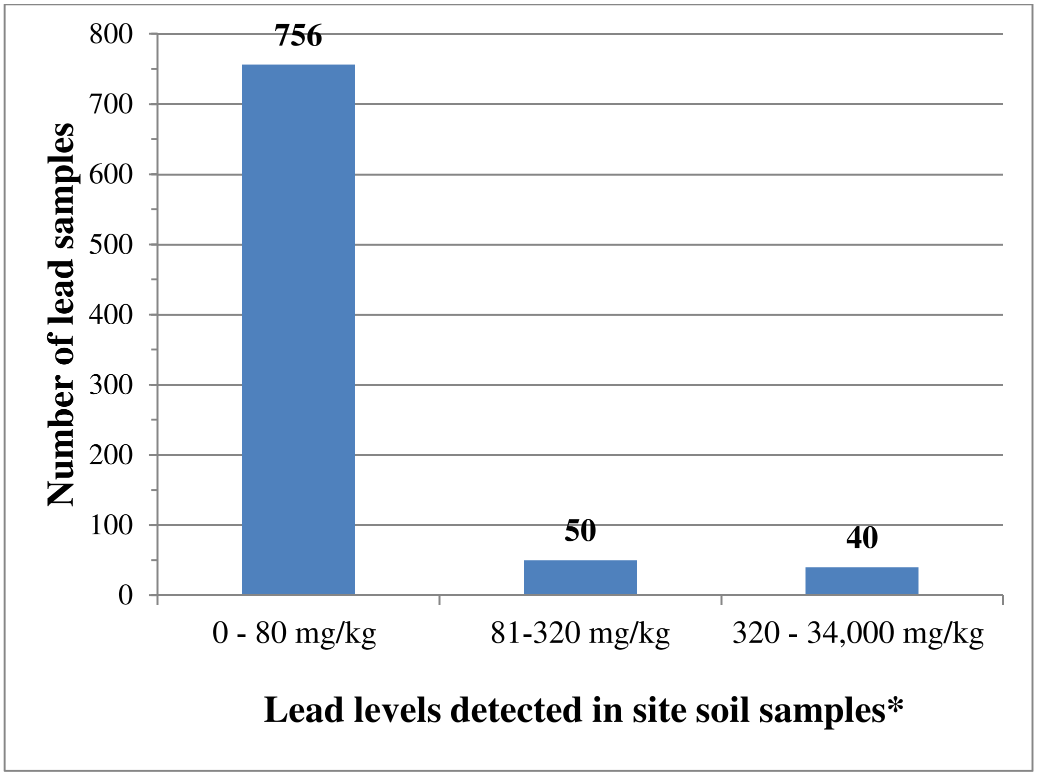
€ The upper confidence limit for PAHs was the 97.5% Chebyshev value recommended by ProUCL. N=992

† The benzo(a)pyrene toxic equivalent dose was calculated from the individual PAH concentrations at each location.

Figure 14 shows the range of lead levels found in soil samples at the site. In the three-phased sampling, the lead levels of 89% of the soil samples were lower than the California residential screening level of 80 mg/kg; lead levels of 7% of the samples were between the residential and the California commercial/industrial clean-up level of 320 mg/kg; and lead levels of 4% of the samples were higher than the commercial/industrial clean-up level (OEHHA 2009). See **Table 11** for information on the lead clean-up levels EPA used at the PCPL site.

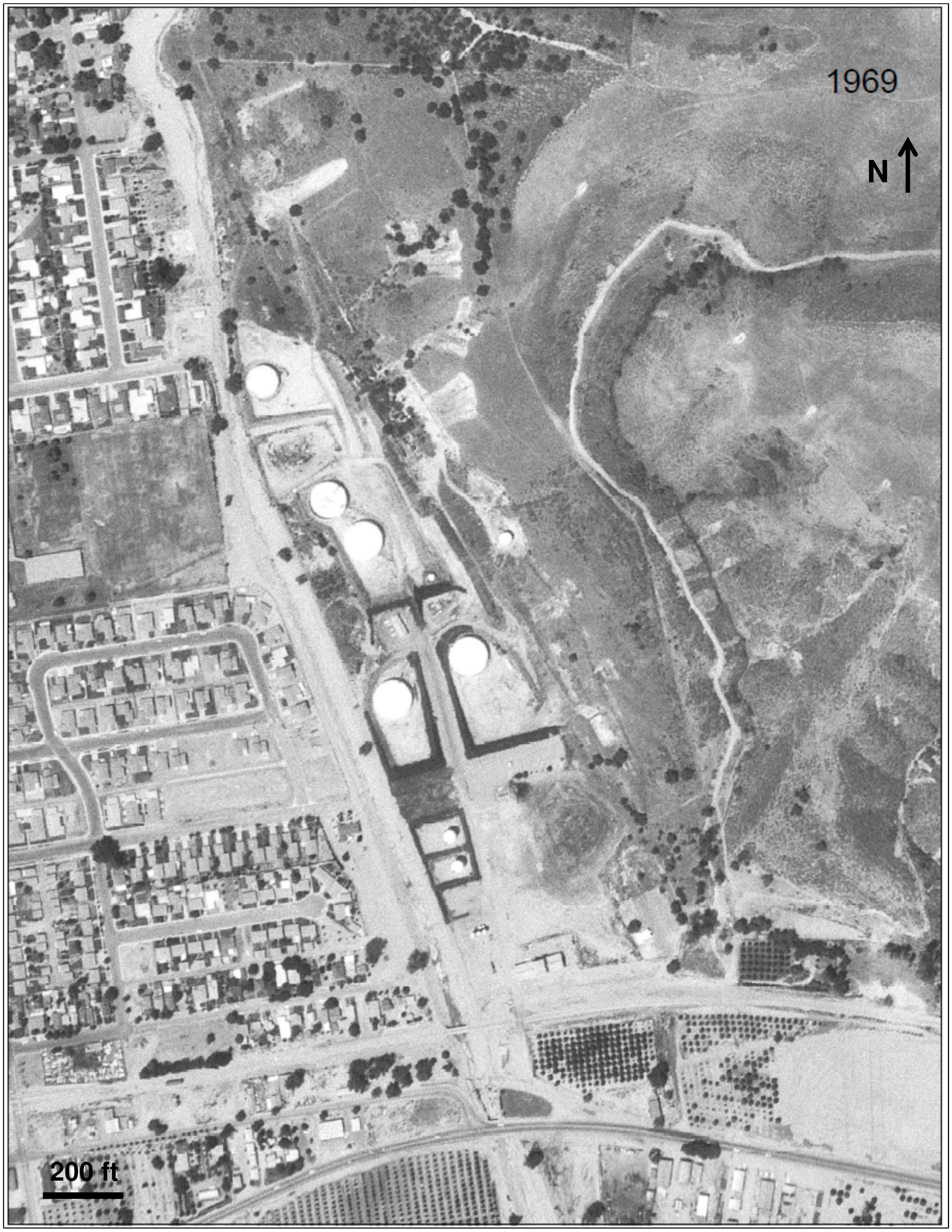
Samples were collected along the periphery of the site to determine background levels for lead in the area. The shallow soil (0 to 1 foot below ground surface) had a maximum background concentration of 26 mg/kg. Subsurface soil (1 to 6 feet below ground surface) had a maximum background concentration of 56 mg/kg. In 2007, the Ventura County Watershed Protection District (VCWPD) tested soils just west of Pole Creek for contaminants. ATSDR included the data VCWPD collected: at least 16 soil samples collected at various depths from 7 soil borings. These data do not suggest that lead and PAH contamination extends beyond the site boundary and into the neighboring residential area and school yard. These data are further discussed in the Uncertainties section of this report. Soils from private properties and near the school building were not sampled. Other sources of lead are likely present in the residential area near the site; for example, lead-based paint was used commonly on houses constructed before 1978. Before lead was removed from gasoline in 1995, burning leaded fuel deposited lead particles along roadways and on urban soil. **Figure 15** shows that residences existed adjacent to the site during the time when lead-based paint was used commonly.

Figure 14. Range of Lead Levels Detected in Soil



*California soil screening levels for lead are 80 mg/kg for residential land uses and 320 mg/kg for commercial/industrial land uses. See Table 11 for information on the lead clean-up levels EPA used at the PCPL site and Appendix F for a more detailed lead histogram.

Figure 15. 1969 Aerial Photo of the Site (housing was built before lead-based paint was phased out in 1978)*



* U.S. Geological Survey

Chemical Contamination in Dust

Site-dust measurements in 2011 and 2012 found no lead. However, at that time, Chevron was using the Occupational Safety and Health Administration Permissible Exposure Limit (PEL) of 50 µg/m^3 as the lead screening level. The 2011-2012 data cannot be used to determine if lead was greater than ATSDR's preferred lead screening level (the National Ambient Air Quality Standard for lead, 0.15 µg/m^3) because the laboratory that analyzed the samples used equipment and methods that set the detection limits too high (around 0.35 µg/m^3). ATSDR corresponded with EPA about improving this aspect of the dust-monitoring methods used at the site, and EPA and Chevron adjusted the detection limit levels (EPA 2013a). ATSDR reviewed monitoring data from May through July 2013 and found that all measurements were lower than the lead detection limits (0.13 µg/m^3 or lower) which is also lower than the EPA NAAQS (0.15 µg/m^3).

The average daily PM_{10} levels measured from 2011 through 2013 were lower than the NAAQS PM_{10} limit, except for 2 days in 2012. ATSDR used the NAAQS PM_{10} limit and site soil measurements to estimate a "worst case scenario" for long-term lead and PAH concentrations in dust (**Table 8**). The average PM_{10} levels for each year were from 26 µg/m^3 to 37 µg/m^3, and the 3 month rolling average of PM_{10} did not exceed the 24 hour average NAAQS limit of 150 µg/m^3. Therefore, estimated dust concentrations using the NAAQS level over-estimated the actual levels of these chemicals present in dust. The upper confidence limits for soil (1-10 feet deep) were calculated using ProUCL (EPA 2013b). The possible concentrations in dust represent PM generated by area disturbances, for example, vehicle traffic, earth-moving activities, or wind gusts. The lead PM estimate of 0.091 µg/m^3 is within the range of values that were measured during the six month sampling period in 2013 which were 0.13 µg/m^3 or lower. In addition, because clean-up activities of the most contaminated portions of the site did not begin until 2013, the actual dust generated on-site in 2011 and 2012 likely would not be from the soil with the highest concentrations of lead. ATSDR recommended to EPA that knowledge of soil contamination with real-time monitoring be used on the site to prevent the release of elevated lead dust emissions from the site (ATSDR 2013).

Table 8. Possible Contaminants in Dust Calculated from the NAAQS PM_{10} Limit (24-hour average) and the Upper Confidence Limit Average Soil Concentrations*

Contaminant	PM_{10} Limit (NAAQS)	Upper Confidence Limit (mg/kg)	Possible Concentration in Dust (µg/m^3)*,‡
Lead	150	605	0.091
PAHs†	150	1.64	0.00025

* Concentration of chemical in dust (µg/m^3) = PM_{10} (µg/m^3) x soil concentration (mg/kg) / unit conversion factor (1,000,000 mg/kg)

‡ For comparison to the NAAQS limit of 0.15 µg/m^3 lead and 0.00092 µg/m^3 PAH TEQ

† Toxic equivalents of benzo(a)pyrene calculated as shown in Appendix G

Exposure Evaluation

The following sections discuss the potential for exposures to PM, lead, and PAHs that could pose health risks to people near the site. The first section addresses whether dust generated during the clean-up process could expose nearby community members to PM, lead, and PAHs. The second section addresses whether the levels of lead and PAHs that remain in the soil after clean-up could pose health risks to site visitors.

PM, Lead, and PAH Exposures during Clean-up

Direct Contact with Soil Contaminants during Clean-up

Community members were unlikely to come into direct contact with site soils during the clean-up process. A fence that blocks unauthorized access surrounds the site. The date the fence was installed is unknown, but historic refinery photographs taken in 1931 and 1941 (available at the Fillmore Historical Museum) show the perimeter fencing in place (Leslie Klinchuch, Chevron, Personal Communication, March 31, 2014).

PM Exposures during Clean-up

Site soil clean-up activities started in 2013; from May to November, the clean-up team excavated contaminated soil and deposited it in two on-site consolidation areas (URS 2013). During this time, the clean-up team followed the site Dust Suppression and Air Monitoring Plan (URS 2013) to minimize the potential for releasing unacceptable levels of airborne contaminants in dust and to document conditions during clean-up activities. This included continuous monitoring to confirm that PM_{10} remained lower than the CARB recommended level of 50 µg/m^3. Still, contaminated dust could have migrated off-site to community areas during clean-up activities.

Exposure to Lead-contaminated Fugitive Dust during Clean-up

ATSDR investigated whether lead-contaminated fugitive dust could have migrated off site during clean-up activities. A residential area and an elementary school border the west side of the site. ATSDR reviewed lead-monitoring data from 10 monitoring stations around the site perimeter during clean-up activities from May through November of 2013. Lead in all dust samples measured was lower than the NAAQS limit of 0.15 µg/m^3. The amount of lead in each sample was also lower than the detection limit, which varied between 0.039 µg/m^3 and 0.13 µg/m^3. The EPA RSL for lead corresponds to the NAAQS standard for lead (NAAQS 2011).

In addition to the monitoring data, ATSDR estimated the possible range of lead dust that the clean-up activities could have created, based on the concentrations of site soil lead and which areas of the site were disturbed. As shown in **Table 9**, lead was more highly concentrated in specific areas of the soil. When those areas were disturbed, the resulting dust may have contained more lead. **Figure 14** shows the distribution of lead in all of the site soil sampled and Appendix F shows a more detailed view of the distribution of lead in site soil samples.

The dust-lead level estimated from the median, average, and upper confidence limit in site soil was lower than the RSL of 0.15 µg/m^3 (**Table 9**) and, therefore, lead blown off the site would likely not be present at high enough levels to be harmful. Average dust from work in each area of concern was estimated to be below the RSL. Dust from isolated soil borings with high lead contamination, such as that with the maximum concentration of 34,000 mg/kg, likely would have been dispersed into the air with other dust from site activities (such as vehicle travel, dozing, and dumping). The dispersion and mixing of dust likely would not result in off-site lead levels higher than the RSL. If areas of soil with average lead concentrations (3,000 mg/kg or lower) had been disturbed, predicted lead levels would have been lower than the 0.15 µg/m^3 RSL. Just 1.3% of soil lead samples were above the RSL of 3,000 mg/kg and they were scattered across the site indicating that lead hotspots of substantial size were not present (Appendix F). The monitoring of lead in dust at the site confirms that elevated lead in dust did not occur.

Table 9. Range of Maximum Estimated Lead Dust Concentrations from Clean-up

Measure	**Soil* Concentration (mg/kg)**	**Corresponding Dust Concentration (µg/m^3)[§]**	**Regional Screening Level (RSL; µg/m^3)[‡]**
Upper Confidence Limit	606	0.030	0.15
Average for Individual Areas of Concern	7 – 836	0.0004 – 0.042	
Site-wide Average	251	0.013	
Median	8	0.0004	
RSL Threshold	3,000	0.15	
Site-wide Maximum	34,000	1.7	

*Concentration of chemical in dust (µg/m^3) = PM_{10} (50 µg/m^3) x soil concentration (mg/kg) / unit conversion factor (1,000,000 mg/kg)

§ 1-10 feet deep

‡ RSL = EPA's Regional Screening Levels (EPA 2015).

Exposures to PAH-contaminated Fugitive Dust during Clean-up

ATSDR investigated whether PAH-contaminated dust could have migrated off-site during clean-up activities and posed a health risk to nearby residents. **Table 10** shows a range of soil concentrations of the PAH mixture and the corresponding estimated amount of PAH mixture that could have been present in 50 µg/m^3 of site dust during clean-up. These estimated PAH in dust levels can be compared to EPA's regional screening dust level, which is based on a calculated risk of 1 more cancer case per 1,000,000 exposed people.

The estimated average PAH-dust level throughout the site was more than 20 times lower than the RSL. Dust from work in the individual areas of concern were also estimated to be below the RSL. The PAH screening level was based on a 1-in-a-million cancer risk, which is considered no apparent increased cancer risk. **Figure G.1.** (see Appendix G) shows the statistical distribution of PAHs in soil in the different areas of concern. The average levels of PAHs in dust Fillmore residents may have been exposed to during site clean-up did not increase estimated cancer risk (risk less than 1 in 1,000,000). This assessment was based on people engaging in outdoor activities and being exposed to dust over many years. The site-wide maximum concentration of PAHs in soil, 103 mg/kg, was also more than an order of magnitude lower than EPA's generic RSL for inhalation of benzo(a)pyrene from residential soil, 1,300 mg/kg.

Table 10. Range of Maximum Estimated PAH-dust Concentrations from Clean-up

Type of Concentration	PAH Mixture Soil Concentration (mg/kg)[€, §]	Corresponding PAH Dust Concentration ($\mu g/m^3$)*	Regional Screening Level for PAH in Dust ($\mu g/m^3$)[‡]
Upper Confidence Limit	1.6	0.00008	0.00092
Average for Individual Areas of Concern	0.065 – 4.66	0.0000033 – 0.00023	
Site-wide Average	0.62	0.000031	
Median	0.038	0.0000019	
Site-wide Maximum	103	0.0052	

€ Toxic equivalents of benzo(a)pyrene were calculated as shown in Appendix G. Data from URS 2011.

§ 1-10 feet deep

* Concentration of chemical in dust ($\mu g/m^3$) = PM_{10} (50 $\mu g/m^3$) x soil concentration (mg/kg) / unit conversion factor (1,000,000 mg/kg).

‡ RSL = EPA's Regional Screening Level (EPA 2015) for benzo(a)pyrene inhalation in air.

Future Exposures to Soil Lead and PAHs after Clean-up

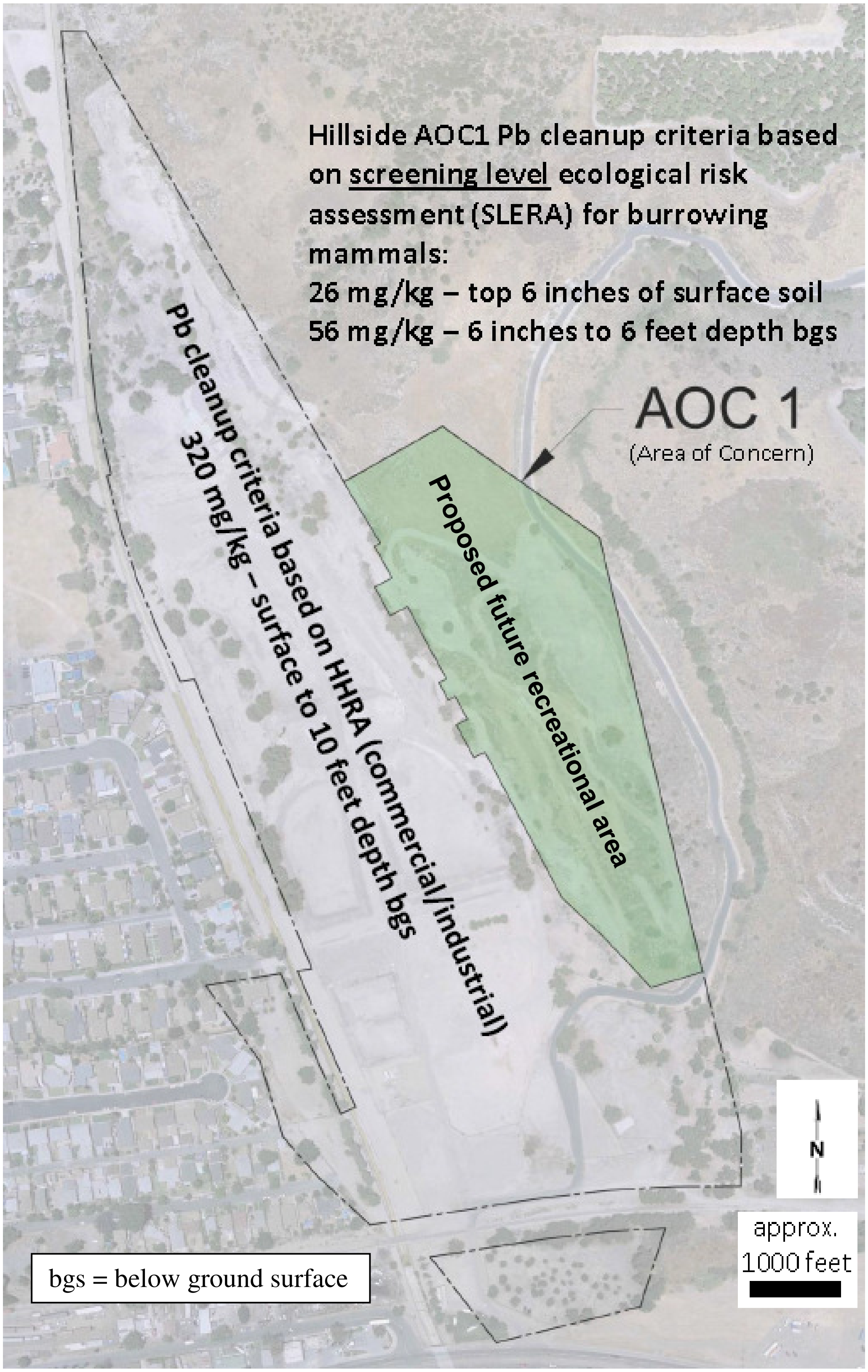
EPA's Record of Decision notes that institutional controls will limit future land uses to commercial, industrial, and recreational (EPA 2011b). More specifically, institutional controls prohibit residences, hospitals, schools, or daycare facilities to be built, or plants to be grown for human consumption, on the redeveloped property (URS 2011). Given those reuse plans, ATSDR investigated whether exposures to lead and PAHs that remain in soils after site clean-up could pose health risks to site visitors.

On-site soil was cleaned to meet the levels described in **Table 11** and **Figure 16**. While the soil clean-up itself reduced potential exposures to future site visitors, redevelopment will add additional protections. If site redevelopment proceeds as planned, a variety of physical barriers likely will prevent contact with site soils. For instance, on the western, flat portion of the site that was cleaned to meet commercial/industrial standard levels, if a commercial solar array is developed, portions of the site may remain fenced. If the redevelopment includes constructing roads and buildings and landscaping in that area, such features would also prevent contact with site soils. If the hillside open space is redeveloped for passive recreation, future visitors may be exposed to site soil in that area; however, the hillside area has been cleaned to a very low level (see **Table 11** and **Figure 16**).

Table 11. Soil Clean-up Levels for Chemicals of Concern at the PCPL Site

Contaminant/Area	Clean-up Level
Lead (Commercial/Industrial Area)	320 mg/kg surface to 10 ft depth below ground surface (bgs)
Lead (Potential Recreational Area)	26 mg/kg – top 6 inches of surface soil 56 mg/kg – 6 inches to 6 feet depth bgs
PAHs	Individual PAHs cleaned to 1 x 10^{-6} cancer risk

Figure 16. Map of Soil Clean-up Levels for the PCPL Site



Future Exposures to Soil Lead after Clean-up

ATSDR investigated whether lead remaining in site soils after clean-up could pose a health risk to people visiting the site. EPA Region 9 selected the California soil-screening level for lead, 320 mg/kg, as the clean-up level for the area of the site restricted to commercial/industrial land uses. The California soil-screening level was based on the Department of Toxic Substances Control LeadSpread 8 worksheet[19] and a 1 µg/dL incremental increase in children's blood lead that would theoretically reduce intelligence quotient (IQ) by 1 point or less (DTSC 2013).

CDC considers the total level of lead in blood instead of estimating how much soil alone will increase blood lead. CDC's previous action level was 10 µg/dL or higher of lead in blood. CDC adopted a new "reference value" of 5 µg/dL for young children in 2012. Blood-lead levels (BLLs) at the reference value or higher indicate that a child was exposed to a higher lead level than most children in the same age group. If a child's BLL is higher than the reference value, both the child's health and their environment should be assessed (ACCLPP 2012). Even though the clean-up value for the PCPL site was lower than the RSL, ATSDR chose to further evaluate the potential for site-lead exposures after clean-up and redevelopment.

ATSDR evaluated potential lead exposure in the commercial/industrial site soils for projected future use by estimating a child's BLL using the Integrated Exposure Uptake Biokinetic (IEUBK)[20] model and an unborn child's BLL using EPA's Adult Lead Model (ALM). The IEUBK model is used to estimate the probability of young children (aged 1–5 years) having BLLs higher than the reference value; the ALM model is used to estimate the probability of unborn children (fetuses) having BLLs higher than the reference value. If children have greater than 5% probability of BLLs above the reference value, ATSDR recommends further assessment of exposure sources and possibly blood-lead testing to determine if the reference BLL value was exceeded.

ATSDR modeled the blood-lead estimates using the site-specific assumptions presented in Appendix H. The IEUBK model and ALM results for the most sensitive populations are shown in **Table 12**. As can be seen in the model results, young children spending time (4 hours a day, 5 days a week), at the site should not have unusually high BLLs. Young children are not likely to regularly spend more than 4 hours a day on 5 days each week at the site, due to the institutional controls not allowing residences, hospitals, schools, or daycare facilities to be built on site (URS 2011).

[19] The value of 320 mg/kg is based on a 90th percentile estimate in soil.

[20] The Integrated Exposure Uptake Biokinetic (IEUBK) model is used for estimating lead exposures in children (the most sensitive group). Inputs to the model include factors such as lead in soil, indoor and outdoor dust, water and food (EPA 1994).

Table 12. Results of Models Used to Predict Child Blood Lead Levels*

Site Use Scenario	% Over 5 µg/dL‡	Model
Child Site Visitor	1.4%	IEUBK
Unborn Child of Site Worker	4.5%	Adult Lead Model

* The assumptions used to run the models are presented in Appendix H.

‡ The desired value is 5% or less. NOTE: ATSDR does not recommend any reuse that exposes children to commercial/industrial site soils for extended periods of time, such as an 8-hour workday, on a regular basis.

<u>Future Exposures to PAHs in Soil after Clean-up</u>

ATSDR investigated whether PAHs remaining in site soils after clean-up could pose a health risk to people visiting the site in the future. The EPA selected 8.67 mg/kg (benzo(a)pyrene TEQ) as the soil clean-up level for PAH mixtures at the site (Appendix G). ATSDR assessed the possibility of cancer risk from exposure to PAHs in soil at the clean-up level for adults and children scenarios (5 days a week, 4 hours a day for a period of 6 years for children and 8 hours a day for 25 years for adults) (**Table 13**). The calculations evaluated the possibility of people swallowing, breathing, and absorbing PAH's through skin.

Table 13. Site-specific Estimated Cancer-risk Calculations from PAHs in Soil

Site Use Scenario	PAH Mixture in Soil (mg/kg)*	Estimated Cancer Risk Calculated Using EPA's Slope Factor‡
Child (4 hours / day)	0.867	3.6×10^{-6}
Adult (8 hours / day)		2.6×10^{-6}

* Benzo(a)pyrene toxic equivalent derived from individual PAH clean-up levels from URS 2011 (Appendix G).

‡ Cancer risk (CR) calculated using equation and assumptions in Appendix G:

ATSDR's calculation indicates no increased cancer risk for part-time use of the commercial, industrial, or recreational site after clean-up. Cancer risks were below 3.6×10^{-6} for children and below 2.6×10^{-6} for adults, which is within EPA's cancer risk management range.

Reducing Dust and Soil Exposures during Clean-up

The Dust Suppression and Air Monitoring Plan for the site is discussed in the Exposure Evaluation Section of this document (URS 2013). ATSDR also corresponded with EPA regarding the site Dust Suppression and Air Monitoring Plan (ATSDR 2013; EPA 2013a). ATSDR stressed the importance of using the plan to protect the health of the nearby community. Chevron posted signs at the site with a contact number so that community members could report emissions if dust suppression measures were visibly out of compliance during the soil clean-up.

According to Chevron, between April and November 2013, their contractors suspended work at the site seven times for part of a day or a full day due to concerns about dust levels (Leslie Klinchuch, Chevron, Personal Communication, October 28, 2013, and November 20, 2013). In most instances, work was stopped when high wind speeds were predicted.

The Ventura County Air Pollution Control Division (VCAPCD) also played a role in protecting the community from dust exposures. VCAPCD inspected the site on October 15, 2013, after community complaints about dust and odors from the site. VCAPCD toured the site, reviewed dust-monitoring data, and discussed the dust-control activities in use at the site with Chevron's contractors (VCAPCD 2013). VCAPCD did not find any problems.

Health Effects Discussion

This section discusses the potential for health effects from dust, and chemicals in soil and dust, at the site. Behaviors and lifestyle choices that could increase exposure to dust and contamination are reviewed in Appendix I.

Health Effects from Dust

Environmental PM is typically a complex mixture of solid and liquid particles of organic and inorganic substances suspended in the air. Usually PM is composed of sulfate, nitrates, ammonia, sodium chloride, carbon, mineral dust, and water (EPA 1998). Sources of PM other than natural ones include emissions from burning fossil fuels in automobiles, power plants, homes, and various industrial processes. Natural sources of PM include volcanoes, sea spray, forest fires, and dust storms. Gases such as sulfur and nitrogen oxidize and can form PM indirectly in the atmosphere (EPA 1998).

Because environmental PM originates from a variety of sources, its chemical and physical compositions vary widely. These solid and liquid particles come in a wide range of sizes. Some particles are large or dark enough to be visible as soot or smoke. Others are so small they are visible only with an electron microscope (PCDEQ 2012).

PM_{10} poses a health concern because the particles can be inhaled and accumulate in the respiratory system, unlike larger particles that are filtered in the nose and throat by hair and mucus. "Coarse" (PM_{10}) particles have diameters of 10 micrometers (µm) or less. Sources of coarse particles include crushing or grinding operations, and dust from paved or unpaved roads (PCDEQ 2012). "Fine" particles are 2.5 µm or smaller ($PM_{2.5}$) and pose a greater health risk because they travel deeper into the lungs. Fine particles can contain hazardous chemicals such as heavy metals and cancer-causing organic compounds that also increase health risk. Sources of fine particles include all types of combustion activities (motor vehicles, power plants, wood burning, etc.) and certain industrial processes (EPA 1998).

Both human and animals studies have shown that short-term exposure to fine particles is associated with higher risks for breathing disorders, heart attacks, cardiac arrhythmia, and strokes (CARB 2005, EPA 2009a). People with asthma have higher health risks from exposure to PM_{10} and $PM_{2.5}$ (Merrifield et al. 2013). The elderly, people with heart or lung disease, and children are particularly sensitive to fine particles, and might need more medication or have to go to the doctor or emergency room more often after exposures (Delfino et al. 1997, Lippmann 2010, Shumake et al. 2013). Short term PM exposure also can cause coughing, wheezing, shortness of breath, and increased asthma symptoms, and affects the health of the most sensitive people (those with severe heart or breathing problems) (PCDEQ). The World Health Organization claims that no level of PM exposure is safe, and recommends protecting health by limiting exposure as much as possible (WHO 2011). $PM_{2.5}$ appears to be the most harmful, followed by PM_{10}. More studies are needed to evaluate low-level exposures to PM (EPA 2009a) and ultra-fine particles (Kappos et al. 2004).

Health Effects from Chemicals (in Dust and Soil)

Lead

"In the U.S. today at least 4 million households have children living in them that are being exposed to lead. There are approximately half a million U.S. children ages 1-5 with BLLs above 5 micrograms per deciliter (µg/dL), the reference value at which CDC recommends public health actions be initiated. Lead exposure can affect nearly every system in the body. Because lead exposure often occurs with no obvious symptoms, it frequently goes unrecognized. CDC's Childhood Lead Poisoning Prevention Program is committed to the Healthy People 2020 goals of eliminating BLLs ≥ 10 µg/dL and differences in average risk based on race and social class as public health concerns (CDC 2012)."

The most common household lead exposures are from lead-based paint in homes built before 1978 and from household plumbing installed before 1986 (ATSDR 2007a). Some cosmetics, folk remedies, and other commercial products (typically imported) may contain lead also. Lead-contaminated dust and soil are also important sources of lead exposure. Lead builds up in the body over time and is stored in bone tissue and blood. Therefore, sustained contact with lead over months or years is a serious health concern, especially for children (ATSDR 2007a).

Elevated BLLs in children are associated with lower IQs, behavior, cardiovascular, immune and endocrine system problems; some of these problems do not go away (ACCLPP 2012). Some studies show that any level of blood lead during childhood may affect health to some degree (ACCLPP 2012). Decreasing lead in the environment and making sure people eat a proper diet can help reduce BLLs (see Appendix I: Lifestyle Factors). Children with BLLs greater than the reference value may need to see their doctor and require further medical treatment.

CDC's lead reference value of 5 µg/dL is based on children aged from 1 to 5 years in the highest 2.5% of children who were tested nationwide for blood lead (ACCLPP 2012). CDC updates the reference value every 4 years using the two most recent National Health and Nutrition Examination Survey (NHANES 2009). Keeping pregnant mothers' lead exposures low enough to prevent unborn children's blood from exceeding CDC's reference value appears to be protective for lead's effect on blood pressure in adult males (EPA 2013c).

Table 14 shows regional childhood BLL information and indicates that rates of elevated BLLs in Ventura County were similar to those throughout California in 2011. Ventura County has lower rates of old housing and childhood poverty than elsewhere in California (CPDH 2014). From 2009 to 2011, two children younger than 21 years had BLLs > 9.5 µg/dL in ZIP code 93015 (where Fillmore is located), but no children in ZIP code 93016 (also a Fillmore zip code) had BLLs that high (CDPH 2013).

Table 14. Ventura County and California Blood-lead Surveillance Data for 2011 and Census 2000 Data for Pre-1950 Housing Units and Children Younger than 6 Years Living in Poverty

Region	Children younger than 6 years with BLLs >4.5 & <9.5 µg/dL	Children younger than 6 years with BLLs >9.5 µg/dL	Pre-1950 housing units	Children younger than 6 years living in poverty
California	2.22%	0.31%	17%	20%
Ventura County	1.99%	0.34%	7%	13%

Exposure to lead from the PCPL site is likely minimal, however, attention to the environmental health of Fillmore children is a prudent public health measure. The focus of Ventura County Healthcare Agency's Childhood Lead Poisoning Prevention program is preventing and reducing the harmful effects of lead exposure among children younger than 6 years in the county (VCHCA 2012). More information about the Ventura County Health Care Agency's Childhood Lead Poisoning Prevention program is available in the Public Health Action Plan of this document.

Children younger than 6 years (including developing fetuses) living in houses built before 1978 are at the greatest risk for lead exposures. For children or women of childbearing age living in houses built before 1978, ATSDR recommends that the family contact the Ventura County Health Care Agency about testing paint and dust from the home for lead, unless the paint has already been tested. Because many children in the United States have elevated BLLs, ATSDR encourages blood-lead testing for all children younger than 6 years who have not been tested or whose exposures may have increased since they were last tested.

<u>PAHs</u>

People can come into contact with PAHs in multiple ways. People breathe in PAHs in smoke from cigarettes and other combustion sources. Eating grilled or charred meats is also a common source of PAH exposure (ATSDR 1995).

The Department of Health and Human Services (DHHS) has determined that some PAHs may cause cancer in humans if exposure is high and over a long period. Some people who have breathed or touched mixtures of PAHs and other chemicals for long periods have developed cancer. Some PAHs have caused cancer when laboratory animals breathed them (lung cancer), ate them in food (stomach cancer), or had them applied to their skin (skin cancer). However, the exposure levels in these animal studies are much higher than typical exposure levels people experience.

Community residents and future PCPL site visitors are not likely to be exposed to PAH levels high enough to increase the normally expected cancer rate in the population (background rate). Estimates of PAHs in dust that could have migrated offsite were less than EPA's regional screening levels. High soil-level PAHs were cleaned up to meet the EPA standard, and the cancer risk from the remaining PAHs is estimated to be insignificant.

Uncertainties

There are inherent uncertainties (basic doubts) in estimating exposures and the likelihood of health effects from site-related contaminants.

- *Site contribution to PM_{10} levels in the community*: For 2013, ATSDR attempted to estimate the amount of particulate matter generated by the site as opposed to other local or regional sources. However, due to limitations in the way dust monitoring was conducted in 2013, ATSDR could not provide an estimate. **Figure B.2** clearly shows the greatest PM_{10} coming from the east to northeast, but the source cannot be determined. The hand-held monitoring data available to analyze this issue did not allow ATSDR to make a direct comparison of upwind and downwind PM levels at specific times because there was only one monitor moved from station to station in addition to the E-BAM monitor. The E-BAM monitoring station would only detect downwind levels in cases where the wind was blowing in a straight line from an upwind hand-held unit towards the E-BAM at the time of measurement. In addition, sampling with hand-held monitors, which was conducted periodically throughout each work day, may have missed short term PM_{10} elevations. A community member noted having reported that air monitors were not working one day and having witnessed air monitors that had fallen over on windy days.
- The soil samples from west of Pole Creek were collected for a Ventura County Watershed Protection District investigation focused on potential modifications to the Pole Creek access road and channel (URS 2007). These samples do not indicate site related chemicals at levels of concern west of Pole Creek. However, the work was not intended to serve as a comprehensive site investigation to characterize health risks related to the soil in this area. The report recommended that any soils excavated from the west side of the channel not be exported for off-site use as “clean” fill material on residential sites unless more extensive investigation and analyses are performed, including a human-health risk assessment.
- *Weekly collection of dust for lab analysis*: Samples collected once per week for lab analysis were collected mostly on Tuesdays (61%) and Wednesdays (29%) and may not equally reflect different exposures from weekly patterns during the other week days.
- *Bioavailability*: It is difficult to estimate how much lead and PAH gets into a person’s body after they swallow soil-bound lead and PAH; we call this body estimate *bioavailability*. ATSDR used information from Chevron’s *in vitro* (outside a living plant or animal, such as a test tube) lead bioavailability studies (URS 2011) to perform IEUBK modeling. EPA indicates that the *in vitro* bioavailability method may be used without *in vivo* (within a living plant or animal) analyses for lead mining and milling sites (EPA 2011c). Using *in vitro* analyses for other types of contamination, such as at the PCPL site, makes the results more uncertain, but the *in vitro* studies support use of the default value, which ATSDR used in the IEUBK model for this consultation. For the PAH analysis, ATSDR used a conservative approach, assuming 100% bioavailability.
- *Exposure estimation*: Scientists have performed many studies to estimate how much dust people breathe and how much soil people accidentally swallow during their daily activities. However, there is considerable uncertainty in estimating the amount of dust or

chemicals that a person gets into their body. This report estimates how much lead and PAHs people will be exposed to, based on dust levels and the concentrations of chemicals in dust and soil. The concentrations of lead and PAHs in different particle size fractions were not addressed in this report. For PAHs, the detection limits in dust were greater than the screening levels for long-term, residential exposure. Therefore, the conclusions in this report rely on estimates of how much PAH could be in dust based on measured soil concentrations. This indirect analysis was performed as an added precaution due to the elevated detection limits for PAHs. Exposures to lead in dust were more certain because the detection limits were lowered to detect concentrations lower than the screening level during clean-up activities.

- *Personal exposure variability*: The amount of dust and soil to which people are exposed varies considerably depending on individual behaviors. People who are outdoors on dusty, windy days will likely breathe and swallow more dust than people who stay indoors on those days. Additionally, cleaning practices such as wet mopping and dusting with damp cloths causes less airborne dust indoors than dry sweeping and dusting. Personal exposures to lead sources such as aged lead paint and to PAH sources such as cigarette smoke, vehicle exhaust, and grilled meats can add to other environmental exposures. Exposures from combined site and non-site related sources cannot be determined because sampling data from the homes and nearby schools was not available for review.

Other Health Risks Related to Soil Dust

The *Coccidioides* (Valley Fever) fungus is endemic (widespread) to central and southern California, and several cases occurred recently in Ventura County (Wilken et al. 2014). A fungus that lives in the top layer of soil causes Valley Fever (Tsang et al. 2013). In endemic areas, soil-disturbing activities that create dust could put people at risk for Valley Fever (CDC 2014; Wilken et al. 2014). At least 30%–60% of people who live in an endemic region are exposed to the fungus at some point during their lives (CDC 2014). In most people the infection will go away on its own, but for people who develop severe infections or chronic pneumonia, medical treatment is necessary (CDC 2014).

ATSDR does not know whether the *Coccidiodes* fungus is in PCPL site soils, but its possible presence confirms the need to maintain good dust-control practices at the site. ATSDR encourages Fillmore residents to visit the CDC Valley Fever Web page (http://www.cdc.gov/fungal/diseases/coccidioidomycosis/) to learn more about this health risk.

Conclusions

Based on the available data and information, ATSDR reached three conclusions:

Conclusion 1:
ATSDR concludes that windblown dust from the *greater geographic area (including the site)* was unlikely to affect the health of healthy community members. However, the amount of dust in the air on windy days occasionally exceeded California's 24 hour standard for dust. Long-term effects from these exposures are unlikely, but dust levels on these days could have increased short term risk of respiratory irritation, heart attack, and stroke for residents with pre-existing health conditions, such as asthma, chronic obstructive pulmonary disease (COPD), or emphysema. ATSDR cannot conclude how much dust can be attributed to the site.

Conclusion 2: Community members were not likely to be exposed to lead or PAHs in site soil or airborne dust from 2011 to 2013 at levels that could cause health effects.

Conclusion 3: Implementing the proposed site redevelopment plans will protect site visitors and workers from harmful contact with lead and PAHs in the soil.

Recommendations

ATSDR recommends that organizations and individuals take the following steps to protect the health of nearby residents, students, and future visitors to the site.

Site Management and Land Use Planning Personnel

- **Continue PM-specific dust-control measures and monitoring during redevelopment activities.**
    - ATSDR recommends maintaining ground cover and expanding ground cover if necessary at the site to prevent future dust releases.
    - Given that the PCPL site is located in an area prone to elevated PM levels, ATSDR recommends following the PM-specific measures outlined in the site Dust Suppression and Air Monitoring Plan to prevent dust from moving off-site during future redevelopment work at the site. In addition, to better monitor the site's contribution to ambient PM levels, ATSDR recommends simultaneous deployment of multiple monitors to concurrently detect upwind and downwind PM when sampling air during future earth moving at the site.
- **Observe deed restrictions into the future.** People and organizations seeking to redevelop the site are required by the state to follow deed restrictions. ATSDR supports these deed restrictions, which prohibit building residences, hospitals, day care centers, homes, and schools, or growing plants for human consumption on the site. ATSDR recommends site re-evaluation if the City of Fillmore considers residential development on the site.
- **Maintain waste-consolidation area into the future**. Contaminated soil was deposited and covered in two capped consolidation areas on-site to prevent people from coming in contact with contaminants. ATSDR recommends long-term maintenance of these on-site consolidation areas for contaminated soil, including monitoring the protective caps and

ground cover to ensure they stay intact. This will help ensure that contaminated soil will not harm people who use the site in the future.

Community Members

- **Be aware of local air quality.** You can check local air quality by entering your zip code at http://www.airnow.gov.
- **Move indoors on dusty days.** Residents with pre-existing health conditions listed in conclusion one may want to reduce their level of activity and the amount of time they spend outdoors on dusty days.
- **Report dust problems.** Call the posted dust complaint number or the Ventura County Air Pollution Control District's 24-hour complaint hotline if you see dust blowing off-site during future site activities.
- **Do not trespass.** Site soils are now safe for redevelopment, however, ATSDR recommends for safety reasons, heeding warning signs posted by the site owner or operator.
- **Contact your county lead poisoning prevention program if you have concerns about lead poisoning.** ATSDR does not expect site-related dust to be a substantial contributor to lead exposures, however, ATSDR recommends all children younger than 6 years have their blood tested for lead due to the number of homes in Fillmore that were built before the 1978 ban on lead in paint.

Public Health Action Plan

The public health action plan for the site is a description of actions that ATSDR has taken or will take at the site. The purpose of the public health action plan is to ensure that this public health consultation provides a plan of action to mitigate and prevent harmful human health effects resulting from exposure to hazardous substances in the environment.

Public health actions that ATSDR has taken include:

- In a March 2013 letter, ATSDR provided recommendations to EPA regarding dust air monitoring, analysis, and control methods at the site (ATSDR 2013).
- In a December 2014 letter, ATSDR provided comments on the City of Fillmore's Fillmore Works Specific Plan Initial Study and Notice of Preparation of an Environmental Impact Assessment (ATSDR 2014). These comments addressed health concerns that might arise through the site redevelopment process.
- ATSDR met with community stakeholders to discuss the findings of the public comment version of this health consultation.
- ATSDR invited members of the public to comment on this health consultation. ATSDR responded to comments received and finalize the health consultation (Appendix J).

Public health actions that ATSDR will implement in the future:

- ATSDR will continue to dialogue with the community to address health and exposure concerns.
- ATSDR may be available for technical assistance upon request
    - to review work-plans for future site redevelopment and make recommendations to protect public health
    - to review sampling data from additional environmental investigations and make recommendations to protect public health

- ATSDR is available to work with the Ventura County Health Care Agency Childhood Lead Poisoning Prevention program (VCHCA 2012) that provides the following services:
    - Information and resources for lead-poisoning prevention
    - Community resources for lead screening
    - Case management by a Public Health Nurse for children with elevated BLLs
    - Environmental assessment for children with lead poisoning
    - Medical nutrition therapy
    - Community outreach and education

  Contact information for the program:

  Telephone: 805-981-5291
  Toll Free Phone: 1-800-597-LEAD (1-800-597-5323)
  Address: 2240 E Gonzales Rd, Oxnard, CA 93036
  Hours: Monday to Friday, 8a.m.-5pm

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Appendix A. Dust Complaint Sign Posted at the Site during 2013 Activities*

TEXACO PCPL SUPERFUND SITE

If You See Dust Coming From This Project Contact:

Leslie Klinchuch: (661) 632-1408
Jeremy Oliveto: (805) 540-0829

If You Do Not Receive a Response Within Two (2) Hours Contact:

Ventura County Air Pollution Control District
(805) 654-2797
(805) 645-1445

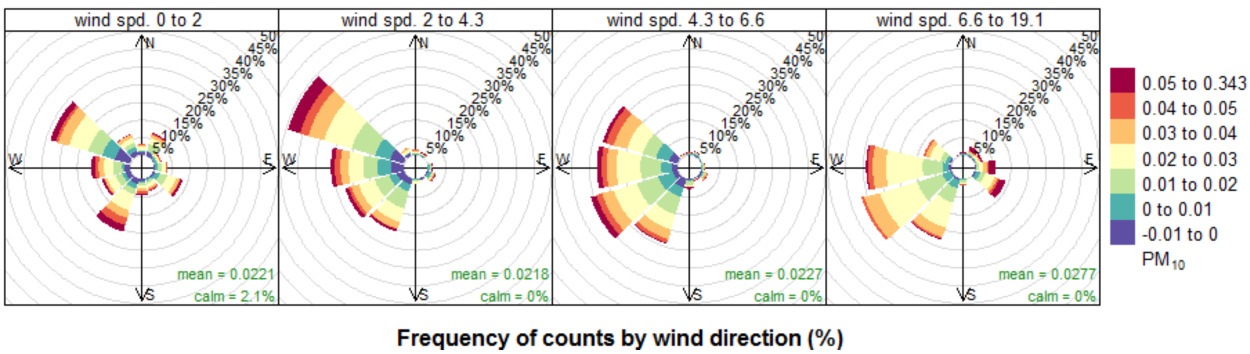
* Note these numbers may change over time. Please consult posted signs at the site to find current contact numbers.

Appendix B - Distribution of Dust Data

Effect of Wind Speed and Direction on PM_{10}

R programming was used to analyze the statistical distribution of discrete hourly data points from the EBAM dust monitoring. **Figure B.1.** shows the PM_{10} concentrations as a function of wind direction and wind speed quartiles for the time period May 10, 2013 to November 7, 2013. As can be seen in the figure, most measurements with high PM_{10} concentrations blew from the west (in the left half of the plots), but there were a few instances where high PM_{10} concentrations blew from the east at high wind speeds.

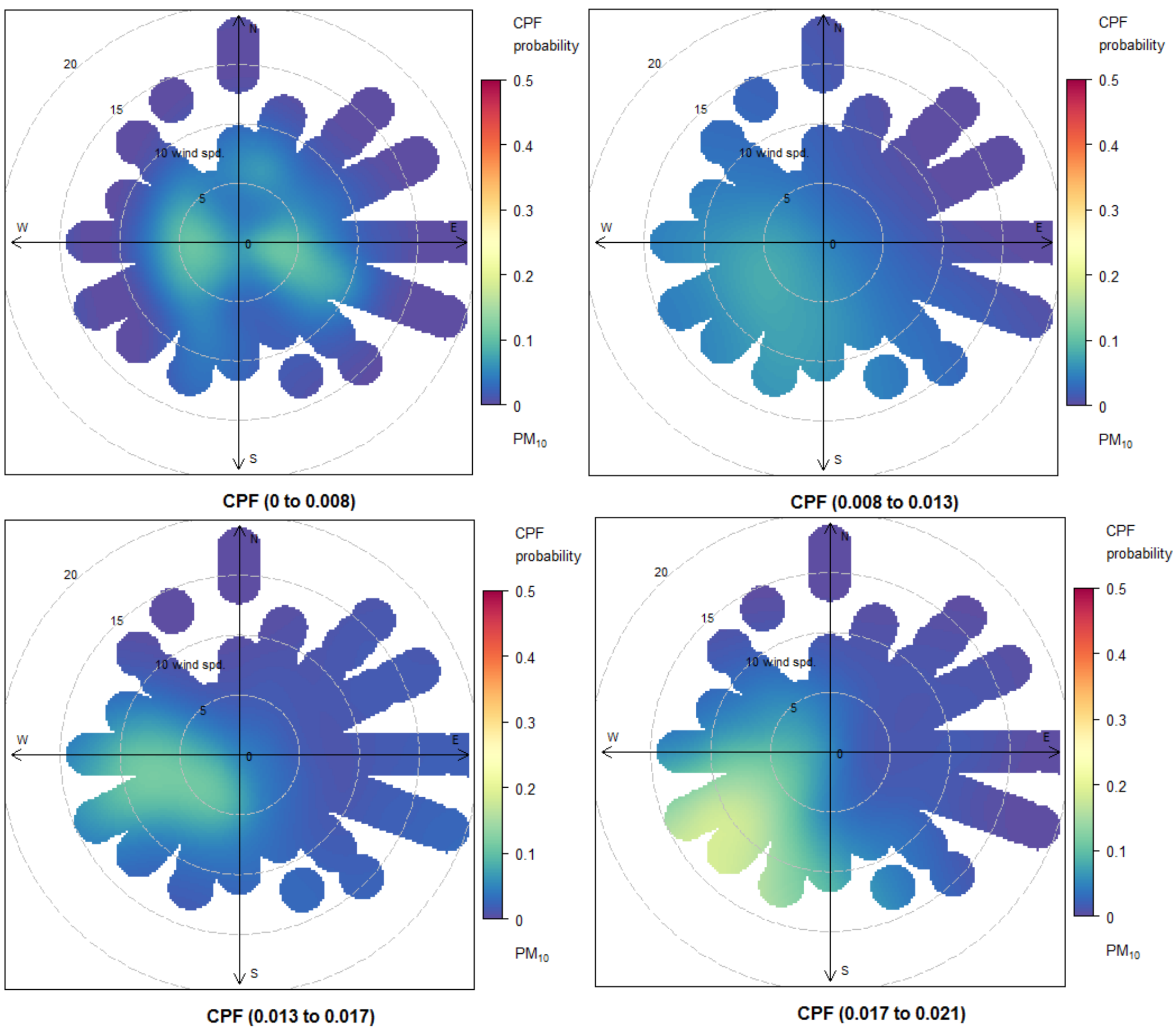
Figure B.1. Pollutionrose Plot of Data from May 10, 2013 to November 7, 2013



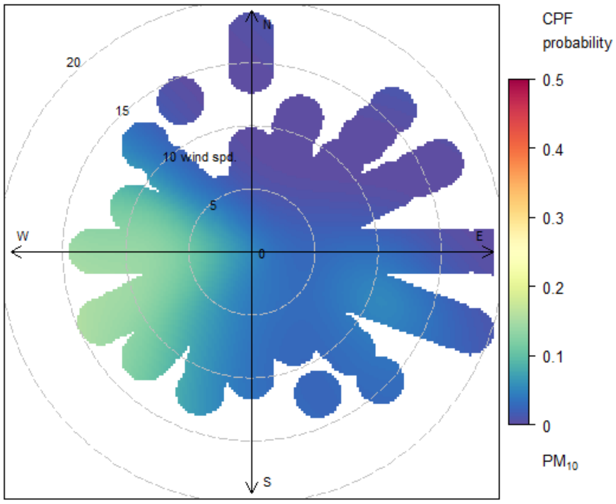
Probability of PM_{10} at Certain Concentrations from Given Wind Direction and Speed

Bivariate conditional probability function (CPF) plots made using the E-BAM data (**Figure B.2.**) show the probability that wind direction and speed produced PM_{10} in a given concentration range (split into 10^{th} percentiles). The highest PM_{10} concentration (in the 90-100^{th} percentile; the plot on the bottom of the following page) shows a high probability (0.3->0.5) that winds over 10 mph from the east-northeast (from the site toward the residential area) brought the highest PM_{10} concentrations (i.e. within the 44-343 µg/m^3 range). The plots for the 10-80^{th} percentiles show that winds up to 15 mph from the west-southwest directions have some probability (up to about 0.15 for the combined percentiles) of generating PM_{10} within the 0-44 µg/m^3 range.

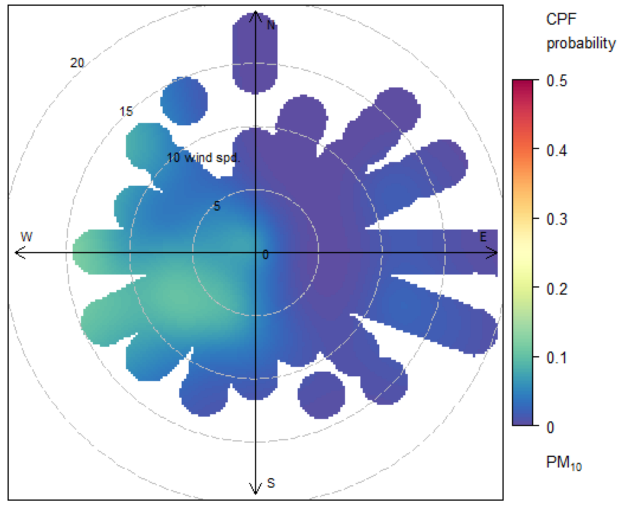
Figure B.2. Conditional Bivariate Probability Function Plots of PM_{10} (mg/m^3)[21]



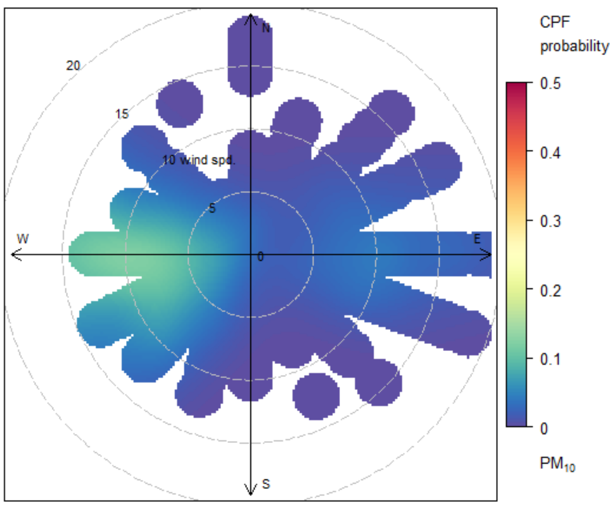
[21] Plots are for PM_{10} concentrations in the 10-20^{th}, 20-30^{th}, 30-40^{th}, 40-50^{th}, 50-60^{th}, 60-70^{th}, 70-80^{th}, 80-90^{th}, and 90-100^{th} percentiles



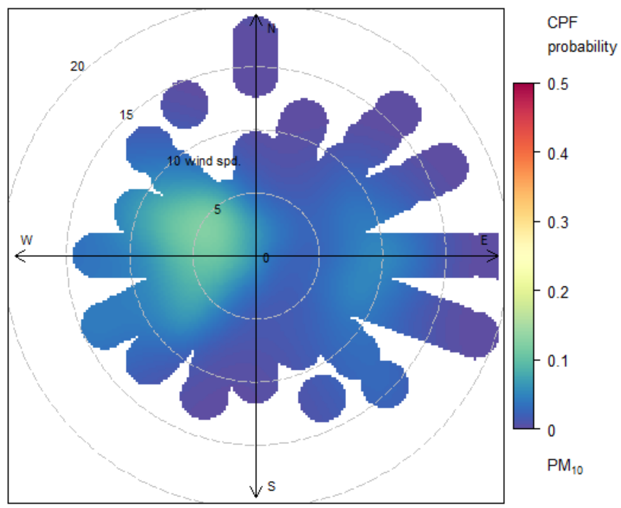
CPF (0.021 to 0.025)



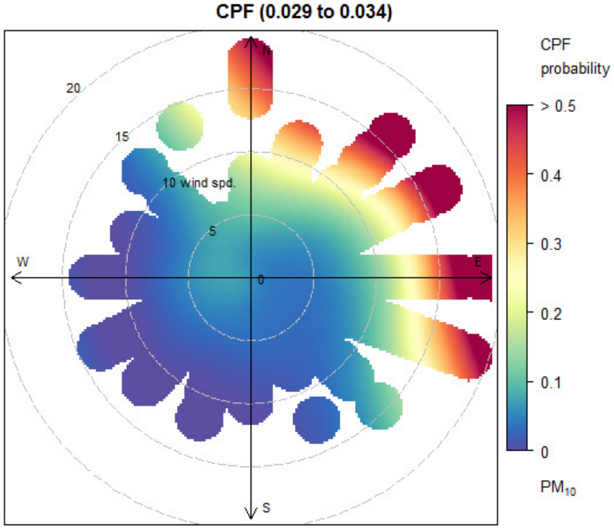
CPF (0.025 to 0.029)



CPF (0.029 to 0.034)



CPF (0.034 to 0.044)



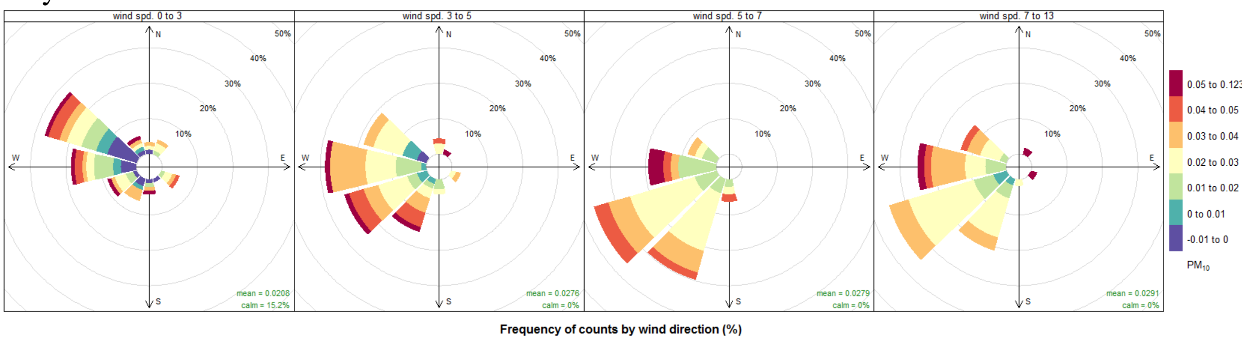
CPF (0.044 to 0.34)

Monthly PM_{10} Characteristics for May to November 2013

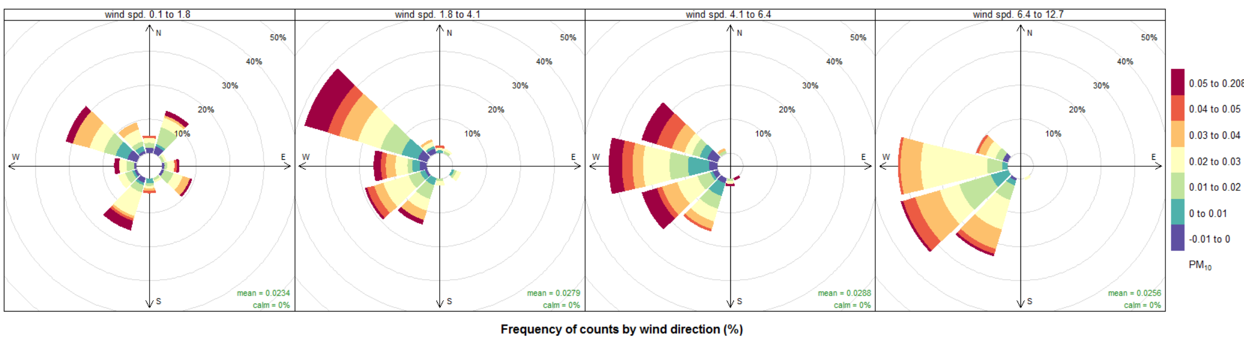
Monthly analysis showed high wind speeds began to shift to blow high PM_{10} concentrations from the east mostly after August (**Figure B.3.**).

Figure B.3. Monthly Pollution Rose Plots for May to November 2013

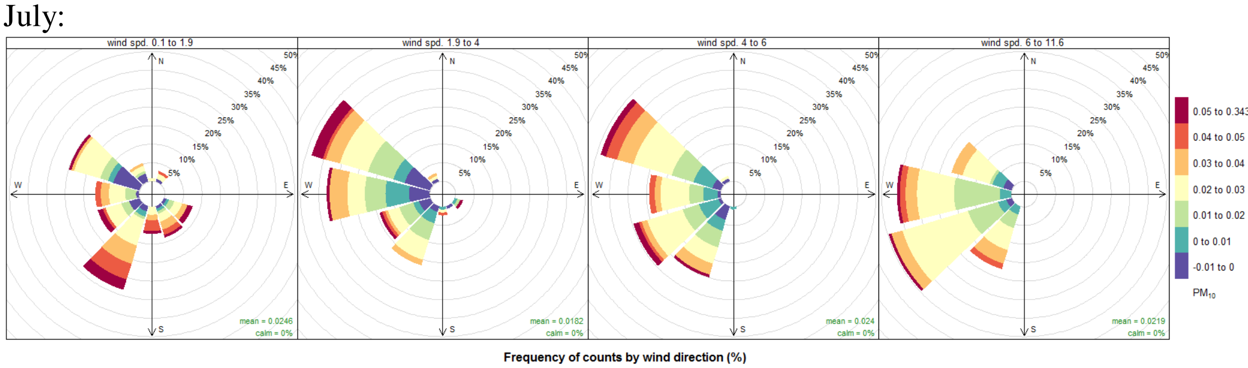
May:



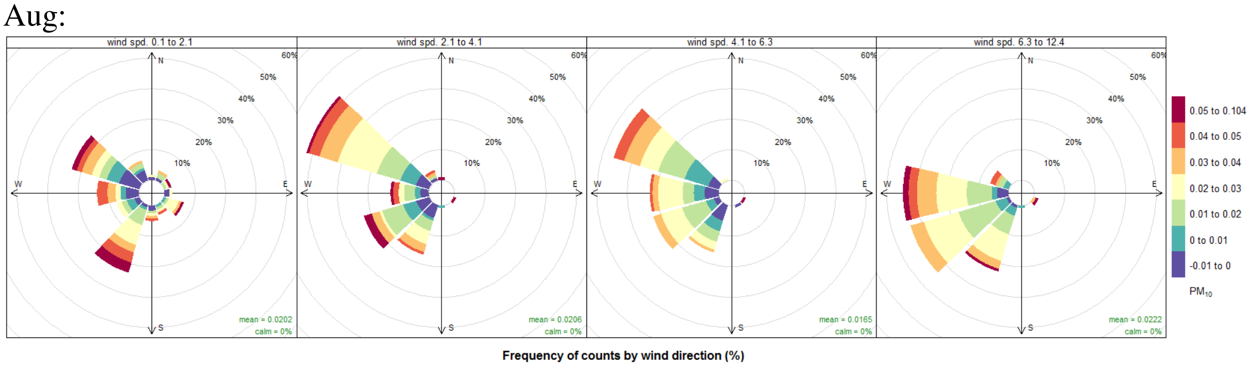
June:



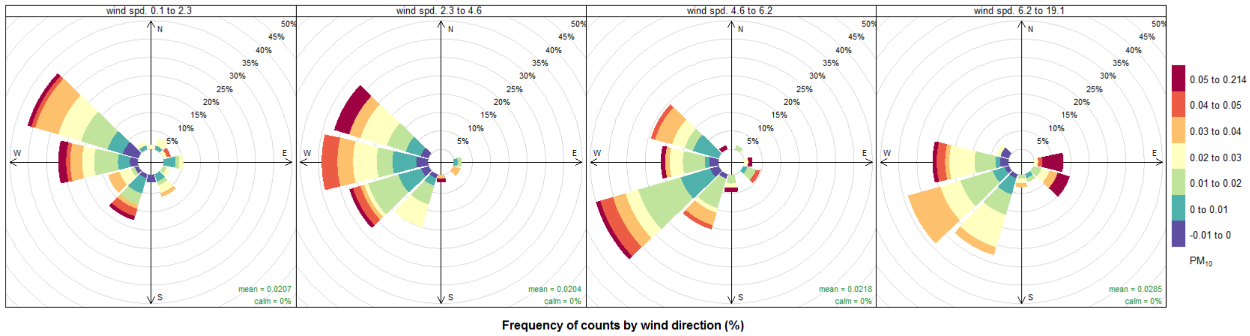
July:



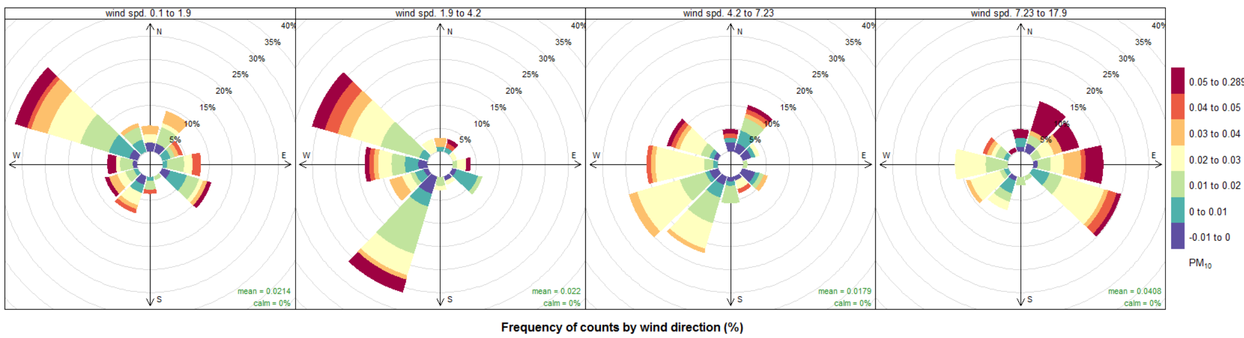
Aug:



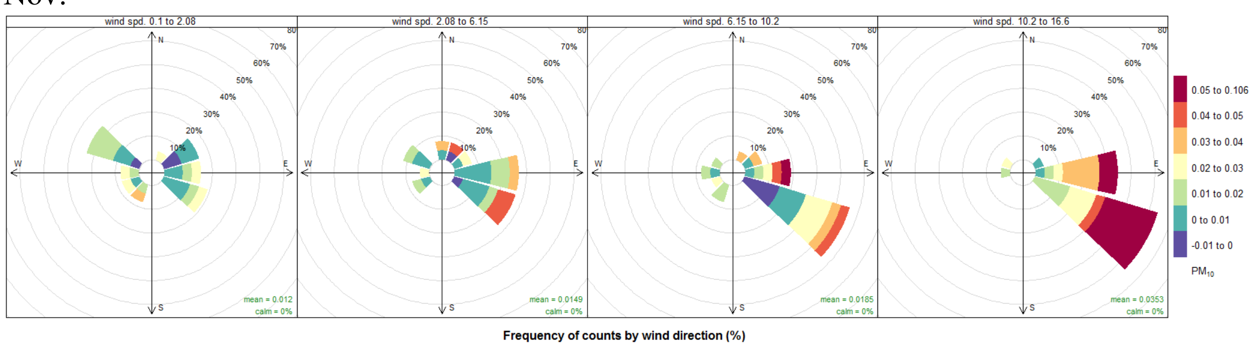
Sept:


wind spd. 0.1 to 2.3
wind spd. 2.3 to 4.6
wind spd. 4.6 to 6.2
wind spd. 6.2 to 19.1
mean = 0.0207
mean = 0.0204
mean = 0.0218
mean = 0.0285
calm = 0%
0.05 to 0.214
0.04 to 0.05
0.03 to 0.04
0.02 to 0.03
0.01 to 0.02
0 to 0.01
-0.01 to 0
PM_{10}
Frequency of counts by wind direction (%)

Oct:


wind spd. 0.1 to 1.9
wind spd. 1.9 to 4.2
wind spd. 4.2 to 7.23
wind spd. 7.23 to 17.9
mean = 0.0214
mean = 0.022
mean = 0.0179
mean = 0.0408
calm = 0%
0.05 to 0.289
0.04 to 0.05
0.03 to 0.04
0.02 to 0.03
0.01 to 0.02
0 to 0.01
-0.01 to 0
PM_{10}
Frequency of counts by wind direction (%)

Nov:

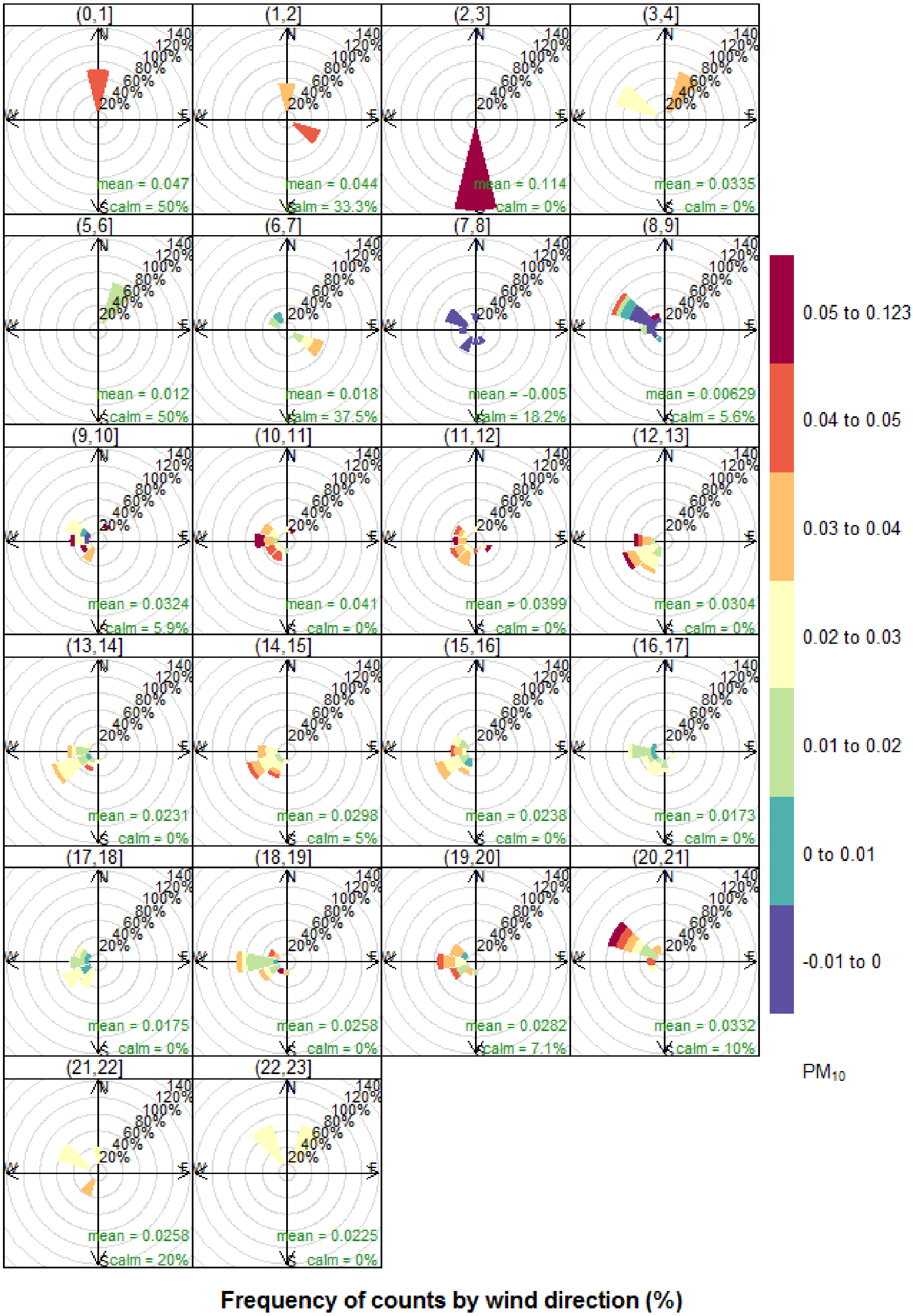

wind spd. 0.1 to 2.08
wind spd. 2.08 to 6.15
wind spd. 6.15 to 10.2
wind spd. 10.2 to 16.6
mean = 0.012
mean = 0.0149
mean = 0.0185
mean = 0.0353
calm = 0%
0.05 to 0.106
0.04 to 0.05
0.03 to 0.04
0.02 to 0.03
0.01 to 0.02
0 to 0.01
-0.01 to 0
PM_{10}
Frequency of counts by wind direction (%)

PM_{10} Characteristics over 24-Hour Periods for May to November

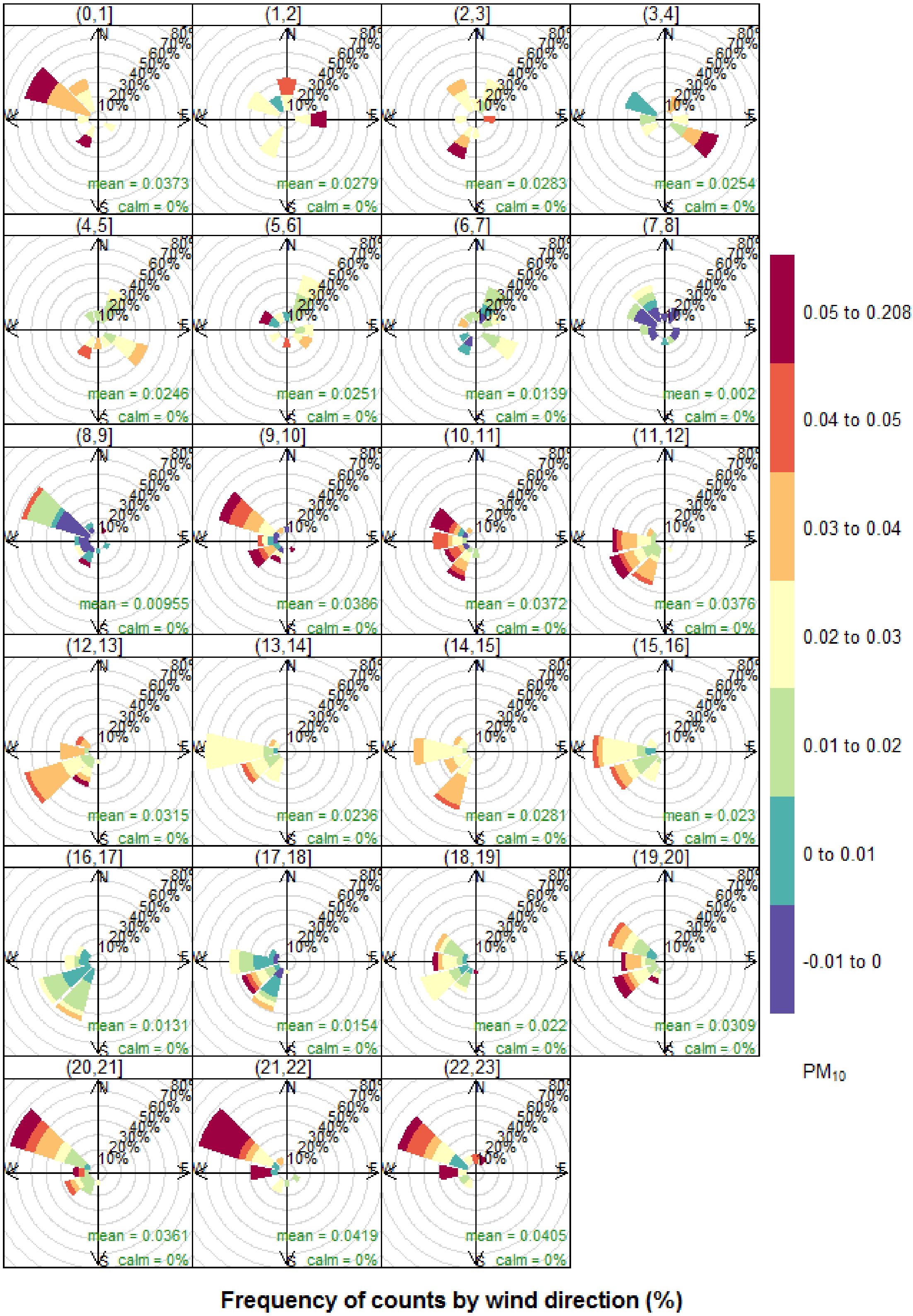
An analysis of PM_{10} and wind direction (but not wind speed) during each hour of the day [(0,1) represents 12:01 to 1:00 a.m., (1,2) represents 1:01 to 2:00 a.m., etc.] showed that PM_{10} during the workday hours were primarily from the west from May through August (**Figure B.4.**). High PM_{10} dust occurrences were sporadic during the night from May through August. Starting in September the PM_{10} and wind direction became more erratic during the day and some elevated PM_{10} occurred at night.

Figure B.4. Hourly Pollution Rose Plots for Each Month (2013)

May

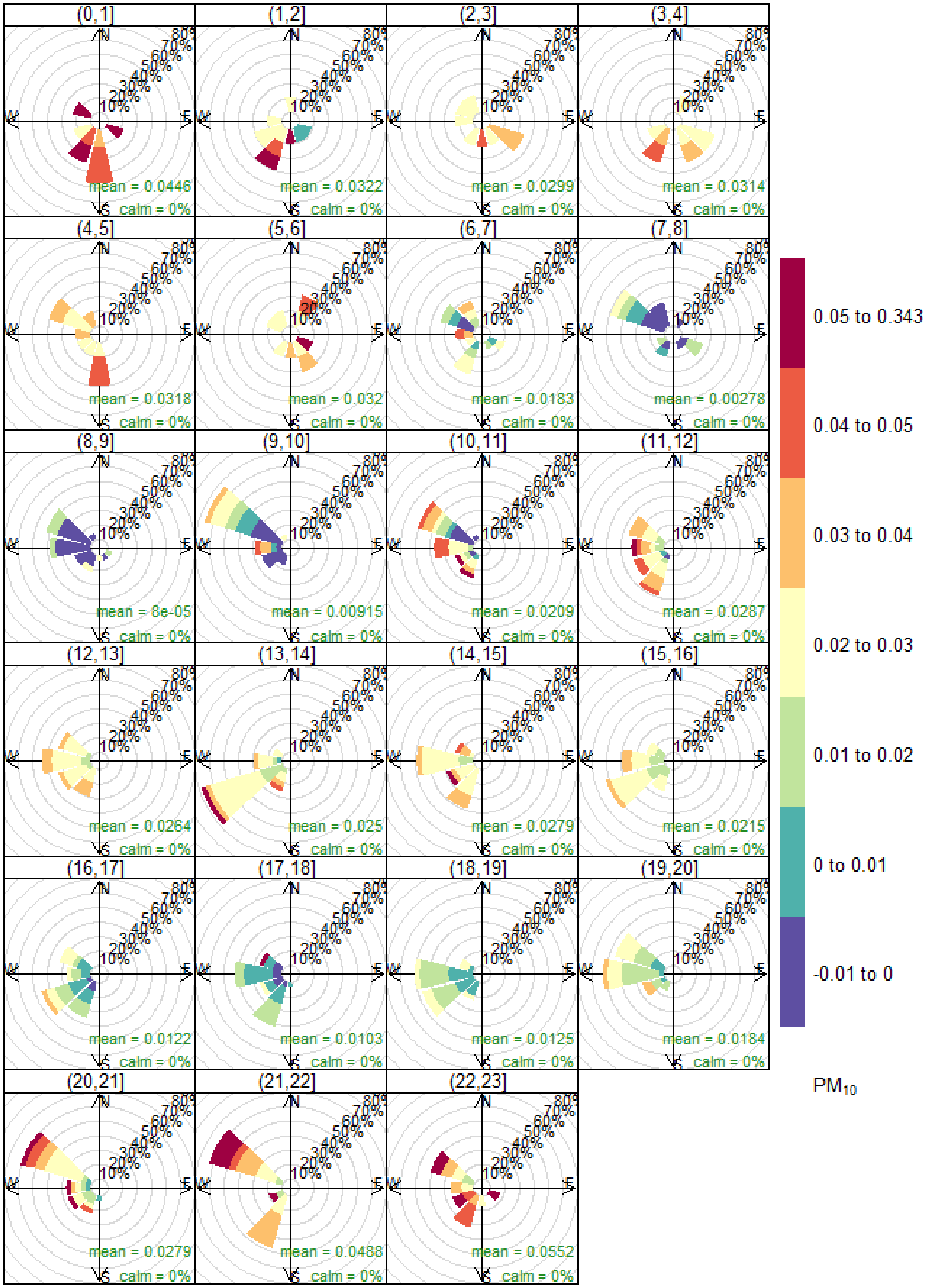


June



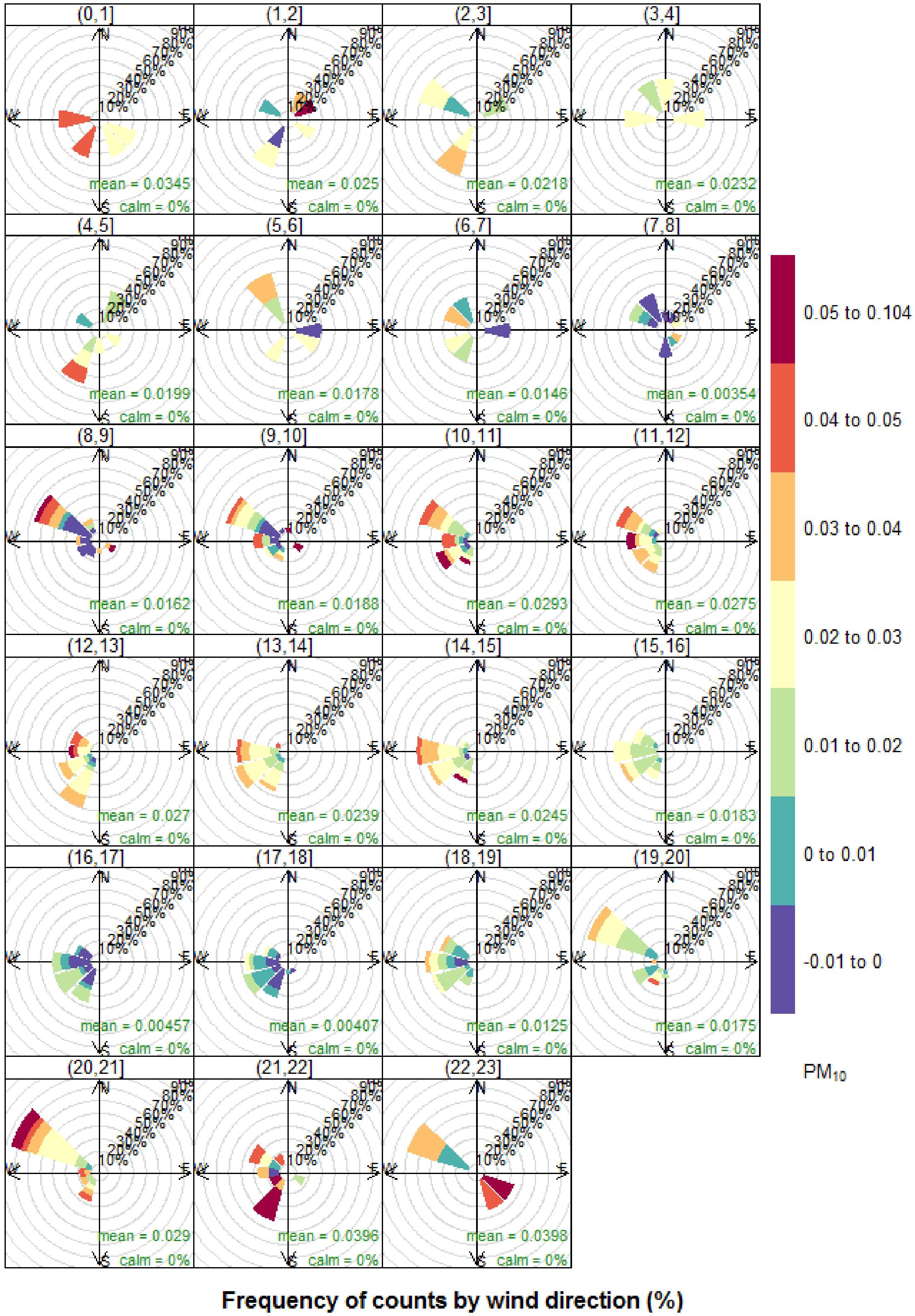
(0,1]
mean = 0.0373
calm = 0%
(1,2]
mean = 0.0279
calm = 0%
(2,3]
mean = 0.0283
calm = 0%
(3,4]
mean = 0.0254
calm = 0%
(4,5]
mean = 0.0246
calm = 0%
(5,6]
mean = 0.0251
calm = 0%
(6,7]
mean = 0.0139
calm = 0%
(7,8]
mean = 0.002
calm = 0%
(8,9]
mean = 0.00955
calm = 0%
(9,10]
mean = 0.0386
calm = 0%
(10,11]
mean = 0.0372
calm = 0%
(11,12]
mean = 0.0376
calm = 0%
(12,13]
mean = 0.0315
calm = 0%
(13,14]
mean = 0.0236
calm = 0%
(14,15]
mean = 0.0281
calm = 0%
(15,16]
mean = 0.023
calm = 0%
(16,17]
mean = 0.0131
calm = 0%
(17,18]
mean = 0.0154
calm = 0%
(18,19]
mean = 0.022
calm = 0%
(19,20]
mean = 0.0309
calm = 0%
(20,21]
mean = 0.0361
calm = 0%
(21,22]
mean = 0.0419
calm = 0%
(22,23]
mean = 0.0405
calm = 0%
0.05 to 0.208
0.04 to 0.05
0.03 to 0.04
0.02 to 0.03
0.01 to 0.02
0 to 0.01
-0.01 to 0
PM_{10}
Frequency of counts by wind direction (%)

July



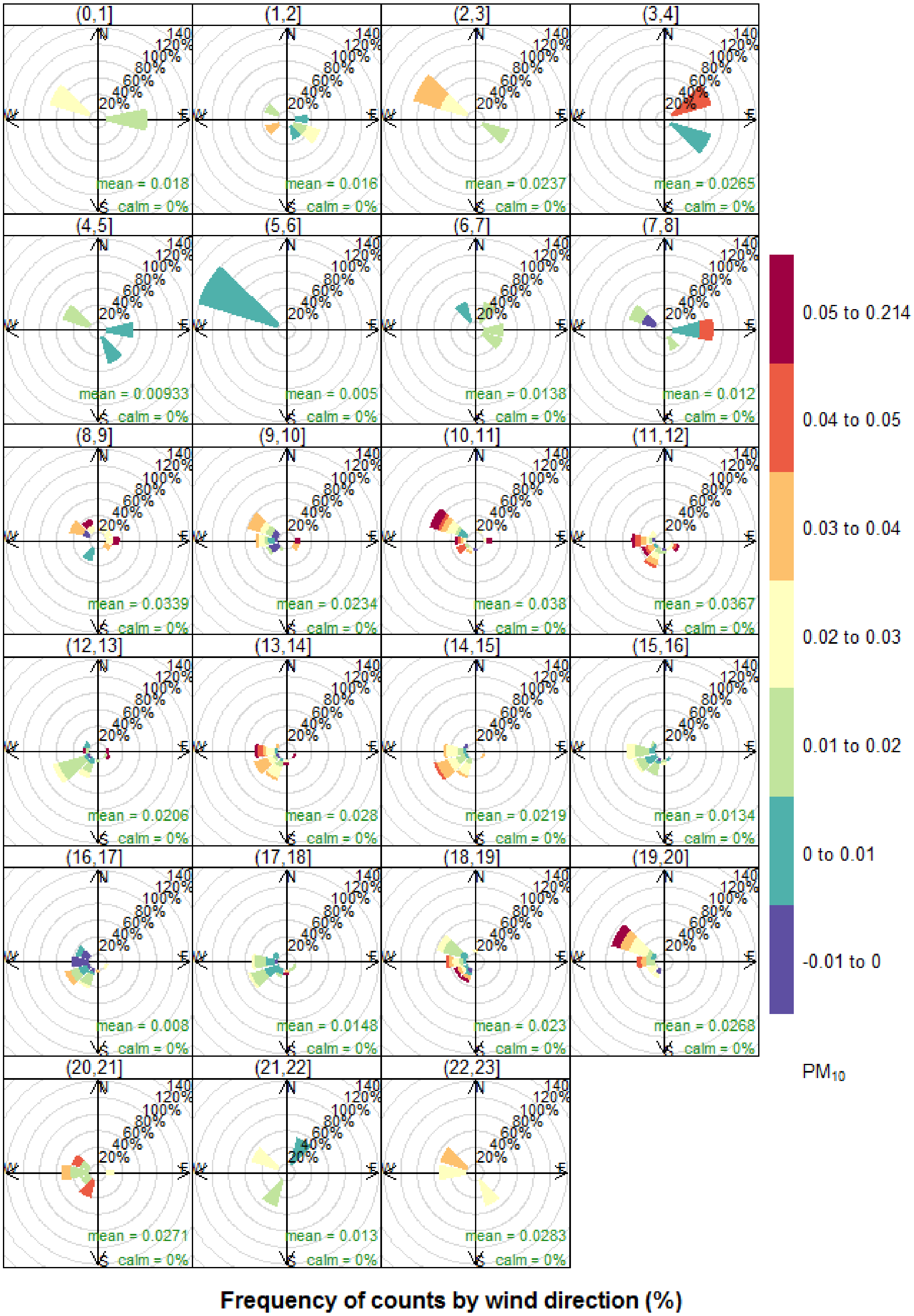
Frequency of counts by wind direction (%)

August

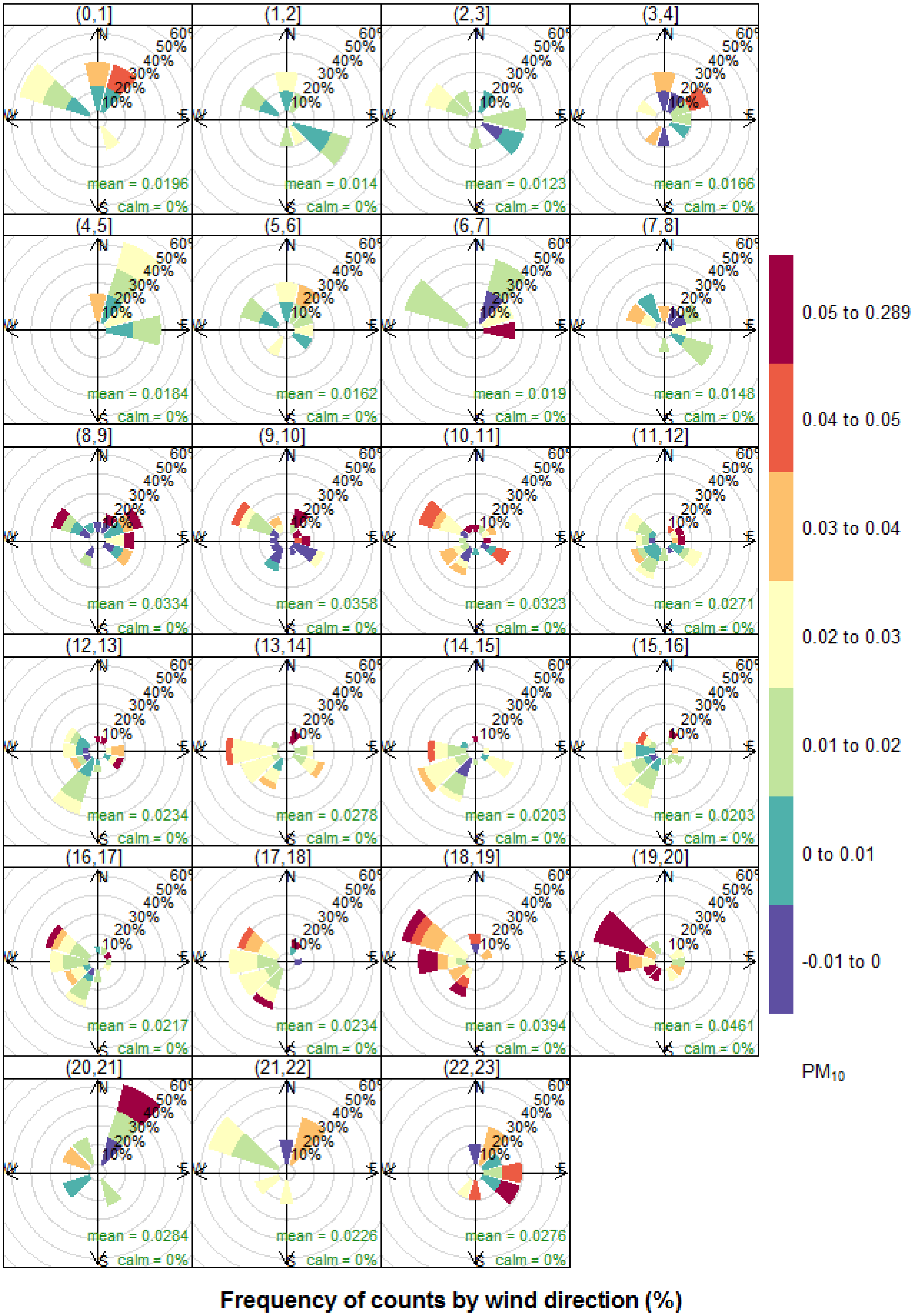


(0,1]
mean = 0.0345
calm = 0%
(1,2]
mean = 0.025
calm = 0%
(2,3]
mean = 0.0218
calm = 0%
(3,4]
mean = 0.0232
calm = 0%
(4,5]
mean = 0.0199
calm = 0%
(5,6]
mean = 0.0178
calm = 0%
(6,7]
mean = 0.0146
calm = 0%
(7,8]
mean = 0.00354
calm = 0%
(8,9]
mean = 0.0162
calm = 0%
(9,10]
mean = 0.0188
calm = 0%
(10,11]
mean = 0.0293
calm = 0%
(11,12]
mean = 0.0275
calm = 0%
(12,13]
mean = 0.027
calm = 0%
(13,14]
mean = 0.0239
calm = 0%
(14,15]
mean = 0.0245
calm = 0%
(15,16]
mean = 0.0183
calm = 0%
(16,17]
mean = 0.00457
calm = 0%
(17,18]
mean = 0.00407
calm = 0%
(18,19]
mean = 0.0125
calm = 0%
(19,20]
mean = 0.0175
calm = 0%
(20,21]
mean = 0.029
calm = 0%
(21,22]
mean = 0.0396
calm = 0%
(22,23]
mean = 0.0398
calm = 0%
N
E
S
W
10%
20%
30%
40%
50%
60%
70%
80%
90%
0.05 to 0.104
0.04 to 0.05
0.03 to 0.04
0.02 to 0.03
0.01 to 0.02
0 to 0.01
-0.01 to 0
PM_{10}
Frequency of counts by wind direction (%)

September

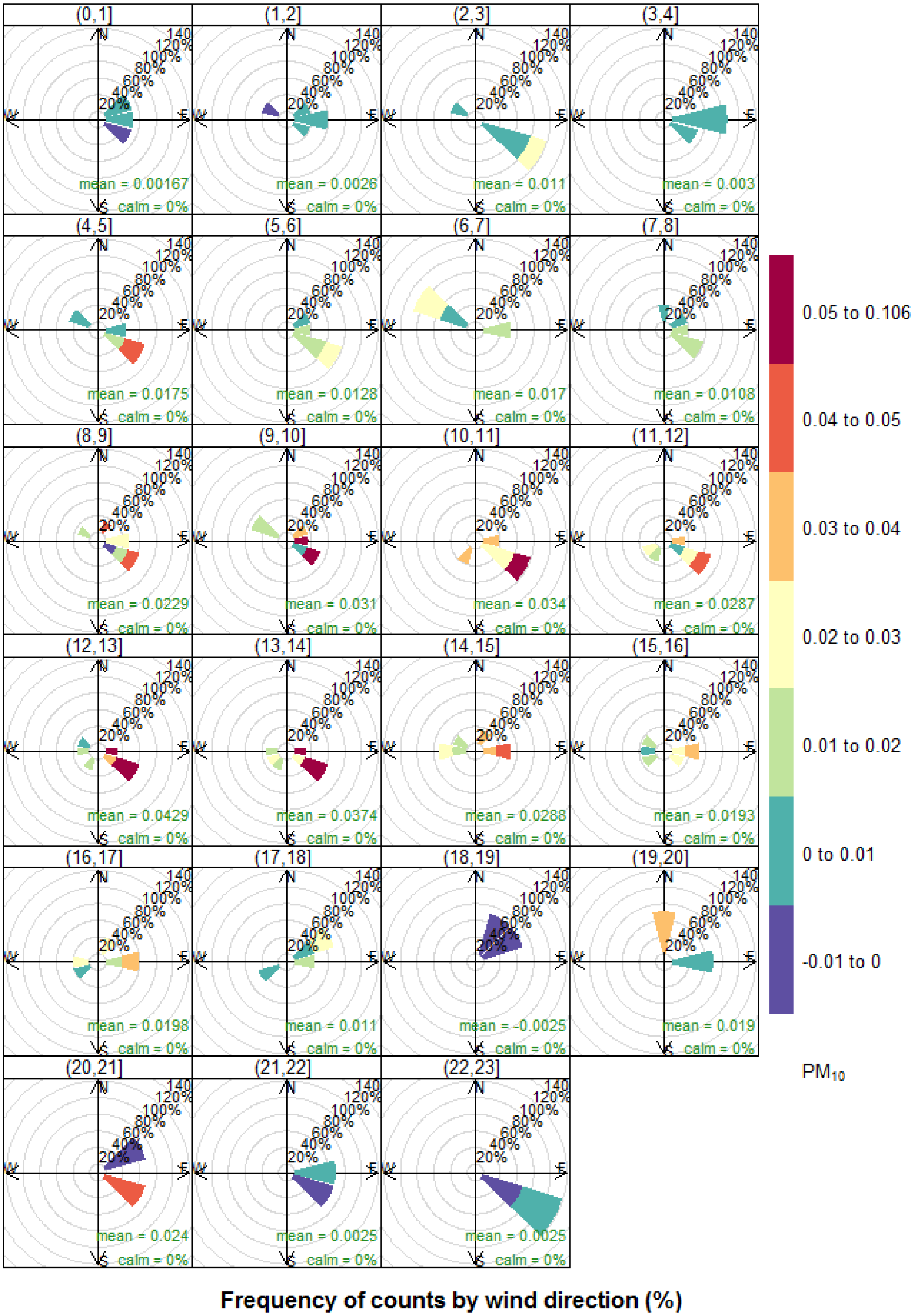

(0,1]
mean = 0.018
calm = 0%
(1,2]
mean = 0.016
calm = 0%
(2,3]
mean = 0.0237
calm = 0%
(3,4]
mean = 0.0265
calm = 0%
(4,5]
mean = 0.00933
calm = 0%
(5,6]
mean = 0.005
calm = 0%
(6,7]
mean = 0.0138
calm = 0%
(7,8]
mean = 0.012
calm = 0%
(8,9]
mean = 0.0339
calm = 0%
(9,10]
mean = 0.0234
calm = 0%
(10,11]
mean = 0.038
calm = 0%
(11,12]
mean = 0.0367
calm = 0%
(12,13]
mean = 0.0206
calm = 0%
(13,14]
mean = 0.028
calm = 0%
(14,15]
mean = 0.0219
calm = 0%
(15,16]
mean = 0.0134
calm = 0%
(16,17]
mean = 0.008
calm = 0%
(17,18]
mean = 0.0148
calm = 0%
(18,19]
mean = 0.023
calm = 0%
(19,20]
mean = 0.0268
calm = 0%
(20,21]
mean = 0.0271
calm = 0%
(21,22]
mean = 0.013
calm = 0%
(22,23]
mean = 0.0283
calm = 0%
0.05 to 0.214
0.04 to 0.05
0.03 to 0.04
0.02 to 0.03
0.01 to 0.02
0 to 0.01
-0.01 to 0
PM10
Frequency of counts by wind direction (%)

October



(0,1] mean = 0.0196 calm = 0%
(1,2] mean = 0.014 calm = 0%
(2,3] mean = 0.0123 calm = 0%
(3,4] mean = 0.0166 calm = 0%
(4,5] mean = 0.0184 calm = 0%
(5,6] mean = 0.0162 calm = 0%
(6,7] mean = 0.019 calm = 0%
(7,8] mean = 0.0148 calm = 0%
(8,9] mean = 0.0334 calm = 0%
(9,10] mean = 0.0358 calm = 0%
(10,11] mean = 0.0323 calm = 0%
(11,12] mean = 0.0271 calm = 0%
(12,13] mean = 0.0234 calm = 0%
(13,14] mean = 0.0278 calm = 0%
(14,15] mean = 0.0203 calm = 0%
(15,16] mean = 0.0203 calm = 0%
(16,17] mean = 0.0217 calm = 0%
(17,18] mean = 0.0234 calm = 0%
(18,19] mean = 0.0394 calm = 0%
(19,20] mean = 0.0461 calm = 0%
(20,21] mean = 0.0284 calm = 0%
(21,22] mean = 0.0226 calm = 0%
(22,23] mean = 0.0276 calm = 0%
0.05 to 0.289
0.04 to 0.05
0.03 to 0.04
0.02 to 0.03
0.01 to 0.02
0 to 0.01
-0.01 to 0
PM10
Frequency of counts by wind direction (%)

November


(0,1]
mean = 0.00167
calm = 0%
(1,2]
mean = 0.0026
calm = 0%
(2,3]
mean = 0.011
calm = 0%
(3,4]
mean = 0.003
calm = 0%
(4,5]
mean = 0.0175
calm = 0%
(5,6]
mean = 0.0128
calm = 0%
(6,7]
mean = 0.017
calm = 0%
(7,8]
mean = 0.0108
calm = 0%
(8,9]
mean = 0.0229
calm = 0%
(9,10]
mean = 0.031
calm = 0%
(10,11]
mean = 0.034
calm = 0%
(11,12]
mean = 0.0287
calm = 0%
(12,13]
mean = 0.0429
calm = 0%
(13,14]
mean = 0.0374
calm = 0%
(14,15]
mean = 0.0288
calm = 0%
(15,16]
mean = 0.0193
calm = 0%
(16,17]
mean = 0.0198
calm = 0%
(17,18]
mean = 0.011
calm = 0%
(18,19]
mean = -0.0025
calm = 0%
(19,20]
mean = 0.019
calm = 0%
(20,21]
mean = 0.024
calm = 0%
(21,22]
mean = 0.0025
calm = 0%
(22,23]
mean = 0.0025
calm = 0%
N
E
S
W
20%
40%
60%
80%
100%
120%
140
0.05 to 0.106
0.04 to 0.05
0.03 to 0.04
0.02 to 0.03
0.01 to 0.02
0 to 0.01
-0.01 to 0
PM10
Frequency of counts by wind direction (%)

Appendix C. $PM_{2.5}$ Estimation

EPA's *AP42, compilation of Air Pollutant Emission Factors*, is the primary compilation of EPA's emission factor information (EPA 2014b). It contains emission factors and process information for more than 200 air pollution source categories. The emission factors have been developed and compiled from source test data, material balance studies, and engineering estimates. $PM_{2.5}/PM_{10}$ ratios are provided for a variety of fugitive dust creating activities, and new values are proposed from a study based specifically on a variety of western soils (**Table C.1.**; MRI 2006).

Table C.1. Proposed Particle Size Ratios (MRI 2006)

Fugitive dust source category	EPA $PM_{2.5}/PM_{10}$ Ratio	
	Current	**Proposed***
Unpaved Roads (Public & Industrial)	0.15	0.1
Construction & Demolition	0.208	0.1
Aggregate Handling & Storage Piles	0.314	0.1 (traffic) 0.15 (transfer)
Industrial Wind Erosion	0.40	0.15
Open Area Wind Erosion		0.15

* The proposed values are based on a study completed for the Western Regional Air Partnership that analyzed different samplers and a variety of western soils (MRI 2006).

ATSDR estimated daily average $PM_{2.5}$ levels during the 2013 clean-up time-frame from the measured PM_{10} (from all sources) for the range of $PM_{2.5}/PM_{10}$ ratios provided by EPA (**Table C.2.**, EPA 2014b, MRI 2006). Using this method, ATSDR found only one instance in 2013 (October 4) when the 24-hour $PM_{2.5}$ NAAQS of 35 $\mu g/m^3$ may have been exceeded (44$\mu g/m^3$) if EPA's worst-case emission factors were applicable.

Table C.2. Range of Estimated $PM_{2.5}$ Daily Averages May – November 2013

Type of $PM_{2.5}$ Estimate	Estimated $PM_{2.5}$ Daily Averages ($\mu g/m^3$)	
	Current $PM_{2.5}/PM_{10}$ Ratio (0.15 – 0.40)	**Proposed $PM_{2.5}/PM_{10}$ Ratio (0.10 – 0.15)**
Maximum	17 – 44*	11 – 17
Minimum	1.2 – 3.2	0.8 – 1.2
Median	3.3 – 8.8	2.2 – 3.3
Average	3.6 - 9.5	2.4 – 3.6

*NOTE: One date, October 4, 2013, had an estimated $PM_{2.5}$ (44 $\mu g/m^3$) greater than the EPA NAAQS 24-hour standard of 35 $\mu g/m^3$.

Appendix D. Detailed Analysis of Dust Monitoring Data

Hand-held Dust Monitoring Data

On September 20, 2013, October 2, 2013, and October 23, 2013, dust measurements taken upwind of the site during prevailing easterly winds were higher than those on the downwind west side of the site, supporting that fugitive dust generated on-site was not a major contributor to dust blowing towards Fillmore residences. On October 24, 2013, and October 25, 2013, variable winds appear to have caused dust to blow from the site towards Fillmore residences for a short period of time (**Table D.1.**). The wind speeds were very low and the wind was measured to be blowing from the neighborhood onto and then across the site at these stations for the remainder of the day. Station 3 is located off-site near the Cayetano Elementary School and station 5 is located off-site near the Boy Scout house. The daily hand-held dust measurements and station wind readings indicate that the elevated levels of dust did blow towards the residential area on October 24, 2013 and October 25, 2013 for a short period of time and could have been the result of fugitive dust releases from the site. The station-specific measurements are insufficient to infer the exact origin and direction of the dust measurements in **Table D.1.** During the 3-hour window surrounding the elevated measurements blowing towards the neighborhood, the weather station measurements show that the wind was erratic, blowing north, south, east and west on October 24, 2013, and north, south and east on October 25, 2013. All other measurements on the west side of the site showed the wind blowing away from the neighborhood toward the site. These few measurements with wind blowing from the site towards the neighborhood at slightly elevated levels could have caused a very short-term exposure to site dust from a few minutes to a couple of hours. It is also possible that the dust was from off-site sources. The 24-hour average contribution from the site on October 24, 2013 and October 25, 2013 was below AAQS standards according to the hand-held dust monitoring data.

Table D.1. Summary of Wind and PM_{10} Data During the Two Days When Winds Blew Towards Fillmore Residences and Hand-held Data Indicated that the CARB AAQS (24 hour) Was Exceeded

Date	Station-Specific Hand-held Measurements				Weather Station Measurements		
	Station	Time	PM_{10}†	Wind Direction¥	Time	Wind Speed‡	Wind Direction¥
October 24, 2013	4	10:50 a.m.	66	W	10:00 a.m.	2.8	ESE
	6	10:56 a.m.	66	W	11:00 a.m.	0.8	SW
					12:00 p.m.	2.4	NNE
October 25, 2013	3	8:20 a.m.	60	W	8:00 a.m.	1.6	N
	5	8:36 a.m.	59	W	9:00 a.m.	0.7	SE
	4	9:36 a.m.	64	W	10:00 a.m.	3.3	NE

† Units = micrograms per cubic meter ($\mu g/m^3$)

‡ Units = miles per hour (mph)

¥ Indicates the direction the wind is blowing towards

Time-weighted, Lab analyzed Dust Monitoring Data (2013 Only)

All wind direction measurements for days with elevated continuous PM_{10} data through July 2013 were from the west towards the east (i.e. away from the adjacent neighborhood). Thus, it is unlikely that dust from the site was blown into the community on those days. The following August, September, and November dates had wind blowing towards the residences at some point during the day and measured continuous PM_{10} greater than 50 µg/m^3:

- On August 27, 2013, stations 1, 2, 8, and 9 had wind blowing towards the neighborhood for a short time and had 8-hour measurements > 50 µg/m^3. The measurements ranged from 54 to 76 µg/m^3. Wind measured at these stations blew from the site towards the neighborhood between 7:48 and 9:30 a.m. but away from the neighborhood for the remainder of the day. The on-site weather station reported calm wind at 7:00 and 8:00 a.m., but the wind speed rose to 9.0 mph by 9:00 a.m. and 9.9 mph by 10:00 a.m. Wind for the remainder of the day blew away from the neighborhood and toward the site and ranged from 2.6 to 10.9 mph (averaging 7.7 mph) from 11:00 a.m. to 5:00 p.m. Therefore, the dust that ranged from 54 to 76 µg/m^3 and blew from the site towards the neighborhood does not appear to have lasted more than 2 hours or approximately 25% of the measured day. This yields an estimated contribution of 14 to 19 µg/m^3 of site dust to the daily recorded level of dust at these stations, which is well below the CAARB AAQS.
- On September 17, 2013, stations 2 and 6 had measured light wind blowing from the site towards the neighborhood at 7:47 and 8:33 a.m. and had 8-hour measurements of 52 and 53 µg/m^3. Very light wind ranging from calm to 0.1 mph was measured at the weather station between 7:00 a.m. and 9:00 a.m. Wind for the remainder of the day blew away from the neighborhood and toward the site and ranged from 0.7 to 7.9 mph (averaging 4.5 mph) from 10:00 a.m. to 5:00 p.m. The wind measurements indicate that all of the measured dust at these stations was likely from wind blowing away from the neighborhood and toward the site and not a major factor in dust transport from the site into the residential area.
- On September 26, 2013, the 8 hour PM_{10} measurement was 92 µg/m^3 at station 8 on the northeast side of the site farthest from the residences. The wind direction fluctuated with two measurements found to blow towards the west (towards the residences) and three towards the east. Wind speed at the on-site meteorological station was less than 10 mph. None of the other stations exceeded 50 µg/m^3 on this date supporting that elevated dust was not blowing from the site into the residential area. However, since simultaneous upwind and downwind data are not available, the true nature of the dust on this date is uncertain.
- On November 14, 2013, measurements found PM_{10} ranging from 51 to 99 µg/m^3 on the residential side of the site. Work was stopped on that day at 11:30 a.m. due to high winds, which reached 10 mph between 10:00 and 11:00 a.m. and peaked at 15 mph around 3:00 p.m. Since work was stopped around the time that winds began to increase, the majority of the PM_{10} measured to exceed the 24-hour CARB AAQS was most likely due to ambient dust, not dust from the clean-up activities.
- On November 5, 2013, one station on the section south of the railroad measured over 8 hours a PM_{10} of 110 µg/m^3. Records indicate that minimal site activities were being performed that day to close the site for winter. Winds reached 15 mph that day and primarily blew towards the neighborhood. The weather was fair in the mid-70's. If

individuals were outside between about 10:00 a.m. and 3:00 p.m., when the wind was over 10 mph, it is possible that they may have breathed dust levels greater than the 24-hour CARB AAQS (50 $\mu g/m^3$) but less than the 24-hour NAAQS (150 $\mu g/m^3$). The primary concern would have been for PM exposure, since the contaminated soil had been moved into containment areas by this date.

Appendix E. Soil Screening Evaluation

Table E.1. shows the maximum detected concentrations of chemicals in soil and highlights values exceeding ATSDR's soil CVs. In **Table E.2.** arsenic, cadmium and copper are eliminated from further analysis based on EPA's risk management range and ATSDR's minimal risk level calculations for chronic exposure to the highest dose receptors (incidental child soil ingestion).

Table E.1. Screening of soil concentrations against ATSDR's soil comparison values (CVs)

Contaminant	Maximum Detected Value (mg/kg)[€]	Soil CV (mg/kg)*
Antimony	-	20 RMEG
Arsenic	**14**	0.47 CREG
Barium	540	10,000 cEMEG
Beryllium	0.56	100 cEMEG
Cadmium	**11**	5 cEMEG
Chromium	120	-
Chromium VI	0.27	45 cEMEG
Cobalt	13	20 pica iEMEG
Copper	**546**	20 pica a,iEMEG
Lead	**34000**	400 EPA action level
Mercury	0.35	4 pica iEMEG
Molybdenum	17	250 RMEG
Nickel	82	1000 RMEG
Selenium	3.2	250 cEMEG
Silver	-	250 RMEG
Thallium	-	-
Vanadium	15	20 pica iEMEG
Zinc	120	15,000 cEMEG
PAHs	**103**	0.096 CREG

[€] **Bolded** values exceed soil CVs

* These soil screening levels consider direct residential exposure. NOTE: Actual exposures at the PCPL site include dust blowing off-site from wind and remedial activities and future uses following clean-up.

Table E.2. Soil Contaminants Eliminated from Further Consideration by Comparison of Estimated Child Exposure Dose from Direct Soil Exposure with Critical Health Studies

Contaminant	Maximum Detected Value (mg/kg) €	Exposure Dose (mg/kg-day)*	Critical Health Study (mg/kg-day)
Arsenic	**14**	0.0002	0.0008/ This NOAEL for cancer is based on skin cancer cases in a large number of poor farmers exposed to high levels of arsenic in well water in Taiwan (Tseng 1977).[22]
Cadmium	**11**	0.0001	0.0001/ This chronic MRL was based on a pharmacokinetic model showing a 10% increased risk of effects on the kidney at 0.0003 mg/kg-d and an uncertainty factor of 3 for human variability[23]
Copper	**546**	0.007	0.01/ This intermediate MRL was based on gastrointestinal effects from drinking copper contaminated water at 0.091 mg/kg-day. No observed adverse effects occurred at 0.042 mg/kg-day and an uncertainty factor of 3 was used for human variability.[24]

€ **Bolded** values exceed soil CVs

* Exposure dose = soil concentration (mg/kg) x soil ingestion rate (200 mg/day) / (body weight (15 kg) x unit conversion (1,000,000 mg/kg))

[22] An estimated exposure dose of 0.014 mg/kg·day from water containing an estimated 170 µg/L arsenic was found to cause an increase in skin cancers, whereas the group estimated to be exposed to 0.0008 mg/kg·day from water containing an estimated 9 µg/L arsenic was found to exhibit no adverse effects (ATSDR 2007b). The oral MRL is 0.00030 mg/kg/day.

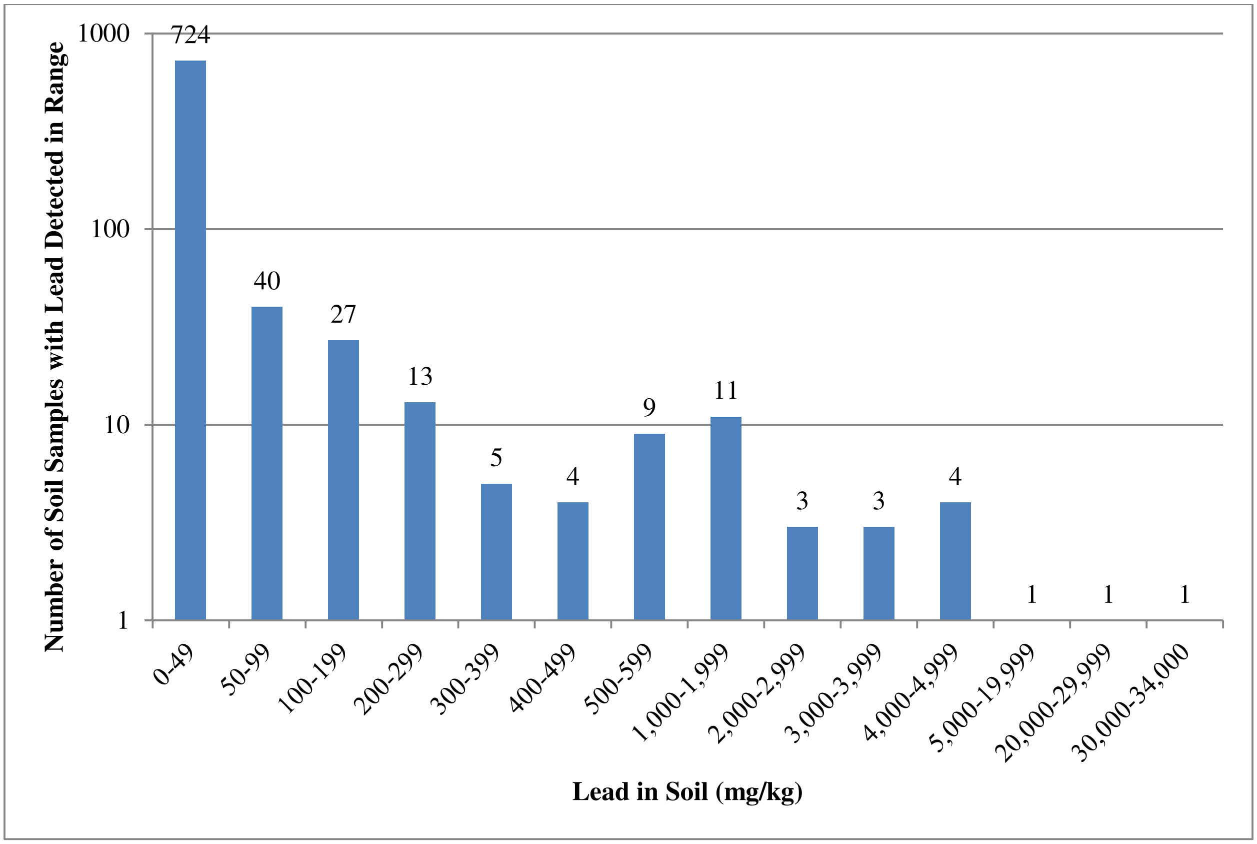
[23] http://www.atsdr.cdc.gov/toxprofiles/tp5.pdf

[24] http://www.atsdr.cdc.gov/ToxProfiles/tp132.pdf

Appendix F. Expanded Soil Lead Histogram

The soil lead data did not follow a discernible distribution with ProUCL analysis. A more detailed histogram of soil lead levels detected during the site investigation shows that 3 samples were detected between 5,000 and 34,000 mg/kg (**Figure F.1**).

Figure F.1. Expanded Soil Lead Histogram



Averages were calculated for the individual areas of concern (AOC) (see Figure 12 for a map of the AOCs) (**Table F.1.**). The higher soil lead averages are spread across a number of AOCs, indicating that the higher lead concentration soil borings are not confined to hotspots that would be expected to produce high concentrations of lead in dust for a sustained period of time. The monitoring of lead in dust at the site confirms that elevated lead in dust did not occur.

Table F.1. Average Soil Lead Concentrations (mg/kg) for Areas of Concern (AOCs)

AOC	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**
Concentration	383	7	43	14	28	628	39	44	227	115	103	16	836	19

Appendix G. Polycyclic Aromatic Hydrocarbons Calculations

Table G.1. Relative Potency Factors for PAHs

Chemical	Relative Potency Factor (RPF)[†]
Acenaphthene	0.001
Acenaphthylene	0.001
Anthracene	0.01
Benzo(a)anthracene	0.1
Benzo(a)pyrene	1
Benzo(b)fluoranthene	0.1
Benzo(g,h,i)perylene	0.01
Benzo(k)fluoranthene	0.01
Chrysene	0.001
Dibenz(a,h)anthracene	1
Fluorene	0.001
Fluoranthene	0.001
Indeno(1,2,3-cd)pyrene	0.1
2-Methylnaphthalene	0.001*
Naphthalene	0.001
Phenanthrene	0.001
Pyrene	0.001

[†] WHO 1998 (Table AI.9)

* Used the RPF for naphthalene as the surrogate for 2-methylnaphthalene (http://www.epa.gov/region4/superfund/programs/riskassess/healtbul.html)

The family of PAHs in the table above all cause a similar type of toxic effect in the body. Therefore, ATSDR added the amount that each individual chemical contributes together to estimate the overall toxic effect on a person. This added or combined effect is called the toxic equivalent (TEQ). The TEQ is expressed according to the individual chemical that is the main cause of toxicity, benzo(a)pyrene. The TEQ of benzo(a)pyrene for a mixture of PAH chemicals is calculated as follows:

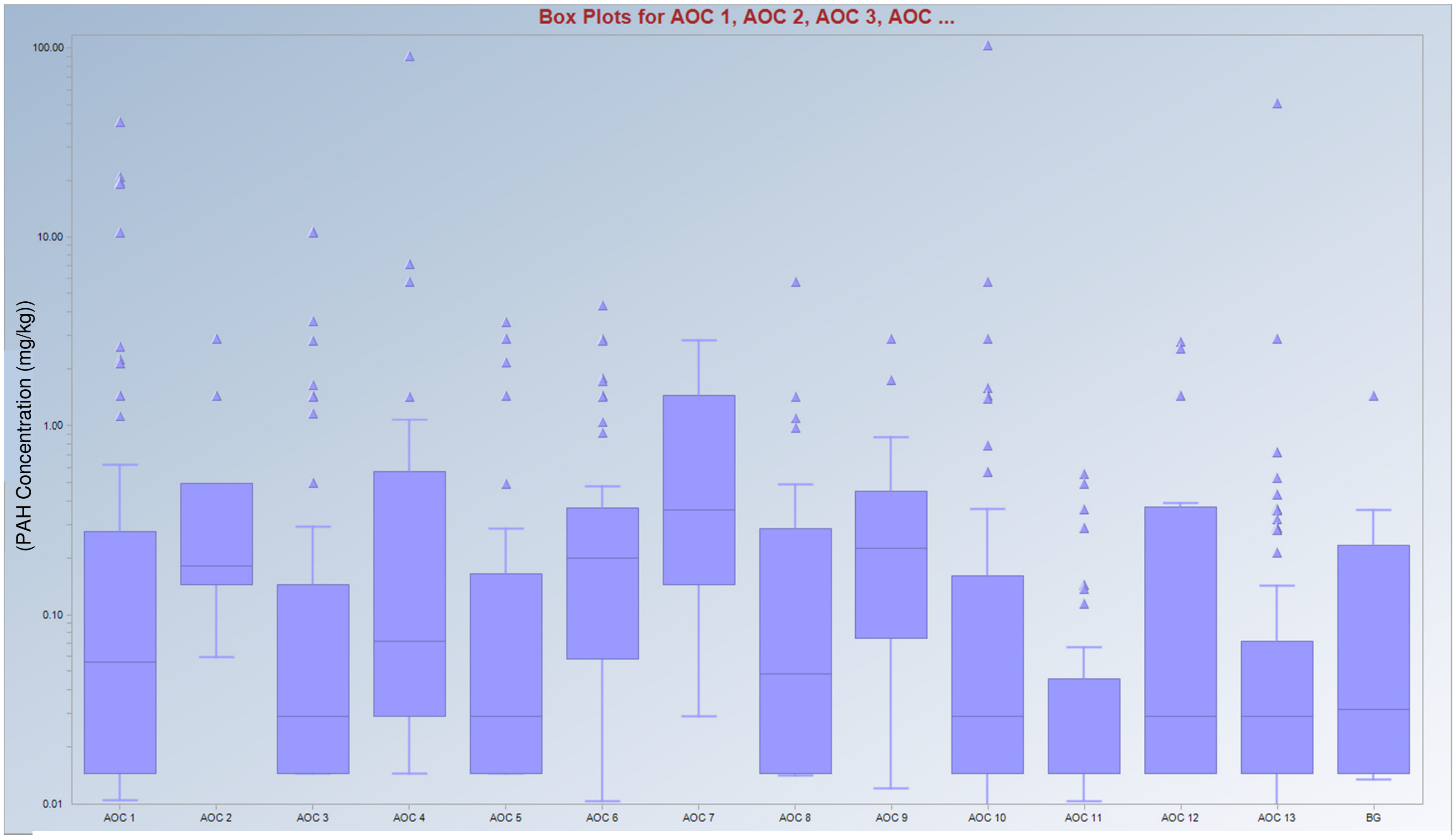
$TEQ = \Sigma\ C_{chemical} * RPF_{chemical}$

where

$C_{chemical}$ = the concentration of each PAH chemical in the mixture, and

$RPF_{chemical}$ = the relative potency factor of each PAH chemical in the mixture

Figure G.1. Box Plots for PAHs in PCPL Site Soil Sample Data



The site-specific clean-up levels are stated for the individual PAHs instead of the mixture. ATSDR evaluates PAH toxicity based on a mixtures approach by using the relative potency factors in **Table G.1**. The TEQ for the site-specific clean-up levels is shown in **Table G.2**.

Table G.2. TEQ for Site-Specific Clean-up Levels

Chemical	**Relative Potency Factor (RPF)†**	**Clean-up Levels (mg/kg)**	**BaP TEQ for Clean-up Levels (mg/kg)**
Acenaphthene	0.001		
Acenaphthylene	0.001		
Anthracene	0.01		
Benzo(a)anthracene	0.1	1.2	0.12
Benzo(a)pyrene	1	0.12	0.12
Benzo(b)fluoranthene	0.1	1.2	0.12
Benzo(g,h,i)perylene	0.01		
Benzo(k)fluoranthene	0.01	1.2	0.012
Chrysene	0.001	12	0.012
Dibenz(a,h)anthracene	1	0.35	0.35
Fluorene	0.001		
Fluoranthene	0.001		
Indeno(1,2,3-cd)pyrene	0.1	1.2	0.12
2-Methylnaphthalene	0.001*		
Naphthalene	0.001	13	0.013
Phenanthrene	0.001		
Pyrene	0.001		
		TEQ for Site-Specific Clean-up Levels:	**0.867**

† WHO 1998 (Table AI.9)

* Used the RPF for naphthalene as the surrogate for 2-methylnaphthalene

The assumptions for the PAH cancer calculations used to develop **Table 13** are shown below:

Cancer risk =
ingestion risk [C_{soil} x IR_{soil} x $UCF_{kg/mg}$ x ED x EF x ET x SFo / (AT x BW)] +
inhalation risk [C_{soil} x IUR x $UCF_{\mu g/mg}$ x (1/VF + 1/PEF) x ED x EF x ET / AT] +
dermal risk [C_{soil} x $UCF_{kg/mg}$ x AF x ABSd x SA x SFo x ED x EF x EV / (AT x BW)]

where soil concentration (C_{soil}) = PAH soil clean-up levels (defined above)
soil ingestion rate (IR_{soil}) = 200 mg/day for children and 100 mg/day for adults[25]
unit conversion factor ($UCF_{kg/mg}$) = 0.000001 kg/mg
exposure duration (ED) = 6 years for children and 25 years for adults (EPA 2002)[25]
exposure frequency (EF) = 5 days per 7 week days
exposure time (ET) = 4 hours for children or 8 hours for adults per 12 waking hours
oral cancer slope factor (SFo) = 7.3/(mg/(kg-day))
averaging time (AT) = 70 years[25]
body weight (BW) = 15 kg for children and 70 kg for adults[25]
conversion factor ($UCF_{\mu g/mg}$) = 1000 µg/mg
volatilization factor (VF) = 9,890,000 m^3/kg[25]
particulate emissions factor (PEF) = 1,000,000,000 m^3/kg for Los Angeles[26]
soil adherence factor (AF) = 0.2 mg/cm^2 for children and 0.07 mg/cm^2 for adults[25]
dermal absorption factor (ABSd) = 0.13[25]
surface area (SA) = 2800 cm^2 for children and 3300 cm^2 for adults[25]
event frequency (EV) = 1 event per day[25]
Assumes 100% bioavailability

[25] http://rais.ornl.gov/documents/SSG_nonrad_supplemental.pdf.

[26] http://www.dtsc.ca.gov/Schools/upload/Appendix_D.pdf

Appendix H. Site-specific Assumptions Used in the Lead Models

Following are the assumptions and results of the IEUBK model:

Soil – The soil value used was a time-weighted average of site soil and local residential soil. ATSDR analyzed a child site user scenario and a child non-site user scenario to evaluate the potential impact of site soil levels on BLLs. Time-weighted averages are estimated as follows:

$TWA_{soil} = C_{site} \times f_{site} + C_{resid} \times f_{resid}$

where TWA_{soil} = time-weighted average of soil concentration (96 mg/kg)
C_{site} = site soil concentration (320 mg/kg cleanup level for the commercial/industrial area)
f_{site} = fraction of waking hours at site

- 0.24; assumes 4 hours at site per 12 waking hours per day, 5 days per 7 day week

C_{resid} = residential soil concentration (26 mg/kg background for surface soil at 1 foot or less depth (URS 2011))
f_{resid} = fraction of waking hours at residence

- 1.0 - f_{site}; assumes remaining time is spent at residence

The background level of 26 mg/kg was determined by taking soil samples in uncontaminated areas on-site. The actual levels in the Fillmore neighborhood and school yard have not been sampled. Residential sources like lead paint may contribute to lead levels around local homes. **Figure 15** shows that many homes were built prior to the phase-out of lead based paint in 1978.

Drinking water - The drinking water level of 1.7 µg/L for flushed water is the 90th percent level from the City of Fillmore, Consumer Confidence Report, Water Quality, 2011 http://www.fillmoreca.com/docs/water-report-2011.pdf. The value was entered into the IEUBK model as the concentration of lead in flushed water. The default value of lead (4 µg/L) was maintained as first draw because older pipes (typically installed prior to 1986) may leach lead into drinking water at homes and schools before it reaches the tap (EPA 2012b).

Lead type - Chevron had the soil tested to find out what types of lead were present in the soil. The health assessment process is different for different types of lead. Most of the lead detected at the site is assumed to be inorganic lead. Though the original source of lead contamination is assumed to be tetraethyl lead, tetraethyl lead is highly volatile, existing almost entirely in the vapor phase in the atmosphere (Eisenreich et al. 1981). Tetraethyl lead also has a short half-life of 5.7 hours during summer conditions (Nielsen et al. 1991), and ultimately degrades to inorganic lead. Studies on site soil found no alkylated species of lead (like tetraethyl lead) (Geomega 2010). If tetraethyl lead were present, a health assessment method other than the IEUBK model would be used. Some organic lead was detected at the site and is likely present due to adsorption of inorganic lead to natural soil organic matter (Geomega 2010). Lead adsorbed to soil organic matter may be assessed using the IEUBK model. The tests confirmed that the IEUBK default assumption for relative bioavailability was consistent with site soils (URS 2011).

Exposure duration - About 3 months of sustained intermittent exposure is required for lead to reach pseudo-steady state levels in blood (EPA 2003, 2006).

Following are the assumptions and results of the ALM:

Calculations of Blood Lead Concentrations (PbBs)

U.S. EPA Technical Review Workgroup for Lead, Adult Lead Committee

Version date 6/21/09

Variable	Description of Variable	Units	GSDi & PbBo from Analysis of NHANES 1999-2004
PbS	Soil lead concentration	ug/g or ppm	320
$R_{fetal/maternal}$	Fetal/maternal PbB ratio	--	0.9
BKSF	Biokinetic Slope Factor	ug/dL per ug/day	0.4
GSD_i	Geometric standard deviation PbB	--	1.8
PbB_0	Baseline PbB	ug/dL	1.0
IR_S	Soil ingestion rate (including soil-derived indoor dust)	g/day	0.100
IR_{S+D}	Total ingestion rate of outdoor soil and indoor dust	g/day	--
W_S	Weighting factor; fraction of IR_{S+D} ingested as outdoor soil	--	--
K_{SD}	Mass fraction of soil in dust	--	--
$AF_{S, D}$	Absorption fraction (same for soil and dust)	--	0.12
$EF_{S, D}$	Exposure frequency (same for soil and dust)	days/yr	250
$AT_{S, D}$	Averaging time (same for soil and dust)	days/yr	365
PbB_{adult}	**PbB of adult worker, geometric mean**	**ug/dL**	**2.1**
$PbB_{fetal, 0.95}$	95th percentile PbB among fetuses of adult workers	ug/dL	4.9
PbB_t	Target PbB level of concern (e.g., 10 ug/dL)	ug/dL	**5.0**
$P(PbB_{fetal} > PbB_t)$	**Probability that fetal PbB > PbB_t, assuming lognormal distribution**	**%**	**4.5%**

Appendix I. Behavior and Lifestyle Choices

Lifestyle factors can play an important role in the likelihood that people will be exposed to, or experience health effects from, environmental chemicals. People come into contact with chemicals every day in common materials around them like paints, fuels, and other products. Chemical exposures also occur based on behaviors and activities like smoking and eating. Below is information about lifestyle factors which can increase or decrease exposure to lead or PAHs, such as diet, smoking, and the age of the paint in your home.

Behaviors affecting dust exposures - The amount of dust and soil to which people are exposed varies considerably depending on individual behaviors. People who are outdoors on dusty, windy days will likely breathe and swallow more dust than those who seek to avoid such conditions. Additionally, cleaning practices such as wet mopping and dusting with damp clothes can result in less airborne dust indoors than dry sweeping and dusting.

The effect of diet on lead exposures– If a child has elevated blood lead levels, the most important thing to do is identify the source of exposure to lead and reduce or stop contact with the source. In addition, the foods we eat and the vitamins and minerals we take in during meals can influence how our bodies are affected by lead. Below are points about maintaining a diet that can improve nutrition in a person affected by lead.

- Maintain a balanced diet that includes adequate calcium, iron, and vitamin C (ACCLPP 2012).
- Animal and human studies provide good evidence that dietary calcium competitively inhibits lead absorption. Two servings of calcium-rich items per day, such as dairy, broccoli, greens, kidney beans and calcium-fortified juices are recommended (ACCLPP 2012).
- Adequate iron intake has been shown to improve developmental scores in children with EBLLs. Adequate intake of iron-rich foods such as meat and fortified cereals are recommended (ACCLPP 2012)
- Some evidence supports that adequate vitamin C intake can decrease BLLs in adults and improve iron absorption in children. Two servings of vitamin C-rich fruits, vegetables and juices are recommended (ACCLPP 2012).

The effect of diet on exposure to PAHs – PAHs are created when products like coal, oil, gas, and garbage are burned but the burning process is not complete. Grilling and charring food increases the amount of PAHs in the food.

- Avoid cooking foods at excessively high temperatures, such as occurs during the chargrilling of meats. Cooking foods at excessively high temperatures increases their PAH content.

The effect of smoke and fumes on exposure to PAHs and $PM_{2.5}$ – Breathing cigarette smoke and fumes from other combustion processes such as vehicle exhaust typically increases PAH exposure (ATSDR 1995). Epidemiologic studies have provided evidence that cardiovascular effects from $PM_{2.5}$ are affected by smoking status (EPA 2009a).

The effect of lead-based paint on exposure to lead – Homes built before 1978 may have lead-based paint. Home repairs that create even a small amount of lead dust are enough to poison your child and put your family at risk. If you live in a home or apartment that was built before 1978 and are planning a renovation or repair project, you should contact a “Lead-Safe Certified” contractor.[27]

[27] http://www2.epa.gov/lead/renovation-repair-and-painting-program-consumers

Appendix J. Comments on the Draft Health Consultation and ATSDR's Responses

During a public commenting period (6/1/2015 – 8/30/2015), ATSDR received two sets of comments. The comments and ATSDR's responses are provided below.

Comment set #1 [Note: Some comments were lightly edited for clarity]

Comment	ATSDR Response
Concerns about data quality I have seen many discrepancies that Chevron has reported on or didn't report on so my faith in the data they have provided you may be not accurate or forthcoming in its accuracy. A lot of your data was received and taken by Chevron and others. Chevron has not been forthcoming on information that was asked of them from myself and others and the information we received was only information they chose we get. So you can understand why their input into this report with their data collection information also does not hold any value to this report.	The Community Concerns section of the report notes that some community members do not trust the data Chevron has collected. At this site ATSDR relied primarily on environmental data that was collected by Chevron and its contractors using EPA-approved methods and with EPA oversight. The sources of data we used in this analysis are typical of the source of data we use at all sites we work on. ATSDR's capacity to collect our own data is limited. ATSDR shared data quality concerns and limitations in the Uncertainties section of this report.
Concerns about Past Exposures Page 7: The concern that neighbors had was how will or if this contaminated soil would affect them. No one from the ATSDR, Ventura County, EPA, City of Fillmore or Chevron/Texaco to my knowledge ever asked individuals in the background check how this Superfund site had up to that point affected their health. Many of these neighbors and I did not even know that there was a Superfund site next to us. This is not in your report. Page 11: The fence that Chevron had at the site prior to the cleanup was dilapidated in many areas or non-existent. Because of this fact MANY people visited the site over the past 20-30 years prior to the cleanup of the soil. Faith in the new fence being maintained or its effectiveness is minimal.	This report focused on recent past (2011-2014), present, and future exposures at the site. As noted in the Community Concerns section, ATSDR is aware that some community members have concerns about past exposures and health effects. ATSDR added a statement to the Community Concerns section noting that some community members were not aware of the superfund site.
Comments on Dust Control Page 9 & 10: Methods used were not followed. Residences were told that work would be stopped if winds were blowing, period. Next they (Chevron) told us	This report evaluates dust levels on high wind days, including information on when and why work was stopped. We acknowledge the commenter's assertion that Chevron did not

(neighbors/school) that it would stop work if the winds were from the east, and then they told us if the winds were greater than 25 mph. What really ended up happening is that they would work until someone called and complained about the work on a windy day and even then it may not be a gale of wind so they would keep working despite the fact that it was blowing into to the school and neighborhoods. Their suppression method using soil stabilizers were possibly a hazard themselves. Page 23: Contaminated dust did move across the property lines. All dust came over to us as the Superfund site has been stripped of at least 80 percent of the plants, trees and shrubs that would in the past shield the neighbors, students, and teachers form such dust during wind storms. [The project manager at Chevron]… told us that the winds never blow from the east to west so there would be no problem with dust coming into are areas. Now many of us neighbors have lived in Fillmore all our lives and YES it does blow form the east to the west with regularity seasonally. They were not forthcoming or accurate with their information. Because collection data is uncertain then exact exposure to students/teachers/neighbors is uncertain. Page 35: There is little to no vegetation to help protect neighbors from dust or future odors currently. My concern is with some of the excavated areas that did not get backfilled with clean dirt could now be blown over to us (residents/students). Page 48: the statement "in most instances, work was stopped" (concerning dust). Would be more accurately conveyed if it said "if someone complained then work would be stopped I had dust particles that were black that covered my children's playset, no one ever	implement its own dust control plan as stated to the residents. ATSDR edited the section "Dust Control at the Site" to note that the soil stabilizer Chevron used at the site was approved by EPA. ATSDR edited the Site Clean-up section of the report to clarify that all excavated areas were backfilled in either 2013 or 2014. ATSDR added the concern about the color of backyard dust to the Community Concerns section of the report. ATSDR also noted that the Agency is available to help interpret sampling data collected by individuals.

came over to test. Usually the dust that came over from the site before the cleanup was brown in color and not black.	
Comments on Odors Many neighbors found the odors from the site horrific, to the point of feeling sick. Chevron said it could be the site or the chemical used to suppress odor or concrete work being done by the County in the creek between the site and neighbors. They really had no clue what the smell was. Page 21: The odor problems were EXTREME!! The odors forced my family into our home for the entire summer. The odor would give people headaches and nausea. Chevron said that it could possibly be the suppression method that was the odor but the odor was there before and after they applied their product. This is a GREAT concern for many as to if we were contaminated during this time of cleanup. On one of the last days of cleanup Chevron found yet another unknown pit (contaminated area) that spewed out the horrific odor that this time affected the area from Main St. to Central up to 1st street. This odor caused some of the officials to become concerned enough so they went over to the site to investigate what had happened. This was the same odor that we the neighbors/students/teachers had been living with during the year of cleanup with no concern for our health. I would like to request further investigation on the exposure to naphthalene and benzo (a) pyrene and the increase of cancers for all neighbors, students and teachers.	ATSDR acknowledges that community members experienced foul odors from the site at certain points during the clean-up process, and that the odors caused concern, frustration, and at times the need to change activities by staying indoors. While the foul odors may have caused temporary symptoms, lasting health effects are not expected. ATSDR has developed a website on odors that may be helpful.[28] ATSDR provides a rough estimate for cancer risks related to naphthalene and benzo(a)pyrene exposures in the Community Concerns section.
Complaint sheet: Page 9 & 10: The company name that was given to neighbors with a phone number to complain was Texaco and not Chevron so people may not have even known they were the same site or company.	ATSDR acknowledges the commenter's assertion that the way the company name was used in the complaint information may have been unclear to neighbors.

[28] http://www.atsdr.cdc.gov/odors/

Comments on air monitoring methods used at the site: A monitor on one occasion that I know of was not working and I reported it, so the data for that day would be incomplete. On windy days I would see the units blown over for hours, so the data would be incomplete on those days. I feel that one hand held monitor for 56 acres does not give accurate data on the site and its risks to others. The areas that were being worked on did not always have a dust monitor nearby it.	ATSDR edited the "Uncertainties" section of the report to include these potential air monitoring problems. ATSDR agrees that there are limitations in the conclusions that can be drawn about exposures to contaminants in the air due to the monitoring methods used at the site. These limitations are addressed in the report.
Notification of neighbors At risk neighbors/students were not notified about the high levels of contaminants in the area on certain days. None of the neighbors/school were notified any time.	ATSDR notes that the Dust Suppression and Air Monitoring Plan did not address the issue of whether and how neighbors and San Cayetano Elementary School staff and students would be notified of elevated levels of contaminants. ATSDR's analysis of air contaminant levels suggest that on some days dust levels in the area could have harmed the health of people with certain preexisting conditions. However, we were not able to figure out how much of the dust may have been from the site and how much from off-site locations.
Backfill of excavated areas Page 16: Why were ALL excavated areas not back filled?	ATSDR edited the Site Clean-up section to clarify that all excavated areas were backfilled in either 2013 or 2014.
Community outreach Page 19: The statement says several outreach activities were held to collect and understand the health concerns many had. I live less than 100 feet from this site and did not hear of any of these activities. I and others only learned of the health concerns when the local non-profit One Step A La Vez went door to door contacting neighbors about a health survey. Up until then no government agency had or has asked about health concerns. I was only told of one activity that the ATSDR held, not the same as many. My opinion is the ATSDR's lack of personal contact with individual neighbors, students,	The Background section notes the community outreach ATSDR conducted in 2013 and 2014 to inform community members about our work and learn about their health concerns. ATSDR agrees that it could have conducted additional outreach with site neighbors to better understand their concerns.

and teachers directly affected health-wise before, during, and after the cleanup process does not give confidence that a complete analysis was done and makes the report inaccurate and incomplete.	
Concerns about cancer Page 20: The residents in the affected areas have many cancers and in some homes there are multiple persons who have died of cancers, but a door to door in all the neighborhoods and the school was not done so this data is incomplete. Outreach to those who have moved was also not done. I would like to make a formal request for further investigation of this cancer issue.	ATSDR understands that some community members perceive a high rate of cancers in the neighborhoods near the site. As noted in the Community Concerns section of the report, the California Cancer Registry has analyzed cancer rates in the area and communicated the results to community members. Community members interested in additional cancer evaluations may contact the California Cancer Registry at (916) 731-2500.
Map of soil excavation areas Page 40 Map of Soil Excavation Areas: Work was done on the end of 2nd Street but it is not indicated on the map. This makes this information incomplete and leads a person to wonder what other areas are not marked. I live next to this site so I know. I was also in a meeting when it was being worked on but not reported on as a community update.	This is a map that ATSDR received from EPA showing the proposed excavation areas at the site. ATSDR added a statement in the section "Chemical Contamination in Soil" clarifying that additional areas were excavated based on the soil sampling results taken during the excavation process.
Concerns about lead Page 41: How can it be determined that contamination exposure has not affected students/teachers or neighbors if lead samples were not taken from the individual homes or school site, regardless of the date of their house paint history. The sample would be (would have been) taken from the soil and the air, but this was not done at all. So the data is incomplete and not accurate. Page 45 : The lead monitors were not put on private properties or the elementary school site so the exposures to those areas was not even included in the data, so this makes the data incomplete and not accurate. Page 44: It appears from the data that there is the possibility people WERE exposed to lead during 2011-2012 but because the lab could not use the data it is unknown, incomplete data.	ATSDR edited both the "Chemical Contamination in Soil" and the "Uncertainties" section to provide additional information about the soil samples that were taken west of Pole Creek. This data suggests that site contaminants do not extend into the neighborhood west of the site. ATSDR is not aware of data to evaluate potential exposures at residences or the school near the site. ATSDR notes in this report that there could be non-site sources of contamination at residences and the school. As shown in the map "Location and Type of Air Monitoring at the PCPL Site in 2013," several air monitors were located along the west side of the site, near homes and the school. ATSDR edited the "Chemical Contamination in Dust" section to clarify the lead monitoring methods that were used in 2011-2012. In

	2011-2012 the laboratory detection limits for lead air samples was set higher than ATSDR's preferred screening level. Thus it is not possible to know whether lead levels in air at the time were below the laboratory level of detection (about 0.35 µg/m^3) but above ATSDR's preferred screening level (0.15 µg/m^3). During soil excavation in 2013, the laboratory detection limit for airborne lead samples was set lower than 0.15 µg/m^3. All measurements were lower than this level.
Use of qualifiers Throughout your report the words unlikely, may not, and possibly are used to describe the likelihood that these hazardous contaminants have or will affect neighbors, teachers, and children. These are not definitive words and hold little value to those of us who have lived with this concern for years now.	ATSDR acknowledges the commenter's desire for definitive answers. However, ATSDR uses these qualifiers to communicate the uncertainty associated with some of the information presented in the report.
Proposed solar energy reuse I would also like to request investigation into what health issues may affect neighbors/students, and teachers if the superfund site is not developed as planned but turned into a solar farm.	ATSDR has incorporated information about the proposed solar energy reuse into the report.

Comment set #2

Comment	ATSDR Response
Corrections for historical accuracy Page 7: In 1986, the California Department of Health Services Oversaw the removal of waste and soil from the Site, not EPA as stated in the Report.	ATSDR corrected this in the text.
Dust complaints Page 11 & 56: The Report recommends that members of the public call (661) 632-1408 for dust complaints. This number is no longer in service. It would be best to refer people to the dust complaint number that will be posted during future construction activities, because that number may change depending upon who performs the work.	ATSDR edited the report to indicate that people should refer to the posted dust complaint number.
Correction of typographical error Page 14: The Report states "During a January 1415 visit, ATSDR regional staff toured the	ATSDR corrected this in the text. ATSDR corrected the name of the Act.

site…” A hyphen is missing for January 14-15. Page 21-22, Table 1. The report incorrectly references the federal Occupational Safety and Health Act as the “Occupational Safety and Hygiene Act”. Page 24-35: The acronym “CAARB in the paragraph beneath Figure 8 is incorrect and should be changed to “CARB” (California Air Resources Board). Page 45: The Report references the “Dust Suppression and Monitoring Plan”. The correct title of that document is “Dust Suppression and Air Monitoring Plan”.	ATSDR corrected the acronym for the California Air Resources Board. ATSDR corrected the name of the Dust Suppression and Air Monitoring Plan.
Community concerns Pages 21-22, Table 1: The concerns listed in Table 1 have been addressed by studies directed by EPA and related documentation is available.	ATSDR added a sentence to the Community Concerns section of the report noting that the EPA project website has information related to several of these issues.
Dust monitoring Pages 24-25, Dust Monitoring Data section, including Table 3: This Section of the Report incorrectly characterizes the dust monitoring activities conducted in 2011 and 2012 while remedial work was being performed at the Site. The information in this section of the Report should be revised to be consistent with the following descriptions of the dust monitoring activities conducted at the Site. In 2011 stationary Dustrak 8520 particulate monitors recorded dust concentrations every minute. The upwind and downwind concentrations were compared to evaluate dust levels potentially originating from the site. In 2012 stationary Dustrak 8530 particulate monitors were established at nine monitoring stations. The Dustrak monitors recorded dust concentrations every 15 minutes. The upwind and downwind concentrations were compared	ATSDR adjusted the report to reflect the air monitoring methods used at the site. ATSDR clarified in the DustTrak Monitoring Data section that uncertainty associated with the use of hand held dust monitoring methods pertains to 2013 data. ATSDR also added a sentence noting that the E-BAM may not have measured dust migrating to the north or south of its location. ATSDR clarified in the Uncertainties section that comments on the adequacy of the data to determine the site contribution to dust levels measured near the site pertains to 2013 data only. ATSDR did not have the data necessary to analyze upwind/downwind particulate matter levels for 2011 and 2012. ATSDR added a sentence noting that the E-BAM monitoring station would only detect downwind levels in cases where the wind was blowing in a straight line from an upwind hand-held unit towards the E-BAM at the time of measurement.

to evaluate dust levels potentially originating from the Site. In 2013, a handheld Dustrak 8532 particulate monitor was used to collect discrete measurements at each of the ten monitoring stations shown on Figure 4 for comparison to the stationary beta attenuation monitor (E-BAM) that operated 24/7 in the neighborhood. Page 32, Figure 7: As noted above, stationary dust monitors were used in 2011 and 2012. Therefore, the references to hand-held monitoring equipment in the title and footnote of Figure 7 are inaccurate and should be revised. Page 33, Figure 8: As noted above, stationary dust monitors were used in 2011 and 2012. Therefore, the references to hand-held monitoring equipment in the title and footnote of Figure 8 are inaccurate and should be revised. Page 31: The following statement in the Report that "there is uncertainty…because the hand-held instrument…was moved from station to station and did not measure upwind and downwind data simultaneously" is inaccurate and should be revised for two reasons. First, as was noted above, the dust monitors used in 2011 and 2012 were stationary, not hand-held. Second, in 2011 and 2012, upwind and downwind dust measurements were in fact taken simultaneously. Similarly, in 2013, when hand-held monitoring equipment was actually used, those measurements were taken simultaneously with the E-BAM measurements. These data support ATSDR's conclusion that dust measurements were primarily from off-site (background) sources. Chevron believes that these data confirm that dust suppression	

during Site earthwork was effective and protected the community. See additional comment below for page 54. Page 54: The Report states: "*ATSDR could not estimate the amount of PM10 originating from the site (as opposed to other local or regional sources). The hand-held monitoring data available to analyze this issue did not allow ATSDR to make a direct comparison of upwind and downwind PM levels at specific times because there was only one monitor that was used and it was moved from station to station rather than having several monitors recording concurrently.* As described above, the 2011 and 2012 dust monitoring data were continuous measurements collected simultaneously with the either seven (2011) or nine (2012) air monitoring stations. In 2013, although the hand-held meter was moved from station to station, the E-BAM remained fixed off-site at Station 3 and operated continuously. Therefore, the monitoring data results can be used to evaluate off-site dust concentrations throughout the 2013 excavation activities at the Site. The 2012 and 2013 average PM_{10} concentrations are summarized as follows:	

Monitor Type	Eastern Average (µg/m^3)	Western Average (µg/m^3)
2013 (Handheld)	0.028	0.027
2013 (BAM)	---	0.024
2012 Stationary	0.029	0.026

Both upwind and downwind dust concentrations measured with the hand-held monitor in 2013 closely match measurements collected with the stationary monitors in 2012. These results support the validity of the estimated dust contribution calculated in the 2013 soil remedial action report.

Sharing of additional air monitoring data Page 28: The Report states that the E-BAM did not operate from 8:00am October 3, 2013 until 9:00am October 4, 2013. However, the E-BAM was in fact operating during that times. URS inadvertently missed these data when extracting the E-BAM dataset into an Excel file for ATSDR. The complete data was forwarded to ATSDR via email on 6/26/2015.	ATSDR received the missing data, included it in the final analysis, and removed the sentence from the final report.
Page 35: Although the Site has a low percentage of vegetative cover, over 70% of the Site is in fact covered by cover materials, as required by the State of California at the conclusion of grading. In addition to seeded slopes, the majority of the lot areas and all access roads are covered with crushed concrete and brick material to prevent fugitive dust. These cover materials were shown to ATSDR staff during the 6/25/2015 Site tour.	ATSDR added a sentence to the Vegetative Cover section noting the ground cover in place at the site.
Lead comparison levels Page 44: The Report states that "[lead] data cannot be used to determine if lead was greater than the screening level (0.15 $\mu g/m^3$)." The screening level referenced here is the National Ambient Air Quality Standard (NAAQS) for lead. However, as noted in the Report, this was not the lead screening level used for the Site until 2013 when soil remedial actions were performed. For the infrastructure removal activities conducted at the Site in 2011 and 2012, the lead results were compared to the U.S. Occupational Safety and Health Administration (OSHA) Permissible Exposure Limit (PEL) of 50 $\mu g/m^3$. The results from the 2011 and 2012 lead sampling at the Site were below the PEL.	ATSDR clarified that the screening level used for lead was the OSHA Permissible Exposure Limit (PEL) in 2011-2012 and the EPA NAAQS in 2013.
Future dust monitoring Page 56: It appears that ATSDR's misunderstanding about the dust instrumentation used at the Site led to ATSDR's statement "to better monitor site contribution to ambient PM levels," which suggests that the air monitoring efforts used previously were insufficient. Thus Chevron suggests striking this part of the sentence.	ATSDR continues to recommend concurrent upwind and downwind particulate matter monitoring as a prudent public health measure at this site during any future earthwork, given its location in an area prone to elevated PM levels.

Additionally, as discussed with ATSDR staff during the 6/25/2015 site tour, mass grading at the site has been completed. Future earthwork for development will be limited and will not warrant an air monitoring program as extensive as the one described in the Dust Suppression and Air Monitoring Plan.	
Fencing at the site Page 56: While Chevron supports warning community members to not trespass on private property, it is important to state that the site is safe and does not pose any health hazards to a would-be trespasser. Otherwise, ATSDR's recommendation will create significant misperception about the site. For example, a community member already stated during the 6/24/2015 public meeting, "there must be something wrong if your recommendation is to not trespass." As discussed during the 6/25/2015 site tour, much of the site's perimeter fencing was replaced with new fence during restoration activities, since sections of the existing fencing had to be removed to allow access for heavy equipment. Perimeter fencing previously existed around the site dating back to the refinery years, and was maintained during both pumping station operations and as required by EPA prior to completion of the soil remedial action. EPA no longer requires a perimeter fence around the site, but the site remains fenced simply to protect Chevron's private property.	ATSDR modified the Recommendations section to note that the site is safe for designated reuse.
Historic signage Appendix A: We do NOT recommend changing the Appendix A phone numbers, because Appendix A accurately represents the Site signage during soil remedial action.	ATSDR edited Appendix A to indicate that (1) the Appendix A sign was used in 2013 and (2) community members should refer to signs posted at the site for current contact information.

Greetings,

You are receiving a document from the Agency for Toxic Substances and Disease Registry (ATSDR). We are very interested in your opinions about the document you received. We ask that you please take a moment now to complete the following ten question survey. You can access the survey by clicking on the link below.

Completing the survey should take less than 5 minutes of your time. If possible, please provide your responses within the next two weeks. All information that you provide will remain confidential.

The responses to the survey will help ATSDR determine if we are providing useful and meaningful information to you. ATSDR greatly appreciates your assistance as it is vital to our ability to provide optimal public health information.

https://www.surveymonkey.com/r/ATSDRDocumentSatisfaction

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