FINAL
Screening Level Human Health and Ecological Risk Assessment

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Spent Catalyst Release from Martinez Refining Company

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CONTRA COSTA HEALTH

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Acronyms and Abbreviations

Notation	Definition
ATSDR	The Agency for Toxic Substance and Disease Registry
BAAQMD	Bay Area Air Quality Management District
COPC	Chemical of Potential Concern
CSM	Conceptual Site Model
DTSC	California Department of Toxic Substances Control
ESL	Environmental Screening Level
ESSL	Ecological Soil Screening Level
HERO	Human and Ecological Risk Office
HI	Hazard Index
HQ	Hazard Quotient
LOEs	Lines of Evidence
mg/kg	Milligrams per Kilogram
mg/L	Milligrams per Liter
MRC	Martinez Refining Company
QC	Quality Control
RPD	Relative Percent Difference
SFBRWQCB	San Francisco Region Water Quality Control Board
SLHHERA	Screening Level Human Health and Ecological Risk Assessment
SOP	Standard Operating Procedure
USEPA	U.S. Environmental Protection Agency

Glossary

Term	Definition
Agency for Toxic Substances and Disease Registry (ATSDR)	A Federal public health agency of the United States Department of Health and Human Services.
Chemicals of Potential Concern (COPCs)	A chemical identified for further evaluation in a risk evaluation because its concentration may exceed a screening level.
Conceptual Site Model (CSM)	Graphical representation of how a contaminant is released into the environment and is transported to various media that humans and animals may contact.
Deionized (DI) Water	Substance having had the ions or ionic constituents removed.
Ecological Soil Screening Levels (ESSLs)	Soil contaminant concentrations associated with an exposure dose equivalent to a no-observed-adverse-effect level.
Hazard Index (HI)	Sum of hazard quotients for substances that affect the same target or organ system.
Hazard Quotient (HQ)	The ratio of the potential exposure to a substance and the level at which no adverse effects are expected.
Human Health (HH)	Describing how exposure to a chemical can impact a person's health.
Lines of Evidence (LOEs)	Evidence drawn from one sort of test result that bears on the accuracy of an idea.
Maximum Detected Concentration (MDC)	The maximum concentration in soil that is detected above laboratory reporting limits.
Relative Percent Difference (RPD)	A measure of the change in a value related to the average of that value.
Screening Level Human Health and Ecological Risk Assessment (SLHHERA)	A convential approach to evaluate chemicals in the environment and identify whether their concentrations may pose a potential risk to humans and ecological receptors (e.g., animals) by comparing the concentrations against USEPA or California environmental agency soil standards protective of humans and animals.
U.S. Environmental Protection Agency (USEPA)	An agency of the United States Federal government whose mission is to protect human health and the environment.

Executive Summary

This Screening Level Human Health and Ecological Screening Risk Assessment (SLHHERA) Report provides the background and results of an investigation conducted in May-June 2023 in response to a release of spent catalyst from the Martinez Refining Company (MRC) which occurred in November 2022. The investigation was commissioned by the Contra Costa County Health Department Hazardous Materials Program (County) to determine the nature and extent of the November 2022 release, and to conduct a screening level assessment of health and ecological risk potentially posed to the affected community. This report summarizes the investigation and the findings of the SLHHERA.

The November 24-25, 2022, release of spent catalyst dust into the surrounding community from a Fluid Catalytic Cracker Unit at the MRC facility located at 3485 Pacheco Boulevard in Martinez, California resulted in community observations of metallic dust on surfaces throughout the affected community. Physical evidence of the release was observed and reported by community members as a white powder covering surfaces. This evidence included actual dust particulates observed on vehicles, trash cans, and residential garden areas within the community.

The following objectives of the SLHHERA were identified by the County as an important step in determining the nature and extent of impacts; as part of this determination, an assessment of potential risks and potential need for additional investigation/soil sampling, as applicable, to mitigate any identified risks was initiated:

- Determination of the nature and extent of the release
- Determination of the chemical composition of the dust
- Determination of the extent of dust in soils within the release area
- Determination of potential risks to human and ecological receptors posed by exposure to dust in a residential setting (e.g., in affected soils)
    - Human health risks were conservatively evaluated for a residential setting via comparison to screening levels protective of residential land use
    - Exposure pathways incorporated in the SLHHERA included:
        - Incidental ingestion of soil
        - Dermal contact with soil
        - Inhalation of soil particulates
        - Ingestion of fruits & vegetables affected by constituents in soil (e.g., via root uptake)

The spatial extent of the release area was determined by field surveys of affected areas reported by community members and dispersion modeling conducted by the Bay Area Air Quality Management District (BAAQMD). Following review of the BAAQMD modeling assumptions and the results provided by BAAQMD and with community input, fourteen (14) locations proposed for the collection of soil samples were identified (**Figure 1**). The plan for the collection of soil samples included an analytical program for Eurofins Calscience Environmental Laboratory, a California-certified analytical laboratory to test the soil samples for the fourteen (14) constituents identified in catalyst dust.

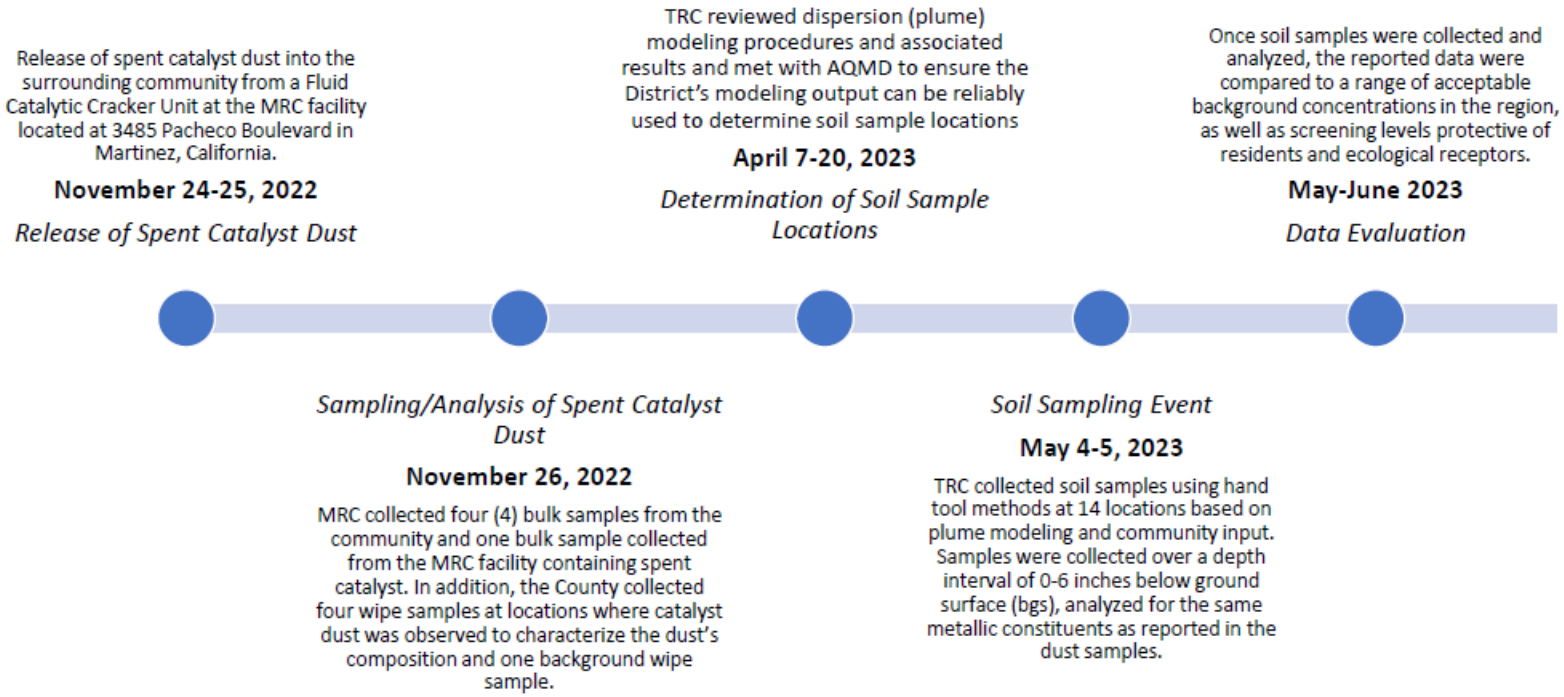
The results of the sampling and laboratory analyses were compared to soil health standards to identify potential human and ecological risks to the community. These sampling results were also compared to regional background levels for the naturally occurring metals comprising the catalyst dust.

The findings of the investigation found no increased risk to public health resulting from the November 2022 catalyst dust release in Martinez:

- The most common metal in the catalyst dust is aluminum silicate (analyzed as aluminum); other metals expected in the dust are vanadium, nickel, barium, and zinc. Arsenic and lead are not expected to be present in significant quantities in the catalyst dust.
- No evidence of catalyst dust in collected soil samples was noted (i.e., soil samples did not appear to have typical make-up of spent catalyst dust).
- Metals detected in the soil samples were within expected background ranges for California and Bay Area soils.
- Several soil samples contained levels of metals, (e.g., arsenic and lead) above published health-based screening levels. As stated above, these levels were within expected background ranges for California and Bay Area soils and are not likely to be associated with catalyst dust.

Based on these findings, additional sampling and evaluation is not required.

Chart 1: Site Investigation Timeline



1.0 Introduction

1.1 Purpose

This Screening Level Human Health and Ecological Screening Risk Assessment (SLHHERA) Report provides the background and results of an investigation conducted in May-June 2023 in response to a release of spent catalyst from the Martinez Refining Company (MRC) which occurred in November 2022. The investigation was commissioned by the Contra Costa County Health Department Hazardous Materials Program (County) to determine the nature and extent of the November 2022 release, and to conduct a screening level assessment of health and ecological risk potentially posed to the affected community. This report summarizes the investigation and the findings of the SLHHERA.

1.2 Background

The November 24-25, 2022, release of spent catalyst dust into the surrounding community from a Fluid Catalytic Cracker Unit at the MRC facility located at 3485 Pacheco Boulevard in Martinez, California resulted in community observations of metallic dust on surfaces throughout the affected community. Physical evidence of the release was observed and reported by community members as a white powder covering surfaces. This evidence included actual dust particulates observed on vehicles, trash cans, and residential garden areas within the community.

To understand the composition of catalyst dust deposited within the community, on November 26, 2023, MRC collected four (4) bulk samples from the community and one bulk sample collected from the MRC facility containing spent catalyst. In addition, the County collected four wipe samples at locations where catalyst dust was observed to characterize the dust's composition and one background wipe sample. The November 2022 bulk and dust analytical laboratory reports are presented in **Appendices A and B**, respectively. In addition, the bulk and dust data are summarized in **Table 1**. Although the most common metal in catalyst dust is aluminum silicate (analyzed as aluminum), this metal wasn't included in the bulk sample analysis. The bulk sample collected from MRC appears to mostly contain vanadium, followed by nickel, and then barium. Other metals analyzed, but not found in large quantities were copper, zinc, total chromium, lead, molybdenum, arsenic, selenium, and beryllium. The wipe samples were analyzed for aluminum, which was the major component, followed by zinc, vanadium, and barium. Other metals analyzed, but not found in large quantities were nickel, copper, total chromium, cobalt, and lead. A few metals had some detects and non-detects in the wipe samples (arsenic, molybdenum, selenium), and beryllium was not detected in any of the wipe samples.

The following objectives of the SLHHERA were identified by the County as an important step in determining the nature and extent of impacts; as part of this determination, an assessment of potential risks and potential need for additional investigation/soil sampling, as applicable, to mitigate any identified risks was initiated:

- Determination of the nature and extent of the release
- Determination of the chemical composition of the dust
- Determination of the extent of dust in soils within the release area

- Determination of potential risks to human and ecological receptors posed by exposure to dust in a residential setting (e.g., in affected soils)
    - Human health risks were conservatively evaluated for a residential setting via comparison to screening levels protective of residential land use
    - Exposure pathways incorporated in the SLHHERA included:
        - Incidental ingestion of soil
        - Dermal contact with soil
        - Inhalation of soil particulates
        - Ingestion of fruits & vegetables affected by constituents in soil (e.g., via root uptake)

The spatial extent of the release area was determined by field surveys of affected areas reported by community members and dispersion modeling conducted by the Bay Area Air Quality Management District (BAAQMD). Following review of the BAAQMD modeling assumptions and the results provided by BAAQMD and with community input, fourteen (14) locations proposed for collection of soil samples were identified (**Figure 1**). The plan for collection of soil samples included an analytical program for Eurofins Calscience Environmental Laboratory, a California-certified analytical laboratory to test the soil samples for the constituents identified in the catalyst dust samples and the catalyst bulk sample, as well as a hexavalent chromium, which is a more toxic form of chromium. A total of fourteen (14) metals were analyzed, as well as pH.

1.3 Conceptual Site Model Development

Development of a conceptual site model (CSM) aids in selecting the appropriate screening levels for use in the SLHHERA. The CSM describes the source/release mechanisms of the spent catalyst dust, migration routes for constituents in environmental media, and identifies potential receptors and exposure pathways. The CSM also provides an assessment of complete pathways (USEPA 1989).

The following subsections present information relevant to the development of the CSM for the spent catalyst dust release, which is presented in **Figure 2.**

Contaminant Source and Release Mechanisms

As previously discussed, spent catalyst dust was released between November 24-25, 2022, into the surrounding community from a Fluid Catalytic Cracker Unit at the Martinez Refining Company facility located at 3485 Pacheco Boulevard in Martinez, California. Physical evidence of the release was observed and reported by community members as a white powder covering surfaces in local residential communities. This evidence includes actual dust particulates observed on vehicles, trash cans, and residential garden areas within the community.

Migration Routes (i.e., Fate and Transport)

Chemical release and transport mechanisms carry chemicals from the source to points where human and ecological receptors may be exposed. For source-area constituents to impact potential receptors, a release mechanism (i.e., migration route) must be present for constituent

transport from a source medium (e.g., surface soil) to an exposure medium (e.g., ambient air), which a receptor directly contacts. Several potential release mechanisms associated with the impacted media at the Site were evaluated in the Human Health CSM and include the following:

- Wind erosion and volatilization of soil into ambient air; and
- Deposition in surface soil in surrounding neighborhood.

Potential Receptors and Exposure Pathways

In general, California's Department of Toxic Substance Control (DTSC), Human and Ecological Risk Office (HERO) recommends that a residential scenario be conservatively assumed for site screening and is typically considered protective of other land uses (i.e., industrial, recreational etc. [DTSC 2022a]). As residential neighborhoods are located near the refinery, residents were identified as the most sensitive population of people to evaluate and include all adults and children who live in the vicinity of the refinery. Residents may potentially contact chemicals in surface soil (0-6 inches) via incidental ingestion, dermal contact, or inhalation of airborne soil particulates, referred to in the CSM as direct contact. Note, the list of analytes are all non-volatile metals; therefore, the inhalation of volatiles in ambient air is not a complete exposure pathway. In addition to contacting soil, residents may eat fruits and vegetables from plants grown in their yards. Therefore, the ingestion of homegrown produce is considered a complete exposure pathway.

As shown in **Figure 2**, ecological receptors (e.g., animals) may also be exposed to surface soil. Therefore, they are also evaluated in this SLHHERA.

2.0 Soil Investigation

Soil collection and analysis activities occurred in May 2023 to determine the following objectives:

1. Determine whether soil concentrations are within regional background concentrations;
2. Determine whether soil concentrations pose a potential human health or ecological risk to the community; and
3. Determine whether soil concentrations are the result of spent catalyst release from Martinez Refining Company.

2.1 Scope of Work

2.1.1 Pre-Field Activities

A total of 14 soil sample locations (**Figure 1**) were selected by TRC and the County. Soil samples were collected at these 14 locations based on plume modeling and community input. The locations of the soil samples were also informed by the results of dispersion modeling conducted and previously presented by the BAAQMD.

2.1.2 Soil Sampling

On May 4-5, 2023, TRC collected soil samples using hand tool methods at 14 locations based on plume modeling and community input. To characterize nearby residential soil potentially affected by airborne spent catalyst, surface soil samples (depth of 0-6 inches) were collected at all 14 locations. A duplicate sample was also collected at one location for quality control purposes. No visible dust was observed at any of the sample locations. Field notes of the soil sampling, including photographs are provided as **Appendix C**.

Soil samples were placed in laboratory-provided glass jars and kept on ice. Samples were collected using standard industry practices and following TRC's Standard Operating Procedure (SOP) for soil sampling (included in **Appendix C**), including worker safety protocols, equipment decontamination, sample handling, and chain-of-custody documentation. Upon completion, sample locations were backfilled with soil cuttings to match the existing grade.

The 14 soil samples (plus a duplicate sample) were analyzed by Eurofins Environment Testing laboratory located in West Sacramento, California, a State-certified chemical laboratory. All samples were analyzed for the following metals detected in the catalyst dust sample previously collected by the County:

- Aluminum (USEPA Method 6010B)
- Arsenic (USEPA Method 6010B)
- Barium (USEPA Method 6010B)
- Beryllium (USEPA Method 6010B)
- Chromium, Total (USEPA Method 6010B)
- Chromium, Hexavalent (USEPA Method 7199)

- Cobalt (USEPA Method 6010B)
- Copper (USEPA Method 6010B)
- Lead (USEPA Method 6010B)
- Molybdenum (USEPA Method 6010B)
- Nickel (USEPA Method 6010B)
- Selenium (USEPA Method 6010B)
- Vanadium (USEPA Method 6010B)
- Zinc (USEPA Method 6010B)
- pH (USEPA Method 9045C)

2.1.3 Summary of Results

Copies of the laboratory reports with chain-of-custody documentation are presented in **Appendix D**.

2.2 Quality Assurance / Quality Control

To ensure that the laboratory analytical data are of sufficient quality for the intended purpose, the soil data were evaluated using national and regional data quality protocols for precision, accuracy, and completeness, as well as overall compliance with the stated laboratory methodology in accordance with procedures outlined in *USEPA Region 2 Standard Operating Procedure (SOP) HW-31 (Revision 6)* Analysis of VOCs in Air Contained in Canisters by Method TO-15, June 2014 and *USEPA National Functional Guidelines for Organic (and Inorganic) Superfund Methods Data Review (USEPA-540-R-2017-002, USEPA-540-R-2017-001),* January 2017 (USEPA 2017).

Data precision was evaluated by reviewing field and laboratory duplicate analyses. The relative percent difference between primary and duplicate field Quality Control (QC) samples was used to assess sample homogeneity and whether proper sample collection was employed in the field. The relative percent difference between primary and duplicate laboratory samples was also used to assess whether proper sample preparation took place within the laboratory.

On May 4, 2023, a blind field duplicate soil sample was collected at sample location MRC-8 and analyzed for the analytes and pH listed in Section 2.1.2. For all detected analytes in both MRC-8 and DUP-1, the relative percent difference (RPD) was calculated. Results of analyses have RPD values ranging from 0 to 24.6 percent. No calculated RPDs exceed 50 percent, the limit generally accepted for solid samples.

Additionally, one equipment blank was collected by using laboratory-grade deionized water and tested for the metals listed above and pH. Analyses detected no metals in the equipment blank, with the exception of a low concentration of lead (0.0063 milligrams per liter [mg/L]), just above the reporting limit of 0.0050 mg/L. Lead in the soil samples was generally detected at or below the background concentration with a maximum detection just above the residential screening level at one sample location. Additionally, based on the results of this investigation, lead is not a main driver of risk in soil. Therefore, the low lead detection in the equipment blank is considered to be insignificant for the purposes of this investigation.

The quality assurance/quality control findings were documented in a data validation report, as presented in **Appendix E**. The validation report documents sample custody and condition, in addition to discussing the results of field and laboratory QC analyses. The validation report also lists any qualifications applied to the sample results as a result of these reviews.

Based on the findings of these quality control analyses, the chemical data generated during this investigation are considered valid and acceptable for the purposes of this investigation.

3.0 Data Evaluation

Once soil samples were collected and analyzed, the reported data were compared to a range of acceptable background concentrations in the region, as well as screening levels protective of residents and ecological receptors (e.g., animals). A summary of background studies conducted in the region is discussed below in Section 3.1.

3.1 Data Comparison to Expected Background Range

Metals occur naturally in soil. Therefore, it is important to understand this natural occurrence and what range of concentrations occur naturally, which is called the expected background range. For this SLHHERA, the expected background range exists in the literature, as presented on **Table 2**. These regional background studies were selected to characterize background contribution to overall human health risks. The expected background range presented in **Table 2** is compared to May 2023 soil data, as shown in **Table 3** and **Figures 3 through 15**, **which show that all soil data fall within the expected background range**. A brief description of arsenic background is included below due to arsenic's lower (0.11 milligrams per kilogram [mg/kg]) residential soil health standard.

3.1.1 Arsenic Background

Arsenic is a naturally occurring metal in soil and is commonly found at concentrations greater than risk-based standards. The catalyst dust release occurred in a complex urbanized area surrounded by streets, parking and paved surfaces, and various operating industrial facilities that may contribute to non-site related concentrations via air pollutant depositions or areas affected by runoff from concentrated air pollution depositions.

Due to the historic residential and industrial use of the vicinity surrounding MRC, there is the potential for widespread anthropogenic contamination and elevated levels of arsenic above naturally occurring concentrations and the risk-based screening level for arsenic (0.11 mg/kg). Area background concentrations range from 1 to 31 mg/kg, exceeding the risk-based soil concentration of 0.11 mg/kg. Surface soil samples were collected at 14 locations and all concentrations were within the expected background range of 1 to 31 mg/kg, with the maximum detected concentration for arsenic at 28 mg/kg. Therefore, collected soil concentrations are consistent with the background range expected for this area for all analytes.

3.2 Data Composition and Comparison to Spent Catalyst Dust and Bulk Samples

Appendix F provides a composition analysis of the May 2023 soil samples to determine whether their composition is similar to spent catalyst dust and bulk samples collected in November 2022. The most common metal in catalyst dust is aluminum silicate (analyzed as aluminum), as well as vanadium. Arsenic is not a metal typically found in catalyst dust. Based on the composition analysis, aluminum and vanadium are the main components of both the bulk and wipe samples; however, vanadium was not found in significant quantities in any of the soil samples. In addition, arsenic was not detected in three of the four wipe samples, while it was detected in every soil sample. In general, while it is possible that some catalyst dust is mixed in with soil in the community, the soil samples do not appear to have the same composition as the spent catalyst dust or bulk samples.

4.0 Screening Level Human Health and Ecological Risk Assessment

A SLHHERA was conducted to provide a screening level assessment of the potential for adverse human health effects that may result from exposure to chemicals detected in surface soil at the Site. The SLHHERA was conducted in accordance with DTSC's HERO HHRA Note 4: Guidance for Screening Level Human Health Risk Assessments in conjunction with HERO's Note 3 (DTSC 2022a,b), as well as San Francisco Region Water Quality Control Board's (SFBRWQCB's) Summary of Environmental Screening Levels for Terrestrial Habitat in Significantly Vegetated Area (SFBRWQCB 2019).

The SLHHERA focuses on chemicals detected during the May 2023 sampling event discussed above, as these data are considered representative of current conditions. Eleven (11) of the 14 chemicals were detected in soil and were retained as chemicals of potential concern (COPC) for the risk evaluation. Note, three analytes (molybdenum, selenium, and chromium VI) were not detected in soil and were not retained for further risk evaluation in accordance with DTSC guidance (DTSC 2022a).

4.1 Methodology

Screening levels can be used to simply compare whether a chemical is either above or below the default screening value (DTSC 2022a).Additionally, screening levels can be used to conduct a risk assessment by applying simplified equations to calculate excess cancer risk and noncancer hazard quotient (HQ [DTSC 2022a]).This SLHHERA conducted both screening level comparisons and simplified estimation of potential risk for exposure via soil in residential and plant uptake scenarios,

Excess cancer risks were calculated using the following simplified equation:

$$Cancer\ Risk = \frac{C_{SS} \times 1x10^{-6}}{Cancer\ SL}$$

where:
C_{SS} = concentration in surface soil (mg/kg)
Cancer $_{SL}$ = cancer-based residential screening level (mg/kg)

Noncancer risks were calculated in accordance with DTSC guidance using the following simplified equation:

$$Noncancer\ Risk = \frac{C_{SS}x1}{Noncancer\ SL}$$

where:
C_{SS} - concentration in surface soil (mg/kg)
Noncancer $_{SL}$ = noncancer-based residential screening level (mg/kg)

Use of the residential soil screening levels is consistent with the CSM (see **Figure 2**) and exposure scenario being evaluated at the Site. In accordance with DTSC guidance, the residential screening levels are based on DTSC's modified SLs in HHRA Note 3 and incorporate DTSC standard default exposure assumptions and toxicity values (DTSC 2019a,b). If a DTSC screening level is not available, the SFBRWQCB residential soil Environmental Screening

Levels (ESLs) or the U.S. Environmental Protection Agency's (USEPA's) Regional Screening Levels for residential soil were applied (SFBRWQCB 2019; USEPA 2023). Screening levels for homegrown produce were calculated based on the potential root uptake of constituents from soil as presented in **Appendix H**. These calculations are based on the equations provided in USEPA's Human Health Risk Assessment Protocol for Hazardous Waste Combustion Facilities (USEPA 2005) and exposure assumptions for produce provided in the Exposure Factors Handbook (USEPA 2011).

Residential soil screening levels are based on an excess cancer risk level of $1x10^{-6}$ and noncancer HQ of 1. In general, the maximum detected concentration should be used to assess potential human health risks posed by surface soil (DTSC 2022a) This SLHHERA, however, evaluates risks on an individual sample-by-sample basis given the residential nature of exposure potential and the need to characterize the Site extent.

When more than one COPC is present, the cumulative cancer risk and noncancer hazard indices (HI) for all COPCs are calculated by summing the chemical-specific risks. Note, this is a conservative approach, as not all COPCs have the same toxic endpoint. The USEPA has defined what is considered to be an acceptable level of risk. The USEPA considers one in one million (1×10^{-6}) to one in ten thousand (1×10^{-4}) to be the target range for acceptable risk (USEPA 1990). Estimates of lifetime excess cancer risk associated with exposure to chemicals of less than 1×10^{-6} are considered *de minimis,* a risk level that is so low as to not warrant any further investigation or analysis (USEPA 1990). It should be noted that cancer risks in the 1×10^{-6} to 1×10^{-4} range or higher do not necessarily mean that adverse health effects will be observed. The current methodology for estimating the carcinogenic potential of chemicals could overestimate the true risk by a considerable degree.

Within the state of California, CalEPA also generally targets the same range for acceptable risks. However, DTSC's points of departure for risk management decisions are $1x10^{-6}$ excess cancer risk and a noncancer HI of 1 (DTSC 2022a). If any calculation of risk exceeds the point of departure, current and future risk evaluation and/or risk management decisions may be warranted. This includes the process of using the characterization of health risks and all Lines of Evidence (LOEs), both qualitative and quantitative, to determine the appropriate response actions (DTSC 2023).

4.1.1 Background Approach

Background inorganic elements in soil can prove problematic for risk assessment purposes because these elements detected at a site may be comprised of naturally occurring metals, regional anthropogenic contributions, or a site-specific release (DTSC 2020). Background and ambient concentrations of some inorganic elements can exceed risk-based concentrations. Arsenic is especially problematic since the risk-based soil concentration can sometimes be 100 times below typical background and ambient soil concentrations not related to site-specific releases of arsenic (DTSC 2020).

In accordance with USEPA and DTSC guidance, COPCs should not be eliminated from the risk assessment based on background (USEPA 2002; DTSC 2022a). Instead, USEPA and DTSC guidance states that "background issues for inorganic chemicals are to be addressed during the risk characterization" (DTSC 2022a). HERO recommends the screening level risk assessment include the calculation of both the site-related risk and hazard index and the total risk and hazard index. The latter presents the risk and hazard associated with exposure to all detected

chemicals prior to elimination of inorganic chemicals that are determined to be consistent with site-specific background or ambient concentrations. This information is useful for risk management decisions about appropriate land uses and for public transparency. Therefore, for naturally occurring COPCs at the Site (which in this case includes all the metals), the SLHHERA includes additional consideration of background soil concentrations in the risk evaluation.

Mitigation or remediation is usually not undertaken to reduce the concentration of contaminants below ambient levels, which comprise both naturally occurring background with added anthropogenic source inputs (i.e., ambient) (USEPA 2002).

4.2 Data Comparison to Soil Standards for Human Health

With the exception of homegrown produce, the residential screening levels consider all the above potential exposure routes including ingestion, inhalation of particulates in ambient air, and dermal absorption, and are utilized in the risk characterization below. As ingestion of homegrown produce represents a complete exposure pathway at the Site, the development of homegrown produce screening levels was conducted separately and is discussed in **Appendix H**.

The resulting concentrations of COPCs in the soil samples were compared with applicable human health and ecological screening levels published by the California DTSC HERO, SFBRWQCB, and USEPA, as provided on **Table 4.**

Overall, all COPCs were detected in the 14 soil samples with the exception of chromium VI, molybdenum, and selenium. COPC concentrations were compared to residential screening levels established by the DTSC, SFBRWQCB and/or USEPA, as presented in **Table 4**. The following concentrations exceeded the respective residential soil health standards:

- **Arsenic**. Arsenic exceeded its residential soil health standard of 0.11 mg/kg at all 14 locations.
- **Lead**. Lead exceeded its residential soil health standard of 80 mg/kg at MRC-1 (82 mg/kg).

As shown in **Table 5** and detailed in **Appendices G and H**, the cumulative cancer risks based on direct contact with surface soil and ingestion of homegrown produce (not excluding background) range from zero $2x10^{-4}$ to $1x10^{-3}$ The risks are above the point of departure of $1x10^{-6}$ and the upper-bound cancer risk level of $1x10^{-4}$ and are generally due to arsenic concentrations. When the background contribution to soil concentrations is excluded (removed), the resulting excess cancer risks all drop to 0, indicating that the arsenic concentrations in soil are within the range of regional background and not attributable to the release of spent catalyst dust. In general, soil concentrations are consistent with background conditions.

As shown in **Table 5** and detailed in **Appendices G and H**, the estimated noncancer HIs based on direct contact with surface soil and ingestion of homegrown produce (not excluding background) range from 15.6 to 93.2. This range is above the acceptable HI of 1 and generally due to arsenic concentrations. When the background contribution to soil concentrations is excluded (removed), the resulting noncancer HIs all drop to 0, indicating that the arsenic concentrations in soil are within the range of regional background and not attributable to the release of spent catalyst dust. In general, soil concentrations are consistent with background conditions.

These LOEs are discussed in detail below.

4.2.1 Arsenic Uptake by plants

Although arsenic concentrations in soil are within the range of regional background and not attributable to the release of spent catalyst dust, community concerns related to ingestion of homegrown produce warrant a closer look at how arsenic is taken up by plants. Plants vary in the amount of arsenic they absorb from the soil and where they store arsenic. Some plants move arsenic from the roots to the leaves, while others absorb and store it in the roots only. Fruit-type vegetables, such as tomatoes, concentrate arsenic in the roots and very little arsenic is taken up in the edible portion of the plant. Leafy vegetables also store arsenic in their roots, but some is also stored in the stems and leaves. Lettuce and some members of the Brassica plant family (e.g., collards, kale, mustard, and turnip greens) store more arsenic in the leaves than do other crops, but not at concentrations high enough to cause concern. Root crops such as beets, turnips, carrots, and potatoes absorb most of the arsenic in the surface skin of the vegetable. By peeling the skins of root crops, you can eliminate the portion of the plant that contains arsenic.

The Agency for Toxic Substances and Disease Registry (ATSDR) published a pamphlet in 2015 called Safe Gardening, Safe Play, and a Safe Home | Spring Valley in Washington DC | ATSDR (cdc.gov) which looks at exposure and risk when arsenic in soil is greater than 20 mg/kg, similar to a handful of May 2023 soil samples (MRC-2 and MRC-4). The ATSDR study concluded that "*even for those areas showing elevated levels of arsenic, the uptake into home grown vegetables or fruits, is not likely to be sufficient to cause any health effects to persons gardening in the soil or eating vegetables grown in the garden*."

Total concentrations of arsenic in soil are a poor indicator of plant-available arsenic because water-soluble forms are considered the most phytoavailable (Kabata-Pendias and Pendias 1992). The speciation and valence state of arsenic under ambient conditions are greatly influenced by environmental factors such as oxidation-reduction (redox), pH, temperature, and other compounds. Bioavailability and uptake by plants, in turn, depend upon the species of arsenic present (API 1998).

Under low redox potential values typical of flooded conditions and wetland soils, the more mobile, soluble, and phytoavailable reduced state of arsenic (trivalent arsenic) is more abundant than the oxidized state of arsenic (pentavalent arsenic), which is predominant in aerated soils. (API 1998). However, aerated garden soils in neighborhoods surrounding MRC would generally contain the less soluble, less mobile, and less phytoavailable pentavalent arsenic.

Acidic soil (lower pH) promotes arsenic solubility and increases uptake by plants, as observed in several studies where pH decreased from 7 to 5.0 (Marin, et al. 1993; Speir, et al. 1992). Many plant uptake studies are conducted with acidic soils (pH less than 6), which would increase arsenic solubility and bioavailability for plants. Across the 14 soil sample locations, the pH of soil ranged from 5.7 to 7.3, which reduces arsenic plant uptake.

The presence of other metals in the soil (aluminum and iron) tend to sorb to the arsenic in soil, which significantly restricts the downward movement (leaching) of arsenic in soils, as well as the availability of arsenic to plants (Walsh, et al. 1977), (Wauchope 1975). Aluminum is abundant in

the soil (maximum aluminum soil concentration is 23,000 mg/kg) and likely sorb to much of the arsenic, rendering it less available to plant uptake.

Therefore, while concentrations of arsenic in surface soil are reported above the residential soil health standard, soil conditions in the region (e.g., aerated soils with neutral soil pH and high aluminum content) significantly reduce uptake of arsenic into plants and any concern related to consuming homegrown produce

4.3 Data Comparison to Ecological Soil Standards

A screening level ecological risk assessment was conducted for all detected surface soil COPCs. Ecological soil screening levels (ESSLs) were obtained from the SFBRWQCB ESLs and are based on terrestrial habitats that are present in significantly vegetated areas such as parkland or single-family homes with yards (SFBRWQCB 2019). The ESSLs are provided in **Table 6**.

The following concentrations exceeded their ecological soil standards:

- **Arsenic**. Arsenic exceeded the ecological soil standard of 25 mg/kg at MRC-2 (28 mg/kg).
- **Barium**. Barium exceeded the ecological soil standard of 390 mg/kg at MRC-5 (600 mg/kg) and MRC-7 (560 mg/kg).
- **Lead**. Lead exceeded the ecological soil standard of 32 mg/kg at MRC-1 (82 mg/kg) and MRC-2 (79 mg/kg).
- **Nickel**. Nickel exceeded the ecological soil standard of 130 mg/kg at MRC-4 (200 mg/kg).
- **Vanadium**. Vanadium exceeded the ecological soil standard of 18 mg/kg at all 14 locations.

In addition, surface soil concentrations for each detected metal (minus background) were adjusted for each sample location on a point-by point basis. Medium-specific hazard quotients (HQs) were calculated using the following equation.

$$HQ_{xy} = [COPC_{xy}]/ ESSL_{xy}$$

Where:
HQ_{xy} = hazard quotient for a COPC (x) in a given medium (y)
$COPC_{xy}$ = the surface soil concentration for COPCs in each sample
$ESSL_{xy}$ = the COPC-specific ecological soil screening level

Chemicals with an HQ less than 1 are considered unlikely to pose a risk to ecological receptors. Similar to human health, ecological HQs are then summed to determine the cumulative HI. If all medium-specific HIs are equal to or less than one, then it is reasonable to conclude no unacceptable ecological risks are associated with COPCs at the Site.

As shown in **Table 7** and detailed in **Appendix I**, the estimated ecological HIs based on direct contact (not excluding background) range from 2.7 to 9.2. This range is slightly above the

acceptable HI of 1. When the background contribution to soil concentrations is excluded (removed), the resulting noncancer HIs all drop to 0, indicating that ecological receptors (animals) contacting soil is not a concern when background is considered, as all soil concentrations fall within the expected background range.

5.0 Conclusions and Recommendations

A screening level human health and ecological risk assessment was conducted for receptors potentially exposed to spent catalyst dust deposited in surface soil from the MRC release. Residents may be exposed to surface soil COPCs via incidental ingestion, dermal contact, inhalation of particulates and ingestion of homegrown produce, while ecological receptors (e.g., animals) may be exposed to soils through direct contact. A summary of the risk assessment results after the background contribution of COPCs is accounted for does not indicate any concern to human health (residents) or ecological receptors (e.g., animals). While exceedances of acceptable cancer risk levels and noncancer HIs occur when background contribution is not removed, the following conclusions are made:

- None of the metals analyzed exceed the expected regional background range,
- Two metals (arsenic and lead) exceed residential direct contact screening levels, however these exceedances do not represent the spent catalyst material, as the proportions of the metals found did not match the spent catalyst composition in the bulk material or dust (wipe samples).

Based on these findings, TRC does not recommend additional sampling or further evaluation.

6.0 References

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Tables

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Table 1

Summary of November 2022 Bulk and Wipe Data

Spent Catalyst Release from Martinez Refining Company

Analyte	Sample ID									
	B-1	B-2	B-3	B-4	B-6	D-1	D-2	D-4	D-5	D-6
	11/26/2022					11/26/2022				11/28/2022
	Bulk Sample					Wipe Sample				
	Community Sample				Source Sample	Community Sample				Background Sample
	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	ug/wipe	ug/wipe	ug/wipe	ug/wipe	ug/wipe
Title 22 Metals (EPA 6020/7000 series)										
Aluminum	--	--	--	--	--	**5,900**	**13,000**	**56,000**	**39,000**	**1,300**
Antimony	<24	<3.4	<13	<340	<0.50	**1.1**	**1.6**	**2.8**	**1.7**	<1.0
Arsenic	<24	<3.4	<13	<340	**5.8**	<1.0	**1.1**	**2.7**	**1.8**	<1.0
Barium	<240	**86**	<130	<3,400	**63**	**39**	**61**	**140**	**96**	**23**
Beryllium	<24	<3.4	<13	<340	**0.68**	<1.0	<1.0	<1.0	<1.0	<1.0
Cadmium	<24	<3.4	<13	<340	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Chromium	<24	**15**	**16**	<340	**15**	**5.7**	**9.5**	**27**	**17**	**3.8**
Cobalt	<24	**6.5**	<13	<340	**7.9**	**1.1**	**2.4**	**8.5**	**5.4**	**1.2**
Copper	<24	**23**	**26**	<340	**29**	**14**	**24**	**55**	**37**	**11**
Lead	<24	**12**	<13	<340	**12**	**6.9**	**12**	**36**	**21**	**3.3**
Mercury	<2.4	<0.34	<1.3	<34	<0.050	**0.10**	<0.10	**0.13**	<0.10	<0.10
Molybdenum	<24	<3.4	<13	<340	**12**	<1.0	**2.0**	**5.2**	**3.6**	<1.0
Nickel	**160**	**200**	**200**	<340	**200**	**17**	**40**	**160**	**110**	**5.9**
Selenium	<24	**3.8**	<13	<340	**3.5**	<1.0	<1.0	**4.2**	**3.0**	<1.0
Silver	<24	<3.4	<13	<340	<0.50	<1.0	<1.0	<1.0	<1.0	<1.0
Thallium	<24	<3.4	<13	<340	<0.50	<1.0	<1.0	<1.0	<1.0	<1.0
Vanadium	**570**	**580**	**610**	**510**	**510**	**52**	**130**	**540**	**380**	**5.8**
Zinc	<240	**61**	**200**	**19,000**	**16**	**130**	**180**	**370**	**240**	**290**

Notes:

Bold indicates detection above laboratory reporting limit.

Bulk sample B-5 did not contain enough material to analyze; therefore, no analysis was conducted.

Dust sample D-3 was not collected.

< = not detected at or above specified laboratory reporting limit

mg/kg = milligrams per kilogram

ug/wipe = micrograms per wipe

-- = Not analyzed

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Table 2
Summary of Regional Soil Background Studies
Spent Catalyst Release from Martinez Refining Company

Analyte	Expected Background Concentration Range	Additional Background Studies (mg/kg)	Source	Geometric Mean California Soils (mg/kg) *Bradford-Kearney Foundation Report 1996. Background Concentrations of Trace and Major Elements in California Soils*	Geometric Mean Western United States (West of 96th Meridian) (mg/kg) *Shacklette and Boerngen, 1984. Elements Concentrations in Soils and Other Surficial Materials of the Conterminous United States U.S. Geological Survey Professional Paper 1270.*	Arithmetic Mean	95th Percentile	2017 Napa County Fire Background Table Cleanup Goals for Metals in Soil (mg/kg)						95% UCL City of Oakland Survey of Background Metal Concentration Studies (mg/kg)							
						Summary of Statistics for Background Data Sets after Removal of Outliers (mg/kg) *Analysis of Background Distributions of Metals in the Soil at Lawrence Berkeley National Laboratory, Table 3. June 2002, Revised April 2009*		UM Geological Area	QLS Geological Area	KL Geological Area	Q/QOA Geological Area	TV/TVP Geological Area	KU/KJFM Geological Area	Lawrence Berkley National Laboratories	Colluvian and Fill	Great Valley Group	Moraga Formation	Orinda Formation	San Pablo Group	San Leandro, CA	Union City, CA
Aluminum	58,000 - 71,000	NA	NA	71,000	58,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Arsenic	1.8 - 31	11	Duverge	2.8	5.5	5.5	17	5.2	7.062	9.3	8.88	30	18.9	19.2	14	31	9.3	17.8	15.7	1.8-5.9	6.92-9.34
Barium	130 - 1,500	1,500	LBNL [a]	468	580	130	280	159	351	328	446	455	482	NA	NA	NA	NA	NA	NA	NA	NA
Beryllium	0.368 - 3	3	LBNL [a]	1.14	0.68	NA [b]	NA [b]	0.368	0.733	0.52	1.78	1.73	1.8	1	0.9	1	0.8	1.1	0.8	<0.25-<1.3	0.5-0.81
Chromium, Total	24.8 - 1,690	160	LBNL [a]	76	41	58	100	1,690	29.8	124	53.3	156	75.6	99.6	91.4	59	142.2	95.2	78.6	24.8-43	46.5-112
Chromium, Hexavalent	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cobalt	7.1 - 136	23	LBNL [a]	12.6	7.1	14	22	136	19.48	33.7	31.9	53.9	30.9	NA	NA	NA	NA	NA	NA	NA	NA
Copper	11.8 - 99.7	76	LBNL [a]	24	21	32	58	33.8	30.9	44.93	38.6	59.1	91.3	69.4	59.6	99.7	54.1	66.9	40.9	11.8-68	28.2-60.1
Lead	3.3 - 247	48	LBNL [a]	21.7	17	7	17	14.45	22.22	26.9	117	247	43.7	16.1	14.7	21.5	8.9	14.8	10.3	3.3-10.4	19.8-148
Molybdenum	0.67 - 3.3	3.3	LBNL [a]	0.9	0.85	NA [b]	NA [b]	0.69	0.67	0.77	0.98	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nickel	2.93 - 2,240	55	LBNL [a]	36	15	68	164	2,240	41.9	496	24.4	53	123	119.8	120.2	69.7	100.4	144.3	125.9	2.93-43.60	32.4-60.6
Selenium	0.028 -7	1.1	LBNL [a]	0.028	0.23	NA [b]	NA [b]	1.8	2.4	2.21	1.84	NA	NA	5.6	5.6	4.8	4.7	7	4.9	<0.25-<2.5	0.5
Vanadium	46 - 230	230	LBNL [a]	101	70	46	77	95.5	108.3	60.35	89.5	145	96.9	NA	NA	NA	NA	NA	NA	NA	NA
Zinc	9.3 - 474	150	LBNL [a]	145	55	64	110	90.8	66.88	81.48	108	82	156	106.1	91.5	135.9	84.7	98.3	97.7	9.3-61.3	97.1-474

Notes:
[a] insufficient sample size to calculate statistic
[b] Table 4 of LBNL based on data in S&B paper

Abbreviations:
NA = not available
mg/kg = milligrams per kilogram
95%UCL = 95% Upper Confidence Limit on the arithmetic mean

Source:
Bradford: Bradford, G.R., A.C. Chang, A.L. Page, D. Bakhtark, J.A. Frampton, and H. Wright 1996. Background Concentrations of Trace and Major Elements in California Soils, Kearney Foundation Special Report, Kearney Foundation of Soil Science, Division of Agriculture and Natural Resources, University of California, Riverside, 52 p.
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Table 3

Summary of Soil Data and Comparison to Expected Background Range

Spent Catalyst Release from Martinez Refining Company

Analyte	Sample ID															Max Detect	Location	Expected Background Range (mg/kg)	Are Soil Data Within Expected Background Range?
	MRC-1	MRC-2	MRC-3	MRC-4	MRC-5	MRC-6	MRC-7	MRC-8	MRC-8 /Dup-1	MRC-9	MRC-10	MRC-11	MRC-12	MRC-13	MRC-14				
	5/4/2023	5/5/2023	5/4/2023	5/4/2023	5/5/2023	5/5/2023	5/5/2023	5/4/2023	5/4/2023	5/4/2023	5/4/2023	5/4/2023	5/4/2023	5/4/2023	5/4/2023				
Title 22 Metals (Method SW846 6010B) (mg/kg)																			
Aluminum	**9,200**	**19,000**	**17,000**	**9,800**	**23,000**	**17,000**	**21,000**	**19,000**	**18,000**	**9,300**	**15,000**	**10,000**	**15,000**	**8,900**	**14,000**	**23,000**	**MRC-5**	58,000 - 71,000	Yes
Arsenic	**7.1**	**28**	**11**	**24**	**7.5**	**6.8**	**8.8**	**16.0**	**14.0**	**6.1**	**5.1**	**5.7**	**3.9**	**5.4**	**8.5**	**28.0**	**MRC-2**	1.8 - 31	Yes
Barium	**99**	**110**	**150**	**110**	**600**	**170**	**560**	**130**	**130**	**100**	**130**	**98**	**86**	**90**	**86**	**600.0**	**MRC-5**	130 - 1,500	Yes
Beryllium	**0.57**	**0.53**	**0.93**	**0.58**	**0.61**	**0.48**	**0.62**	**0.77**	**0.69**	**0.73**	**1.2**	**0.64**	**0.65**	**0.55**	**0.88**	**1.2**	**MRC-10**	0.368 - 3	Yes
Chromium, Total	**22**	**57**	**46**	**87**	**46**	**43**	**51**	**64**	**56**	**24**	**27**	**29**	**20**	**16**	**35**	**87**	**MRC-4**	24.8 - 1,690	Yes
Cobalt	**7.1**	**19**	**17**	**16**	**15**	**12**	**18**	**15**	**15**	**6.3**	**11**	**7.9**	**5.1**	**6.5**	**9.9**	**19**	**MRC-2**	7.1 - 136	Yes
Copper	**20**	**53**	**44**	**36**	**44**	**28**	**63**	**48**	**43**	**14**	**30**	**23**	**7.9**	**11**	**29**	**63**	**MRC-7**	11.8 - 99.7	Yes
Lead	**82**	**79**	**31**	**23**	**11**	**31**	**31**	**32**	**25**	**15**	**10**	**13**	**6.6**	**18**	**33**	**82**	**MRC-1**	3.3 - 247	Yes
Molybdenum	<2.5	<2.4	<2.1	<2.7	<2.4	<2.5	<2.4	<2.3	<2.3	<2.4	<2.2	<2.5	<2.5	<2.4	<2.3	<2.7	MRC-4	0.67 - 3.3	Yes
Nickel	**19**	**56**	**50**	**200**	**44**	**40**	**60**	**65**	**60**	**23**	**30**	**31**	**14**	**13**	**32**	**200**	**MRC-4**	2.93 - 2,240	Yes
Selenium	<2.5	<2.4	<2.1	<2.7	<2.4	<2.5	<2.4	<2.3	<2.3	<2.4	<2.2	<2.5	<2.5	<2.4	<2.3	<2.7	MRC-4	0.028 -7	Yes
Vanadium	**30**	**70**	**60**	**30**	**69**	**59**	**64**	**70**	**64**	**29**	**59**	**34**	**30**	**30**	**54**	**70**	**MRC-2/-8**	46 - 230	Yes
Zinc	**160**	**82**	**210**	**56**	**65**	**66**	**110**	**88**	**82**	**64**	**79**	**59**	**32**	**41**	**270**	**270**	**MRC-14**	9.3 - 474	Yes
Hexavalent Chromium (Method SW846 7199) (mg/kg)																			
Chromium VI	<0.25	<0.25	<0.22	<0.27	<0.24	<0.23	<0.23	<0.23	<0.23	<0.24	<0.22	<0.25	<0.26	<0.25	<0.23	<0.27	MRC-4	NA	NA
General Parameters																			
pH	5.9	6.1	6.9	6.9	6.8	7.1	7.2	7.2	6.0	6.5	6.9	7.1	7.3	6.0	5.7	5.7-7.3		NA	NA

Notes:

Bold indicates detection above laboratory reporting limit.

< = not detected at or above specified laboratory reporting limit
mg/kg = milligrams per kilogram
NA = Not applicable

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Table 4
Summary of Soil Data and Residential Soil Health Standards
Spent Catalyst Release from Martinez Refining Company

Analyte	Sample ID															Max Detect	Location	Residential Soil Health Standards (mg/kg)			
	MRC-1	MRC-2	MRC-3	MRC-4	MRC-5	MRC-6	MRC-7	MRC-8	MRC-8 /Dup-1	MRC-9	MRC-10	MRC-11	MRC-12	MRC-13	MRC-14			Ingestion, Dermal Contact, Inhalation of Airborne Soil Particulates [a]		Ingestion of Homegrown Produce [b]	
	5/4/2023	5/5/2023	5/4/2023	5/4/2023	5/5/2023	5/5/2023	5/5/2023	5/4/2023	5/4/2023	5/4/2023	5/4/2023	5/4/2023	5/4/2023	5/4/2023	5/4/2023						
Title 22 Metals (Method SW846 6010B) (mg/kg)																					
Aluminum	**9,200**	**19,000**	**17,000**	**9,800**	**23,000**	**17,000**	**21,000**	**19,000**	**18,000**	**9,300**	**15,000**	**10,000**	**15,000**	**8,900**	**14,000**	**23,000**	**MRC-5**	77,000	USEPA RSL (NC)	30,053	NC
Arsenic	**7.1**	**28**	**11**	**24**	**7.5**	**6.8**	**8.8**	**16.0**	**14.0**	**6.1**	**5.1**	**5.7**	**3.9**	**5.4**	**8.5**	**28.0**	**MRC-2**	0.11	DTSC-SL (C)	0.03	C [NC = 5.19]
Barium	**99**	**110**	**150**	**110**	**600**	**170**	**560**	**130**	**130**	**100**	**130**	**98**	**86**	**90**	**86**	**600.0**	**MRC-5**	15,000	SFRWQCB-ESL	727	NC
Beryllium	**0.57**	**0.53**	**0.93**	**0.58**	**0.61**	**0.48**	**0.62**	**0.77**	**0.69**	**0.73**	**1.2**	**0.64**	**0.65**	**0.55**	**0.88**	**1.2**	**MRC-10**	16	SFRWQCB-ESL	90	NC
Chromium, Total	**22**	**57**	**46**	**87**	**46**	**43**	**51**	**64**	**56**	**24**	**27**	**29**	**20**	**16**	**35**	**87**	**MRC-4**	120,000	SFRWQCB-ESL [c]	34,617	NC
Cobalt	**7.1**	**19**	**17**	**16**	**15**	**12**	**18**	**15**	**15**	**6.3**	**11**	**7.9**	**5.1**	**6.5**	**9.9**	**19**	**MRC-2**	23	SFRWQCB-ESL	1.8	NC
Copper	**20**	**53**	**44**	**36**	**44**	**28**	**63**	**48**	**43**	**14**	**30**	**23**	**7.9**	**11**	**29**	**63**	**MRC-7**	3,100	SFRWQCB-ESL	12	NC
Lead	**82**	**79**	**31**	**23**	**11**	**31**	**31**	**32**	**25**	**15**	**10**	**13**	**6.6**	**18**	**33**	**82**	**MRC-1**	80	SFRWQCB-ESL	NA	NA
Molybdenum	<2.5	<2.4	<2.1	<2.7	<2.4	<2.5	<2.4	<2.3	<2.3	<2.4	<2.2	<2.5	<2.5	<2.4	<2.3	<2.7	MRC-4	390	SFRWQCB-ESL	NA	NA
Nickel	**19**	**56**	**50**	**200**	**44**	**40**	**60**	**65**	**60**	**23**	**30**	**31**	**14**	**13**	**32**	**200**	**MRC-4**	820	SFRWQCB-ESL	243	NC
Selenium	<2.5	<2.4	<2.1	<2.7	<2.4	<2.5	<2.4	<2.3	<2.3	<2.4	<2.2	<2.5	<2.5	<2.4	<2.3	<2.7	MRC-4	390	SFRWQCB-ESL	NA	NA
Vanadium	**30**	**70**	**60**	**30**	**69**	**59**	**64**	**70**	**64**	**29**	**59**	**34**	**30**	**30**	**54**	**70**	**MRC-2/-8**	390	SFRWQCB-ESL	106	NC
Zinc	**160**	**82**	**210**	**56**	**65**	**66**	**110**	**88**	**82**	**64**	**79**	**59**	**32**	**41**	**270**	**270**	**MRC-14**	23,000	SFRWQCB-ESL	206	NC
Hexavalent Chromium (Method SW846 7199) (mg/kg)																					
Chromium VI	<0.25	<0.25	<0.22	<0.27	<0.24	<0.23	<0.23	<0.23	<0.23	<0.24	<0.22	<0.25	<0.26	<0.25	<0.23	<0.27	MRC-4	0.3	SFRWQCB-ESL	NA	NA
General Parameters																					
pH	5.9	6.1	6.9	6.9	6.8	7.1	7.2	7.2	6.0	6.5	6.9	7.1	7.3	6.0	5.7	5.7-7.3		NA			

Notes:

Bold indicates detection above laboratory reporting limit.
[a] California-specific DTSC or SFRWQCB screening levels assumed. When California-specific screening levels not available, USEPA Residential Soil RSL value assumed.
[b] Based on site-specific plant uptake and homegrown produce risk-based calculation, as presented in Appendix G.
[c] Value not available for total chromium; therefore, trivalent chromium assumed.
< = not detected at or above specified laboratory reporting limit
C = cancer based on a Target Risk Level = 1E-06
DTSC = California Department of Toxic Substances Control
ESL = Environmental Screening Level
HERO = Human and Ecological Risk Office
mg/kg = milligrams per kilogram
NA = Not applicable
NC = noncancer based on a Target Hazard Quotient = 1.0
RSL = Regional Screening Level
SFRWQCB = San Francisco Regional Water Quality Control Board
USEPA = United States Environmental Protection Agency

References:

San Francisco Bay Regional Water Quality Control Board, Bay Area. Summary of Environmental Screening Levels (ESLs), 2019 (Rev 2), Updated 2022.

Human Health Risk Assessment, Note Number 3, DTSC-modified Screening Levels (DTSC-SLs), California Department of Toxic Substances Control (DTSC), Human and Ecological Risk Office (HERO), Release date: June 2020; Revised May 2022. [Table 1. DTSC-recommended Screening Levels for Soil Analytes]

USEPA Regional Screening Level (RSL) Table. May 2023 update. Available online at: https://www.epa.gov/risk/regional-screening-levels-rsls-generic-tables

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Table 5
Summary of Human Health Risks from Direct Contact with Soil and Ingestion of Homegrown Produce
Spent Catalyst Release from Martinez Refining Company

Exposure Pathways	Background Contribution Included?	MRC-1		MRC-2		MRC-3		MRC-4		MRC-5		MRC-6		MRC-7		MRC-8		MRC-8 /Dup-1		MRC-9		MRC-10		MRC-11		MRC-12		MRC-13		MRC-14	
		C Risk	NC HI	C Risk	NC HI	C Risk	NC HI	C Risk	NC HI	C Risk	NC HI	C Risk	NC HI	C Risk	NC HI	C Risk	NC HI	C Risk	NC HI	C Risk	NC HI	C Risk	NC HI	C Risk	NC HI	C Risk	NC HI	C Risk	NC HI	C Risk	NC HI
Soil Ingestion, Dermal, Inhalation (Appendix G)	YES	6.5E-05	18.9	2.5E-04	70.7	1.0E-04	28.5	2.2E-04	60.0	6.8E-05	19.7	6.2E-05	18.0	8.0E-05	23.2	1.5E-04	40.7	1.3E-04	35.7	5.5E-05	15.6	4.6E-05	13.5	5.2E-05	14.7	3.5E-05	10.2	4.9E-05	13.9	7.7E-05	22.0
Home-Grown Produce Ingestion (Appendix H)	YES	2.3E-04	8.7	9.0E-04	22.8	3.5E-04	18.1	7.7E-04	18.6	2.4E-04	16.5	2.2E-04	12.4	2.8E-04	20.2	5.2E-04	17.9	4.5E-04	16.9	2.0E-04	7.1	1.6E-04	11.5	1.8E-04	8.8	1.3E-04	5.4	1.7E-04	6.6	2.7E-04	12.3
Combined Residential Exposure Pathways	**YES**	**2.9E-04**	**27.6**	**1.2E-03**	**93.4**	**4.5E-04**	**46.6**	**9.9E-04**	**78.7**	**3.1E-04**	**36.2**	**2.8E-04**	**30.3**	**3.6E-04**	**43.4**	**6.6E-04**	**58.5**	**5.8E-04**	**52.6**	**2.5E-04**	**22.7**	**2.1E-04**	**25.1**	**2.4E-04**	**23.5**	**1.6E-04**	**15.6**	**2.2E-04**	**20.6**	**3.5E-04**	**34.3**

Exposure Pathways	Background Contribution Included?	MRC-1		MRC-2		MRC-3		MRC-4		MRC-5		MRC-6		MRC-7		MRC-8		MRC-8 /Dup-1		MRC-9		MRC-10		MRC-11		MRC-12		MRC-13		MRC-14	
		C Risk	NC HI	C Risk	NC HI	C Risk	NC HI	C Risk	NC HI	C Risk	NC HI	C Risk	NC HI	C Risk	NC HI	C Risk	NC HI	C Risk	NC HI	C Risk	NC HI	C Risk	NC HI	C Risk	NC HI	C Risk	NC HI	C Risk	NC HI	C Risk	NC HI
Soil Ingestion, Dermal, Inhalation (Appendix G)	NO	0.0E+00	0.0	0.0E+00	0.0	0.0E+00	0.0	0.0E+00	0.0	0.0E+00	0.0	0.0E+00	0.0	0.0E+00	0.0	0.0E+00	0.0	0.0E+00	0.0	0.0E+00	0.0	0.0E+00	0.0	0.0E+00	0.0	0.0E+00	0.0	0.0E+00	0.0	0.0E+00	0.0
Home-Grown Produce Ingestion (Appendix H)	NO	0.0E+00	0.0	0.0E+00	0.0	0.0E+00	0.0	0.0E+00	0.0	0.0E+00	0.0	0.0E+00	0.0	0.0E+00	0.0	0.0E+00	0.0	0.0E+00	0.0	0.0E+00	0.0	0.0E+00	0.0	0.0E+00	0.0	0.0E+00	0.0	0.0E+00	0.0	0.0E+00	0.0
Combined Residential Exposure Pathways	**NO**	**0.0E+00**	**0.0**	**0.0E+00**	**0.0**	**0.0E+00**	**0.0**	**0.0E+00**	**0.0**	**0.0E+00**	**0.0**	**0.0E+00**	**0.0**	**0.0E+00**	**0.0**	**0.0E+00**	**0.0**	**0.0E+00**	**0.0**	**0.0E+00**	**0.0**	**0.0E+00**	**0.0**	**0.0E+00**	**0.0**	**0.0E+00**	**0.0**	**0.0E+00**	**0.0**	**0.0E+00**	**0.0**

Notes:
all soil concentrations and screening levels in mg/kg

C = cancer based on a Target Risk Level = 1E-06
HI = noncancer Hazard Index = ∑HQ
HQ = noncancer Hazard Quotient
NA = Not applicable
NC = noncancer based on a Target Hazard Quotient = 1.0

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Table 6
Summary of Soil Data and Ecological Soil Standards
Spent Catalyst Release from Martinez Refining Company

Analyte	Sample ID															Max Detect	Location	Ecological Soil Standards (mg/kg) [a]
	MRC-1	MRC-2	MRC-3	MRC-4	MRC-5	MRC-6	MRC-7	MRC-8	MRC-8 /Dup-1	MRC-9	MRC-10	MRC-11	MRC-12	MRC-13	MRC-14			
	5/4/2023	5/5/2023	5/4/2023	5/4/2023	5/5/2023	5/5/2023	5/5/2023	5/4/2023	5/4/2023	5/4/2023	5/4/2023	5/4/2023	5/4/2023	5/4/2023	5/4/2023			
Title 22 Metals (Method SW846 6010B) (mg/kg)																		
Aluminum	**9,200**	**19,000**	**17,000**	**9,800**	**23,000**	**17,000**	**21,000**	**19,000**	**18,000**	**9,300**	**15,000**	**10,000**	**15,000**	**8,900**	**14,000**	**23,000**	**MRC-5**	OK when pH ≥ 5.5 [b]
Arsenic	**7.1**	**28**	**11**	**24**	**7.5**	**6.8**	**8.8**	**16.0**	**14.0**	**6.1**	**5.1**	**5.7**	**3.9**	**5.4**	**8.5**	**28.0**	**MRC-2**	25
Barium	**99**	**110**	**150**	**110**	**600**	**170**	**560**	**130**	**130**	**100**	**130**	**98**	**86**	**90**	**86**	**600.0**	**MRC-5**	390
Beryllium	**0.57**	**0.53**	**0.93**	**0.58**	**0.61**	**0.48**	**0.62**	**0.77**	**0.69**	**0.73**	**1.2**	**0.64**	**0.65**	**0.55**	**0.88**	**1.2**	**MRC-10**	5.0
Chromium, Total	**22**	**57**	**46**	**87**	**46**	**43**	**51**	**64**	**56**	**24**	**27**	**29**	**20**	**16**	**35**	**87**	**MRC-4**	160
Cobalt	**7.1**	**19**	**17**	**16**	**15**	**12**	**18**	**15**	**15**	**6.3**	**11**	**7.9**	**5.1**	**6.5**	**9.9**	**19**	**MRC-2**	50
Copper	**20**	**53**	**44**	**36**	**44**	**28**	**63**	**48**	**43**	**14**	**30**	**23**	**7.9**	**11**	**29**	**63**	**MRC-7**	180
Lead	**82**	**79**	**31**	**23**	**11**	**31**	**31**	**32**	**25**	**15**	**10**	**13**	**6.6**	**18**	**33**	**82**	**MRC-1**	32
Molybdenum	<2.5	<2.4	<2.1	<2.7	<2.4	<2.5	<2.4	<2.3	<2.3	<2.4	<2.2	<2.5	<2.5	<2.4	<2.3	<2.7	MRC-4	6.9
Nickel	**19**	**56**	**50**	**200**	**44**	**40**	**60**	**65**	**60**	**23**	**30**	**31**	**14**	**13**	**32**	**200**	**MRC-4**	130
Selenium	<2.5	<2.4	<2.1	<2.7	<2.4	<2.5	<2.4	<2.3	<2.3	<2.4	<2.2	<2.5	<2.5	<2.4	<2.3	<2.7	MRC-4	2.4
Vanadium	**30**	**70**	**60**	**30**	**69**	**59**	**64**	**70**	**64**	**29**	**59**	**34**	**30**	**30**	**54**	**70**	**MRC-2/-8**	18
Zinc	**160**	**82**	**210**	**56**	**65**	**66**	**110**	**88**	**82**	**64**	**79**	**59**	**32**	**41**	**270**	**270**	**MRC-14**	340
Hexavalent Chromium (Method SW846 7199) (mg/kg)																		
Chromium VI	<0.25	<0.25	<0.22	<0.27	<0.24	<0.23	<0.23	<0.23	<0.23	<0.24	<0.22	<0.25	<0.26	<0.25	<0.23	<0.27	MRC-4	10
General Parameters																		
pH	5.9	6.1	6.9	6.9	6.8	7.1	7.2	7.2	6.0	6.5	6.9	7.1	7.3	6.0	5.7	5.7-7.3		NA

Notes:
Bold indicates detection above laboratory reporting limit.
[a] All ecological screening levels taken from San Francisco Bay Summary of Environmental Screening Levels (ESLs) for Terrestrial Habitat Levels in Significantly Vegetated Area, except aluminum.
[b] As recommended in USEPA's EcoSSL for aluminum.

< = not detected at or above specified laboratory reporting limit
mg/kg = milligrams per kilogram
NA = Not applicable

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Table 7
Summary of Ecological Risks
Spent Catalyst Release from Martinez Refining Company

Ecological Exposure Pathways	Background Contribution Included?	MRC-1	MRC-2	MRC-3	MRC-4	MRC-5	MRC-6	MRC-7	MRC-8	MRC-8 /Dup-1	MRC-9	MRC-10	MRC-11	MRC-12	MRC-13	MRC-14
		HI	HI	HI	HI	HI	HI	HI	HI	HI	HI	HI	HI	HI	HI	HI
Direct Contact with Soil (Appendix I)	YES	5.8	9.2	6.9	6.0	7.2	5.9	7.9	7.3	6.6	3.3	5.2	3.6	2.7	3.2	6.2
Direct Contact with Soil (Appendix I)	NO	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Notes:

all soil concentrations and screening levels in mg/kg

C = cancer based on a Target Risk Level = 1E-06
HI = noncancer Hazard Index = ∑HQ
HQ = noncancer Hazard Quotient
NA = Not applicable
NC = noncancer based on a Target Hazard Quotient = 1.0

Figures

SOURCE AERIAL PHOTO: Google Earth, June 2022.

LEGEND

- Approximate soil sample location, May 2023

N

APPROXIMATE SCALE (FEET)

0 8,000 16,000

SOIL SAMPLING LOCATIONS

Contra Costa County
Hazardous Materials Program

TRC | 537895 | **FIGURE 1**

FILE NAME: C:\Users\kquinnell\OneDrive - TRC\Documents\TRC\Contra Costa Hazmat_Martinez Refinery\Fig1_Soil Sampling Locations.dwg | Layout Tab: 11x17

Figure 2 - Human Health and Ecological Conceptual Site Model
Martinez Refinery Company Sampling

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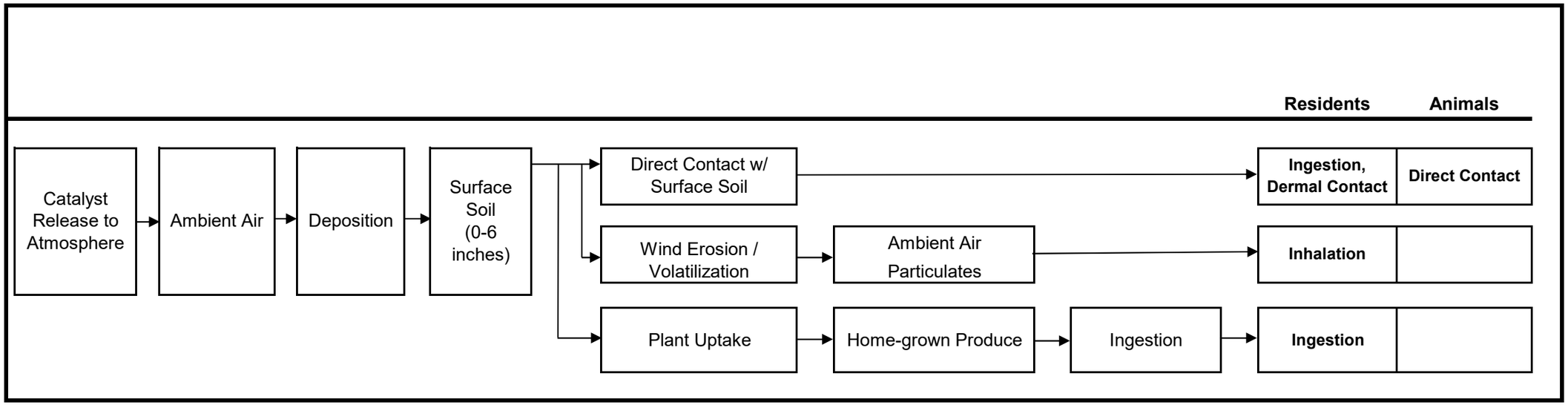


Notes:
Blank box (no text) = incomplete exposure pathway

Figure 3 Aluminum Soil Data Comparison

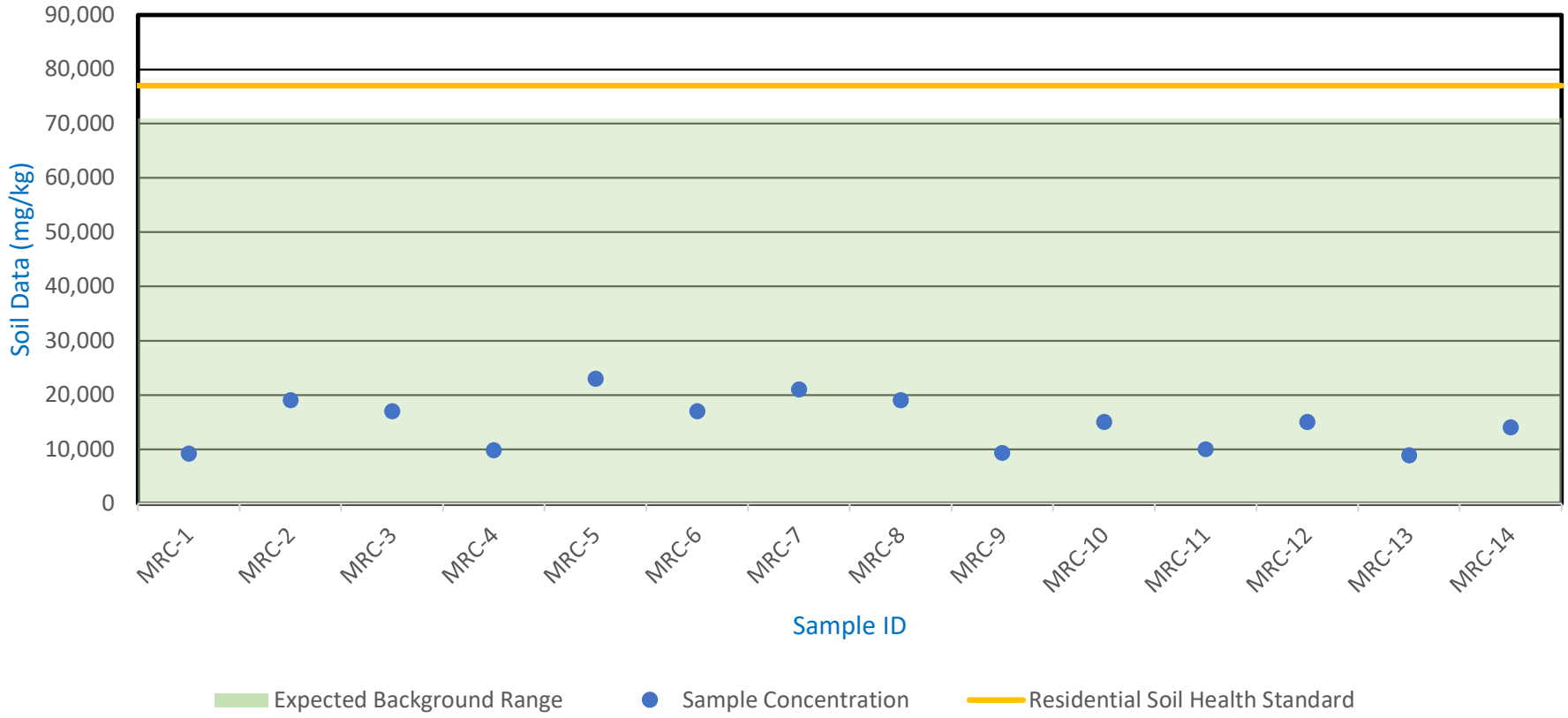


Figure 4 Arsenic Soil Data Comparison

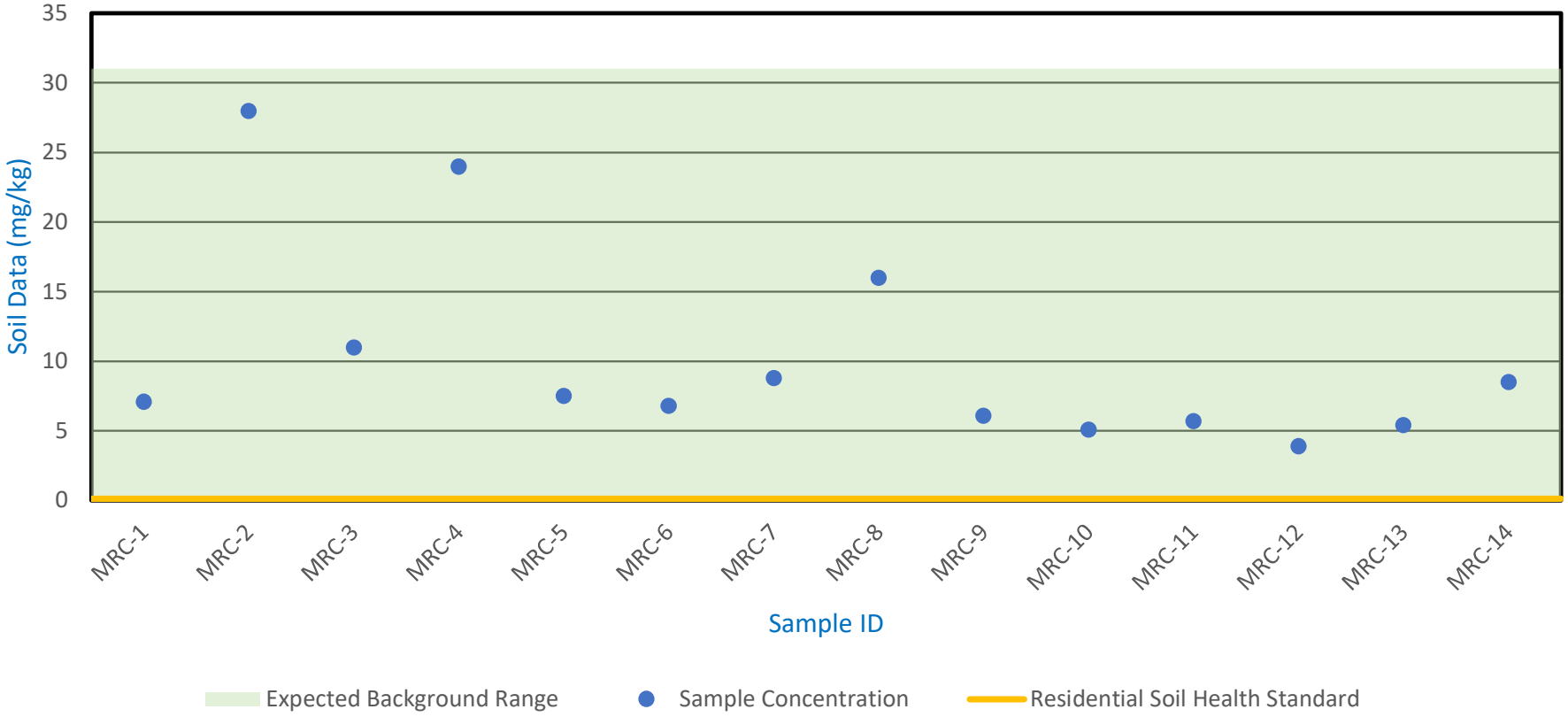


Figure 5 Barium Soil Data Comparison

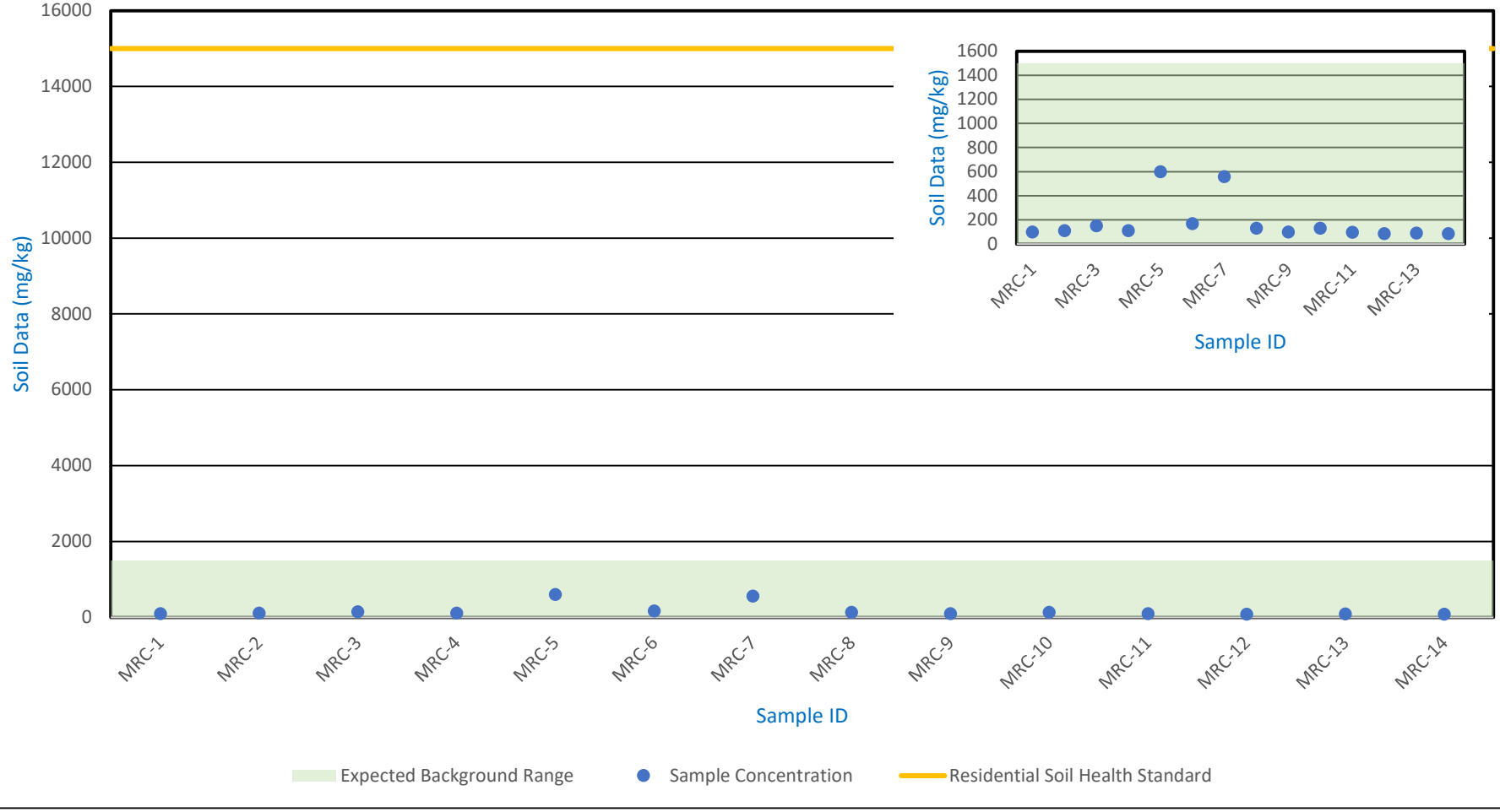


Figure 6 Beryllium Soil Data Comparison

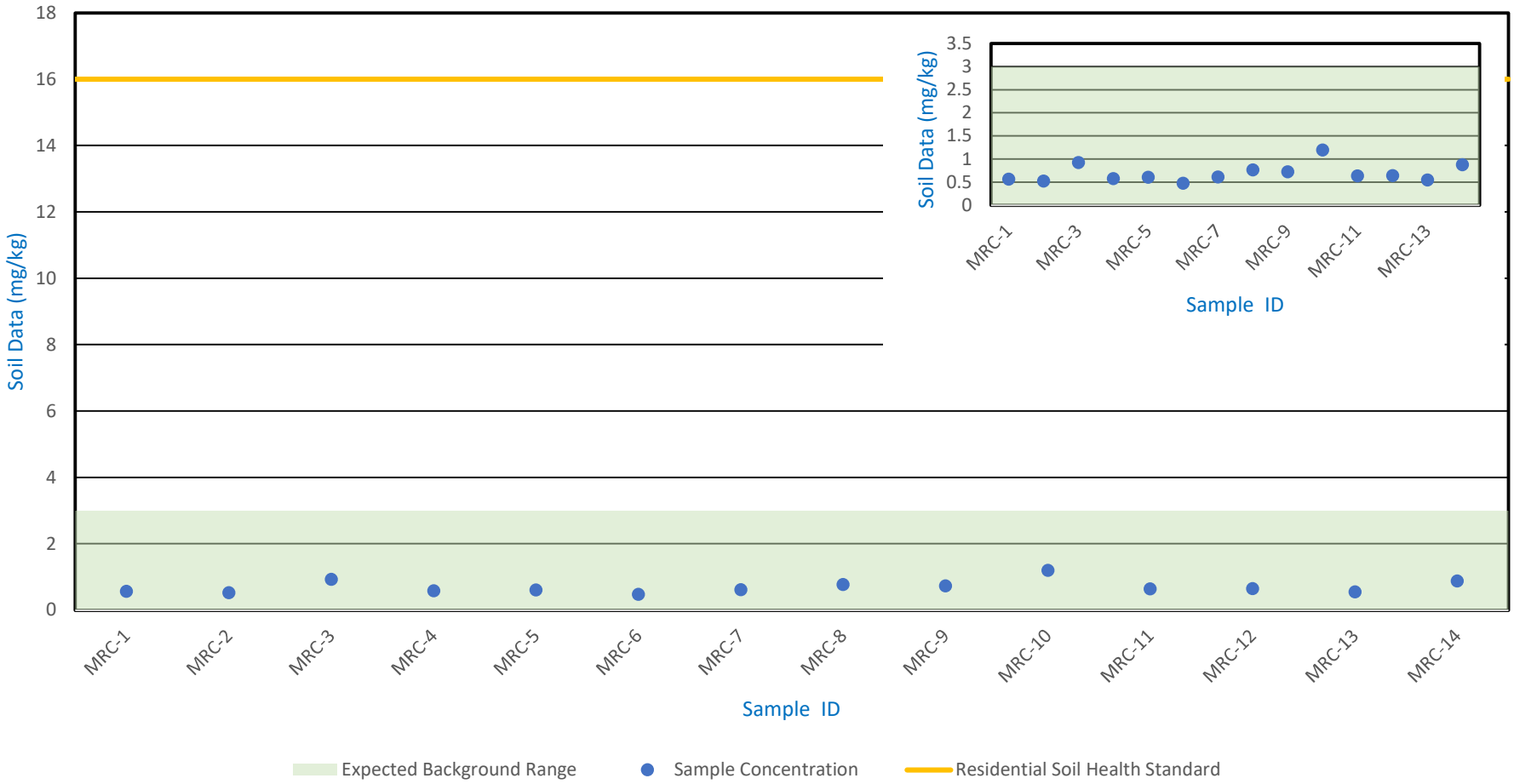


Figure 7 Cobalt Soil Data Comparison

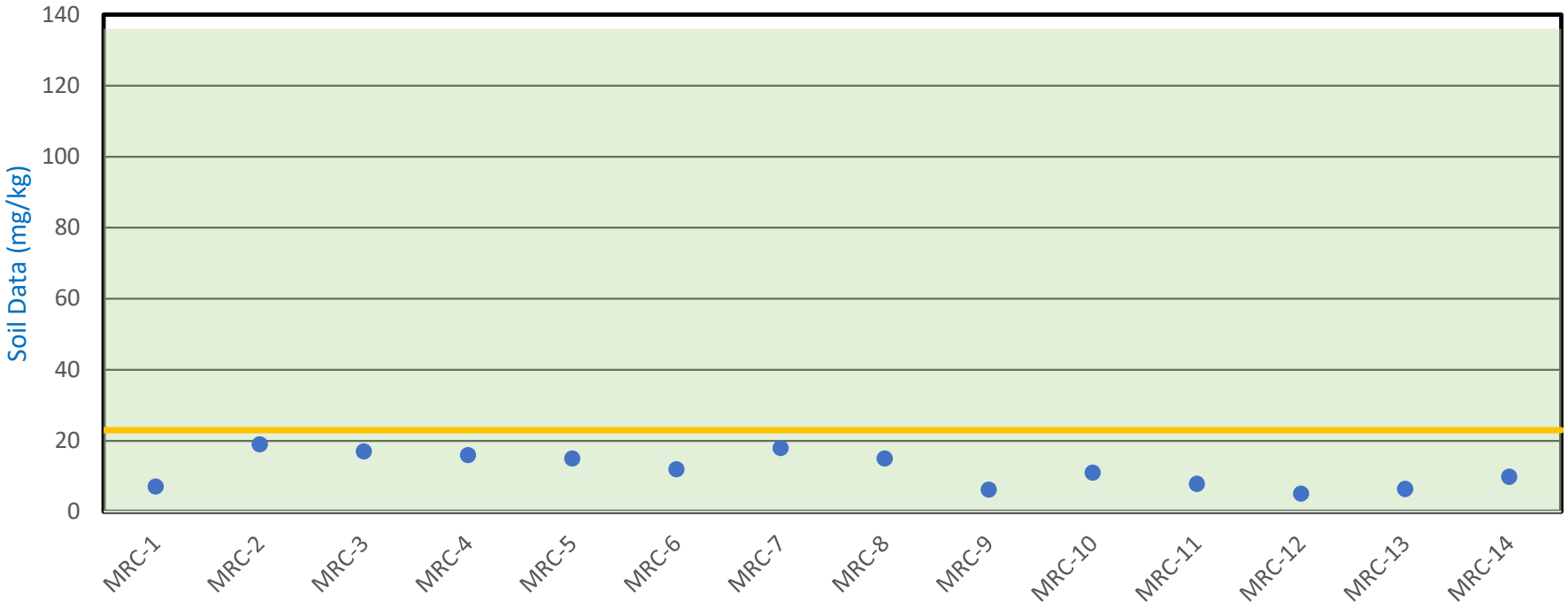


Figure 8 Chromium, Total Soil Data Comparison

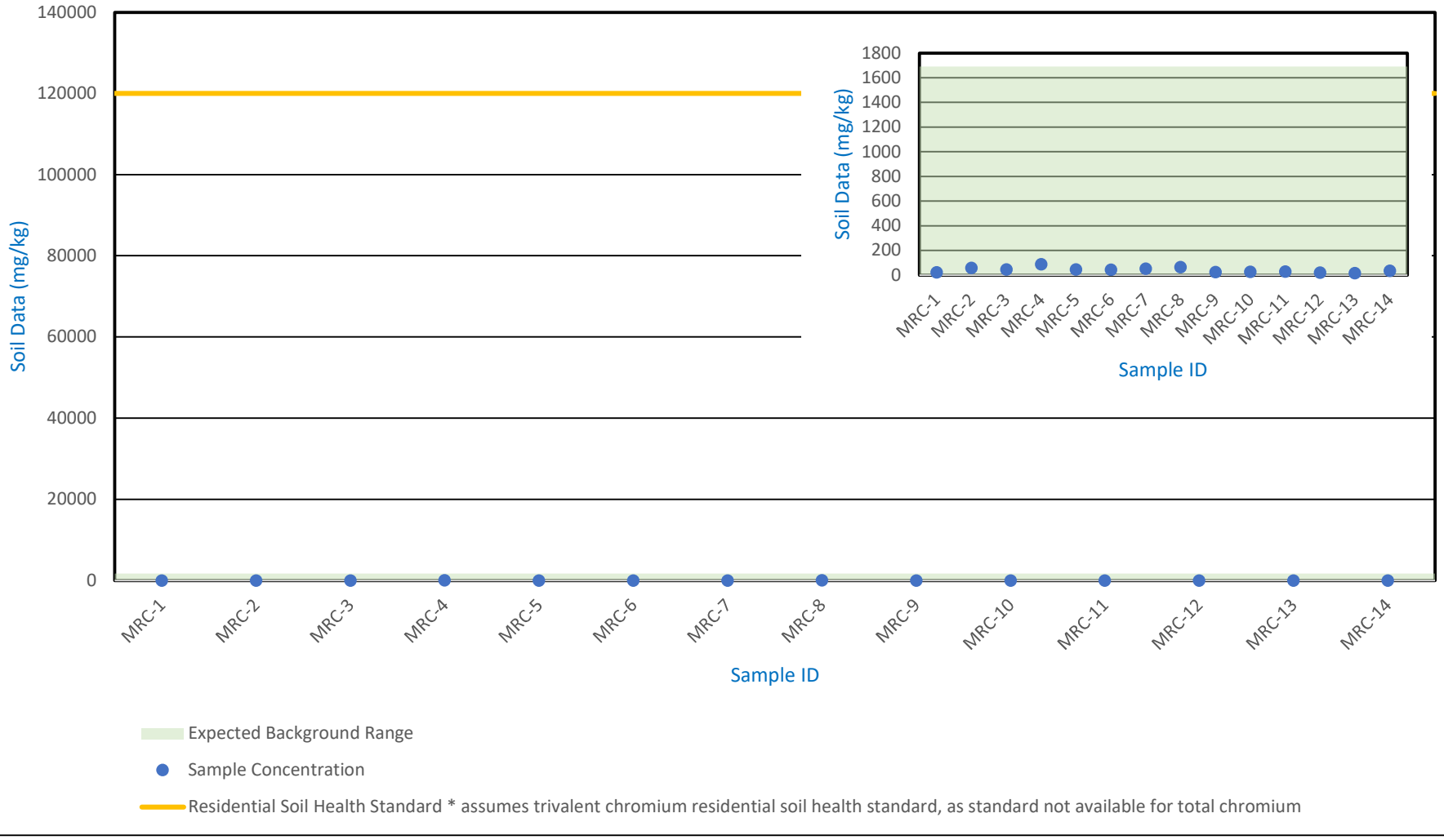


Figure 9 Copper Soil Data Comparison

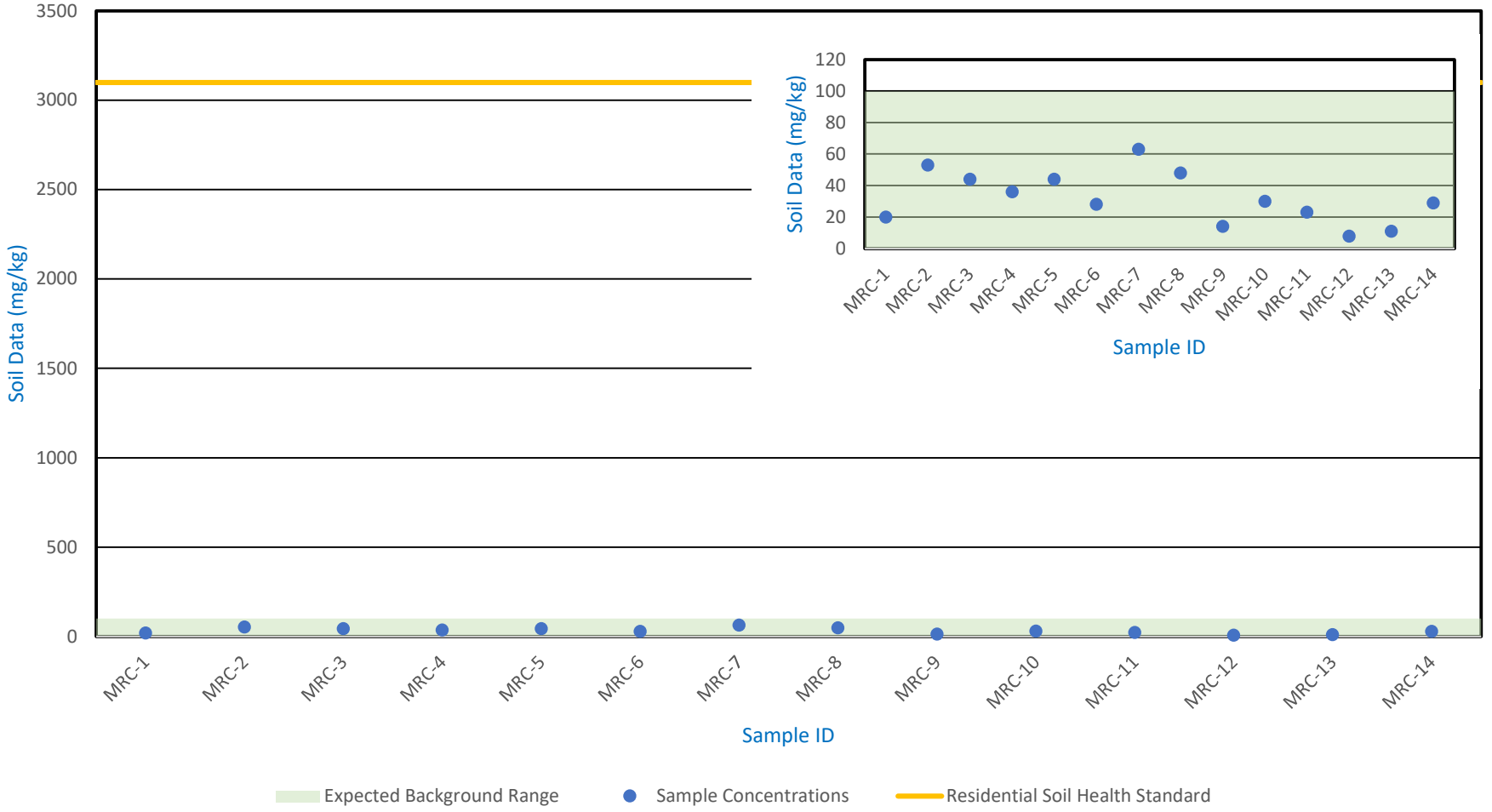


Figure 10 Lead Soil Data Comparison

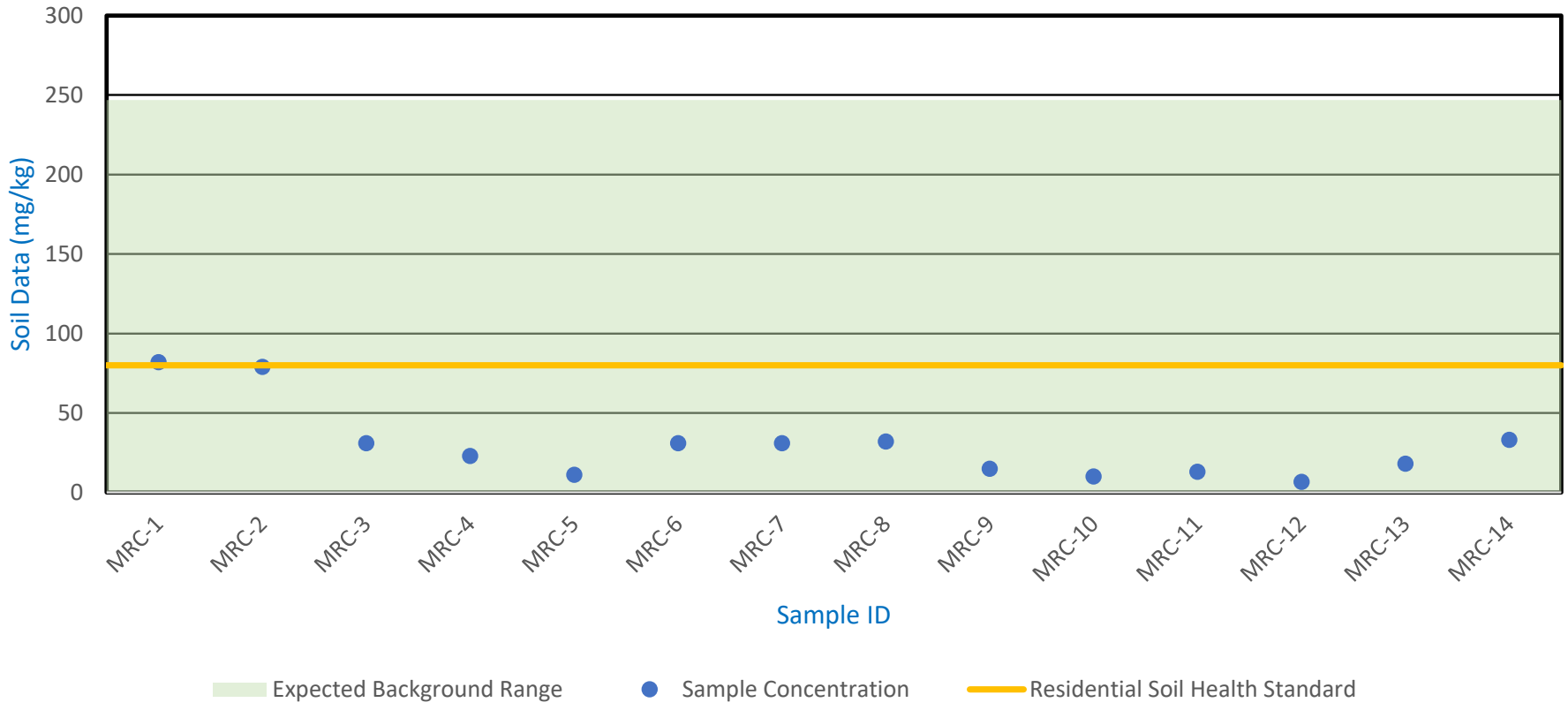


Figure 11 Molybdenum Soil Data Comparison

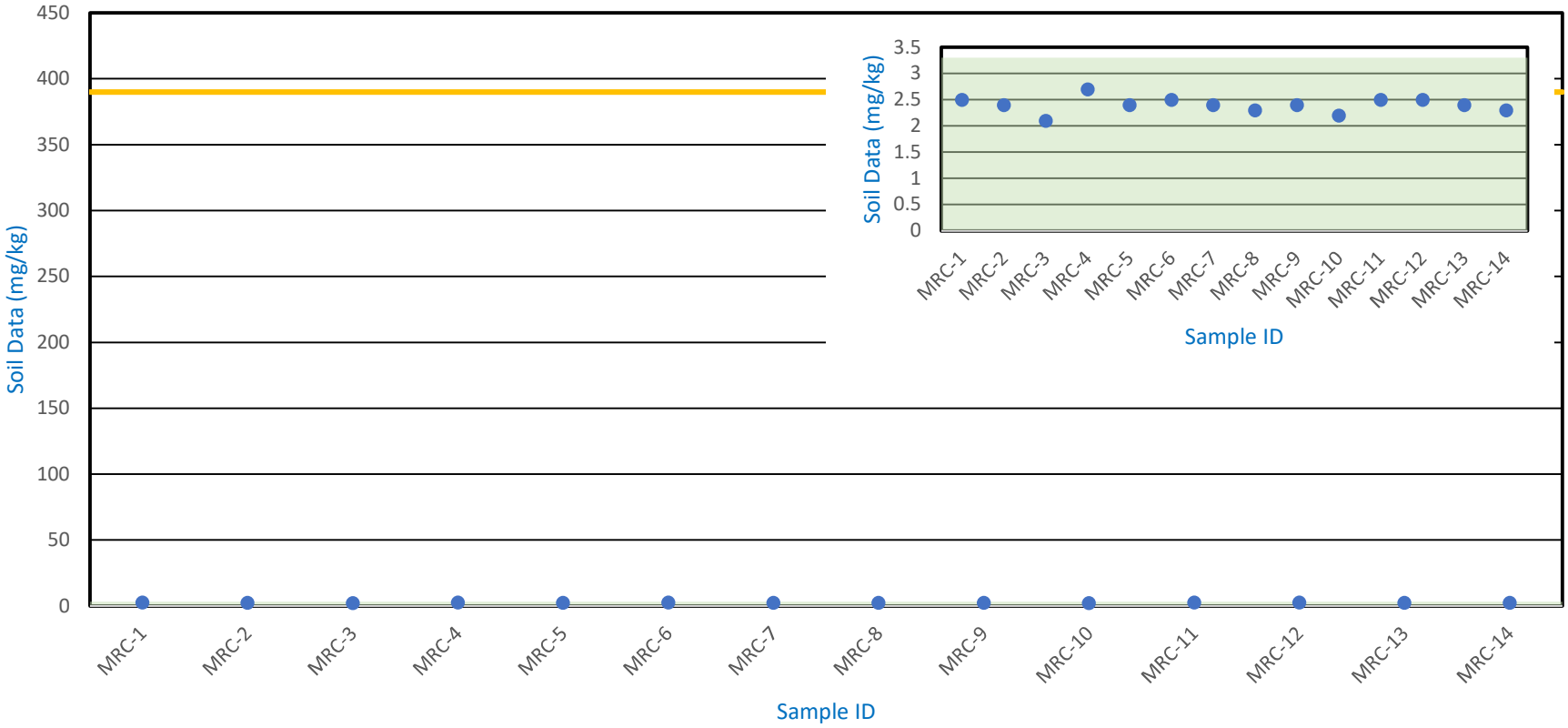


Figure 12 Nickel Soil Data Comparison

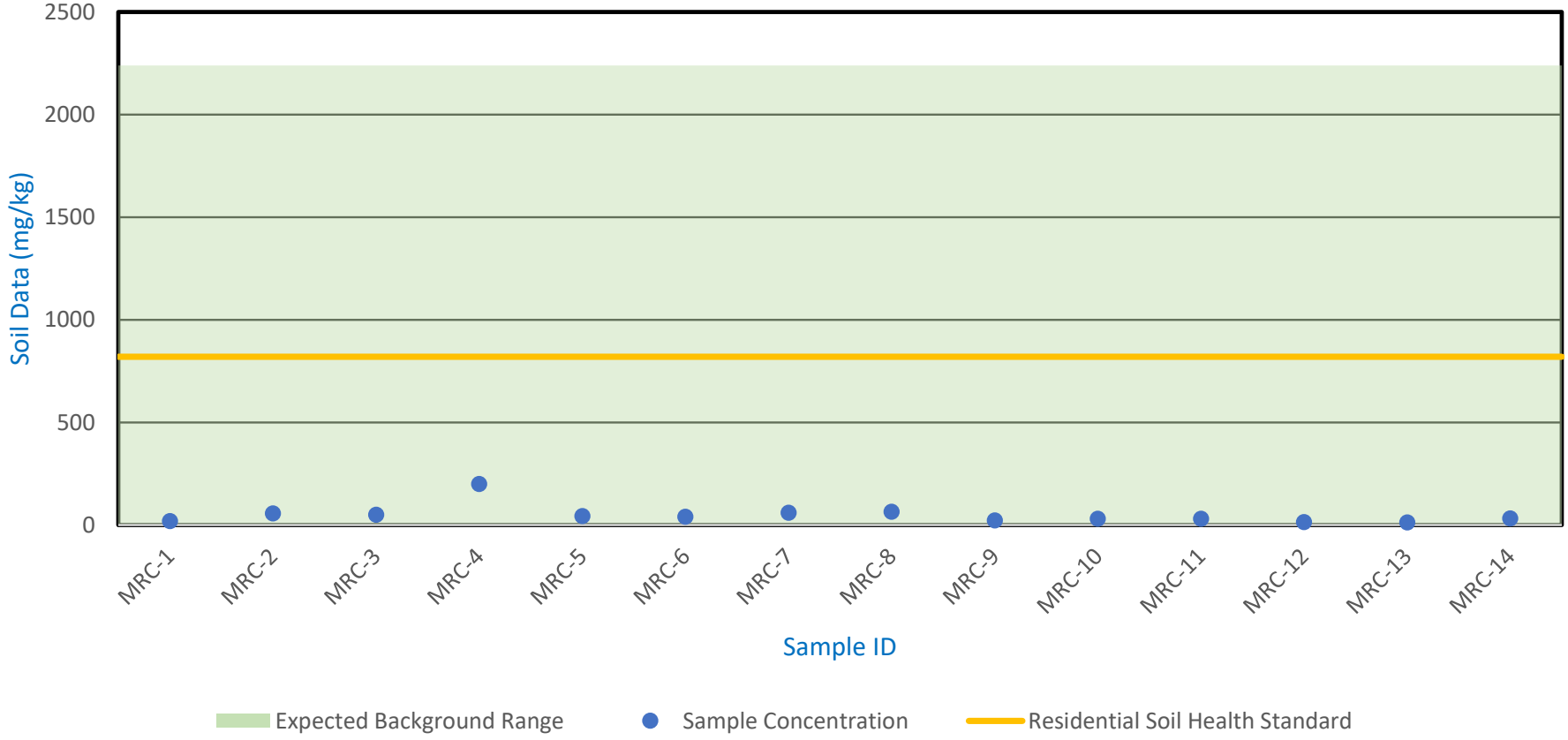


Figure 13 Selenium Soil Data Comparison

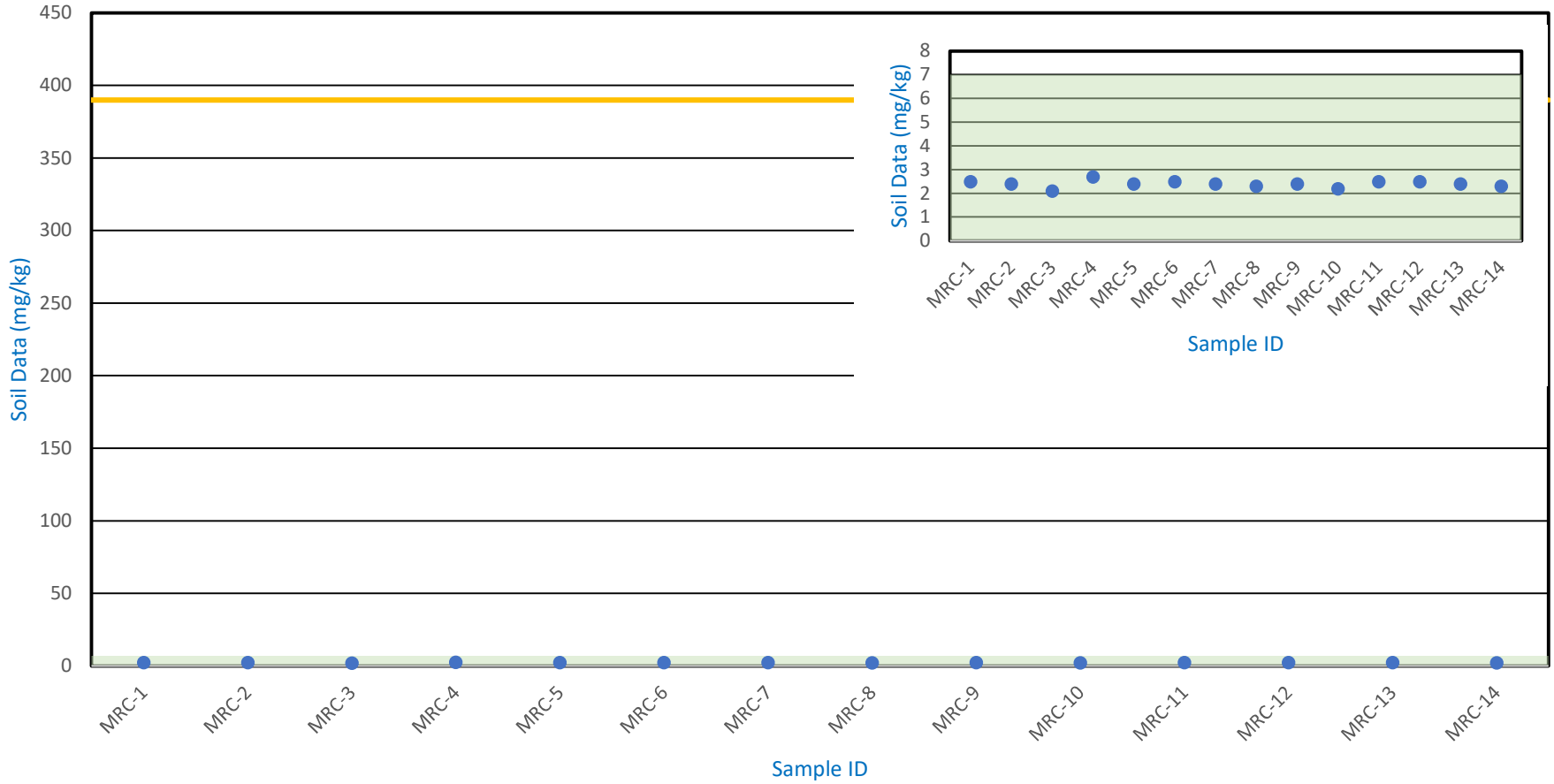


Figure 14 Vanadium Soil Data Comparison

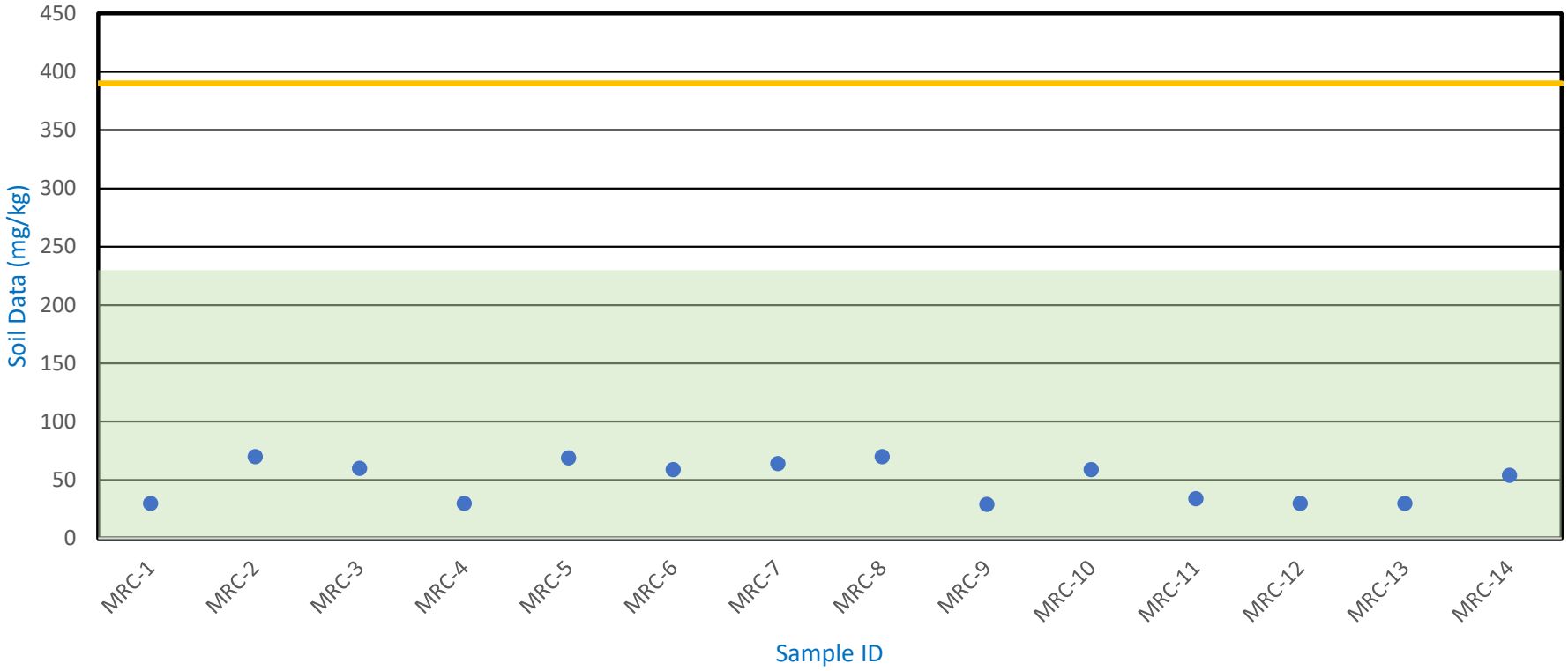
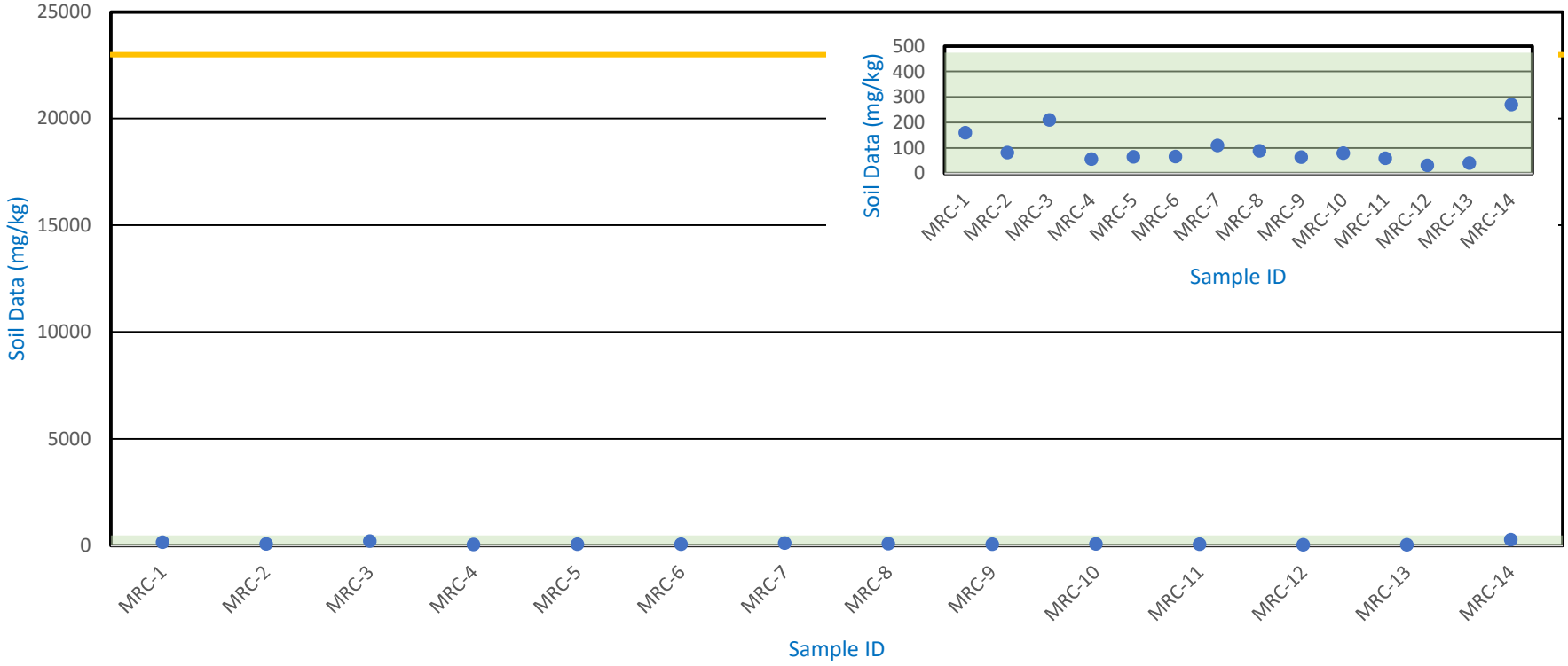


Figure 15 Zinc Soil Data Comparison



Appendix A. Laboratory Analytical Report for November 2022 Bulk Data

McCampbell Analytical, Inc.

"When Quality Counts"

Analytical Report

WorkOrder: 2211J04

Report Created for: BAAQMD

375 Beale Street Suite 600
San Francisco, CA 94105

Project Contact: McKenzie Bell
Project P.O.:
Project: MRC

Note: CCH bulk dust samples collected in a sample container by BAAQMD. Samples reported in milligrams per kilogram.

Project Received: 11/30/2022

Analytical Report reviewed & approved for release on 12/01/2022 by:

Jennifer Lagerbom
Project Manager

McCampbell Analytical, Inc.
"When Quality Counts"

1534 Willow Pass Road, Pittsburg, CA 94565-1701
Toll Free Telephone: (877) 252-9262 / Fax: (925) 252-9269
http://www.mccampbell.com / E-mail: main@mccampbell.com

Glossary of Terms & Qualifier Definitions

Client: BAAQMD **WorkOrder:** 2211J04

Project: MRC

Glossary Abbreviation

%D	Serial Dilution Percent Difference
95% Interval	95% Confident Interval
CPT	Consumer Product Testing not NELAP Accredited
DF	Dilution Factor
DI WET	(DISTLC) Waste Extraction Test using DI water
DISS	Dissolved (direct analysis of 0.45 µm filtered and acidified water sample)
DLT	Dilution Test (Serial Dilution)
DUP	Duplicate
EDL	Estimated Detection Limit
ERS	External reference sample. Second source calibration verification.
ITEF	International Toxicity Equivalence Factor
LCS	Laboratory Control Sample
LQL	Lowest Quantitation Level
MB	Method Blank
MB % Rec	% Recovery of Surrogate in Method Blank, if applicable
MDL	MDL is the minimum measured concentration of a substance that can be reported with 99% confidence that the measured concentration is distinguishable from method blank results. Definition and Procedure for the Determination of the Method Detection Limit, Revision 2, 40CFR, Part 136, Appendix B, EPA 821-R-16-006, December 2016.
ML	Minimum Level of Quantitation
MS	Matrix Spike
MSD	Matrix Spike Duplicate
NA	Not Applicable
ND	Not detected at or above the indicated MDL or RL
NR	Data Not Reported due to matrix interference or insufficient sample amount.
PDS	Post Digestion Spike
PDSD	Post Digestion Spike Duplicate
PF	Prep Factor
RD	Relative Difference
RL	Reporting limit is the lowest level that can be reliably determined within specified limits of precision and accuracy during routine laboratory operating conditions. (The RL cannot be lower than the lowest calibration standard used in the initial calibration of the instrument and must be greater than the MDL.)
RPD	Relative Percent Deviation
RRT	Relative Retention Time
SPK Val	Spike Value
SPKRef Val	Spike Reference Value
SPLP	Synthetic Precipitation Leachate Procedure
ST	Sorbent Tube
TCLP	Toxicity Characteristic Leachate Procedure
TEQ	Toxicity Equivalents
TZA	TimeZone Net Adjustment for sample collected outside of MAI's UTC.
WET (STLC)	Waste Extraction Test (Soluble Threshold Limit Concentration)

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Glossary of Terms & Qualifier Definitions

Client: BAAQMD **WorkOrder:** 2211J04
Project: MRC

Analytical Qualifiers

a7	Reporting limit raised due to limited sample amount.

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Analytical Report

Client:	BAAQMD	**WorkOrder:**	2211J04
Date Received:	11/30/2022 14:37	**Extraction Method:**	SW3050B
Date Prepared:	11/30/2022	**Analytical Method:**	SW6020
Project:	MRC	**Unit:**	mg/Kg

CAM / CCR 17 Metals

Client ID	Lab ID	Matrix	Date Collected	Instrument	Batch ID
1-1635 Alhambra Community Sample	2211J04-001A	Solid	11/26/2022 12:56	ICP-MS5 110SMPL.d	259224

Analytes	Result	RL	DF	Date Analyzed
Antimony	ND	24	1	12/01/2022 10:08
Arsenic	ND	24	1	12/01/2022 10:08
Barium	ND	240	1	12/01/2022 10:08
Beryllium	ND	24	1	12/01/2022 10:08
Cadmium	ND	24	1	12/01/2022 10:08
Chromium	ND	24	1	12/01/2022 10:08
Cobalt	ND	24	1	12/01/2022 10:08
Copper	ND	24	1	12/01/2022 10:08
Lead	ND	24	1	12/01/2022 10:08
Mercury	ND	2.4	1	12/01/2022 10:08
Molybdenum	ND	24	1	12/01/2022 10:08
Nickel	**160**	24	1	12/01/2022 10:08
Selenium	ND	24	1	12/01/2022 10:08
Silver	ND	24	1	12/01/2022 10:08
Thallium	ND	24	1	12/01/2022 10:08
Vanadium	**570**	24	1	12/01/2022 10:08
Zinc	ND	240	1	12/01/2022 10:08

Surrogates	REC (%)	Limits	
Terbium	109	70-130	12/01/2022 10:08

Analyst(s): AL Analytical Comments: a7

(Cont.)

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Analytical Report

Client:	BAAQMD	**WorkOrder:**	2211J04
Date Received:	11/30/2022 14:37	**Extraction Method:**	SW3050B
Date Prepared:	11/30/2022	**Analytical Method:**	SW6020
Project:	MRC	**Unit:**	mg/Kg

CAM / CCR 17 Metals

Client ID	Lab ID	Matrix	Date Collected	Instrument	Batch ID
2- 210 Buckley St Community Sample	2211J04-002A	Solid	11/26/2022 13:18	ICP-MS5 113SMPL.d	259224

Analytes	Result	RL	DF	Date Analyzed
Antimony	ND	3.4	1	12/01/2022 10:19
Arsenic	ND	3.4	1	12/01/2022 10:19
Barium	**86**	34	1	12/01/2022 10:19
Beryllium	ND	3.4	1	12/01/2022 10:19
Cadmium	ND	3.4	1	12/01/2022 10:19
Chromium	**15**	3.4	1	12/01/2022 10:19
Cobalt	**6.5**	3.4	1	12/01/2022 10:19
Copper	**23**	3.4	1	12/01/2022 10:19
Lead	**12**	3.4	1	12/01/2022 10:19
Mercury	ND	0.34	1	12/01/2022 10:19
Molybdenum	ND	3.4	1	12/01/2022 10:19
Nickel	**200**	3.4	1	12/01/2022 10:19
Selenium	**3.8**	3.4	1	12/01/2022 10:19
Silver	ND	3.4	1	12/01/2022 10:19
Thallium	ND	3.4	1	12/01/2022 10:19
Vanadium	**580**	3.4	1	12/01/2022 10:19
Zinc	**61**	34	1	12/01/2022 10:19

Surrogates	REC (%)	Limits	
Terbium	106	70-130	12/01/2022 10:19

Analyst(s): AL Analytical Comments: a7

(Cont.)

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Analytical Report

Client:	BAAQMD	**WorkOrder:**	2211J04
Date Received:	11/30/2022 14:37	**Extraction Method:**	SW3050B
Date Prepared:	11/30/2022	**Analytical Method:**	SW6020
Project:	MRC	**Unit:**	mg/Kg

CAM / CCR 17 Metals

Client ID	Lab ID	Matrix	Date Collected	Instrument	Batch ID
3- 225 Buckley St Community Sample	2211J04-003A	Solid	11/26/2022 13:31	ICP-MS5 114SMPL.d	259224

Analytes	Result	RL	DF	Date Analyzed
Antimony	ND	13	1	12/01/2022 10:22
Arsenic	ND	13	1	12/01/2022 10:22
Barium	ND	130	1	12/01/2022 10:22
Beryllium	ND	13	1	12/01/2022 10:22
Cadmium	ND	13	1	12/01/2022 10:22
Chromium	**16**	13	1	12/01/2022 10:22
Cobalt	ND	13	1	12/01/2022 10:22
Copper	**26**	13	1	12/01/2022 10:22
Lead	ND	13	1	12/01/2022 10:22
Mercury	ND	1.3	1	12/01/2022 10:22
Molybdenum	ND	13	1	12/01/2022 10:22
Nickel	**200**	13	1	12/01/2022 10:22
Selenium	ND	13	1	12/01/2022 10:22
Silver	ND	13	1	12/01/2022 10:22
Thallium	ND	13	1	12/01/2022 10:22
Vanadium	**610**	13	1	12/01/2022 10:22
Zinc	**200**	130	1	12/01/2022 10:22

Surrogates	REC (%)	Limits	
Terbium	107	70-130	12/01/2022 10:22

Analyst(s): AL Analytical Comments: a7

(Cont.)

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Analytical Report

Client:	BAAQMD	**WorkOrder:**	2211J04
Date Received:	11/30/2022 14:37	**Extraction Method:**	SW3050B
Date Prepared:	11/30/2022	**Analytical Method:**	SW6020
Project:	MRC	**Unit:**	mg/Kg

CAM / CCR 17 Metals

Client ID	Lab ID	Matrix	Date Collected	Instrument	Batch ID
4- 815 Estudillo St Community Sample	2211J04-004A	Solid	11/26/2022 13:07	ICP-MS5 115SMPL.d	259224

Analytes	Result	RL	DF	Date Analyzed
Antimony	ND	340	1	12/01/2022 10:26
Arsenic	ND	340	1	12/01/2022 10:26
Barium	ND	3400	1	12/01/2022 10:26
Beryllium	ND	340	1	12/01/2022 10:26
Cadmium	ND	340	1	12/01/2022 10:26
Chromium	ND	340	1	12/01/2022 10:26
Cobalt	ND	340	1	12/01/2022 10:26
Copper	ND	340	1	12/01/2022 10:26
Lead	ND	340	1	12/01/2022 10:26
Mercury	ND	34	1	12/01/2022 10:26
Molybdenum	ND	340	1	12/01/2022 10:26
Nickel	ND	340	1	12/01/2022 10:26
Selenium	ND	340	1	12/01/2022 10:26
Silver	ND	340	1	12/01/2022 10:26
Thallium	ND	340	1	12/01/2022 10:26
Vanadium	**510**	340	1	12/01/2022 10:26
Zinc	**19,000**	3400	1	12/01/2022 10:26

Surrogates	REC (%)	Limits	
Terbium	105	70-130	12/01/2022 10:26

Analyst(s): AL

Analytical Comments: a7

(Cont.)

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Analytical Report

Client:	BAAQMD	**WorkOrder:**	2211J04
Date Received:	11/30/2022 14:37	**Extraction Method:**	SW3050B
Date Prepared:	11/30/2022	**Analytical Method:**	SW6020
Project:	MRC	**Unit:**	mg/Kg

CAM / CCR 17 Metals

Client ID	Lab ID	Matrix	Date Collected	Instrument	Batch ID
6- 3487 Pachecco Blvd Source Sample from refinery	2211J04-006A	Solid	11/26/2022 14:15	ICP-MS5 116SMPL.d	259224

Analytes	Result	RL	DF	Date Analyzed
Antimony	ND	0.50	1	12/01/2022 10:29
Arsenic	**5.8**	0.50	1	12/01/2022 10:29
Barium	**63**	5.0	1	12/01/2022 10:29
Beryllium	**0.68**	0.50	1	12/01/2022 10:29
Cadmium	ND	0.50	1	12/01/2022 10:29
Chromium	**15**	0.50	1	12/01/2022 10:29
Cobalt	**7.9**	0.50	1	12/01/2022 10:29
Copper	**29**	0.50	1	12/01/2022 10:29
Lead	**12**	0.50	1	12/01/2022 10:29
Mercury	ND	0.050	1	12/01/2022 10:29
Molybdenum	**12**	0.50	1	12/01/2022 10:29
Nickel	**200**	0.50	1	12/01/2022 10:29
Selenium	**3.5**	0.50	1	12/01/2022 10:29
Silver	ND	0.50	1	12/01/2022 10:29
Thallium	ND	0.50	1	12/01/2022 10:29
Vanadium	**510**	2.5	5	12/01/2022 10:48
Zinc	**16**	5.0	1	12/01/2022 10:29

Surrogates	REC (%)	Limits	
Terbium	96	70-130	12/01/2022 10:29

Analyst(s): AL

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Quality Control Report

Client:	BAAQMD	**WorkOrder:**	2211J04
Date Prepared:	11/30/2022	**BatchID:**	259224
Date Analyzed:	12/01/2022	**Extraction Method:**	SW3050B
Instrument:	ICP-MS5	**Analytical Method:**	SW6020
Matrix:	Soil	**Unit:**	mg/kg
Project:	MRC	**Sample ID:**	MB/LCS/LCSD-259224

QC Summary Report for Metals

Analyte	MB Result	MDL	RL	SPK Val	MB SS %REC	MB SS Limits
Antimony	ND	0.12	0.50	-	-	-
Arsenic	ND	0.11	0.50	-	-	-
Barium	ND	0.71	5.0	-	-	-
Beryllium	ND	0.10	0.50	-	-	-
Cadmium	ND	0.092	0.50	-	-	-
Chromium	ND	0.13	0.50	-	-	-
Cobalt	ND	0.064	0.50	-	-	-
Copper	ND	0.13	0.50	-	-	-
Lead	ND	0.065	0.50	-	-	-
Mercury	ND	0.038	0.050	-	-	-
Molybdenum	ND	0.092	0.50	-	-	-
Nickel	ND	0.080	0.50	-	-	-
Selenium	ND	0.21	0.50	-	-	-
Silver	ND	0.057	0.50	-	-	-
Thallium	ND	0.072	0.50	-	-	-
Vanadium	ND	0.11	0.50	-	-	-
Zinc	ND	2.5	5.0	-	-	-
Surrogate Recovery						
Terbium	540			500	108	70-130

(Cont.)

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Quality Control Report

Client:	BAAQMD	**WorkOrder:**	2211J04
Date Prepared:	11/30/2022	**BatchID:**	259224
Date Analyzed:	12/01/2022	**Extraction Method:**	SW3050B
Instrument:	ICP-MS5	**Analytical Method:**	SW6020
Matrix:	Soil	**Unit:**	mg/kg
Project:	MRC	**Sample ID:**	MB/LCS/LCSD-259224

QC Summary Report for Metals

Analyte	LCS Result	LCSD Result	SPK Val	LCS %REC	LCSD %REC	LCS/LCSD Limits	RPD	RPD Limit
Antimony	50	51	50	100	101	75-125	1.27	20
Arsenic	50	51	50	100	102	75-125	1.93	20
Barium	510	510	500	102	101	75-125	0.512	20
Beryllium	51	52	50	102	104	75-125	1.21	20
Cadmium	51	52	50	101	103	75-125	1.92	20
Chromium	48	49	50	96	98	75-125	1.70	20
Cobalt	52	52	50	103	104	75-125	1.25	20
Copper	51	52	50	101	104	75-125	2.70	20
Lead	49	50	50	98	100	75-125	2.04	20
Mercury	1.2	1.3	1.25	100	102	75-125	2.46	20
Molybdenum	51	52	50	102	103	75-125	0.840	20
Nickel	50	51	50	100	103	75-125	2.53	20
Selenium	49	52	50	97	104	75-125	7.10	20
Silver	50	51	50	101	102	75-125	0.809	20
Thallium	50	51	50	100	102	75-125	2.01	20
Vanadium	50	51	50	100	102	75-125	1.88	20
Zinc	500	510	500	101	103	75-125	2.10	20
Surrogate Recovery								
Terbium	530	540	500	106	108	70-130	1.58	20

McCampbell Analytical, Inc.
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CHAIN-OF-CUSTODY RECORD

WorkOrder: 2211J04 **ClientCode: BAAQ**

☐ WaterTrax ☐ CLIP ☐ EDF ☑ EQuIS ☑ Dry-Weight ☐ Email ☐ HardCopy ☐ ThirdParty ☐ J-flag
☑ Detection Summary ☐ Excel

Report to:
McKenzie Bell
BAAQMD
375 Beale Street Suite 600
San Francisco, CA 94105
(415) 793-6649 FAX: 415-749-5082

Email: mbell@baaqmd.gov
cc/3rd Party:
PO:
Project: MRC

Bill to:
Alexandra McMullen
Contra Costa-Hazardous Materials
4585 Pacheco Blvd., Ste 100
Martinez, CA 94553
cchazmat@cchealth.org

Requested TAT: **1 day;**

Date Received: **11/30/2022**
Date Logged: **11/30/2022**

Lab ID	ClientSampID	Matrix	Collection Date	Hold	Requested Tests (See legend below)											
					1	2	3	4	5	6	7	8	9	10	11	12
2211J04-001	1-1635 Alhambra	Solid	11/26/2022 12:56	☐	A	A										
2211J04-002	2- 210 Buckley St	Solid	11/26/2022 13:18	☐	A	A										
2211J04-003	3- 225 Buckley St	Solid	11/26/2022 13:31	☐	A	A										
2211J04-004	4- 815 Estudillo St	Solid	11/26/2022 13:07	☐	A	A										
2211J04-005	5- 318 Halen St	Solid	11/26/2022 15:07	☐	A	A										
2211J04-006	6- 3487 Pachecco Blvd	Solid	11/26/2022 14:15	☐	A	A										

Test Legend:

1	CAM17MS_TTLC_S	2	PRDisposal Fee	3		4	
5		6		7		8	
9		10		11		12	

Prepared by: Agustina Venegas

Comments:

NOTE: Soil samples are discarded 60 days after receipt unless other arrangements are made (Water samples are 30 days).
Hazardous samples will be returned to client or disposed of at client expense.

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WORK ORDER SUMMARY

Client Name: BAAQMD **Project:** MRC **Work Order:** 2211J04
Client Contact: McKenzie Bell **QC Level:** LEVEL 2
Contact's Email: mbell@baaqmd.gov **Comments:** **Date Logged:** 11/30/2022

☐ WaterTrax ☐ CLIP ☐ EDF ☐ Excel ☑ EQuIS ☐ Email ☐ HardCopy ☐ ThirdParty ☐ J-flag

LabID	ClientSampID	Matrix	Test Name	Containers /Composites	Bottle & Preservative	U**	Head Space	Dry-Weight	Collection Date & Time	TAT	Test Due Date	Sediment Content	Hold	Sub Out
001A	1-1635 Alhambra	Solid	SW6020 (CAM 17)	1	Plastic Baggie, Small	☐	☐	☐	11/26/2022 12:56	1 day	12/1/2022		☐	☐
002A	2- 210 Buckley St	Solid	SW6020 (CAM 17)	1	Plastic Baggie, Small	☐	☐	☐	11/26/2022 13:18	1 day	12/1/2022		☐	☐
003A	3- 225 Buckley St	Solid	SW6020 (CAM 17)	1	Plastic Baggie, Small	☐	☐	☐	11/26/2022 13:31	1 day	12/1/2022		☐	☐
004A	4- 815 Estudillo St	Solid	SW6020 (CAM 17)	1	Plastic Baggie, Small	☐	☐	☐	11/26/2022 13:07	1 day	12/1/2022		☐	☐
005A	5- 318 Halen St	Solid	SW6020 (CAM 17)	1	Plastic Baggie, Small	☐	☐	☐	11/26/2022 15:07	1 day	12/1/2022		☑	☐
006A	6- 3487 Pachecco Blvd	Solid	SW6020 (CAM 17)	1	2OZ Black Plastic Jar	☐	☐	☐	11/26/2022 14:15	1 day	12/1/2022		☐	☐
				1	Plastic Baggie, Small	☐	☐	☐					☐	☐

NOTES: * STLC and TCLP extractions require 2 days to complete; therefore, all TATs begin after the extraction is completed (i.e., One-day TAT yields results in 3 days from sample submission).

- Organic extracts are held for 40 days before disposal; Inorganic extract are held for 30 days.

- MAI assumes that all material present in the provided sampling container is considered part of the sample - MAI does not exclude any material from the sample prior to sample preparation unless requested in writing by the client.

U = An unpreserved container was received for a method that suggests a preservation in order to extend hold time for analysis.**

General COC **RUSH** MAI Work Order # 2211J04

McCAMPBELL ANALYTICAL, INC.

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CHAIN OF CUSTODY RECORD

Turn Around Time: 1 Day Rush X | 2 Day Rush | 3 Day Rush | STD | Quote #
J-Flag / MDL | ESL | Cleanup Approved | Dry Weight | Bottle Order #
Delivery Format: PDF | GeoTracker EDF | EDD | Write On (DW) | Detect Summary

Report To: BAAQMD-McKenzie Bell Bill To: CCounty Tax mail
Company: Bay Area Air Quality Management District
Address: mbell@baaqmd.gov
Email: 375 Beale St SF 94105 Tele: 415-793-6099
Project Name: MRC Project #:
Project Location: Multiple PO #
Sampler Signature:

SAMPLE ID Location / Field Point	Sampling Date	Sampling Time	#Containers	Matrix	Preservative	Multi Range as Gas, Diesel, and Motor Oil (8021/8015)	BTEX & TPH as Gas (8021/ 8015) MTBE	TPH as Diesel (8015) + Motor Oil Without Silica Gel	TPH as Diesel (8015) + Motor Oil With Silica Gel	Total Oil & Grease (1664 / 9071) Without Silica Gel	Total Petroleum Hydrocarbons - Oil & Grease (1664 / 9071) With Silica Gel	Total Petroleum Hydrocarbons (418.1) With Silica Gel	EPA 505/ 608 / 8081 (Cl Pesticides)	EPA 608 / 8082 PCB's ; Aroclors only	EPA 524.2 / 624 / 8260 (VOCs)	EPA 525.2 / 625 / 8270 (SVOCs)	EPA 8270 SIM / 8310 (PAHs / PNAs)	CAM 17 Metals (200.8 / 6020)*	Metals (200.8 / 6020)*	Baylands Requirements	Lab to filter sample for dissolved metals analysis			
1 1035 Alhambra Ave	11/20/22	12:50	1															X	?					
2 210 Buckley St	11/20/22	13:15	1															X	?					
3 225 Buckley St	11/20/22	13:31	1															X	?					
4 815 Estudillo St	11/20/22	13:07	1															X	?					
* 5 318 Haven St	11/20/22	15:07	1															X	?					
6 3487 Pacheco Blvd	11/20/22	14:15	1															X	?					

Note: CCH bulk dust samples were collected in a sample container by BAAQMD. Samples are in milligrams per kilogram

MAI clients MUST disclose any dangerous chemicals known to be present in their submitted samples in concentrations that may cause immediate harm or serious future health endangerment as a result of brief, gloved, open air, sample handling by MAI staff. Non-disclosure incurs an immediate $250 surcharge and the client is subject to full legal liability for harm suffered. Thank you for your understanding and for allowing us to work safely.

* If metals are requested for water samples and the water type (Matrix) is not specified on the chain of custody, MAI will default to metals by E200.8.

Please provide an adequate volume of sample. If the volume is not sufficient for a MS/MSD a LCS/LCSD will be prepared in its place and noted in the report.

Relinquished By / Company Name	Date	Time	Received By / Company Name	Date	Time
McKenzie Bell BAAQMD	11/30/22	14:37	[signature]	11/30/2022	1437

Comments / Instructions
* Not a measureable amount of sample provided - cancelled 11-30-22

Matrix Code: DW=Drinking Water, GW=Ground Water, WW=Waste Water, SW=Seawater, S=Soil, SL=Sludge, A=Air, WP=Wipe, O=Other
Preservative Code: 1=4°C 2=HCl 3=H_2SO_4 4=HNO_3 5=NaOH 6=ZnOAc/NaOH 7=None

Temp _____ °C Initials _____

BAY AREA AIR QUALITY MANAGEMENT DISTRICT 375 Beale Street, Suite 600, San Francisco, CA 94105

REQUEST FOR LABORATORY ANALYSIS — FL-1

SAMPLE LOCATION

Site Name	Martinez Refining Company
Address	3485 Pacheco Blvd Martinez CA 94553
City, Zip	Martinez 94553
Source Operation #	COBS I-3 hopper
Site #	A0011

SAMPLE COLLECTION

Taken by (print name)	Tim Paris
Date & Time	11/28/22 14:15 # of Samples
Taken from (exact location)	COBS main hopper
Air District Staff present at collection	☒ Y ☐ N
Sample Description	white powder substance
SDS or other documentation attached	☒ Y ☐ N
MFTR Code & Name	
Field Comments	sample of spent catalyst from main hopper at COBs

CHAIN OF CUSTODY

Transfer	From	To	Date & Time
1	Sign: Tim Paris / Print: Tim Paris		11/28/22 14:15
2	Sign: [signature] / Print: Kenzie Bell		11/28/22 13:37
3	Sign: [signature] / Print: Kenzie Bell		11/30/22 9:20
4	Sign: / Print:		

SAMPLE PURPOSE | LAB

Analysis requested	
Billing Code	

Reason for sampling

☐ Compliance with Reg ____ Rule ____ Sec ____

Limit specification ____

☐ Operation under Permit # ____

Limit specification ____

☒ Other (specify) Incidence Response

SAMPLE SUBMISSION TO LABORATORY

	Name (print)	Date & Time
Delivered by	McKenzie Bell	11/28/22 13:37
Received by		

QUALITY CONTROL CHECK

	Y	N	N/A
Received at appropriate temperature	☐	☐	☐
Received in appropriate container	☐	☐	☐
Sample container intact	☐	☐	☐
Sample label affixed & complete	☐	☐	☐
Seals affixed & intact	☐	☐	☐

LABORATORY

Storage Location	
Stored Date & Initials	
Analyst	
Analysis Date	
Lab Comments	

Use mm/dd/yy hh:mm 24hr format for dates and times

Rec'd Nov. 28, 2022 cyn 1:30pm

Relq: cyn 12:09 Nov. 30th

Forensic Analytical Laboratories, Inc.

Analysis Request Form (COC)

Client Name & Address:
Bay Area Air Quality Management District
375 Beale St SF CA 94105

PO / Job#: 37208
Date:

Turn Around Time: Same Day / 1Day / 2Day / 3Day / 4Day / 5Day

☐ PCM: ☐ NIOSH 7400A / ☐ NIOSH 7400B ☐ Rotometer

☐ PLM: ☐ Standard / ☐ Point Count 400 / 1000 / ☐ CARB 435

Contact: Mckenzie Bell

☐ TEM Air: ☐ AHERA / ☐ Yamate2 / ☐ NIOSH 7402
☐ TEM Bulk: ☐ Quantitative / ☐ Qualitative / ☐ Chatfield
☐ TEM Water: ☐ Potable / ☐ Non-Potable / ☐ Weight %
☐ TEM Microvac: ☐ Qual(+/-) / ☐ D5755(str/area) / ☐ D5756(str/mass)

Phone: 415-793-6649 Fax:

E-mail: mbell@baaqmd.gov

☐ IAQ Particle Identification (PLM LAB) ☐ PLM Opaques/Soot
☐ Particle Identification (TEM LAB) ☐ Special Project

Site:

☒ Metals Analysis: Method:

Site Location:

Matrix:

Analytes:

Comments: Please test #1-5 to ① compare w/ #6 and ② metal analysis

Report Via: ☐ Fax ☐ E-Mail ☐ Verbal

Sample ID	Date / Time	Sample Location / Description (all locations sites were in Martinez CA)	FOR AIR SAMPLES ONLY: Type (A P C)	Time On/Off	Avg. LPM	Total Time	Sample Area / Air Volume
1	11/20/22 12:56	1635 Alhambra Ave	A P C				
2	11/20/22 13:18	210 Buckley Street	A P C				
3	11/20/22 13:31	225 Buckley Street	A P C				
4	11/20/22 13:07	815 Estudillo St	A P C				
5	11/20/22 15:07	38 Haven St	A P C				
6	11/20/22 14:15	3487 Pacheco Blvd	A P C				
			A P C				
			A P C				
			A P C				
			A P C				

Sampled By: 1-5 Mckenzie Bell & Tim Paul Date: 11/20/22 Time: —

Shipped Via: ☐ Fed Ex ☐ DHL ☐ UPS ☐ US Mail ☐ Courier ☐ Drop Off ☐ Other:

Relinquished By:	Relinquished By:	Relinquished By:
Date / Time:	Date / Time:	Date / Time: 12:09 30 NOV 22
Received By:	Received By:	Received By:
Date / Time: NOV 28 2022 1:30 pm	Date / Time:	Date / Time:
Condition Acceptable? ☐ Yes ☐ No	Condition Acceptable? ☐ Yes ☐ No	Condition Acceptable? ☐ Yes ☐ No

RECEIVED
NOV 28 2022
BY:

San Francisco Office: 3777 Depot Road, Suite 409, Hayward, California 94545-2761 / Ph: (510)887-8828 * (800)827-3274 / Fax: (510)887-4218
Los Angeles Office: 2959 Pacific Commerce Drive, Rancho Dominguez, California 90221 / Ph: (310)763-2374 * (888)813-9417 / Fax: (310)763-4450
Las Vegas Office: 6765 S. Eastern Avenue, Suite 3, Las Vegas, Nevada 89119 / Ph: (702)784-0040 / Fax: (702)784-0030

~~3 day per Client~~ - afm afm

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http://www.mccampbell.com / E-mail: main@mccampbell.com

Sample Receipt Checklist

Client Name:	BAAQMD	Date and Time Received:	11/30/2022 14:37
Project:	MRC	Date Logged:	11/30/2022
		Received by:	Agustina Venegas
WorkOrder №:	2211J04 Matrix: Solid	Logged by:	Agustina Venegas
Carrier:	Client Drop-In		

Chain of Custody (COC) Information

Chain of custody present?	Yes	☑	No	☐	
Chain of custody signed when relinquished and received?	Yes	☑	No	☐	
Chain of custody agrees with sample labels?	Yes	☑	No	☐	
Sample IDs noted by Client on COC?	Yes	☑	No	☐	
Date and Time of collection noted by Client on COC?	Yes	☑	No	☐	
Sampler's name noted on COC?	Yes	☑	No	☐	
COC agrees with Quote?	Yes	☐	No	☐	NA ☑

Sample Receipt Information

Custody seals intact on shipping container/cooler?	Yes	☐	No	☐	NA ☑
Custody seals intact on sample bottles?	Yes	☐	No	☐	NA ☑
Shipping container/cooler in good condition?	Yes	☑	No	☐	
Samples in proper containers/bottles?	Yes	☑	No	☐	
Sample containers intact?	Yes	☑	No	☐	
Sufficient sample volume for indicated test?	Yes	☑	No	☐	

Sample Preservation and Hold Time (HT) Information

All samples received within holding time?	Yes	☑	No	☐	NA ☐
Samples Received on Ice?	Yes	☐	No	☑	
Sample/Temp Blank temperature	Temp:				NA ☑
ZHS conditional analyses: VOA meets zero headspace requirement (VOCs, TPHg/BTEX, RSK)?	Yes	☐	No	☐	NA ☑
Sample labels checked for correct preservation?	Yes	☑	No	☐	
pH acceptable upon receipt (Metal: <2; Nitrate 353.2/4500NO3: <2; 522: <4; 218.7: >8)?	Yes	☐	No	☐	NA ☑
UCMR Samples:					
pH tested and acceptable upon receipt (200.7: ≤2; 533: 6 - 8; 537.1: 6 - 8)?	Yes	☐	No	☐	NA ☑
Free Chlorine tested and acceptable upon receipt (<0.1mg/L) [not applicable to 200.7]?	Yes	☐	No	☐	NA ☑

Comments:

Appendix B. Laboratory Analytical Report for November 2022 Dust Data

McCampbell Analytical, Inc.

"When Quality Counts"

Analytical Report

WorkOrder: 2211G11

Report Created for: Contra Costa-Hazardous Materials

4585 Pacheco Blvd., Ste 100
Martinez, CA 94553

Project Contact: Sara Dwight
Project P.O.: #023961
Project: MRC

Project Received: 11/28/2022

Note: CCH wipe sample data samples 1,2,6 and 7 are collected from a 12"x12" surface area and reported in micrograms per sample wipe. Others are bulk aproxamatly 60"x30".

Analytical Report reviewed & approved for release on 11/29/2022 by:

Jennifer Lagerbom
Project Manager

1534 Willow Pass Rd. Pittsburg, CA 94565 ♦ TEL: (877) 252-9262 ♦ FAX: (925) 252-9269 ♦ www.mccampbell.com
CA ELAP 1644 ♦ NELAP 4033 ORELAP

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Glossary of Terms & Qualifier Definitions

Client: Contra Costa-Hazardous Materials **WorkOrder:** 2211G11

Project: MRC

Glossary Abbreviation

%D	Serial Dilution Percent Difference
95% Interval	95% Confident Interval
CPT	Consumer Product Testing not NELAP Accredited
DF	Dilution Factor
DI WET	(DISTLC) Waste Extraction Test using DI water
DISS	Dissolved (direct analysis of 0.45 µm filtered and acidified water sample)
DLT	Dilution Test (Serial Dilution)
DUP	Duplicate
EDL	Estimated Detection Limit
ERS	External reference sample. Second source calibration verification.
ITEF	International Toxicity Equivalence Factor
LCS	Laboratory Control Sample
LQL	Lowest Quantitation Level
MB	Method Blank
MB % Rec	% Recovery of Surrogate in Method Blank, if applicable
MDL	MDL is the minimum measured concentration of a substance that can be reported with 99% confidence that the measured concentration is distinguishable from method blank results. Definition and Procedure for the Determination of the Method Detection Limit, Revision 2, 40CFR, Part 136, Appendix B, EPA 821-R-16-006, December 2016.
ML	Minimum Level of Quantitation
MS	Matrix Spike
MSD	Matrix Spike Duplicate
NA	Not Applicable
ND	Not detected at or above the indicated MDL or RL
NR	Data Not Reported due to matrix interference or insufficient sample amount.
PDS	Post Digestion Spike
PDSD	Post Digestion Spike Duplicate
PF	Prep Factor
RD	Relative Difference
RL	Reporting limit is the lowest level that can be reliably determined within specified limits of precision and accuracy during routine laboratory operating conditions. (The RL cannot be lower than the lowest calibration standard used in the initial calibration of the instrument and must be greater than the MDL.)
RPD	Relative Percent Deviation
RRT	Relative Retention Time
SPK Val	Spike Value
SPKRef Val	Spike Reference Value
SPLP	Synthetic Precipitation Leachate Procedure
ST	Sorbent Tube
TCLP	Toxicity Characteristic Leachate Procedure
TEQ	Toxicity Equivalents
TZA	TimeZone Net Adjustment for sample collected outside of MAI's UTC.
WET (STLC)	Waste Extraction Test (Soluble Threshold Limit Concentration)

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Glossary of Terms & Qualifier Definitions

Client: Contra Costa-Hazardous Materials **WorkOrder:** 2211G11

Project: MRC

Analytical Qualifiers

a22	Reporting limit raised due to increased prep factor because of physical size of ghost wipe.

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Case Narrative

Client: Contra Costa-Hazardous Materials
Project: MRC

Work Order: 2211G11
November 29, 2022

Al2O3 is estimated from the Al data determined by E6020B. It is assumed that all the Aluminum detected is in the form of Al2O3.

Sample ID	Al2O3 ug/wipe
2211G11-001A	11,112
2211G11-002A	24,656
2211G11-003A	106,680
2211G11-004A	73,144
2211G11-005A	2,501
2211G11-006A	ND<189

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Analytical Report

Client:	Contra Costa-Hazardous Materials	**WorkOrder:**	2211G11
Date Received:	11/28/2022 9:55	**Extraction Method:**	SW3050B
Date Prepared:	11/28/2022	**Analytical Method:**	SW6020
Project:	MRC	**Unit:**	µg/wipe

Metals

Client ID	Lab ID	Matrix	Date Collected	Instrument	Batch ID
D-1 Community Sample	2211G11-001A	Wipe	11/26/2022 11:55	ICP-MS5 106SMPL.d	259077

Analytes	Result	RL	DF	Date Analyzed
Aluminum	**5900**	100	1	11/29/2022 09:57
Antimony	**1.1**	1.0	1	11/29/2022 09:57
Arsenic	ND	1.0	1	11/29/2022 09:57
Barium	**39**	10	1	11/29/2022 09:57
Beryllium	ND	1.0	1	11/29/2022 09:57
Cadmium	ND	0.50	1	11/29/2022 09:57
Chromium	**5.7**	1.0	1	11/29/2022 09:57
Cobalt	**1.1**	1.0	1	11/29/2022 09:57
Copper	**14**	1.0	1	11/29/2022 09:57
Lead	**6.9**	1.0	1	11/29/2022 09:57
Mercury	**0.10**	0.10	1	11/29/2022 09:57
Molybdenum	ND	1.0	1	11/29/2022 09:57
Nickel	**17**	1.0	1	11/29/2022 09:57
Selenium	ND	1.0	1	11/29/2022 09:57
Silver	ND	1.0	1	11/29/2022 09:57
Thallium	ND	1.0	1	11/29/2022 09:57
Vanadium	**52**	1.0	1	11/29/2022 09:57
Zinc	**130**	10	1	11/29/2022 09:57

Surrogates	REC (%)	Limits	
Terbium	104	70-130	11/29/2022 09:57

Analyst(s): WV

Analytical Comments: a22

(Cont.)

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Analytical Report

Client:	Contra Costa-Hazardous Materials	**WorkOrder:**	2211G11
Date Received:	11/28/2022 9:55	**Extraction Method:**	SW3050B
Date Prepared:	11/28/2022	**Analytical Method:**	SW6020
Project:	MRC	**Unit:**	µg/wipe

Metals

Client ID	Lab ID	Matrix	Date Collected	Instrument	Batch ID
D-2 Community Sample	2211G11-002A	Wipe	11/26/2022 12:00	ICP-MS4 156SMPL.d	259077

Analytes	Result	RL	DF	Date Analyzed
Aluminum	**13,000**	500	5	11/29/2022 13:33
Antimony	**1.6**	1.0	1	11/29/2022 10:01
Arsenic	**1.1**	1.0	1	11/29/2022 10:01
Barium	**61**	10	1	11/29/2022 10:01
Beryllium	ND	1.0	1	11/29/2022 10:01
Cadmium	ND	0.50	1	11/29/2022 10:01
Chromium	**9.5**	1.0	1	11/29/2022 10:01
Cobalt	**2.4**	1.0	1	11/29/2022 10:01
Copper	**24**	1.0	1	11/29/2022 10:01
Lead	**12**	1.0	1	11/29/2022 10:01
Mercury	ND	0.10	1	11/29/2022 10:01
Molybdenum	**2.0**	1.0	1	11/29/2022 10:01
Nickel	**40**	1.0	1	11/29/2022 10:01
Selenium	ND	1.0	1	11/29/2022 10:01
Silver	ND	1.0	1	11/29/2022 10:01
Thallium	ND	1.0	1	11/29/2022 10:01
Vanadium	**130**	1.0	1	11/29/2022 10:01
Zinc	**180**	10	1	11/29/2022 10:01

Surrogates	REC (%)	Limits	
Terbium	101	70-130	11/29/2022 10:01

Analyst(s): WV

Analytical Comments: a22

(Cont.)

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Analytical Report

Client:	Contra Costa-Hazardous Materials	**WorkOrder:**	2211G11
Date Received:	11/28/2022 9:55	**Extraction Method:**	SW3050B
Date Prepared:	11/28/2022	**Analytical Method:**	SW6020
Project:	MRC	**Unit:**	µg/wipe

Metals

Client ID	Lab ID	Matrix	Date Collected	Instrument	Batch ID
D-4 Community Sample	2211G11-003A	Wipe	11/26/2022 12:34	ICP-MS4 157SMPL.d	259077

Analytes	Result	RL	DF	Date Analyzed
Aluminum	**56,000**	2000	20	11/29/2022 13:37
Antimony	**2.8**	1.0	1	11/29/2022 10:04
Arsenic	**2.7**	1.0	1	11/29/2022 10:04
Barium	**140**	10	1	11/29/2022 10:04
Beryllium	ND	1.0	1	11/29/2022 10:04
Cadmium	ND	0.50	1	11/29/2022 10:04
Chromium	**27**	1.0	1	11/29/2022 10:04
Cobalt	**8.5**	1.0	1	11/29/2022 10:04
Copper	**55**	1.0	1	11/29/2022 10:04
Lead	**36**	1.0	1	11/29/2022 10:04
Mercury	**0.13**	0.10	1	11/29/2022 10:04
Molybdenum	**5.2**	1.0	1	11/29/2022 10:04
Nickel	**160**	1.0	1	11/29/2022 10:04
Selenium	**4.2**	1.0	1	11/29/2022 10:04
Silver	ND	1.0	1	11/29/2022 10:04
Thallium	ND	1.0	1	11/29/2022 10:04
Vanadium	**540**	1.0	1	11/29/2022 10:04
Zinc	**370**	10	1	11/29/2022 10:04

Surrogates	REC (%)	Limits	
Terbium	94	70-130	11/29/2022 10:04

Analyst(s): WV Analytical Comments: a22

(Cont.)

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Analytical Report

Client:	Contra Costa-Hazardous Materials	**WorkOrder:**	2211G11
Date Received:	11/28/2022 9:55	**Extraction Method:**	SW3050B
Date Prepared:	11/28/2022	**Analytical Method:**	SW6020
Project:	MRC	**Unit:**	µg/wipe

Metals

Client ID	Lab ID	Matrix	Date Collected	Instrument	Batch ID
D-5 Community Sample	2211G11-004A	Wipe	11/26/2022 12:36	ICP-MS4 158SMPL.d	259077

Analytes	Result	RL	DF	Date Analyzed
Aluminum	**39,000**	2000	20	11/29/2022 13:41
Antimony	**1.7**	1.0	1	11/29/2022 10:08
Arsenic	**1.8**	1.0	1	11/29/2022 10:08
Barium	**96**	10	1	11/29/2022 10:08
Beryllium	ND	1.0	1	11/29/2022 10:08
Cadmium	ND	0.50	1	11/29/2022 10:08
Chromium	**17**	1.0	1	11/29/2022 10:08
Cobalt	**5.4**	1.0	1	11/29/2022 10:08
Copper	**37**	1.0	1	11/29/2022 10:08
Lead	**21**	1.0	1	11/29/2022 10:08
Mercury	ND	0.10	1	11/29/2022 10:08
Molybdenum	**3.6**	1.0	1	11/29/2022 10:08
Nickel	**110**	1.0	1	11/29/2022 10:08
Selenium	**3.0**	1.0	1	11/29/2022 10:08
Silver	ND	1.0	1	11/29/2022 10:08
Thallium	ND	1.0	1	11/29/2022 10:08
Vanadium	**380**	1.0	1	11/29/2022 10:08
Zinc	**240**	10	1	11/29/2022 10:08

Surrogates	REC (%)	Limits	
Terbium	97	70-130	11/29/2022 10:08

Analyst(s): WV

Analytical Comments: a22

(Cont.)

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Analytical Report

Client:	Contra Costa-Hazardous Materials	**WorkOrder:**	2211G11
Date Received:	11/28/2022 9:55	**Extraction Method:**	SW3050B
Date Prepared:	11/28/2022	**Analytical Method:**	SW6020
Project:	MRC	**Unit:**	µg/wipe

Metals

Client ID	Lab ID	Matrix	Date Collected	Instrument	Batch ID
D-6 Background sample	2211G11-005A	Wipe	11/28/2022 08:40	ICP-MS5 110SMPL.d	259077

Analytes	Result	RL	DF	Date Analyzed
Aluminum	**1300**	100	1	11/29/2022 10:11
Antimony	ND	1.0	1	11/29/2022 10:11
Arsenic	ND	1.0	1	11/29/2022 10:11
Barium	**23**	10	1	11/29/2022 10:11
Beryllium	ND	1.0	1	11/29/2022 10:11
Cadmium	ND	0.50	1	11/29/2022 10:11
Chromium	**3.8**	1.0	1	11/29/2022 10:11
Cobalt	**1.2**	1.0	1	11/29/2022 10:11
Copper	**11**	1.0	1	11/29/2022 10:11
Lead	**3.3**	1.0	1	11/29/2022 10:11
Mercury	ND	0.10	1	11/29/2022 10:11
Molybdenum	ND	1.0	1	11/29/2022 10:11
Nickel	**5.9**	1.0	1	11/29/2022 10:11
Selenium	ND	1.0	1	11/29/2022 10:11
Silver	ND	1.0	1	11/29/2022 10:11
Thallium	ND	1.0	1	11/29/2022 10:11
Vanadium	**5.8**	1.0	1	11/29/2022 10:11
Zinc	**290**	10	1	11/29/2022 10:11

Surrogates	REC (%)	Limits	
Terbium	101	70-130	11/29/2022 10:11

Analyst(s): WV Analytical Comments: a22

(Cont.)

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Analytical Report

Client:	Contra Costa-Hazardous Materials	**WorkOrder:**	2211G11
Date Received:	11/28/2022 9:55	**Extraction Method:**	SW3050B
Date Prepared:	11/28/2022	**Analytical Method:**	SW6020
Project:	MRC	**Unit:**	µg/wipe

Metals

Client ID	Lab ID	Matrix	Date Collected	Instrument	Batch ID
D-7 Blank	**2211G11-006A**	**Wipe**	**11/28/2022 08:45**	**ICP-MS5 113SMPL.d**	**259077**

Analytes	Result	RL	DF	Date Analyzed
Aluminum	ND	100	1	11/29/2022 10:22
Antimony	ND	1.0	1	11/29/2022 10:22
Arsenic	ND	1.0	1	11/29/2022 10:22
Barium	ND	10	1	11/29/2022 10:22
Beryllium	ND	1.0	1	11/29/2022 10:22
Cadmium	ND	0.50	1	11/29/2022 10:22
Chromium	ND	1.0	1	11/29/2022 10:22
Cobalt	ND	1.0	1	11/29/2022 10:22
Copper	ND	1.0	1	11/29/2022 10:22
Lead	ND	1.0	1	11/29/2022 10:22
Mercury	ND	0.10	1	11/29/2022 10:22
Molybdenum	ND	1.0	1	11/29/2022 10:22
Nickel	ND	1.0	1	11/29/2022 10:22
Selenium	ND	1.0	1	11/29/2022 10:22
Silver	ND	1.0	1	11/29/2022 10:22
Thallium	ND	1.0	1	11/29/2022 10:22
Vanadium	ND	1.0	1	11/29/2022 10:22
Zinc	**52**	10	1	11/29/2022 10:22

Surrogates	REC (%)	Limits	
Terbium	105	70-130	11/29/2022 10:22

Analyst(s): WV

Analytical Comments: a22

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Quality Control Report

Client:	Contra Costa-Hazardous Materials	**WorkOrder:**	2211G11
Date Prepared:	11/28/2022	**BatchID:**	259077
Date Analyzed:	11/29/2022	**Extraction Method:**	SW3050B
Instrument:	ICP-MS5	**Analytical Method:**	SW6020
Matrix:	Wipe	**Unit:**	µg/wipe
Project:	MRC	**Sample ID:**	MB-259077

QC Summary Report for Metals

Analyte	MB Result	MDL	RL	SPK Val	MB SS %REC	MB SS Limits
Aluminum	ND	100	100	-	-	-
Antimony	ND	1.0	1.0	-	-	-
Arsenic	ND	1.0	1.0	-	-	-
Barium	ND	10	10	-	-	-
Beryllium	ND	1.0	1.0	-	-	-
Cadmium	ND	0.50	0.50	-	-	-
Chromium	ND	1.0	1.0	-	-	-
Cobalt	ND	1.0	1.0	-	-	-
Copper	ND	1.0	1.0	-	-	-
Lead	ND	1.0	1.0	-	-	-
Mercury	ND	0.10	0.10	-	-	-
Molybdenum	ND	1.0	1.0	-	-	-
Nickel	ND	1.0	1.0	-	-	-
Selenium	ND	1.0	1.0	-	-	-
Silver	ND	1.0	1.0	-	-	-
Thallium	ND	1.0	1.0	-	-	-
Vanadium	ND	1.0	1.0	-	-	-
Zinc	ND	10	10	-	-	-
Surrogate Recovery						
Terbium	1100			1000	107	70-130

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CHAIN-OF-CUSTODY RECORD

WorkOrder: 2211G11 **ClientCode: CCHM**

☐ WaterTrax ☐ CLIP ☐ EDF ☒ EQuIS ☒ Dry-Weight ☑ Email ☐ HardCopy ☐ ThirdParty ☐ J-flag
☒ Detection Summary ☐ Excel

Report to:
Sara Dwight
Contra Costa-Hazardous Materials
4585 Pacheco Blvd., Ste 100
Martinez, CA 94553
(925) 335-3200 FAX: (925) 646-2073
Email: sara.dwight@hsd.cccounty.us
cc/3rd Party:
PO: #023961
Project: MRC

Bill to:
Alexandra McMullen
Contra Costa-Hazardous Materials
4585 Pacheco Blvd., Ste 100
Martinez, CA 94553
cchazmat@cchealth.org

Requested TAT: **1 day;**

Date Received: **11/28/2022**
Date Logged: **11/28/2022**

Lab ID	ClientSampID	Matrix	Collection Date	Hold	Requested Tests (See legend below)											
					1	2	3	4	5	6	7	8	9	10	11	12
2211G11-001	D-1	Wipe	11/26/2022 11:55	☐	A	A	A									
2211G11-002	D-2	Wipe	11/26/2022 12:00	☐	A	A	A									
2211G11-003	D-4	Wipe	11/26/2022 12:34	☐	A	A	A									
2211G11-004	D-5	Wipe	11/26/2022 12:36	☐	A	A	A									
2211G11-005	D-6	Wipe	11/28/2022 08:40	☐	A	A	A									
2211G11-006	D-7 Blank	Wipe	11/28/2022 08:45	☐	A	A	A									

Test Legend:

1	METALSMS_TTLC_WI	2	PRDisposal Fee	3	PRMISC	4	
5		6		7		8	
9		10		11		12	

Prepared by: Agustina Venegas

Comments:

NOTE: Soil samples are discarded 60 days after receipt unless other arrangements are made (Water samples are 30 days).
Hazardous samples will be returned to client or disposed of at client expense.

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WORK ORDER SUMMARY

Client Name: CONTRA COSTA-HAZARDOUS MATERIALS **Project:** MRC **Work Order:** 2211G11
Client Contact: Sara Dwight **QC Level:** LEVEL 2
Contact's Email: sara.dwight@hsd.cccounty.us **Comments:** **Date Logged:** 11/28/2022

☐ WaterTrax ☐ CLIP ☐ EDF ☐ Excel ☐ EQuIS ☑ Email ☐ HardCopy ☐ ThirdParty ☐ J-flag

LabID	ClientSampID	Matrix	Test Name	Containers /Composites	Bottle & Preservative	U**	Head Space	Dry-Weight	Collection Date & Time	TAT	Test Due Date	Sediment Content	Hold	Sub Out
001A	D-1	Wipe	SW6020 (Metals) <Aluminum, Antimony, Arsenic, Barium, Beryllium, Cadmium, Chromium, Cobalt, Copper, Lead, Mercury, Molybdenum, Nickel, Selenium, Silver, Thallium, Vanadium, Zinc>	1	50mL Digestion Tube	☐	☐	☐	11/26/2022 11:55	1 day	11/29/2022		☐	☐
002A	D-2	Wipe	SW6020 (Metals) <Aluminum, Antimony, Arsenic, Barium, Beryllium, Cadmium, Chromium, Cobalt, Copper, Lead, Mercury, Molybdenum, Nickel, Selenium, Silver, Thallium, Vanadium, Zinc>	1	50mL Digestion Tube	☐	☐	☐	11/26/2022 12:00	1 day	11/29/2022		☐	☐
003A	D-4	Wipe	SW6020 (Metals) <Aluminum, Antimony, Arsenic, Barium, Beryllium, Cadmium, Chromium, Cobalt, Copper, Lead, Mercury, Molybdenum, Nickel, Selenium, Silver, Thallium, Vanadium, Zinc>	1	50mL Digestion Tube	☐	☐	☐	11/26/2022 12:34	1 day	11/29/2022		☐	☐

NOTES: * STLC and TCLP extractions require 2 days to complete; therefore, all TATs begin after the extraction is completed (i.e., One-day TAT yields results in 3 days from sample submission).

- Organic extracts are held for 40 days before disposal; Inorganic extract are held for 30 days.

- MAI assumes that all material present in the provided sampling container is considered part of the sample - MAI does not exclude any material from the sample prior to sample preparation unless requested in writing by the client.

U = An unpreserved container was received for a method that suggests a preservation in order to extend hold time for analysis.**

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WORK ORDER SUMMARY

Client Name: CONTRA COSTA-HAZARDOUS MATERIALS **Project:** MRC **Work Order:** 2211G11
Client Contact: Sara Dwight **QC Level:** LEVEL 2
Contact's Email: sara.dwight@hsd.cccounty.us **Comments:** **Date Logged:** 11/28/2022

☐ WaterTrax ☐ CLIP ☐ EDF ☐ Excel ☐ EQuIS ☑ Email ☐ HardCopy ☐ ThirdParty ☐ J-flag

LabID	ClientSampID	Matrix	Test Name	Containers /Composites	Bottle & Preservative	U**	Head Space	Dry-Weight	Collection Date & Time	TAT	Test Due Date	Sediment Content	Hold	Sub Out
004A	D-5	Wipe	SW6020 (Metals) <Aluminum, Antimony, Arsenic, Barium, Beryllium, Cadmium, Chromium, Cobalt, Copper, Lead, Mercury, Molybdenum, Nickel, Selenium, Silver, Thallium, Vanadium, Zinc>	1	50mL Digestion Tube	☐	☐	☐	11/26/2022 12:36	1 day	11/29/2022		☐	☐
005A	D-6	Wipe	SW6020 (Metals) <Aluminum, Antimony, Arsenic, Barium, Beryllium, Cadmium, Chromium, Cobalt, Copper, Lead, Mercury, Molybdenum, Nickel, Selenium, Silver, Thallium, Vanadium, Zinc>	1	50mL Digestion Tube	☐	☐	☐	11/28/2022 8:40	1 day	11/29/2022		☐	☐
006A	D-7 Blank	Wipe	SW6020 (Metals) <Aluminum, Antimony, Arsenic, Barium, Beryllium, Cadmium, Chromium, Cobalt, Copper, Lead, Mercury, Molybdenum, Nickel, Selenium, Silver, Thallium, Vanadium, Zinc>	1	50mL Digestion Tube	☐	☐	☐	11/28/2022 8:45	1 day	11/29/2022		☐	☐

NOTES: * STLC and TCLP extractions require 2 days to complete; therefore, all TATs begin after the extraction is completed (i.e., One-day TAT yields results in 3 days from sample submission).

- Organic extracts are held for 40 days before disposal; Inorganic extract are held for 30 days.

- MAI assumes that all material present in the provided sampling container is considered part of the sample - MAI does not exclude any material from the sample prior to sample preparation unless requested in writing by the client.

U = An unpreserved container was received for a method that suggests a preservation in order to extend hold time for analysis.**

General COC **RUSH**

MAI Work Order # 221611

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CHAIN OF CUSTODY RECORD (Rush)

Turn Around Time:	1 Day Rush	X	2 Day Rush		3 Day Rush		STD		Quote #						
J-Flag / MDL		ESL		Cleanup Approved			Bottle Order #								
Delivery Format:	PDF		GeoTracker EDF		EDD		Write On (DW)		EQuIS						

Report To: Sara Dwight Bill To: E004855
Company: Contra Costa County Hazardous Materials Programs
Email: sara.dwight@cchealth.org
Alt Email: Tele: 925 464-8477
Project Name: MRC Project #:
Project Location: 4585 Pacheco Blvd Ste 100 MTZ PO #
Sampler Signature:

Analysis Requested

SAMPLE ID Location / Field Point	Sampling Date	Sampling Time	#Containers	Matrix	Preservative	BTEX & TPH as Gas (8021/ 8015) MTBE	TPH as Diesel (8015) + Motor Oil Without Silica Gel	TPH as Diesel (8015) + Motor Oil With Silica Gel	Total Oil & Grease (1664 / 9071) Without Silica Gel	Total Petroleum Hydrocarbons - Oil & Grease (1664 / 9071) With Silica Gel	Total Petroleum Hydrocarbons (418.1) With Silica Gel	EPA 505/ 608 / 8081 (Cl Pesticides)	EPA 608 / 8082 PCB's ; Aroclors only	EPA 524.2 / 624 / 8260 (VOCs)	EPA 525.2 / 625 / 8270 (SVOCs)	EPA 8270 SIM / 8310 (PAHs / PNAs)	CAM 17 Metals (200.8 / 6020)*	Metals (200.8 / 6020)	Baylands Requirements	Lab to filter sample for dissolved metals analysis	"Aluminum Oxide"	CAM17 + Al**
D-1	11/26/22	1155	1	Wipe	—												X				X	X
D-2	11/26/22	1200	1	Wipe	—												X				X	X
~~D-3 (Removed per JL)~~	~~11/26/22~~	~~1233~~	~~1~~	~~Wipe~~	~~—~~																	
D-4	11/26/22	1234	1	Wipe	—												X				X	X
D-5	11/26/22	1236	1	Wipe	—												X				X	X
D-6 / Backyard Vehicle 6153	11/28/22	8:40	1	wipe	—												X				X	X
D-7 BLANK	11/28/22	8:45	1	wipe	—												X				X	X

MAI clients MUST disclose any dangerous chemicals known to be present in their submitted samples in concentrations that may cause immediate harm or serious future health endangerment as a result of brief, gloved, open air, sample handling by MAI staff. Non-disclosure incurs an immediate $250 surcharge and the client is subject to full legal liability for harm suffered. Thank you for your understanding and for allowing us to work safely.

* If metals are requested for water samples and the water type (Matrix) is not specified on the chain of custody, MAI will default to metals by E200.8.

Please provide an adequate volume of sample. If the volume is not sufficient for a MS/MSD a LCS/LCSD will be prepared in its place and noted in the report.

Comments / Instructions

Relinquished By / Company Name	Date	Time	Received By / Company Name	Date	Time
	11/26/22	1400	Secure Location		
Edlin Rue	11/28/22	0955		11/28/2022	0955

Matrix Code: DW=Drinking Water, GW=Ground Water, WW=Waste Water, SW=Seawater, S=Soil, SL=Sludge, A=Air, WP=Wipe, O=Other

Preservative Code: 1=4°C 2=HCl 3=H_2SO_4 4=HNO_3 5=NaOH 6=ZnOAc/NaOH 7=None

Temp 10.0 °C Initials

*CAM17 + AL SET UP TO REPORT AS AL203 PER J.L.
11/28/2022 CW

BLUE

Page ___ of ___

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Sample Receipt Checklist

Client Name:	Contra Costa-Hazardous Materials	Date and Time Received:	11/28/2022 09:55
Project:	MRC	Date Logged:	11/28/2022
		Received by:	Agustina Venegas
WorkOrder №:	2211G11 Matrix: Wipe	Logged by:	Agustina Venegas
Carrier:	Client Drop-In		

Chain of Custody (COC) Information

Chain of custody present?	Yes	☑	No	☐	
Chain of custody signed when relinquished and received?	Yes	☑	No	☐	
Chain of custody agrees with sample labels?	Yes	☑	No	☐	
Sample IDs noted by Client on COC?	Yes	☑	No	☐	
Date and Time of collection noted by Client on COC?	Yes	☑	No	☐	
Sampler's name noted on COC?	Yes	☑	No	☐	
COC agrees with Quote?	Yes	☐	No	☐	NA ☑

Sample Receipt Information

Custody seals intact on shipping container/cooler?	Yes	☐	No	☐	NA ☑
Custody seals intact on sample bottles?	Yes	☐	No	☐	NA ☑
Shipping container/cooler in good condition?	Yes	☑	No	☐	
Samples in proper containers/bottles?	Yes	☑	No	☐	
Sample containers intact?	Yes	☑	No	☐	
Sufficient sample volume for indicated test?	Yes	☑	No	☐	

Sample Preservation and Hold Time (HT) Information

All samples received within holding time?	Yes	☑	No	☐	NA ☐
Samples Received on Ice?	Yes	☑	No	☐	
	(Ice Type: BLUE ICE)				
Sample/Temp Blank temperature		Temp: 10°C			NA ☐
ZHS conditional analyses: VOA meets zero headspace requirement (VOCs, TPHg/BTEX, RSK)?	Yes	☐	No	☐	NA ☑
Sample labels checked for correct preservation?	Yes	☑	No	☐	
pH acceptable upon receipt (Metal: <2; Nitrate 353.2/4500NO3: <2; 522: <4; 218.7: >8)?	Yes	☐	No	☐	NA ☑
UCMR Samples:					
pH tested and acceptable upon receipt (200.7: ≤2; 533: 6 - 8; 537.1: 6 - 8)?	Yes	☐	No	☐	NA ☑
Free Chlorine tested and acceptable upon receipt (<0.1mg/L) [not applicable to 200.7]?	Yes	☐	No	☐	NA ☑

Comments:

Appendix C. Soil Sampling Standard Operating Procedure and May 2023 Field Notes

Title: **Soil Sampling**	Procedure Number: **ECR 003**
	Revision Number: **04**
	Effective Date: **February 2022**

Authorization Signatures

Technical Reviewer	Date	SOP Work Group Co-Lead	Date
Chelsea Wenhardt	2/21/2022	Ryan Jorrey	2/21/2022

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LIST OF ATTACHMENTS

Attachment A	Procedure for Collection of Samples for VOCs, VPH, or GRO (SW-846 Method 5035A)
Attachment B	Shipping Methanol-preserved Samples
Attachment C	SOP Fact Sheet
Attachment D	SOP Modifications for PFAS
Attachment E	Explanation of Subsurface Sampling Technologies

1.0 INTRODUCTION

1.2 Scope and Applicability

This Standard Operating Procedure (SOP) was prepared to direct TRC personnel in the logistics, collection techniques, and documentation requirements for collecting representative soil samples for chemical analysis. These are standard (i.e., typically applicable) operating procedures that may be changed, as required, depending on site conditions, equipment limitations, or limitations imposed by the procedure. In addition, other state or federal requirements may be above and beyond the scope of this SOP and will be followed, if applicable. In all instances, the actual procedures used should be documented and described in the field notes (see ECR SOP-001). Portions of this SOP may be applicable to soil sample collection for geotechnical analysis. However, specific instructions for collection of geotechnical samples are not provided; these samples should be collected in accordance with ASTM methods or other applicable standards.

1.3 Summary of Method

The objective of soil sampling is to obtain a representative sample of soil for laboratory analysis of constituents of interest at a given site. This objective requires that the sample be of sufficient quantity and quality for analysis by the selected analytical method. For specialized sampling programs involving per- and polyfluorinated alkyl substances (PFAS), refer to Attachment D for further details. Soil samples may be collected using a variety of methods and equipment depending on the depth of the desired sample, the type of sample required (disturbed vs. undisturbed), and the soil type. Near-surface soils may be sampled using a spade, trowel, and/or scoop. Sampling at greater depths typically is performed using a hand auger, continuous flight auger, a split-spoon, direct-push methods (i.e., Geoprobe®), sonic drilling, a backhoe, or an excavator. The following reference may be used as a guide to aid in selecting an appropriate method or sampling device for the collection of subsurface soil samples with a drill rig: ASTM D6169–98 *Standard Guide for Selection of Soil and Rock Sampling Devices Used with Drill Rigs for Environmental Investigation*.

1.4 Equipment

The following equipment may be utilized when collecting soil samples. Project-specific conditions or laboratory requirements may warrant the addition or deletion of items from this list.

- Appropriate level of personal protective equipment (PPE), as specified in the site-specific Health and Safety Plan (HASP).
- Sample containers: The proper containers should be determined in conjunction with the analytical laboratory in the planning stages of the project, and will depend on the analytical program, laboratory SOPs, and regulatory requirements.

  For non-volatile organic compound (VOC) parameters, glass containers with Teflon®-lined caps are typically utilized. Typical containers used for VOC parameters are provided in Attachment A. Brass liners, steel liners, or soil core acetate liners with Teflon® tape and plastic end caps may also be used.
- Stainless steel mixing bowl or new aluminum pie pan.

- Stainless steel spoon or spatula or sterile individually wrapped single use scoop.
- Plastic bowl or plastic resealable bag for inorganics.
- Hand auger, mud auger, sand auger, bucket auger, and/or T-handle.
- Post hole auger.
- Extension rods.
- Stainless steel trowel.
- Shovel.
- Applicable field screening equipment with calibration solution/gas [i.e., pH meter, photoionization detector (PID), flame ionization detector (FID), etc.].
- Tape measure or folding ruler.
- Wooden stakes and spray paint, plastic flagging (highly visible), or steel pin flags.
- Field book/field notes and/or boring log.
- Sample container labels.
- Chain-of-custody (COC) forms (TRC or laboratory, as appropriate).
    - Custody seals for sample coolers.
    - Tape to secure sample coolers and sample container labels (if necessary).
- Camera.
- Maps/site plan.
- Survey equipment, global positioning system (GPS), or other means of measuring sample locations.
- Indelible marking pens or markers.
- Organic absorbent material (e.g., Slickwick, ground corn cob, sawdust).
- Sample coolers.
- Bubble wrap.
- Ice (for sample storage/preservation).
- Zip-loc® plastic bags (for ice and COCs).
- Equipment decontamination supplies (see ECR SOP-010).

1.5 Definitions

Composite sample	Composed of two or more grab samples collected over a period of time or space during a single sampling event and mixed together.
En-Core® sampler	A disposable volumetric sampling device with an airtight sealing cap.
Grab sample	Individual discrete sample collected at a particular time.

High-level VOC analysis VOC soil analysis that yields high reporting limits (approximately 50-200 µg/kg, depending on the laboratory). Samples are typically preserved in methanol and cooled to 4°C. High-level VOC analyses are used for samples that are expected to contain elevated concentrations of VOCs (>200 µg/kg).

Low-level VOC analysis VOC soil analysis that yields low reporting limits (approximately 5 µg/kg, depending on the laboratory). Samples are typically preserved in water, cooled to 4°C, and can be frozen within 48 hours of collection. Low-level VOC analyses are used for samples that are expected to contain lower concentrations of VOCs (≤200 µg/kg).

Terra Core™ sampler A disposable volumetric sampling device used to transfer soil samples to the appropriate sample containers.

1.6 Health & Safety Considerations

TRC personnel will be on site when implementing this SOP. Therefore, TRC personnel shall follow the site-specific HASP. TRC personnel will use the appropriate level of PPE, as defined in the HASP.

Soil samples containing chemical contaminants may be handled during implementation of this SOP. Additionally, sample preservatives including caustics and/or acids may be considered hazardous materials and TRC employees will appropriately handle and store them at all times. The HASP will address chemicals that pose specific toxicity or safety concerns and TRC employees will follow relevant requirements, as appropriate. Hazardous substances may be incompatible or may cause dangerous chemical reactions, including the production of heat, violent reactivity, or production of toxic vapors or other byproducts. Hazardous substances may be incompatible with clothing or equipment; some substances can permeate or degrade protective clothing or equipment. Also, hazardous substances may pose a direct health hazard to workers through inhalation or skin contact or if exposed to heat/flame resulting in combustion. Safety data sheets (SDS) for chemicals handled by TRC should be maintained in the field.

1.7 Cautions and Potential Problems

- Cross contamination: Cross contamination problems can be eliminated or minimized through the use of dedicated sampling equipment. If this is not possible or practical, then decontamination of sampling equipment is necessary.

- Improper sample collection: Improper sample collection can involve using contaminated equipment, disturbance of the matrix resulting in compaction of the sample, or inadequate homogenization of the samples where required, resulting in variable, non-representative results.

- Special considerations for the different soil sampling techniques are provided below in the applicable sections. Cautions and potential problems associated with soil sampling for VOCs are provided in Attachment A.

- Special care should be taken when sampling for PFAS. Please refer to Attachment D for details.

1.8 Personnel Qualifications

Since this SOP will be implemented at sites or in work areas that entail potential exposure to toxic chemicals or hazardous environments, TRC personnel must be adequately trained. Project and client-specific training requirements for samplers and other personnel on site should be developed in project planning documents, such as the sampling plan or project work plan. These requirements may include:

- OSHA 40-hour Health and Safety Training for Hazardous Waste Operations and Emergency Response (HAZWOPER) workers
- 8-hour annual HAZWOPER refresher training

2.0 PROCEDURES

Always review the site-specific work plan and/or scope of work for any site-specific sampling procedures.

2.2 Pre-Sampling Activities

Pre-sampling activities that the sampling team should consider include the following:

- reviewing the work plan approved by the client and/or regulatory agency;
- developing a strategy to implement the work plan
- selecting a laboratory; and
- determining laboratory-specific procedures related to bottle orders, holding times, work orders, methods of analysis, COC procedures, data deliverables, schedule, and cost.

Additional activities include determining shipping logistics, utility clearance, and handling of investigation-derived waste (IDW) disposal. Pre-labeling bottles can help to reduce sampling and labeling errors.

The following steps should also be employed:

1. Determine the extent of the sampling effort, the sampling methods to be employed, and the types and amounts of equipment and supplies required.

2. Obtain necessary sampling and monitoring equipment.

3. Decontaminate or clean equipment and ensure that it is in working order.

4. Prepare schedules and coordinate with staff, client, and regulatory agencies, if appropriate.

5. Perform a general site survey prior to site entry in accordance with the site-specific HASP.

6. Use stakes, flagging, or paint, to identify and mark all sampling locations. Specific site factors, including extent and nature of contaminants, should be considered when selecting sample locations. If required, the proposed locations may be adjusted based on site access, property boundaries, and surface obstructions.

   NOTE: If spray paint is used to mark stakes, the spray paint should be carefully isolated from the space used to hold sample bottles, sampling equipment, etc.

7. Prior to any subsurface soil sampling, especially that completed with a drill rig or backhoe, it is important to ensure that all sampling locations are clear of overhead and buried utilities by conducting a utility survey/markout. Locations on private properties should also be reviewed with the owner prior to sampling. Client or project-specific utility clearances may also be required, such as air-knifing or ground-penetrating radar (GPR) and should be specified in the site-specific work plan.

2.3 General Soil Sampling Procedures

These are general soil sampling procedures. However, regulatory requirements may dictate a different procedure.

1. Refer to other TRC SOPs for the proper procedures for classifying soil samples (ECR SOP 005) and for screening of samples for VOCs (ECR SOP 014). Special care is required when sampling for PFAS - Please refer to Attachment D for details.

2. **For sampling in the State of California only:** When the sampling interval is predetermined and soil samples are collected by direct-push methods into an acetate liner, the section of the liner corresponding to the predetermined depth interval may be cut off and submitted to the laboratory for analysis with the exception of samples for VOC, volatile petroleum hydrocarbon (VPH), or gasoline-range organics (GRO) analysis. If VOC, VPH, or GRO analysis is required, then these samples can be collected from either open end of the acetate liner section according to the procedures outlined in Attachment A prior to packaging and submitting it to the laboratory. The laboratory should be consulted for the required length of liner tube (i.e., sample volume) depending on the analytical suite and to ensure that the use of acetate liners is appropriate for the analytical method(s). After collecting material for the VOC, VPH, or GRO analysis samples (if required), seal each end of the acetate liner section with Teflon tape and plastic end caps. Label the acetate liner with the sample identification (ID) and date and time of collection. Ensure that the laboratory will perform homogenization of the soil sample within the acetate liner and proceed to Step #9.

3. Prior to the collection of soil samples from a particular location or depth, the soil is typically screened for organic vapors with a portable meter equipped with a FID and/or PID depending upon the suspected contaminants of concern, site-specific work plan requirements, and/or regulatory requirements. Such organic vapor screening may be used to determine appropriate soil sample locations or depths for laboratory VOC analysis depending upon established site-specific work plan requirements. Soil should be screened *in situ* or immediately upon retrieval of the soil sample from the subsurface. It is good practice to photograph surface soil, stockpiles, etc. prior to sample collection with measurements and orientation identified for reference.

4. Samples for VOC, VPH, or GRO analysis are then collected as soon as possible after the soil has been exposed to the atmosphere and prior to sample collection for other analyses. Refer to Attachment A.

5. After collecting the sample(s) for VOC analysis, the sample portion for the remaining analyses should be well homogenized in a decontaminated stainless-steel bowl, disposable new aluminum pie pan, plastic bowl (for inorganics), or re-sealable plastic bag (for inorganics). These soil samples must be thoroughly mixed to ensure that the sample is uniform and as representative as possible of the sample media. Samples for VOC analysis are not homogenized. The most common method of mixing is referred to as quartering. The quartering procedure should be performed as follows:
    - The material in the sample pan should be divided into quarters and each quarter should be mixed individually.
    - Two quarters should then be mixed to form halves.
    - The two halves should be mixed to form a homogenous matrix.

    This procedure should be repeated several times until the sample is adequately mixed. If round bowls are used for sample mixing, adequate mixing is achieved by stirring the material in a circular fashion, reversing direction, and occasionally turning the material over. Soil can be homogenized and transferred to sample containers using soil sampling devices that have been decontaminated (e.g., stainless steel spoon) prior to use or individually wrapped or new devices (e.g., plastic scoopula). Such devices are generally for one-time use. Stainless steel devices may be decontaminated and individually foil wrapped, plastic bagged, or field decontaminated and foil wrapped between uses. Decontamination of sampling equipment shall be conducted in accordance with TRC's SOP on equipment decontamination.

6. Stones, gravel, or vegetation should be removed from the soil sample as much as practical prior to placement in sample containers, since these materials will not be analyzed. Visible asphalt, concrete, ash, slag, and coal debris should also be removed from the sample as much as possible to ensure sufficient soil quantity for laboratory analyses, unless these matrices are part of the overall characterization program. The soil sample must be representative of what the end user is trying to characterize. In addition, if such debris is to be tested, further sample preparation (e.g., pulverizing) will likely be necessary in the field or laboratory. In any case, the presence of any such materials in the soil at the sample location must be documented in the fieldnotes.

7. Filling of the sample bottles should be completed immediately after sample collection to minimize losses due to volatilization and biodegradation. Soil classification can be completed following VOC sample collection.

8. Place the sample into an appropriate, labeled container(s) by using the alternate shoveling method and secure the cap(s) tightly. The alternate shoveling method involves placing a spoonful of soil in each container in sequence and repeating until the containers are full or the sample volume has been exhausted. Threads on the container and lid should be cleaned to ensure a tight seal when closed.

9. Restore the sampling location to grade in accordance with applicable state or federal guidelines and/or the site-specific work plan. Options include backfilling the sample location

with the remaining removed soil, bentonite pellets, or cement/bentonite grout depending on site conditions/hole depth and patching the surface to match the surrounding area (e.g., topsoil with grass seed, asphalt, or concrete patch), as necessary. The site-specific work plan may prohibit the backfilling of sample locations with removed soil if there is evidence of contamination, site-specific restoration requirements, etc. Boreholes must be abandoned or backfilled after the completion of sampling. In general, shallow boreholes (e.g., less than 10 feet deep) that remain open and do not approach the water table may be abandoned by pouring a cement/bentonite grout mixture from the surface or pouring bentonite pellets from the surface and hydrating the pellets in lifts. The grout mixture should be based on site-specific conditions (e.g., boring depth, groundwater depth, and formation permeability), site-specific work plan procedures, and local regulatory requirements. Boreholes where bridging of the bentonite may be an issue, such as boreholes that intercept groundwater or are greater than approximately 10 feet in depth, should be backfilled by pressure grouting with a cement/bentonite grout mixture, either through a re-entry tool string or through a tremie pipe introduced to within several feet of the borehole bottom.

10. Record locations of soil borings/samples in the field notes by sketching a map and/or providing a description of the location. Always measure and record distances to fixed landmarks, such as buildings, fences, curbs, existing surveyed wells, etc. Additionally, photographs or a GPS unit with real-time sub-meter accuracy (not applicable for interior samples or other site conditions such as heavy tree/brush cover and thick cloud cover that limit unit connection with satellites) could be used to document sample locations. Note observations about elevation changes between sample locations.

3.0 SURFACE SOIL SAMPLING METHODS

The depth of surface soil samples will be determined on a site-specific basis and may be influenced by site-specific conditions and/or applicable local, state, or federal regulatory programs and potential exposure pathways. Surface soils are generally classified as soils between the ground surface and 6 to 12 inches below ground surface (bgs). The most common interval is 0 to 6 inches; however, the data quality objectives of the investigation or regulatory requirements may dictate another interval, such as 0 to 3 inches for risk assessment purposes.

The following procedure should be used for surface soil sampling:

1. If a thick, matted root zone, leaf layer, gravel, surface debris, concrete, etc. is present at or near the surface, it should be carefully removed using clean, decontaminated tools or clean nitrile gloves before the soil sample is collected. The presence and thickness of any such material should be recorded in the field notes for each location. The depth measurement for the soil sample begins at the top of the soil horizon, immediately following any such removed materials.

2. A decontaminated stainless-steel spoon, scoop, or trowel is typically used for surface soil sampling depths from 0 to 12 inches bgs where conditions are generally soft and there is no problematic vegetative layer to penetrate. A hand auger or shovel may also be used to dig down to the desired depth, and then after careful removal of the dug soils from the hole, a decontaminated stainless-steel spoon, scoop, or trowel is used to collect the soil sample from the bottom of the hole for laboratory chemical analysis. Plated trowels typically available

from garden supply centers should not be used due to potential heavy metal impacts from the trowel plating.

3. When using stainless steel spoons or trowels, consideration must be given to the procedure used to collect a soil sample for VOC analysis. Samples for VOC, VPH, or GRO analysis must be collected first and never homogenized or composited. These samples are collected using an open-barrel disposable syringe, a Terra Core™ sampler, an En-Core® sampler, or equivalent. If the soil being sampled is cohesive and holds its *in-situ* texture in the spoon or trowel, the En-Core® sampler or disposable syringe used to collect the sub-sample should be plugged directly from the spoon or trowel. However, if the soil is not cohesive and crumbles when removed from the ground surface for sampling, the sub-sample should be plugged directly from the surface of the appropriate sample depth. Additionally, note that En-Core® samplers are not recommended for non-cohesive soils (see Attachment A). Generally, the sample portion for VOC analysis is collected from several inches below grade to minimize volatilization from the *in-situ* soil.

4. Continue by following the General Soil Sampling Procedures in Section 2.3.

4.0 SUBSURFACE SOIL SAMPLING METHODS

The general soil sampling procedures described above should be followed for subsurface sampling. There are numerous options available for subsurface soil retrieval for sampling, including the following:

- Hand auger methods
- Direct-push drilling (standard or dual tube)
- Hollow-stem auger drilling with split spoon or continuous core sampling
- Shelby tube/thin walled sampling
- Roto-sonic drilling
- Excavator sampling (remedial excavations/trenching and test pits)

Other drilling methods not covered are available and may be appropriate for specific project purposes. Project specific procedures should be defined in project documentation. Be sure that the drilling method selected is appropriate for required sample volumes. For information regarding the applicability and details of commonly used subsurface sampling technologies please refer to Attachment E.

4.2 Hand Auger Sampling Methods

The following procedure is used for collecting soil samples with a hand auger:

1. Attach the auger head to a rod extension and attach the T-handle to the rod.

2. Clear the area to be sampled of any surface debris (e.g., twigs, rocks, litter). It may be advisable to remove the first several inches of surface soil and any root layer for an area approximately 6 inches in radius around the borehole location.

3. Begin augering, periodically removing and depositing accumulated soils onto a plastic sheet spread near the borehole or other appropriate container. This prevents accidental brushing of loose material back down the borehole when removing the auger or adding rod extensions. It also facilitates refilling the borehole and avoids possible contamination of the surrounding area.

4. When the sample depth is reached, remove the bucket used to advance the borehole and attach a decontaminated or clean bucket. Place the clean auger bucket in the borehole, advance the clean auger bucket to fill it with the soil sample, and then carefully remove the clean auger bucket.

5. If VOC analysis is to be performed, collect a sample directly at the bottom of the boring, if within reach, and not from the auger bucket. If not within reach, collect the sample directly from the auger bucket or from minimally disturbed material immediately after the auger bucket is emptied. Use an En-Core® sampler or other coring device (i.e., syringe, Terra Core™) to collect the sub-sample as described in Attachment A. Note: some regulatory agencies do not allow for subsurface VOC sample collection directly with a hand auger; refer to the site-specific work plan and regulatory requirements to ensure the collection of VOC samples with a hand auger is appropriate.

6. Continue by following the General Soil Sampling Procedures in Section 2.3. Note that if another sample is to be collected in the same borehole, but at a greater depth, reattach the auger bucket to the rod assembly, and follow steps 1 through 5 above, making sure to decontaminate the sampling device between samples.

Special Considerations for Hand Auger Sampling

- *Slough* - Because of the tendency for the auger bucket to scrape material from the sides of the auger hole while being extracted, the top several inches of soil in the auger bucket should be discarded prior to placing the bucket contents in the homogenization container for processing.
- *VOC Sample Collection* - Observe precautions for VOC sample collection found in Attachment A and/or the site-specific work plan.
- *Decontamination* - If sampling equipment is to be reused at a new sampling location or at a deeper depth in the same location, proper decontamination of sampling equipment is required.

4.3 Direct-Push Sampling Methods

Direct-push sampling methods include but may not be limited to the following techniques:

- Macro-Core® Sampler (Direct-push)
- Dual-tube Soil Sampling System (Direct-push*)* -
- Discrete Sampling

The following procedure is used for collecting soil samples from direct-push soil cores:

1. The driller will advance and extract the soil sample liner which will then be given to the field sampler - confirm with the driller which end is top and which end is bottom. Record the time

of core collection (military time), the soil boring ID and the depth interval in feet bgs in the field notes, field log sheet, or electronic data collection form.

2. Measurement of vertical depth should start from the top of the ground surface. The presence and thickness of surface asphalt, surficial concrete slabs, or gravel sub-base should be noted on the boring log and in the field notes.

3. Measure the length of recovered soil in inches and record in the field notes.

4. Continue by following the General Soil Sampling Procedures in Section 2.3.

   If a specific depth interval is targeted for sampling, be sure to give consideration to the percent recovery of soil and use professional judgement when selecting the sample interval. For example, if the targeted sample interval was from 2.0 to 2.5-ft, and the core barrel was advanced from 0 to 4 ft bgs, and 30 inches (2.5 ft) of soil was recovered, the sample should be collected immediately below the mid-point of the recovered soil, or 15 inches below the top of the recovered soil (not including slough). If the sample interval is comprised of multiple soil types, there may be one or more materials that are underrepresented in the sample tube (e.g., when a more dense/stiff material overlies a softer material). The sampler should use their best professional judgement to select the sample interval. The sample designation will indicate that the depth was 2.0 to 2.5 ft bgs.

Special Considerations for Direct-push Sampling

- *Liner Use and Material Selection* - Direct-push soil samples are collected within a dedicated new or decontaminated liner to facilitate removal of sample material from the sample barrel. The liners may only be available in a limited number of materials for a given sample tool, although overall, liners are available in brass, stainless steel, cellulose acetate butyrate (CAB), polyethylene terephthalate glycol (PETG), polyvinyl chloride (PVC) and Teflon®. For most investigations, the standard disposable new polymer liner material for a sampling tool will be acceptable. When the study objectives require very low reporting levels or unusual contaminants of concern, the use of more inert liner materials such as Teflon® or stainless steel may be necessary. However, such costly liner materials typically are not disposable and therefore require decontamination between each use.
- *Sample Orientation* - When the liners and associated sample are removed from the sample tubes, it is important to confirm and maintain the proper orientation of the sample. This is particularly important when multiple sample depths are collected from the same push. It is also important to maintain proper orientation to define precisely the depth at which a sample was collected. Maintaining proper orientation is typically accomplished using vinyl end caps. Convention is to place red caps on the top of the liner and black caps on the bottom to maintain proper sample orientation. Orientation can also be indicated by marking on the exterior of the liner with a permanent marker.
- *Core Catchers* - Occasionally the material being sampled lacks cohesiveness and is subject to crumbling and falling out of the sample liner. In such cases, the use of core catchers on the leading end of the sampler may help retain the soil until it is retrieved to the surface. Core catchers may only be available in specific materials and should be evaluated for suitability. However, given the limited sample contact that core catchers have with the sample material, most standard core catchers available for a tool system will be acceptable.

- *VOC Sample Collection* - Observe precautions for VOC sample collection found in Attachment A and/or the site-specific work plan.
- *Decontamination* - The cutting shoe and piston rod point are to be decontaminated between each sample interval. Within a borehole, the sample barrel, rods, and drive head may be subjected to an abbreviated cleaning to remove obvious and loose material, but must be cleaned between boreholes, such as with high-pressure water, steam, or soap solution with 5-gallon buckets and water rinse.
- *Health and Safety* – Liners should be cut open with the proper tools and in accordance with TRC's health and safety policies.

4.4 Split-spoon Sampling Methods

The following procedure is used for collecting soil samples from split-spoon soil cores:

1. Record the blow count per 6-inch interval when advancing split-spoon samplers with the hollow stem auger rig. Record the hammer weight (e.g., 140 pounds [lb] is standard, but 300 lb may also be used to advance the spoon). Blow counts are an indication of soil density and are a measure of the number of blows it takes for a 140 lb slide hammer falling over a distance of 30 inches to penetrate 6 inches of soil. The drillers will keep the count and will repeat them to the field sampler (e.g., 11, 13, 16 – means the number of blows the hammer advanced the spoon every 6 inches over a total depth interval of the split-spoon sampler, in this case over 18 inches). If refusal is encountered, the count is recorded in the field notes as "# of hammer blows / depth in inches the spoon is driven" (e.g., 50/3 – means 50 blows of the hammer advanced the spoon 3 inches).

2. The driller will advance, extract, and open the split spoon, which will then be given to the field sampler - confirm with the driller which end is top and which end is bottom, if a soil sample liner is used and removed from the spoon. Record the time of core collection (military time), the soil boring ID, and the depth interval in feet bgs in the field notes.

3. Measurement of vertical depth should start from the top of the ground surface.; The presence and thickness of surface asphalt, surficial concrete slabs, or gravel sub-base should be noted on the boring log and in the field notes.

4. Measure the length of recovered soil in inches and record in the field notes.

5. Continue by following the General Soil Sampling Procedures in Section 2.3.

Special Considerations for Split-spoon Sampling

- Split-spoon soil sampling for geotechnical purposes should be conducted in accordance with ASTM Method D1586 *Standard Test Method for Standard Penetration Test (SPT) and Split-Barrel Sampling of Soil*.
- *Slough* - Generally discard the top several inches of material in the spoon before removing any portion for sampling. This material normally consists of borehole wall material that has sloughed off of the borehole wall after removal of the drill string prior to and during insertion of the split spoon.

- *VOC Sample Collection* - Observe precautions for VOC sample collection found in Attachment A and/or the site-specific work plan.
- *Decontamination* - Within a borehole, the split spoon sample barrels must be cleaned between each sample - the driller typically has multiple barrels and can alternate between clean and dirty barrels so drilling progress is not affected by decontamination of the barrels. The augers should be decontaminated between boreholes (such as with high-pressure steam).

4.5 Shelby Tube/Thin-walled Sampling Methods

Shelby tube or thin-walled soil sampling should be conducted in accordance with ASTM Method D1587 *Practice for Thin-walled Tube Sampling of Soils for Geotechnical Purposes*.

After retrieval to the surface, the tube containing the sample is then removed from the sampler head. If samples for chemical analyses are needed, the soil contained inside the tube is then removed for sample acquisition by following the direct-push sampling procedures in Section 4.3. If the sample is collected for geotechnical parameters, the tube is typically sealed, to maintain the sample in its relatively undisturbed state, capped, labeled appropriately (including sample ID, top end of sample, inches of recovery, etc.), and shipped to the appropriate geotechnical laboratory. The tube is typically stored in an upright position to maintain the integrity of the undisturbed sample. For geotechnical use, check with the laboratory prior to sampling to understand sample volume recoveries needed to perform the actual tests.

4.6 Sonic Drilling Sampling Methods

The soil core is extruded from the core barrel or casing into a flexible plastic sleeve. The sleeve is then placed on an appropriate surface or prepared sample area to contain spoils. The sleeve is opened to screen with a PID, log lithology and collect samples. The procedures for collecting soil samples from sonic cores are the same as the procedures presented for collecting soil samples from direct-push sampling methods in Section 4.3.

Special Considerations for Sonic Drilling Sampling

- *Utility Clearance* - Due to the ability of sonic drilling to advance through material that may normally cause refusal of standard DPT, extra care should be taken with clearances and borehole location selection.
- Sonic-generated soils are not undisturbed. The resonation of the core barrel during advancement energizes the skin of the sample immediately adjacent to the barrel, approximately ⅛ to ¼ inch around the OD of the sample. Heating of the soils is possible. VOC samples particularly may require permission, approval, or data quality review to be considered representative and/or applicable to the project requirements.
- Depending on site conditions, the outer casing may require adding some water to the borehole if heaving or flowing sand(s) and gravel are present. An adequate water supply should be considered in these site-specific conditions.
- Sonic drilling sleeves in general will produce more IDW to be disposed of than DPT. The sleeves themselves can be awkward and heavy to move to a sample processing area.

4.7 Excavator Sampling Methods

The following procedures are used for collecting soil samples excavated with a backhoe or excavator:

- Refer to the site-specific work plan for the number of floor and/or sidewall samples, which is typically driven by the surface area and can vary depending on the governing regulatory agency.
- For a shallow excavation where the soil samples can be collected directly from the excavation, samples can be collected using a trowel, spoon, or coring device at the desired intervals in the excavation. A clean shovel may be used to remove a 1 to 2- inch layer of soil from the vertical face of the pit that contacted the backhoe bucket and where soil sampling is planned. Scrape the vertical face at the point of sampling to remove any soil that may have fallen from above and to expose fresh soil for sampling.
- For deeper excavations where sample locations are inaccessible, soil samples can be collected directly from the excavator bucket. Do not enter an excavation to collect a sample.
- Soil samples should be collected from the top of the soil in the excavator bucket with special care taken that residual soil on the excavator bucket is not scrapped off and placed in the excavation sample. Collect enough sample volume into a clean, stainless-steel bowl so that the sample containers can be filled at a safe distance from the excavation equipment. Confirm with the equipment operator when the sampling is complete, and excavation can continue.
- Continue by following the General Soil Sampling Procedures in Section 2.3.

Special Considerations for Excavator Sampling

- Effective communication with the excavation equipment operator is critical to collecting the samples safely. Establish a set of hand signals that will be used with the equipment operator to conduct the sampling safely. Confirm with the operator which direction the excavator arm will swing and establish a safe zone where the field staff should stand by to collect the sample. Field staff should always stand at least 3 feet away from the edge of an open excavation. Samples should be collected from the excavator bucket only after the bucket is safely on the ground and confirmation from the equipment operator is received that the equipment is stationary.
- *VOC Sample Collection* - Observe precautions for VOC sample collection found in Attachment A and/or the site-specific work plan.
- Do not physically enter backhoe excavations to collect a sample if the excavations are unstable or not sloped and protected with shoring. A trench with non-cohesive soils (i.e., sand, saturated/wet muds, or flowing water at the base) is particularly susceptible to collapsing suddenly. Never enter a trench without a confined space entry permit, as required by OSHA regulations.
- Smearing is a potential issue when sampling with a backhoe or excavator. Any time a vertical or near vertical surface is sampled, such as achieved when shovels or similar devices are used for subsurface sampling, the surface should be dressed (scraped) to remove smeared soil. This is necessary to minimize the effects of contaminant migration interferences due to smearing of material from other levels.

- The backhoe/excavator bucket should be decontaminated and loose paint, grease, and rust should be removed to the extent practical prior to use for sample collection if the bucket will come in direct contact with the material to be sampled. Care should be taken to collect the soil sample from the center of the excavated material within the bucket (i.e., material that has not touched the bucket walls).

4.8 Stockpile Soil Sampling Methods

Stockpiled soils are typically sampled to characterize the soils for reuse or disposal. The stockpile sampling strategy used must consider the source of the soil, available data, field observations, shape/dimensions and volume of the pile, and sampling frequency requirements established by oversight regulatory agencies or potential soil disposal facilities.

If the stockpile is known to be a representative mixture of soil with no known or suspected significant variability of contamination with depth in the pile, the stockpile sampling may be conducted according to the surface soil sampling method described in Section 3. However, if the soil characteristics are not known or are known or suspected to vary with depth in the pile, both surface soil and deeper subsurface soil samples will be required to properly characterize the soil pile.

A backhoe or excavator equipped with a bucket can be used to collect subsurface soil samples from stockpiles. This method is often preferred for collecting subsurface soil samples from a stockpile since it allows the sampler greater opportunity to inspect the physical characteristics of the pile for potential signs of variability for determining appropriate sample depths and locations.

Typically, based on the minimum required number of samples for the estimated stockpile volume, the stockpile is divided into the appropriate number of estimated volumes equal to that sample number. For example, if the specified sample frequency is 1 sample per 1,000 cubic yards (cy) and the estimated stockpile size is 4,000 cy, the stockpile would be broken down into approximately four equal volumes or quadrants. Grab VOC samples and composite non-VOC samples, as required, would then be collected from each of the areas for characterization of the stockpile.

5.0 POST-SAMPLING ACTIVITIES

1. After the samples have been collected, the sampling locations must be appropriately documented. The type of documentation will depend on the project specific data quality objectives (DQOs). Sampling locations may be marked with wooden stakes colored with highly visible spray paint and/or flagging in order to identify the sample location for surveying purposes, recorded immediately using a GPS receiver with sub-meter accuracy, recorded using GPS on a mobile device, measured from building corners or other fixed reference points, or a combination of the above. If stakes/markers are used to identify the locations for photos or to physically locate the point at a future date, sample and/or location identification should be written on each stake in indelible ink or marking pen. A sketch or photograph of the sampling locations should also be included in the field notes.

2. Package the samples with bubble wrap and/or organic absorbent, as necessary.

3. Place the samples into a shipping container and cool to 4ºC. If wet ice is used to cool the samples, place the ice in double-bags to prevent water from the melting ice from damaging the samples during shipment.

4. Complete the COC form.

5. Decontaminate non-disposable sampling equipment.

6.0 INVESTIGATION-DERIVED WASTE DISPOSAL

Field personnel should discuss specific documentation and containerization requirements for investigation-derived waste disposal with the Project Manager.

Each project must consider investigation-derived waste disposal methods and have a plan in place prior to performing the field work. Provisions must be in place as to what will be done with investigation-derived waste. If investigation-derived waste cannot be returned to the site, consider material containment, such as a composite drum, proper labeling, on-site storage by the client, testing for disposal approval of the materials, and ultimately the pickup and disposal of the materials by appropriately licensed vendors.

7.0 QUALITY ASSURANCE/QUALITY CONTROL

The collection of specific field quality control (QC) samples will be specified in the project-specific planning documents and/or specified by the regulatory agency. and may include one or more of the following: field blank, equipment blank, trip blank, field duplicate, and/or matrix spike/matrix spike duplicates.

7.2 Duplicate Soil Sample Collection

The following procedures should be used for collecting duplicate soil samples:

1. For QC purposes, each duplicate sample will be submitted to the laboratory as a "blind" duplicate sample, in that a unique sample identification not tied to the primary sample identification will be assigned to the duplicate (e.g., DUP-01). Standard labeling procedures used for soil sampling will be employed. However, a sample collection time will not be included on the sample label or the COC form. The actual source of the duplicate sample will be recorded in the field notes.

2. Each duplicate sample will be collected simultaneously with the actual sample in accordance with the same collection procedures. At the same step in the sampling procedures that the VOC, VPH, and/or GRO containers are filled and sealed, the duplicate sample VOC, VPH, and/or GRO containers will also be filled and sealed. Duplicates for all parameters other than VOCs, VPH, and GRO should be filled from the homogenized sample to ensure consistency between the sample and the duplicate. Following the order of collection specified for each set of containers (i.e., VOCs, VPH, GRO, semivolatile organic compounds [SVOCs], other organics and then inorganic compounds), the duplicate sample containers will be filled simultaneously with each parameter.

3. Collection and preservation procedures outlined for soil sampling will be followed for each duplicate sample.

8.0 DATA MANAGEMENT AND RECORDS MANAGEMENT

Record the general sample collection information such as location, identification, and date/time in the field notes or on a field data sheet. Typical field documentation recorded in field notes includes the following information:

- Sample identification number
- Sample location (description or sketch of the sample point)
- Sample depth interval
- GPS coordinates and coordinate system
- Time and date sample was collected
- Personnel performing the task
- Visual or sensory description of the sample (e.g., odors, staining)
- Brief soil descriptions (e.g., color, texture, appearance)
- Presence of any fill materials (e.g., concrete, asphalt, ash)
- Readings from field screening equipment (e.g., PID)
- Weather conditions during sampling (e.g., temperature, wind)
- Other pertinent observations including whether photographs were taken
- Sample collection equipment used
- Decontamination procedure
- Analytical parameters

Affix a properly completed label to each sample container.

All sample numbers must be documented on the COC form that accompanies the samples during shipment. Any deviations from the record management procedures specified in the site-specific work plan must be approved by the Project Manager and documented in the field notes.

For projects using TRC's Environmental Data Management System (EDMS), the project team's Data Manager can assist in planning sampling events to prepopulate bottle labels and chain of custody forms and keep track of COC forms and laboratory EDDs generated for the project. The TRC EDMS system has a completeness report that can track the samples collected and the analyses performed as data are received from the laboratory.

TRC's EDMS includes an approved electronic mobile field data collection system (e.g., EQuIS Collect, Fulcrum, or esri Collector). A TRC Data Manager must be assigned for coordination and setup of the respective application to be used by the project team. The details and specifications of the sampling event should be discussed with the TRC Data Manager during the project kickoff meeting. The TRC Data Manager will work with the TRC project team and field personnel on configuring the system for efficient use in the field with pre-populated, project-specific menus following TRC's best practices for sample ID naming conventions compatible with TRC's EDMS.

For projects that do not use electronic mobile field data collection systems field notes containing sample IDs, sample date, sample matrix, sample start depth, sample end depth, sample method, sample event task code, and sample purpose, along with GPS coordinates for each sample location ID should be transcribed into TRC's standard Location and Field Sample EDDs for import into TRC's EDMS as soon as the soil sampling event is completed, preferably the same day in order to get data into the EDMS in as near real time as possible.

9.0 SUSTAINABLE RECOMMENDATIONS

Sustainable practices should be incorporated wherever practical. Items to consider for soil sampling are as follows:

- Utilize reusable equipment as appropriate;
- Utilize recycled material as appropriate (i.e., Recycle plastic bags or use green bags);
- Utilize laboratories with smaller sample containers;
- Utilize electronic data collection methods rather than paper for field notes and boring logs

10.0 REFERENCES

ASTM Methods D1586 *Standard Test Method for Standard Penetration Test (SPT) and Split-Barrel Sampling of Soil,* D1587 *Practice for Thin-walled Tube Sampling of Soils for Geotechnical Purposes*, ASTM D6169 *Standard Guide for Selection of Soil and Rock Sampling Devices Used With Drill Rigs for Environmental Investigation,* ASTM International, Most Current Version.

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U.S. EPA Environmental Response Team, Soil Sampling SOP #2012, February 18, 2000.

U.S. EPA Science and Ecosystem Support Division, Soil Sampling Operating Procedure (SESDPROC-300-R2), December 20, 2011.

11.0 SOP REVISION HISTORY

REVISION NUMBER	REVISION DATE	REASON FOR REVISION
0	SEPTEMBER 2013	NOT APPLICABLE
1	NOVEMBER 2016	ADDED ATTACHMENT D TO ACCOMMODATE SOP MODIFICATIONS REQUIRED WHEN SAMPLING FOR PFAS; CHANGED NAMING CONVENTION FOR SOP FROM RMD TO ECR.
2	JANUARY 2020	TRC RE-BRANDING
3	AUGUST 2020	ADDITIONAL MODIFICATIONS FOR PFAS SAMPLING
4	JANUARY 2022	SOP UPDATE

Attachment A:

Procedure for Collection of Samples for VOCs, VPH, or GRO (SW-846 Method 5035A)

1.0 SAMPLING FOR VOLATILE ORGANIC COMPOUNDS IN SOIL BY EPA METHOD 5035/5035A

The following sampling protocol is recommended for site investigations assessing the extent of VOCs (including VPH and GRO) in soils. Because of the large number of options available, careful coordination between field and laboratory personnel is needed. The specific sampling containers and sampling tools required will depend upon the required detection levels and intended data use. Once this information has been established, selection of the appropriate sampling procedure and preservation method best applicable to the investigation can be made.

SW-846 Method 5035 provides instructions and options on the preservation of soil samples for low-level and high-level VOC analyses:

- Low-level (≤ 200 µg/kg) and
- High-level (> 200 µg/kg).

The choice of low-level or high-level analysis is determined by the requirements of the project. However, since the low-level method is only valid for a certain concentration range, a sample for analysis by the high-level method must also be collected to ensure quantification of all target analytes is possible, if needed.

The low-level method uses one or more of the following options for the sampling/preservation of soils:

- Soil sampled into a vial with a sodium bisulfate ($NaHSO_4$) solution.
- Soil collected in an En-Core® sampler and immediately shipped to the laboratory for further preservation (within 48 hours).
- Soil collected in a vial with organic-free water, sealed in the field, and shipped to the laboratory immediately in order to meet the method preservation requirement to freeze within 48 hours of collection.

Based on project-specific requirements, trip blanks may be recommended. Refer to the site-specific work plan for quality assurance (QA)/QC requirements.

1.1 Low-level Method (VOCs)

Option A - Direct sampling into En-Core® samplers

- Three 5-gram size En-Core® samplers for each sample.
- One non-preserved container for moisture determination.

Option B - Direct sampling into vial with chemical preservative

- Two 5-gram size cores are added to volatile organic analysis (VOA) vials (one soil core is added to each of two VOA vials with sodium bisulfate solution) for each sample using a Terra Core™ or other coring sampler (e.g., disposable syringe). Once the vials are sealed in the field, these are not opened again.
- One non-preserved container for moisture determination.

Option C - Direct sampling into vial with water (to be frozen at the laboratory)

- Two 5-gram size cores are added to VOA vials (one soil core is added to each of two VOA vials with water) for each sample using a Terra Core™ or other coring sampler (e.g., disposable syringe). Once the vials are sealed in the field, these are not opened again.
- One non-preserved container for moisture determination.

1.2 High-level Method (VOC, VPH, GRO)

Option A - Direct sampling into En-Core® samplers

- One 5-gram size En-Core® sampler for each sample.
- One non-preserved container for moisture determination.

Option B - Direct sampling into a methanol-preserved vial

- For VOCs: 5 or 10 grams of soil is added to a VOA vial (with 5 or 10 grams of methanol, respectively) for each sample using a Terra Core™ or other coring sampler (e.g., disposable syringe). This may also depend upon the regulatory agency (e.g., New Jersey Department of Environmental Protection requires 8 to 12 grams in 25 mL methanol or 5 grams in 10 mL methanol).
- For VPH or GRO: The coring device will be filled with 25 grams of undisturbed soil if 60-ml vials with 25 ml of methanol are used, or 15 grams of undisturbed soil if 40-ml vials with 15 ml of methanol are used. The goal is to have a 1:1 ratio of soil- to- methanol.
- One non-preserved container for moisture determination.

1.3 Cautions and Potential Problems

1. Potential leaking sample containers for VOC, VPH, and GRO analyses:

   Options for evaluating containers for leaking preservatives:

   a. When ordering pre-preserved sample containers, laboratories should be encouraged to mark the meniscus of the preservative on all sample containers. The preservative level should be checked before sampling as a quick check that there has not been any loss of liquid.
   b. Compare preservative level in multiple bottles and select one for comparison purposes to subsequent sample bottles.
   c. Weigh methanol-preserved sample containers prior to sampling. Sample containers found to have lost greater than 0.2 grams of methanol compared to their initial weight should not be used. In order to perform this option, initial container weights must be provided by the laboratory.

2. Potential methanol absorption:

   Soil may be encountered that absorbs all of the methanol preservative (e.g., organic-rich soil, fine-grain soil). These soils can absorb the methanol leaving no methanol extract for the laboratory to analyze. In these instances, the use of additional methanol is required. The laboratory must be contacted for sample containers with an increased volume of methanol. Using a 1:2 ratio of soil to methanol will help to ensure that there will be adequate volume of methanol remaining for analysis. **NOTE: Additional methanol should not be added to the sample container by the sampler in the field. Containers with additional methanol must be obtained from the laboratory.**

3. Collection of samples with high moisture content:

   Soil samples with high (>50%) moisture content (e.g., sediments, soil samples below the water table) may prevent the attainment of the ideal 1:1 soil-to-preservative ratio. In these instances, depending on the data quality objectives, it may be necessary to evaluate the soil to determine what level in the disposable syringe corresponds to the required weight (typically 5 grams for VOCs and 15 or 25 grams for VPH). This can be performed by collecting several trial samples with disposable syringes. Weigh each trial sample and note the length of the soil in the syringe. These measurements would be used to determine how much soil in the syringe corresponds to 5 $\pm$ 0.5 grams (or the desired weight $\pm$ 0.5). All trial samples should be discarded and not used for analysis.

4. En-Core® sampler cautions:

   a. En-Core® samplers, or equivalent, should only be used on fine-grain or cohesive soils (soils that stay together in the En-Core® sampler and do not fall apart). En-Core® samplers should not be used to collect soil samples that consist of dry sand, gravel, or a mixture of gravel and fines, or samples with high moisture (e.g., sediments and soil samples below the water table). In the case of soil samples that consist of dry sand, gravel, or a mixture of gravel and fines, or samples with high moisture (e.g., sediments and soil samples below the water table), a stainless-steel spatula or scoop should be used with field preservation techniques.
   b. The En-Core® sampler is a single-use device and cannot be decontaminated and reused.

c. The volume of material collected in an En-Core® sampler should not cause excessive stress on the coring tool.
d. The volume of material collected should not be so large that the sample easily falls apart during extrusion.
e. The En-Core® sampler should not be used if any of the components are damaged as the seals may be compromised. Under no circumstances should any components be removed or disturbed.
f. It is important to make sure air is not trapped behind the sample, as this could cause air to pass through the sample, resulting in a loss of VOCs, or it could cause the sample to be pushed prematurely from the coring tool.

5. Potential effervescence with use of sodium bisulfate as a preservative for low-level VOC analysis of soils:

This method of preservation is not preferred and, therefore, is not outlined below. If it is used, the following cautions exist:

a. Carbonaceous or strongly alkaline soils may cause potential effervescence when reacting with the sodium bisulfate and may result in a loss of VOCs and a shattered vial. If effervescence occurs, sodium bisulfate should not be used. The laboratory must be contacted and low-level preservation techniques, using water only, should be followed.
b. Loamy materials or materials containing decayed material may result in false positive results for acetone due to the interaction with the sodium bisulfate.
c. Some VOCs may be lost due to the resulting acidification when sodium bisulfate is used (e.g., styrene, 2-chloroethyl vinyl ether, acrylonitrile).
d. Some VOCs may be lost if the laboratory is using a heated purge in combination with the sodium bisulfate preservative (e.g., methyl tert butyl ether [MTBE] and other fuel oxygenates).

1.4 Sample Containers and VOC Sampling Equipment

- Method 5035A-compatible containers or kits (for VOCs, VPH, and GRO): Preservatives may be required for some samples with certain variations of SW-846 method 5035A – consult the governing regulatory agency or principal analytical chemist to determine which preservatives are necessary.

  Low-level VOCs: two 40-mL VOA vials pre-preserved with 5 mL organic-free water and also containing a magnetic stir bar.
  High-level (or medium-level) VOCs: one 40-mL VOA vial pre-preserved with 5 or 10 mL of purge-and-trap-grade methanol. Volume will be dependent upon laboratory's preference or regulatory agency requirements (e.g., New Jersey Department of Environmental Protection prefers vials with 10 or 25 mL of purge-and-trap-grade methanol).
  VPH and GRO: One 60-mL vial pre-preserved with 25 mL of purge-and-trap-grade methanol **or** One 40-mL VOA vial pre-preserved with 15 mL of purge-and-trap-grade methanol
  and
  One glass container (or other appropriate container) with no preservative to allow the laboratory to perform the percent solids measurement. NOTE: The laboratory typically requires a minimum of 20 grams to perform this test. Therefore, submitting a sample size less than 4 ounces may be acceptable. This additional container will not be required if the sample is also being submitted for other non-VOC parameters.

- En-Core® samplers, or equivalent, for VOC, VPH and/or GRO analysis:

  High-level VOC or GRO analysis: one 5-gram En-Core® sampler.
  Low-level VOC analysis: two 5-gram En-Core® samplers.
  VPH, GRO or toxicity characteristic leaching procedure (TCLP) VOC analysis: one 25-gram En-Core® sampler.

- Disposable plastic syringes or Terra Core™ samplers.
- Foam VOC vial holders.
- Portable digital scale (accurate to ± 0.01 grams) with calibration weights.

2.0 COLLECTION OF SAMPLES USING EN-CORE® SAMPLERS, OR EQUIVALENT

- The sample will be collected using an En-Core® sampler, or equivalent, as soon as possible after the soil has been exposed to the atmosphere.
- Check that the En-Core® sampler, or equivalent, is full using both of the following procedures:
  a. Be sure that the back o-ring on the plunger can be seen when looking through the viewing hole on the handle. This will mean that the soil has pushed the plunger fully to the back.
  b. The plunger can only be rotated when it is fully pushed to the back of the body. Therefore, it is important to twist the plunger to guarantee that the soil has filled the sampler and the back o-rings have sealed.
- Immediately seal the En-Core® sampler, or equivalent. Be sure to twist the cap as it is pushed on. The cap is properly sealed when the two locking arms are completely and symmetrically over the body ridge.
- The samples must be shipped to a laboratory within 24 hours of sampling to ensure the 48-hour hold time for preservation will be met.
- In the event that a field screening technique (instrument reading or visual staining of the soil) indicates the possible presence of VOCs or hydrocarbons, note the observations or instrument readings in the field notes. If the field screening technique does not indicate the presence of VOCs, this should also be noted.
- If samples are collected for only VOC and VPH analyses, a separate aliquot must be collected in an unpreserved container in order for the laboratory to perform a dry weight determination.

3.0 COLLECTION OF SAMPLES USING FIELD PRESERVATION

- Samples for VOCs will be collected as soon as possible after the soil has been exposed to the atmosphere.
- Samples for VOCs will be collected first (prior to collection of samples for other parameters) using an open-barrel disposable syringe, Terra Core™ sampler, or equivalent. In the case of soil samples that consist of dry sand, gravel, or a mixture of gravel and fines, or samples with high moisture (e.g., sediments and soil samples below the water table), an open-barrel disposable syringe may not be practical; a stainless steel spatula or scoop can be used with field preservation techniques.
- Soil samples for VOC analyses should **never** be homogenized.
- Each pre-preserved sample container will be weighed prior to sample collection, and the container/preservative weight will be recorded. This procedure will generally be performed by the laboratory prior to shipping the containers to the field.
- Depending upon project requirements, samples for VOC analysis will be collected as low-level, high-level, or both.

A. Low-level VOCs

1. The syringe will be filled with undisturbed soil of the following volume: 5 grams of soil.

   As an option to the syringes, 5-gram Terra Core™ samplers, or equivalent, can be used. The goal is to have a 1:1 ratio of soil- to- preservative.

2. The soil will be extruded into a pre-preserved VOA vial containing a magnetic stir bar and 5 mL organic-free water. This will be done in replicate.
3. Any sand grains present on the container rim or cap must be removed to ensure an air-tight seal of the vial. The VOA vial will be capped quickly and labeled with the sample ID, date, and time of collection. Labels should not be written on the cap of the vial.
4. Gently swirl sample to break up the soil aggregate, if necessary, until the soil is covered with preservative. It is imperative that the soil sample be completely immersed in the preservative solution.

5. In the event that a field screening technique (instrument reading or visual staining of the soil) indicates the possible presence of VOCs or hydrocarbons, note the observations or instrument readings in the field notes. If the field screening technique does not indicate the presence of VOCs, this should also be noted.
6. If samples are collected for only VOC analysis, a separate aliquot must be collected in an unpreserved container in order for the laboratory to perform a dry weight determination.

B. <u>High-level VOCs, VPH, or GRO</u>

1. High-level VOCs: The syringe will be filled with undisturbed soil of the following volume: 5 or 10 grams of soil for high-level analysis (added to the 5 or 10 ml of methanol, respectively). This may also depend upon the regulatory agency (e.g., New Jersey Department of Environmental Protection requires 8 to 12 grams in 25 mL methanol or 5 grams in 10 mL methanol).

   VPH or GRO: The syringe will be filled with 25 grams of undisturbed soil if 60-ml vials with 25 ml of methanol are used, or 15 grams of undisturbed soil if 40-ml vials with 15 ml of methanol are used. The goal is to have a 1:1 ratio of soil- to- methanol.

   As an option to the syringes, 5-gram Terra Core™ samplers, or equivalent, can be used. Typically, the goal is to have a 1:1 ratio of soil- to- preservative.
2. The sample will be extruded into a VOA vial containing purge-and-trap grade methanol
3. Any sand grains present on the container rim or cap must be removed to ensure an air-tight seal of the vial. The VOA vial will be capped quickly and labeled with the sample ID, date, and time of collection. Labels should not be written on the cap of the vial.
4. Gently swirl sample to break up the soil aggregate, if necessary, until the soil is covered with preservative. It is imperative that the soil sample be completely immersed in the preservative solution.
5. In the event that a field screening technique (instrument reading or visual staining of the soil) indicates the possible presence of VOCs or hydrocarbons, note the observations or instrument readings in the field notes. If the field screening technique does not indicate the presence of VOCs, this should also be noted.
6. Methanol is considered to be a hazardous material by the US Department of Transportation (DOT) and the International Air Transportation Association (IATA). Shipments containing methanol between the field and the laboratory must conform to the rules established in Title 49 of the Code of Federal Regulations (49 CFR parts 171 to 179) and the most current edition of the IATA Dangerous Goods Regulations. The volumes of methanol recommended in the VOC method fall under the small quantity exemption of 49 CFR section 173.4. Refer to Attachment B for further details.
7. If samples are collected for only VOC analysis, a separate aliquot must be collected in an unpreserved container in order for the laboratory to perform a dry weight determination.

Attachment B:

Shipping Methanol-preserved Samples

Shipping of Hazardous Materials

Methanol is considered a hazardous material by the US Department of Transportation (DOT) and the International Air Transport Association (IATA). Shipments of methanol between the field and the laboratory must conform to the rules established in Title 49 of the Code of Federal Regulations (49 CFR parts 171 to 179) and the most current edition of the IATA Dangerous Goods Regulations. Consult these documents or your shipping company for complete details.

Small Quantity Exemption

The volumes of methanol recommended in the high-level VOC, VPH, and GRO methods fall under the small quantity exemption of 49 CFR section 173.4. To qualify for this exemption, all of the following conditions must be met:

◊ the maximum volume of methanol in each sample container must not exceed 30 mL
◊ the sample container must not be full of methanol
◊ the sample container must be securely packed and cushioned in an upright position and be surrounded by a sorbent material capable of absorbing spills from leaks or breakage of sample containers
◊ the package weight must not exceed 64 pounds
◊ the volume of methanol per shipping container must not exceed 500 mL
◊ the packaging and shipping container must be strong enough to hold up to the intended use
◊ the package must not be opened or altered while in transit
◊ the shipper must mark the shipping container as follows:

"*This package conforms to 49 CFR 173.4"*

When shipping domestically by Federal Express via ground or air, the following rules apply:

◊ follow the inner packaging requirements of 49 CFR 173.4
◊ no labels, placards, up arrows, or dangerous goods shipping papers are required
◊ if the Federal Express airbill has a shipper's declaration for hazardous goods on it, check the Yes box under *Shipper's Declaration not Required*

When shipping internationally by Federal Express, the following rules apply*:*

◊ follow the inner packaging requirements of 49 CFR 173.4
◊ use dangerous goods shipping papers
◊ apply orientation arrows on opposite vertical sides on the exterior of the package

Shipping Papers for International Shipments

International shipments must be accompanied by dangerous goods shipping papers that include the following:

Proper Shipping Name:	Methyl Alcohol
Hazardous Class:	Flammable Liquid
Identification Number:	UN1230
Total Quantity:	*(mL methanol/container x the number of containers)*
Emergency Response Info:	Methanol SDS attached
Emergency Response Phone:	1-800-424-9300

Attachment C:

SOP Fact Sheet

SOIL SAMPLING PROCEDURES – SOP 003 FACT SHEET

PURPOSE AND OBJECTIVE

Soil sampling is conducted in order to obtain a representative sample for laboratory analysis of constituents of interest at a given site. Soil samples may be collected using a variety of methods and equipment depending on the depth of the desired sample, the type of sample required (disturbed vs. undisturbed), and the soil type.

WHAT TO BRING

- Appropriate level of personal protective equipment (PPE), as specified in the site-specific Health and Safety Plan (HASP).
- Sample containers: The proper containers should be determined in conjunction with the analytical laboratory in the planning stages of the project, and will depend on the analytical program, laboratory SOPs, and regulatory requirements.
- For non-volatile organic compound (VOC) parameters, glass containers with Teflon®-lined caps are typically utilized. Typical containers used for VOC parameters are provided in Attachment A. Brass liners, steel liners, or soil core acetate liners with Teflon® tape and plastic end caps may also be used.
- Stainless steel mixing bowl or new aluminum pie pan.
- Plastic bowl or plastic resealable bag for inorganics.
- Stainless steel spoon or spatula or sterile individually wrapped single use scoop.
- Hand auger, mud auger, sand auger, bucket auger, and/or T-handle.
- Post hole auger.
- Extension rods.
- Stainless steel trowel.
- Shovel.
- Applicable field screening equipment with calibration solution/gas (i.e., pH meter, photoionization detector, flame ionization detector, etc.)
- Tape measure or folding ruler.
- Wooden stakes and spray paint, plastic flagging (highly visible), or steel pin flags.
- Field book and/or boring log.
- Sample container labels.
- Chain-of-custody (COC) forms (TRC or laboratory, as appropriate).
- Custody seals for sample coolers.
- Tape to secure sample coolers and sample container labels (if necessary).
- Camera.
- Maps/site plan.
- Survey equipment, global positioning system (GPS), or other means of measuring sample locations.
- Indelible marking pens or markers.
- Organic absorbent material (e.g., Slickwick, ground corn cob, sawdust).
- Sample coolers.
- Bubble wrap.
- Ice (for sample storage/preservation).
- Zip-loc® plastic bags (for ice and COCs).
- Equipment decontamination supplies (see ECR SOP-010).

OFFICE

- Prepare/update the HASP; make sure the field team is familiar with the latest version.
- Review workplan, discuss the objective for the soil sampling program with the Project Manager and/or the field lead. Develop strategy including sample order, collection method, designation, analytical parameters, turn-around times, laboratory, etc.
  - Are the soil cuttings to be containerized in drums or returned to borehole?
  - Volume of soil required for each sample?
  - QA/QC sample collection?
  - Field decontamination required?
- Confirm that all necessary equipment is available in-house or has been ordered. Rental equipment is typically delivered the day before fieldwork is scheduled. Prior to departure, test equipment and make sure it is in proper working order.
- Verify that a utility survey/mark-out has been performed to ensure that sample locations are clear of overhead and buried utilities. Obtain a copy of the mark out ticket or confirmation number. Additionally, a private geophysical sub-surface survey may be necessary.
- Review sample bottle order for accuracy and completeness.
- Confirm soil boring locations (or specific sampling areas) are clearly identified on figure and that soil boring and sample designations are understood.

SOIL SAMPLING PROCEDURES

ON-SITE

- Verify that underground utilities have been marked out and that the mark outs are clear. Stay at least two feet away from any marked utility. Identify if any overhead obstructions or limited access areas exist near proposed borings and contact the Project Manager if any proposed locations need to be moved. Sketch/photograph mark-out locations. Client or project-specific utility clearances such as air-knifing or GPR may also be required.
- Review the HASP with all field personnel, conduct Health & Safety tailgate meeting.
- Ensure appropriate PPE is worn by all personnel and work area is safe (i.e., utilize traffic cones, minimize interference with on-site activities and pedestrian traffic, etc.)
- Calibrate equipment (if applicable) and record all equipment serial numbers in the field book.

GENERAL SOIL SAMPLING PROCEDURES

- Refer to other TRC SOPs for the proper procedures for classifying soil samples (ECR SOP 005) and for screening of samples for VOCs (ECR SOP 014).
- Refer to Attachment D of this SOP for specialized sampling requirements for PFAS.
- Refer to the appropriate guidance documents for state-specific sampling requirements.
- Perform any required field screening in-situ or immediately upon retrieval of the soil sample from the subsurface.
- Samples for VOC, VPH, or GRO analysis are collected as soon as possible after the soil has been exposed to the atmosphere and prior to sample collection for other analyses. Refer to Attachment A of this SOP for additional details.
- After collecting the sample(s) for VOC analysis, the sample portion for the remaining analyses should be well homogenized in a decontaminated stainless-steel bowl, disposable new aluminum pie pan, plastic bowl (for inorganics), or re-sealable plastic bag (for inorganics) to ensure the sample is uniform and as representative as possible of the sample media.
- Stones, gravel, vegetation, or debris (such as concrete, asphalt, ash or slag) should be removed from the soil sample as much as practical prior to placement in sample containers, unless these matrices are part of the overall characterization program.
- Transfer to sample containers using new, clean, or decontaminated spoons/scoops.
- Filling of the sample bottles should be completed immediately after sample collection to minimize losses due to volatilization and biodegradation. Soil classification can be completed following sample collection.
- Place the sample into an appropriate, labeled container(s) by using the alternate shoveling method and secure the cap(s) tightly. The alternate shoveling method involves placing a spoonful of soil in each container in sequence and repeating until the containers are full or the sample volume has been exhausted. Threads on the container and lid should be cleaned to ensure a tight seal when closed.
- Make sure ALL sample containers are clearly labeled with the site name, sample date, sample collection time and sample designation including depth in indelible ink. Make sure to clearly identify requested samples and analyses on the COC.
- Labeled samples should be immediately put into a cooler with ice; sample coolers should always be kept within eyesight or stored within the cab of the vehicle or other secured place such as a locked office.
- Be aware of sample holding times and arrange for samples to be in the laboratory's possession accordingly.
- Restore the sampling location to grade in accordance with applicable state or federal regulations and/or the site-specific work plan. Options include backfilling the sample location with the remaining removed soil, bentonite pellets, or cement/bentonite grout depending on site conditions/hole depth and patching the surface to match the surrounding area (e.g., topsoil with grass seed, asphalt, or concrete patch), as necessary.
- Record locations of soil borings/samples in the field book by sketching a map and/or providing a description of the location. When measuring locations of soil borings/samples, always use fixed landmarks such as buildings, fences, curbs, etc.
- Decontaminate sampling equipment in accordance with TRC's SOP (ECR SOP 010) on equipment decontamination.
- Ensure any IDW is appropriately managed. If IDW cannot be returned to the site, consider material containment, such as a composite drum, proper labeling, on-site storage by the client, testing for disposal, approval of the materials, and ultimately the pickup and disposal of the materials by appropriately licensed vendors.

SOIL SAMPLING PROCEDURES

SURFACE SOIL SAMPLING PROCEDURES

The depth of surface soil samples are typically from 0-6 in. or 0-12 in. and will be determined on a site-specific basis and may be influenced by site-specific conditions. The following procedure should be used for surface soil sampling:

- If a thick, matted root zone, leaf layer, gravel, surface debris, concrete, etc. is present at or near the surface, it should be carefully removed using clean, decontaminated tools before the soil sample is collected. The presence and thickness of any such material should be recorded in the field book for each location. The depth measurement for the soil sample begins at the top of the soil horizon, immediately following any such removed materials.
- A decontaminated stainless-steel spoon, scoop, or trowel is typically used for surface soil sampling depths from 0 to 12 inches bgs. A hand auger or shovel may also be used to dig down to the desired depth and then after careful removal of the dug soils from the hole, a decontaminated stainless-steel spoon, scoop, or trowel is used to collect the soil sample from the bottom of the hole for laboratory chemical analysis.
- Continue by following the General Soil Sampling Procedures.

HAND AUGER SAMPLING PROCEDURES

Hand augers may be used to advance boreholes and collect soil samples in shallow subsurface intervals. The auger is advanced by simultaneously pushing and turning using an attached T-handle with extensions (if needed). Auger holes are advanced one bucket at a time until the appropriate sample depth is achieved. The following procedure should be used for hand auger sampling:

- Clear the area to be sampled of any surface debris (e.g., twigs, rocks, litter).
- Begin augering, periodically removing and depositing accumulated soils onto a plastic sheet spread near the borehole.
- When the sample depth is reached, remove the bucket used to advance the borehole and attach a decontaminated or clean bucket. Place the clean auger bucket in the borehole, advance the clean auger bucket to fill it with the soil sample and then carefully remove the clean auger bucket.
- If VOC analysis is to be performed, collect a sample directly at the bottom of the boring, if within reach, and not from the auger bucket. If not within reach, collect the sample directly from the auger bucket or from minimally disturbed material immediately after the auger bucket is emptied.
- Continue by following the General Soil Sampling Procedures.
- Refer to the SOP for special considerations for hand auger sampling.

DIRECT PUSH/SPLIT SPOON/SONIC DRILLING SAMPLING PROCEDURES

For some soil investigations, soil logs provide justification for sample locations and intervals, so be descriptive and precise.

- The driller will advance the soil sampler (macrocore, split spoon, sonic casing, etc.) which will then be given to the sampler - confirm with driller which end is top and which end is bottom. Record the time of core collection in the field book (military time). Begin the soil record by indicating the soil boring location and ID, followed by the depth interval in feet bgs [e.g., B-1/0-4].
- Record the blow count per six-inch interval when collecting split-spoon samplers with hollow stem auger rig. The drillers will keep the count and repeat them to you. If refusal is encountered, the count is recorded in the book as "# of hammer blows / depth in inches the spoon is driven" (e.g., 50/3 – means 50 blows of the hammer advanced the spoon 3 inches).
- Measurement of vertical depth should start from the top of the ground surface. The presence and thickness of surface asphalt, surficial concrete slabs or gravel sub-base should be noted in the field book and/or boring log.
- Measure the length of recovered soil in inches and record in the field book.
- Continue by following the General Soil Sampling Procedures. If a specific depth interval is targeted for sampling, be sure to account for percent recovery when selecting the sample interval.
- Refer to the SOP for special considerations for Direct Push, Split Spoon, and Sonic Drilling sampling.

SHELBY TUBE/THIN-WALLED SAMPLING PROCEDURES

Shelby tube or thin-walled soil sampling should be conducted in accordance with ASTM Method D1587 Practice for Thin-walled Tube Sampling of Soils for Geotechnical Purposes.

To collect a sample, the tube is attached to a string of drill rod and is lowered into the borehole, where the sampler is then pressed into the undisturbed material by hydraulic force from the drill rig. After retrieval to the surface, the tube containing the sample is then removed from the sampler head.

- If samples for chemical analyses are needed, the soil contained inside the tube is then removed for sample acquisition by following the direct-push sampling procedures.
- If the sample is collected for geotechnical parameters, the tube is typically sealed to maintain the sample in its relatively undisturbed state, capped, labeled appropriately (including sample ID, top end of sample, inches of recovery, etc.), and shipped to the appropriate geotechnical laboratory. The tube is typically stored in an upright position to maintain the integrity of the undisturbed sample.

- For geotechnical use, check with the laboratory prior to sampling to understand sample volume recoveries needed to perform the actual tests.
    - Refer to the SOP for special considerations for Shelby Tube or Thin-Walled sampling.

EXCAVATOR SAMPLING PROCEDURES

A backhoe or excavator can be used to assist with soil sampling such as during remedial excavation activities (to collect floor and sidewall samples within the excavation), test pit installation, or trenching operations. The following procedures are used for collecting soil samples excavated with a backhoe or excavator:

- For test pits or trench excavation, excavate in accordance with the site-specific work plan. The work plan may also require that excavated soils be placed on plastic sheets or another impervious surface and protected from rain.
- Refer to the site-specific work plan for the number of floor and/or sidewall samples, which is typically driven by the surface area and can vary depending on the governing regulatory agency.
- Samples can be collected using a trowel, spoon, or coring device at the desired intervals. A clean shovel may be used to remove a 1 to 2- inch layer of soil from the vertical face of the pit that contacted the backhoe bucket and where soil sampling is planned. Scrape the vertical face at the point of sampling to remove any soil that may have fallen from above and to expose fresh soil for sampling.
- In many instances, soil sample locations within the excavation area are inaccessible (do not physically enter backhoe excavations to collect a sample). In these cases, soil samples can be collected directly from the backhoe bucket – use caution not to collect a soil sample from edges that may have come into contact with the backhoe bucket.
- Continue by following the General Soil Sampling Procedures.
- Abandon the pit or excavation according to applicable state regulations and the site-specific work plan. Generally, shallow excavations can simply be backfilled with the removed soil material.
    - Refer to the SOP for special considerations for Excavator sampling.

STOCKPILE SOIL SAMPLING PROCEDURES

Stockpiled soils are typically sampled to characterize the soils for reuse or disposal. The stockpile sampling strategy used must consider the source of the soil and all available data, field observations, shape/dimensions and volume of the pile, and sampling frequency requirements established by oversight regulatory agencies or potential soil disposal facilities.

If the stockpile is known to be a representative mixture of soil with no known or suspected significant variability of contamination with depth in the pile, the stockpile sampling may be conducted according to the surface soil sampling method described above. However, if the soil characteristics are not known or are known or suspected to vary with depth in the pile, both surface soil and deeper subsurface soil samples will be required to properly characterize the soil pile. Based on the minimum required number of samples for the estimated stockpile volume, the stockpile is divided into the appropriate number of estimated volumes equal to that sample number.

Refer to the SOP for special considerations for Stockpile Soil sampling.

POST SAMPLING ACTIVITIES

- After the samples have been collected, the sampling location should be surveyed in the field with a GPS unit if not surveyed later by some other means. A sketch or photograph of the sampling locations should also be included in the field book.
- Package the samples with bubble wrap and/or organic absorbent as necessary.
- Place the samples into a shipping container and cool to 4ºC. If wet ice is used to cool the samples, place the ice in double-bags to prevent water from the melting ice from damaging the samples during shipment.
- Complete and cross check the COC form.
- Refer to Attachment B in the SOP for specific guidance on shipping methanol-preserved samples.
- Decontaminate non-disposable sampling equipment.

DOS AND DO NOTS OF SOIL SAMPLING

DOs:

- No matter the work plan or the site, DO have the following items when going into the field:
  - Site-Specific HASP
  - Appropriate PPE
  - Field book and a pen with indelible ink
  -
  - Business cards
- DO review soil boring logs or cross sections from previous sampling events, if available.
- DO call the Project Manager or field team leader if unexpected conditions are encountered and at least twice during the workday to update them. Even if everything is fine and there are no questions, call or text with an update. It is also recommended to call when sampling is winding down for the day to make sure that the work plan has been fully implemented and there are no additional tasks to complete.
- DO have the numbers for laboratory, vehicle rental, and equipment rental providers readily available while in the field.
- DO decontaminate any heavy equipment used for the advancement of sampling devices by steam cleaning or high pressure/hot water wash prior to and between sample locations. This would include, but is not limited to auger flights, drill rods, backhoe buckets and other respective accessories.
- DO review and count the sample bottles and compare to the COC prior to leaving the site.
- DO record sampler type (e.g., macrocore, split spoon, etc.) and boring method (e.g., direct push, hammer, etc.) in the field book.
- DO record the hammer weight, the distance of the hammer drop and the method for hammer lift (i.e., cathead and rope, hydraulic, etc.) in the field book at least once per day when collecting split-spoon samples with a drill rig.

DO NOTs:

- DO NOT sign anything other than the COC in the field. This includes disposal documentation, statements, etc; call the Project Manager if there is an issue.
- DO NOT use non-indelible ink to label samples or record field notes – if the field book gets wet, notes become illegible.
- DO NOT include any upper soils which may "fall" as a result of the open borehole caving in (slough) when recording recovery.
- DO NOT use general terms such as "Fill" or "Till" as a sole description for layers – always give detailed description of soil components

Attachment D:

SOP Modifications for PFAS

Due to the pervasive nature of PFAS in various substances routinely used during sampling and the need to mitigate potential cross-contamination or sampling bias to ensure representative data are collected, special care should be taken when sampling for PFAS. The following table highlights the required modifications to this SOP when sampling for PFAS.

PFAS Sampling Protocols	
SOP Section Number	**Modifications to SOP**
1.3	• Do not use equipment utilizing Teflon® during sample handling or mobilization/demobilization. This includes waterproof/resistant paper products, certain personal protective equipment (PPE) (see below), and Teflon® tape. • Blue Ice® (chemical ice packs) must not be used to cool samples or be used in sample coolers. Regular ice in Ziploc® bags can be used. • Do not use low density polyethylene (LDPE)[1] or glass sample containers or containers with Teflon-lined lids. HDPE or polypropylene containers are acceptable for sample storage. HDPE or polypropylene caps are acceptable. • Do not use aluminum foil. • Waterproof field notes, plastic clipboards and spiral bound notebooks should not be used. Field notes should be recorded on loose paper field forms maintained in aluminum or Masonite clipboards. Field notes should be attached to the project-specific field notes or folder upon returning to the office. • Avoid using waterproof labels for sample bottles. The use of paper labels covered with clear tape or placed in Ziploc® bags to avoid moisture on the sample label is acceptable. • Do not use Post-It Notes during sample handling or mobilization/ demobilization. • Refer to TRC's SOP ECR-010 Equipment Decontamination for PFAS-specific decontamination protocols. Ensure that PFAS-free water is used during the decontamination procedure.
1.5	Always consult the Site Specific Health and Safety Plan (HASP) prior to conducting field work. The following considerations should be made with regards to field preparation during PFAS sampling: • Tyvek® suits should not be worn during PFAS sampling events. Cotton coveralls may be worn. • Boots and other field clothing containing Gore-Tex™ or other waterproof/resistant material should not be worn. This includes rain gear. Boots made with polyurethane and polyvinyl chloride (PVC) are acceptable. • Stain resistant clothing should not be worn. • Food and drink should not be allowed within the exclusion area. Pre-wrapped food or snacks should not be in the possession of sampling personnel during sampling. Bottled water and hydration drinks (e.g., Gatorade®) may be consumed in the staging area only. • Personnel involved with sample collection and handling should wear nitrile gloves at all times while collecting and handling

PFAS Sampling Protocols	
SOP Section Number	**Modifications to SOP**
	samples or sampling equipment. Avoid handling unnecessary items with nitrile gloves. A new pair of gloves must be donned prior to collecting each sample. • Wash hands with Alconox or Liquinox and deionized water after leaving vehicle before setting up at a soil sampling location.
1.6	• Avoid wearing clothing laundered with fabric softeners. • Avoid wearing new clothing (recommended 6 washings since purchase). Clothing made of cotton is preferred. • Avoid using cosmetics, moisturizers, hand creams, or other related products as part of cleaning/showering on the day of sampling. • Avoid using sunscreens or insect repellants that are not natural or chemical free. • If installing borings for PFAS sampling, assume the surface soil is contaminated with PFAS and remove the top six inches and transfer to drums prior to installing the borings. Clear an area of at least 1.5 feet by 1.5 feet. Keep all site surface soil in one drum, if possible. It is important to minimize PFAS in the surface soil from getting into the boring during soil sampling or well construction. • If sampling for PFAS under a roadway, move the dense aggregate subgrade out of the way prior to sampling. • Efficient and consistent homogenization procedures must be performed on soil samples; this is critical due to the small mass used by the laboratory. Do not homogenize soil in aluminum pie pans; use a decontaminated stainless steel bowl.
2.2	• LDPE and/or glass containers should not be used for sampling. Teflon®-lined caps should also not be used during sample collection. Instead, HDPE or polypropylene containers are acceptable for sample storage. HDPE or polypropylene caps are acceptable. Do not homogenize soil in aluminum pie pans. Use a decontaminated stainless steel bowl. • Stainless steel tools should not be wrapped in aluminum foil after decontaminating prior to and in between uses. • Homogenize the soil sample in a decontaminated, stainless steel bowl and place in an appropriate laboratory-provided sample container (as listed above) following the collection of VOC, VPH or GRO samples.
2.2.3	• Do not use Teflon® liners for direct push sampling methods. Cellulose acetate butyrate (CAB) liners are acceptable.
2.2.7	• Homogenize the soil sample in a decontaminated, stainless steel bowl and place in an appropriate laboratory-provided sample container (as listed above) following the collection of VOC, VPH or GRO samples.
2.3	• Samples for PFAS analysis must be shipped at <10°C. Standard coolers are acceptable. Keep high-concentration PFAS samples in separate coolers from low-concentration PFAS samples.

[1]PFAS have been used as an additive in the manufacturing of LDPE to smooth rough surfaces.

Attachment E:

Explanation of Common Subsurface Sampling Technologies

Hand Augering

Hand augers may be used to advance boreholes and collect soil samples in shallow subsurface intervals. Often, 4-inch diameter stainless steel auger buckets with cutting heads are used. The auger is advanced by simultaneously pushing and turning using an attached T-handle with extensions (if needed).

The practical depth of investigation using a hand auger largely depends upon the soil properties and depth of investigation. In sand, augering is typically easy to perform, but the depth of collection is limited to the depth at which the sand begins to flow or collapse. The use of hand augers may be of limited use in soils containing large amounts of unnatural fill (e.g., brick, slag, concrete), coarse gravel and cobbles (or larger grain size), and in tight clays or cemented sands. In these soil types, it becomes more difficult to recover a sample due to increased friction and torque of the hand auger extensions as the depth increases. At some point, these problems become so severe that alternate methods (i.e., power equipment) must be used.

Auger holes are advanced one bucket at a time until the appropriate sample depth is achieved. When the sample depth is reached, the bucket used to advance the hole is removed and decontaminated or a clean bucket is attached. The clean auger bucket is then placed in the hole and filled with soil to make up the sample and then carefully removed.

Direct Push

Direct-push sampling methods are used primarily to collect shallow and deep subsurface soil samples. Soil sampling probes may range from simple hand tools to truck-mounted or track-mounted hydraulically operated rigs. The sampling tool is hydraulically driven into the soil, filling the tube, and withdrawn. All of the sampling tools involve the collection and retrieval of the soil sample within a thin-walled liner. The following sections describe two specific sampling methods using direct-push techniques, along with details specific to each method.

- *Macro-Core® Sampler (Direct-push)* - The Macro-Core® (MC®) sampler is a solid barrel, direct-push sampler equipped with a piston-rod point assembly used primarily for collection of either continuous or depth-discrete subsurface soil samples. Other lengths are available, the standard MC® sampler comes in lengths of 48 or 60 inches (1219 or 1524 mm) with an outside diameter (OD) of 2.25 inches (57 mm). The MC® sampler is capable of recovering a discrete sample the length of the sample core used with a diameter of 1.5 inches (38 mm) contained inside a removable liner. The resultant sample volume is an approximate maximum of 1400 mL (for a 48-inch sampler). The MC® sampler may be used in either an open-tube or closed-point configuration.

- *Dual-tube Soil Sampling System (Direct-push)* - The Dual-tube soil sampling system is a direct-push system for collecting continuous core samples of unconsolidated materials from within a sealed outer casing of 2.25-inch (57 mm) to 6-inch (152 mm) OD probe rod. For the 2.25-inch OD probe rods, the samples are collected and retrieved within a liner that is threaded onto the leading end of a string of 1.25-inch (32 mm) OD diameter probe rods inserted into the bottom of the outer casing. Collected samples have a volume of up to 800 mL in the form of a 1.125-inch x 48-inch (29 mm x 1219 mm) core. In addition to the 48-inch length, nominal liner lengths include 36 inches, 1 meter, and 60 inches. Use of this method allows for collection of a continuous core inside a cased hole, minimizing or preventing cross contamination between different intervals during sample collection. The outer casing is

advanced, one core length at a time, with only the inner probe rod and core being removed and replaced between samples. If the sampling zone of interest begins at some depth below ground surface, a solid drive tip must be used to drive the dual-tube assembly and core to its initial sample depth.

Split Spoon

All split-spoon samplers, regardless of size, are basically split cylindrical barrels that are threaded on each end. The leading end is held together with a beveled threaded collar that functions as a cutting shoe. The other end is held together with a threaded collar that serves as the stub used to attach the spoon to a string of drill rod.

- *Standard Split Spoon* - A drill rig auger is used to advance a borehole to the target depth. The drill auger string is then removed and a standard split spoon is attached to a string of drill rod. Split spoons used for soil sampling must be constructed of hardened carbon steel and are typically 2.0 inches OD (1.5 inches inside diameter) and 18 inches to 24 inches in length. Other diameters and lengths are common and may be used if constructed of the proper material. After the spoon is attached to the string of drill rod, it is lowered into the borehole. The safety hammer is then used to drive the split spoon into the soil at the bottom of the borehole. After the split spoon has been driven into the soil, filling the spoon, it is retrieved to the surface, where it is removed from the drill rod string and opened for sample acquisition.

Shelby Tubes

Shelby tubes, also referred to generically as thin-walled push tubes or Acker thin-walled samplers, are used to collect subsurface soil samples in cohesive soils and clays during drilling activities. In addition to samples for chemical analyses, Shelby tubes are also used to collect relatively undisturbed soil samples for geotechnical analyses of physical properties such as shear strength, grain size distribution, density, hydraulic conductivity and permeability, to support engineering design, construction, and hydrogeologic characterizations at hazardous waste and other sites.

A typical Shelby tube is 30 inches in length, has a 3.0-inch OD (2.875-inch inside diameter) and may be constructed of steel, stainless steel, galvanized steel, or brass. They are typically attached to push heads constructed with a ball check to aid in holding the sample in the tube during retrieval. If used for collecting samples for chemical analyses, it must be constructed of stainless steel. If used for collecting samples for standard geotechnical parameters, any material is acceptable. To collect a sample, the tube is attached to a string of drill rod and is lowered into the borehole, where the sampler is then pressed into the undisturbed material by hydraulic force from the drill rig.

Sonic Drilling

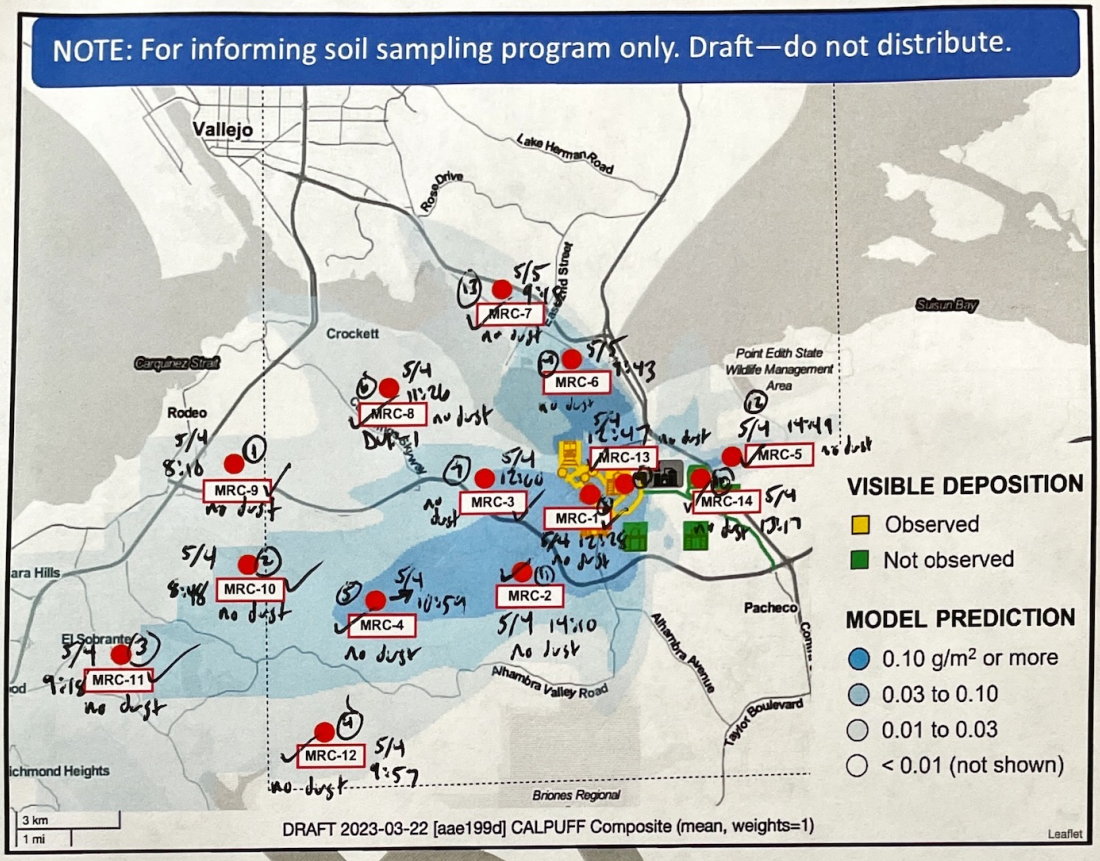
Sonic drilling/rotary vibratory drilling employs the use of high-frequency, resonant energy to advance a core barrel or casing into subsurface formations. Although sonic drilling is not technically a direct-push method of soil sampling, it is similar because soil sample collection from cores of recovered unconsolidated soil would follow the same procedures as described for direct-push methodologies.

Sonic drilling is different than conventional drilling, as sonic drilling minimizes the friction between the borehole wall and the drilling tool by maintaining the resonance of the drill string

with a sonic drill head. It also allows for drilling in areas where standard DPT would be refused, potentially requiring multiple step-outs and/or not sampling the desired area. It is also generally faster to advance than HSA or DPT. Typically, the drilling method utilizes dual casings that independently resonate into the subsurface with an inner core barrel that is overrun by an outer casing, similar to dual tube DPT sampling.

Excavator

A backhoe or excavator can be used to assist with soil sampling. This method is typically used during remedial excavation activities (to collect floor and sidewall samples within the excavation), test pit installation, or trenching operations. Test pit excavations are commonly completed to allow for greater observation of physical soil characteristics (e.g., stockpiles) and/or to further investigate buried suspect areas of concern (e.g., petroleum tanks, drums, waste, fill).



5/4/23

MRC-9: Viewpointe Blvd + Willow Ave (see coordinates)
MRC-10: 6097 Pinole Valley Rd
MRC-11: 4191 Appian Way
MRC-12: 1920 Bear Creek Rd (EBMUD Bear Creek Staging Area)
MRC-4: Christie Road (see coordinates)(across RR)
MRC-8: Crockett flow trailhead (see coordinates); DUP-1
MRC-3: Mc Ewen Road (see coordinates)
MRC-1: Susanna Park
MRC-13: Highland Avenue Park
MRC-14: 136 Camino Del Sol (right next to)
MRC-2: 1820/1815 Franklin Canyon Rd (vineyard)
MRC-5: Waterbird Regional Preserve (EBRPD)

5/5/23

MRC-6: end of East 7th St + E J St (grassy area)
MRC-7: West 7th St + West Military (field next to Taco Bell)

Photograph Log
Martinez Refinery Soil Sampling
May 4-5, 2023

MRC-1: Sampled 5/4/2023 12:28 pm

MRC-2: Sampled 5/4/2023 2:10 pm

MRC-3: Sampled 5/4/2023 12:00 pm

MRC-4: Sampled 5/4/2023 10:59 am

MRC-5: Sampled 5/4/2023 2:49 pm

MRC-6: Sampled 5/5/2023 9:43 am

Photograph Log
Martinez Refinery Soil Sampling
May 4-5, 2023

MRC-7: Sampled 5/5/2023 9:18 am

MRC-8/DUP-1: Sampled 5/4/2023 11:26 am

MRC-9: Sampled 5/4/2023 8:10 am

MRC-10: Sampled 5/4/2023 8:48 am

MRC-11: Sampled 5/4/2023 9:18 am

MRC-12: Sampled 5/4/2023 9:57 am

Photograph Log
Martinez Refinery Soil Sampling
May 4-5, 2023

MRC-13: Sampled 5/4/2023 12:47 pm

MRC-14: Sampled 5/4/2023 1:17 pm

Appendix D. Laboratory Analytical Report for May 2023 Soil Data

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ANALYTICAL REPORT

PREPARED FOR

Attn: Laura Tait
TRC Environmental Corporation
1850 Gateway Blvd
Suite 1000
Concord, California 94520

Generated 5/25/2023 3:32:01 PM Revision 1

JOB DESCRIPTION

Martinez Refinery

JOB NUMBER

320-99906-1

Eurofins Sacramento
880 Riverside Parkway
West Sacramento CA 95605

See page two for job notes and contact information.

Job Notes

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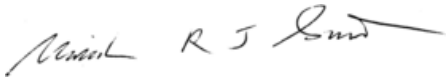
The test results in this report relate only to the samples as received by the laboratory and will meet all requirements of the methodology, with any exceptions noted. This report shall not be reproduced except in full, without the express written approval of the laboratory. All questions should be directed to the Eurofins Environment Testing Northern California, LLC Project Manager.

Authorization



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Revision 1

Authorized for release by
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Qualifiers

Metals

Qualifier	Qualifier Description
^2	Calibration Blank (ICB and/or CCB) is outside acceptance limits.
4	MS, MSD: The analyte present in the original sample is greater than 4 times the matrix spike concentration; therefore, control limits are not applicable.
F1	MS and/or MSD recovery exceeds control limits.

Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
¤	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CFL	Contains Free Liquid
CFU	Colony Forming Unit
CNF	Contains No Free Liquid
DER	Duplicate Error Ratio (normalized absolute difference)
Dil Fac	Dilution Factor
DL	Detection Limit (DoD/DOE)
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision Level Concentration (Radiochemistry)
EDL	Estimated Detection Limit (Dioxin)
LOD	Limit of Detection (DoD/DOE)
LOQ	Limit of Quantitation (DoD/DOE)
MCL	EPA recommended "Maximum Contaminant Level"
MDA	Minimum Detectable Activity (Radiochemistry)
MDC	Minimum Detectable Concentration (Radiochemistry)
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
MPN	Most Probable Number
MQL	Method Quantitation Limit
NC	Not Calculated
ND	Not Detected at the reporting limit (or MDL or EDL if shown)
NEG	Negative / Absent
POS	Positive / Present
PQL	Practical Quantitation Limit
PRES	Presumptive
QC	Quality Control
RER	Relative Error Ratio (Radiochemistry)
RL	Reporting Limit or Requested Limit (Radiochemistry)
RPD	Relative Percent Difference, a measure of the relative difference between two points
TEF	Toxicity Equivalent Factor (Dioxin)
TEQ	Toxicity Equivalent Quotient (Dioxin)
TNTC	Too Numerous To Count

Job ID: 320-99906-1

Laboratory: Eurofins Sacramento

Narrative

Job Narrative
320-99906-1

Comments
No additional comments.

Revision
The report being provided is a revision of the original report sent on 5/16/2023. The report (revision 1) was revised for Method 7199 (soil) to accommodate the client's request for a nominal reporting limit (RL) of 200 ug/kg in lieu of the laboratory's default RL (400 ug/kg).

Receipt
The samples were received on 5/4/2023 7:30 PM. Unless otherwise noted below, the samples arrived in good condition, and where required, properly preserved and on ice. The temperature of the cooler at receipt was 1.1° C.

HPLC/IC
No analytical or quality issues were noted, other than those described in the Definitions/Glossary page.

Metals
Method 6010B: The post digestion spike % recovery for Thallium associated with batch 320-673254 was outside of control limits. The associated sample is: (320-99906-A-1-A PDS).

Method 6010B: The matrix spike / matrix spike duplicate (MS/MSD) recoveries for preparation batch 320-672930 and analytical batch 320-673254 were outside control limits for one or more analytes. See QC Sample Results for detail. Sample matrix interference and/or non-homogeneity are suspected because the associated laboratory control sample (LCS) recovery is within acceptance limits.

Method 6010B: The instrument blank (CCB) for analytical batch 320-673254 contained Aluminum (Al) greater than one-half the reporting limit (RL), and were not re-analyzed because sample results were 10x greater than the CCB or Method blank. The data have been qualified and reported.

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

General Chemistry
No analytical or quality issues were noted, other than those described in the Definitions/Glossary page.

Detection Summary

Client: TRC Environmental Corporation
Project/Site: Martinez Refinery

Job ID: 320-99906-1

Client Sample ID: MRC-9 — Lab Sample ID: 320-99906-1

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Arsenic	6.1	F1	2.4		mg/Kg	1	☼	6010B	Total/NA
Barium	100		1.2		mg/Kg	1	☼	6010B	Total/NA
Beryllium	0.73	F1	0.24		mg/Kg	1	☼	6010B	Total/NA
Aluminum	9300		24		mg/Kg	1	☼	6010B	Total/NA
Chromium	24		0.59		mg/Kg	1	☼	6010B	Total/NA
Cobalt	6.3		0.59		mg/Kg	1	☼	6010B	Total/NA
Copper	14		1.8		mg/Kg	1	☼	6010B	Total/NA
Lead	15		1.2		mg/Kg	1	☼	6010B	Total/NA
Nickel	23		1.2		mg/Kg	1	☼	6010B	Total/NA
Vanadium	29		0.59		mg/Kg	1	☼	6010B	Total/NA
Zinc	64	F1	2.4		mg/Kg	1	☼	6010B	Total/NA
pH adj. to 25 deg C	6.5		0.1		SU	1		9045C	Soluble

Client Sample ID: MRC-10 — Lab Sample ID: 320-99906-2

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Arsenic	5.1		2.2		mg/Kg	1	☼	6010B	Total/NA
Barium	130		1.1		mg/Kg	1	☼	6010B	Total/NA
Beryllium	1.2		0.22		mg/Kg	1	☼	6010B	Total/NA
Aluminum	15000	^2	22		mg/Kg	1	☼	6010B	Total/NA
Chromium	27		0.55		mg/Kg	1	☼	6010B	Total/NA
Cobalt	11		0.55		mg/Kg	1	☼	6010B	Total/NA
Copper	30		1.6		mg/Kg	1	☼	6010B	Total/NA
Lead	10		1.1		mg/Kg	1	☼	6010B	Total/NA
Nickel	30		1.1		mg/Kg	1	☼	6010B	Total/NA
Vanadium	59		0.55		mg/Kg	1	☼	6010B	Total/NA
Zinc	79		2.2		mg/Kg	1	☼	6010B	Total/NA
pH adj. to 25 deg C	6.9		0.1		SU	1		9045C	Soluble

Client Sample ID: MRC-11 — Lab Sample ID: 320-99906-3

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Arsenic	5.7		2.5		mg/Kg	1	☼	6010B	Total/NA
Barium	98		1.2		mg/Kg	1	☼	6010B	Total/NA
Beryllium	0.64		0.25		mg/Kg	1	☼	6010B	Total/NA
Aluminum	10000	^2	25		mg/Kg	1	☼	6010B	Total/NA
Chromium	29		0.62		mg/Kg	1	☼	6010B	Total/NA
Cobalt	7.9		0.62		mg/Kg	1	☼	6010B	Total/NA
Copper	23		1.9		mg/Kg	1	☼	6010B	Total/NA
Lead	13		1.2		mg/Kg	1	☼	6010B	Total/NA
Nickel	31		1.2		mg/Kg	1	☼	6010B	Total/NA
Vanadium	34		0.62		mg/Kg	1	☼	6010B	Total/NA
Zinc	59		2.5		mg/Kg	1	☼	6010B	Total/NA
pH adj. to 25 deg C	7.1		0.1		SU	1		9045C	Soluble

Client Sample ID: MRC-12 — Lab Sample ID: 320-99906-4

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Arsenic	3.9		2.5		mg/Kg	1	☼	6010B	Total/NA
Barium	86		1.3		mg/Kg	1	☼	6010B	Total/NA
Beryllium	0.65		0.25		mg/Kg	1	☼	6010B	Total/NA
Aluminum	15000	^2	25		mg/Kg	1	☼	6010B	Total/NA

This Detection Summary does not include radiochemical test results.

Eurofins Sacramento

Client Sample ID: MRC-12 (Continued) — Lab Sample ID: 320-99906-4

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Chromium	20		0.64		mg/Kg	1	☼	6010B	Total/NA
Cobalt	5.1		0.64		mg/Kg	1	☼	6010B	Total/NA
Copper	7.9		1.9		mg/Kg	1	☼	6010B	Total/NA
Lead	6.6		1.3		mg/Kg	1	☼	6010B	Total/NA
Nickel	14		1.3		mg/Kg	1	☼	6010B	Total/NA
Vanadium	30		0.64		mg/Kg	1	☼	6010B	Total/NA
Zinc	32		2.5		mg/Kg	1	☼	6010B	Total/NA
pH adj. to 25 deg C	7.3		0.1		SU	1		9045C	Soluble

Client Sample ID: MRC-4 — Lab Sample ID: 320-99906-5

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Arsenic	24		2.7		mg/Kg	1	☼	6010B	Total/NA
Barium	110		1.3		mg/Kg	1	☼	6010B	Total/NA
Beryllium	0.58		0.27		mg/Kg	1	☼	6010B	Total/NA
Aluminum	9800	^2	27		mg/Kg	1	☼	6010B	Total/NA
Chromium	87		0.66		mg/Kg	1	☼	6010B	Total/NA
Cobalt	16		0.66		mg/Kg	1	☼	6010B	Total/NA
Copper	36		2.0		mg/Kg	1	☼	6010B	Total/NA
Lead	23		1.3		mg/Kg	1	☼	6010B	Total/NA
Nickel	200		1.3		mg/Kg	1	☼	6010B	Total/NA
Vanadium	30		0.66		mg/Kg	1	☼	6010B	Total/NA
Zinc	56		2.7		mg/Kg	1	☼	6010B	Total/NA
pH adj. to 25 deg C	6.9		0.1		SU	1		9045C	Soluble

Client Sample ID: MRC-8 — Lab Sample ID: 320-99906-6

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Arsenic	16		2.3		mg/Kg	1	☼	6010B	Total/NA
Barium	130		1.2		mg/Kg	1	☼	6010B	Total/NA
Beryllium	0.77		0.23		mg/Kg	1	☼	6010B	Total/NA
Aluminum	19000	^2	23		mg/Kg	1	☼	6010B	Total/NA
Chromium	64		0.58		mg/Kg	1	☼	6010B	Total/NA
Cobalt	15		0.58		mg/Kg	1	☼	6010B	Total/NA
Copper	48		1.7		mg/Kg	1	☼	6010B	Total/NA
Lead	32		1.2		mg/Kg	1	☼	6010B	Total/NA
Nickel	65		1.2		mg/Kg	1	☼	6010B	Total/NA
Vanadium	70		0.58		mg/Kg	1	☼	6010B	Total/NA
Zinc	88		2.3		mg/Kg	1	☼	6010B	Total/NA
pH adj. to 25 deg C	7.2		0.1		SU	1		9045C	Soluble

Client Sample ID: MRC-3 — Lab Sample ID: 320-99906-7

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Arsenic	11		2.1		mg/Kg	1	☼	6010B	Total/NA
Barium	150		1.1		mg/Kg	1	☼	6010B	Total/NA
Beryllium	0.93		0.21		mg/Kg	1	☼	6010B	Total/NA
Aluminum	17000	^2	21		mg/Kg	1	☼	6010B	Total/NA
Chromium	46		0.54		mg/Kg	1	☼	6010B	Total/NA
Cobalt	17		0.54		mg/Kg	1	☼	6010B	Total/NA
Copper	44		1.6		mg/Kg	1	☼	6010B	Total/NA
Lead	31		1.1		mg/Kg	1	☼	6010B	Total/NA

This Detection Summary does not include radiochemical test results.

Client Sample ID: MRC-3 (Continued) — Lab Sample ID: 320-99906-7

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Nickel	50		1.1		mg/Kg	1	☼	6010B	Total/NA
Vanadium	60		0.54		mg/Kg	1	☼	6010B	Total/NA
Zinc	210		2.1		mg/Kg	1	☼	6010B	Total/NA
pH adj. to 25 deg C	6.9		0.1		SU	1		9045C	Soluble

Client Sample ID: MRC-1 — Lab Sample ID: 320-99906-8

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Arsenic	7.1		2.5		mg/Kg	1	☼	6010B	Total/NA
Barium	99		1.2		mg/Kg	1	☼	6010B	Total/NA
Beryllium	0.57		0.25		mg/Kg	1	☼	6010B	Total/NA
Aluminum	9200	^2	25		mg/Kg	1	☼	6010B	Total/NA
Chromium	22		0.62		mg/Kg	1	☼	6010B	Total/NA
Cobalt	7.1		0.62		mg/Kg	1	☼	6010B	Total/NA
Copper	20		1.9		mg/Kg	1	☼	6010B	Total/NA
Lead	82		1.2		mg/Kg	1	☼	6010B	Total/NA
Nickel	19		1.2		mg/Kg	1	☼	6010B	Total/NA
Vanadium	30		0.62		mg/Kg	1	☼	6010B	Total/NA
Zinc	160		2.5		mg/Kg	1	☼	6010B	Total/NA
pH adj. to 25 deg C	5.9		0.1		SU	1		9045C	Soluble

Client Sample ID: MRC-13 — Lab Sample ID: 320-99906-9

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Arsenic	5.4		2.4		mg/Kg	1	☼	6010B	Total/NA
Barium	90		1.2		mg/Kg	1	☼	6010B	Total/NA
Beryllium	0.55		0.24		mg/Kg	1	☼	6010B	Total/NA
Aluminum	8900	^2	24		mg/Kg	1	☼	6010B	Total/NA
Chromium	16		0.59		mg/Kg	1	☼	6010B	Total/NA
Cobalt	6.5		0.59		mg/Kg	1	☼	6010B	Total/NA
Copper	11		1.8		mg/Kg	1	☼	6010B	Total/NA
Lead	18		1.2		mg/Kg	1	☼	6010B	Total/NA
Nickel	13		1.2		mg/Kg	1	☼	6010B	Total/NA
Vanadium	30		0.59		mg/Kg	1	☼	6010B	Total/NA
Zinc	41		2.4		mg/Kg	1	☼	6010B	Total/NA
pH adj. to 25 deg C	6.0		0.1		SU	1		9045C	Soluble

Client Sample ID: Equipment Blank — Lab Sample ID: 320-99906-10

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Lead	0.0063		0.0050		mg/L	1		6010B	Total/NA

Client Sample ID: Dup-1 — Lab Sample ID: 320-99906-11

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Arsenic	14		2.3		mg/Kg	1	☼	6010B	Total/NA
Barium	130		1.1		mg/Kg	1	☼	6010B	Total/NA
Beryllium	0.69		0.23		mg/Kg	1	☼	6010B	Total/NA
Aluminum	18000	^2	23		mg/Kg	1	☼	6010B	Total/NA
Chromium	56		0.57		mg/Kg	1	☼	6010B	Total/NA
Cobalt	15		0.57		mg/Kg	1	☼	6010B	Total/NA
Copper	43		1.7		mg/Kg	1	☼	6010B	Total/NA
Lead	25		1.1		mg/Kg	1	☼	6010B	Total/NA

This Detection Summary does not include radiochemical test results.

Client Sample ID: Dup-1 (Continued)

Lab Sample ID: 320-99906-11

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Nickel	60		1.1		mg/Kg	1	☼	6010B	Total/NA
Vanadium	64		0.57		mg/Kg	1	☼	6010B	Total/NA
Zinc	82		2.3		mg/Kg	1	☼	6010B	Total/NA
pH adj. to 25 deg C	6.0		0.1		SU	1		9045C	Soluble

Client Sample ID: MRC-14

Lab Sample ID: 320-99906-12

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Arsenic	8.5		2.3		mg/Kg	1	☼	6010B	Total/NA
Barium	86		1.1		mg/Kg	1	☼	6010B	Total/NA
Beryllium	0.88		0.23		mg/Kg	1	☼	6010B	Total/NA
Aluminum	14000	^2	23		mg/Kg	1	☼	6010B	Total/NA
Chromium	35		0.57		mg/Kg	1	☼	6010B	Total/NA
Cobalt	9.9		0.57		mg/Kg	1	☼	6010B	Total/NA
Copper	29		1.7		mg/Kg	1	☼	6010B	Total/NA
Lead	33		1.1		mg/Kg	1	☼	6010B	Total/NA
Nickel	32		1.1		mg/Kg	1	☼	6010B	Total/NA
Vanadium	54		0.57		mg/Kg	1	☼	6010B	Total/NA
Zinc	270		2.3		mg/Kg	1	☼	6010B	Total/NA
pH adj. to 25 deg C	5.7		0.1		SU	1		9045C	Soluble

This Detection Summary does not include radiochemical test results.

Client Sample ID: MRC-9

Date Collected: 05/04/23 08:10
Date Received: 05/04/23 19:30

Lab Sample ID: 320-99906-1

Matrix: Solid
Percent Solids: 85.7

Method: SW846 7199 - Chromium, Hexavalent (IC)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chromium, hexavalent	ND		240	230	ug/Kg	☼	05/09/23 02:00	05/09/23 13:32	10

Method: SW846 6010B - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	6.1	F1	2.4		mg/Kg	☼	05/08/23 06:30	05/08/23 15:57	1
Barium	100		1.2		mg/Kg	☼	05/08/23 06:30	05/08/23 15:57	1
Beryllium	0.73	F1	0.24		mg/Kg	☼	05/08/23 06:30	05/08/23 15:57	1
Aluminum	9300		24		mg/Kg	☼	05/08/23 06:30	05/08/23 15:57	1
Chromium	24		0.59		mg/Kg	☼	05/08/23 06:30	05/08/23 15:57	1
Cobalt	6.3		0.59		mg/Kg	☼	05/08/23 06:30	05/08/23 15:57	1
Copper	14		1.8		mg/Kg	☼	05/08/23 06:30	05/08/23 15:57	1
Lead	15		1.2		mg/Kg	☼	05/08/23 06:30	05/08/23 15:57	1
Molybdenum	ND	F1	2.4		mg/Kg	☼	05/08/23 06:30	05/08/23 15:57	1
Nickel	23		1.2		mg/Kg	☼	05/08/23 06:30	05/08/23 15:57	1
Selenium	ND	F1	2.4		mg/Kg	☼	05/08/23 06:30	05/08/23 15:57	1
Vanadium	29		0.59		mg/Kg	☼	05/08/23 06:30	05/08/23 15:57	1
Zinc	64	F1	2.4		mg/Kg	☼	05/08/23 06:30	05/08/23 15:57	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Moisture (ASTM D 2216)	14.3		0.1		%			05/05/23 14:27	1
Percent Solids (ASTM D 2216)	85.7		0.1		%			05/05/23 14:27	1

General Chemistry - Soluble

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
pH adj. to 25 deg C (SW846 9045C)	6.5		0.1		SU			05/09/23 11:24	1

Client Sample ID: MRC-10

Date Collected: 05/04/23 08:48
Date Received: 05/04/23 19:30

Lab Sample ID: 320-99906-2

Matrix: Solid
Percent Solids: 87.8

Method: SW846 7199 - Chromium, Hexavalent (IC)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chromium, hexavalent	ND		220	210	ug/Kg	☼	05/09/23 02:00	05/09/23 11:08	10

Method: SW846 6010B - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	5.1		2.2		mg/Kg	☼	05/08/23 06:30	05/08/23 16:17	1
Barium	130		1.1		mg/Kg	☼	05/08/23 06:30	05/08/23 16:17	1
Beryllium	1.2		0.22		mg/Kg	☼	05/08/23 06:30	05/08/23 16:17	1
Aluminum	15000	^2	22		mg/Kg	☼	05/08/23 06:30	05/08/23 16:17	1
Chromium	27		0.55		mg/Kg	☼	05/08/23 06:30	05/08/23 16:17	1
Cobalt	11		0.55		mg/Kg	☼	05/08/23 06:30	05/08/23 16:17	1
Copper	30		1.6		mg/Kg	☼	05/08/23 06:30	05/08/23 16:17	1
Lead	10		1.1		mg/Kg	☼	05/08/23 06:30	05/08/23 16:17	1
Molybdenum	ND		2.2		mg/Kg	☼	05/08/23 06:30	05/08/23 16:17	1
Nickel	30		1.1		mg/Kg	☼	05/08/23 06:30	05/08/23 16:17	1
Selenium	ND		2.2		mg/Kg	☼	05/08/23 06:30	05/08/23 16:17	1
Vanadium	59		0.55		mg/Kg	☼	05/08/23 06:30	05/08/23 16:17	1
Zinc	79		2.2		mg/Kg	☼	05/08/23 06:30	05/08/23 16:17	1

Client Sample ID: MRC-10

Lab Sample ID: 320-99906-2
Date Collected: 05/04/23 08:48
Matrix: Solid
Date Received: 05/04/23 19:30
Percent Solids: 87.8

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Moisture (ASTM D 2216)	12.2		0.1		%			05/05/23 14:27	1
Percent Solids (ASTM D 2216)	87.8		0.1		%			05/05/23 14:27	1

General Chemistry - Soluble

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
pH adj. to 25 deg C (SW846 9045C)	6.9		0.1		SU			05/09/23 11:24	1

Client Sample ID: MRC-11

Lab Sample ID: 320-99906-3
Date Collected: 05/04/23 09:18
Matrix: Solid
Date Received: 05/04/23 19:30
Percent Solids: 81.3

Method: SW846 7199 - Chromium, Hexavalent (IC)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chromium, hexavalent	ND		250	240	ug/Kg	☼	05/09/23 02:00	05/09/23 11:20	10

Method: SW846 6010B - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	5.7		2.5		mg/Kg	☼	05/08/23 06:30	05/08/23 16:20	1
Barium	98		1.2		mg/Kg	☼	05/08/23 06:30	05/08/23 16:20	1
Beryllium	0.64		0.25		mg/Kg	☼	05/08/23 06:30	05/08/23 16:20	1
Aluminum	10000	^2	25		mg/Kg	☼	05/08/23 06:30	05/08/23 16:20	1
Chromium	29		0.62		mg/Kg	☼	05/08/23 06:30	05/08/23 16:20	1
Cobalt	7.9		0.62		mg/Kg	☼	05/08/23 06:30	05/08/23 16:20	1
Copper	23		1.9		mg/Kg	☼	05/08/23 06:30	05/08/23 16:20	1
Lead	13		1.2		mg/Kg	☼	05/08/23 06:30	05/08/23 16:20	1
Molybdenum	ND		2.5		mg/Kg	☼	05/08/23 06:30	05/08/23 16:20	1
Nickel	31		1.2		mg/Kg	☼	05/08/23 06:30	05/08/23 16:20	1
Selenium	ND		2.5		mg/Kg	☼	05/08/23 06:30	05/08/23 16:20	1
Vanadium	34		0.62		mg/Kg	☼	05/08/23 06:30	05/08/23 16:20	1
Zinc	59		2.5		mg/Kg	☼	05/08/23 06:30	05/08/23 16:20	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Moisture (ASTM D 2216)	18.7		0.1		%			05/05/23 14:27	1
Percent Solids (ASTM D 2216)	81.3		0.1		%			05/05/23 14:27	1

General Chemistry - Soluble

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
pH adj. to 25 deg C (SW846 9045C)	7.1		0.1		SU			05/09/23 11:24	1

Client Sample ID: MRC-12

Lab Sample ID: 320-99906-4
Date Collected: 05/04/23 09:57
Matrix: Solid
Date Received: 05/04/23 19:30
Percent Solids: 79.3

Method: SW846 7199 - Chromium, Hexavalent (IC)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chromium, hexavalent	ND		260	250	ug/Kg	☼	05/09/23 02:00	05/09/23 11:32	10

Method: SW846 6010B - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	3.9		2.5		mg/Kg	☼	05/08/23 06:30	05/08/23 16:23	1
Barium	86		1.3		mg/Kg	☼	05/08/23 06:30	05/08/23 16:23	1

Client Sample ID: MRC-12

Date Collected: 05/04/23 09:57
Date Received: 05/04/23 19:30

Lab Sample ID: 320-99906-4

Matrix: Solid
Percent Solids: 79.3

Method: SW846 6010B - Metals (ICP) (Continued)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Beryllium	0.65		0.25		mg/Kg	☼	05/08/23 06:30	05/08/23 16:23	1
Aluminum	15000	^2	25		mg/Kg	☼	05/08/23 06:30	05/08/23 16:23	1
Chromium	20		0.64		mg/Kg	☼	05/08/23 06:30	05/08/23 16:23	1
Cobalt	5.1		0.64		mg/Kg	☼	05/08/23 06:30	05/08/23 16:23	1
Copper	7.9		1.9		mg/Kg	☼	05/08/23 06:30	05/08/23 16:23	1
Lead	6.6		1.3		mg/Kg	☼	05/08/23 06:30	05/08/23 16:23	1
Molybdenum	ND		2.5		mg/Kg	☼	05/08/23 06:30	05/08/23 16:23	1
Nickel	14		1.3		mg/Kg	☼	05/08/23 06:30	05/08/23 16:23	1
Selenium	ND		2.5		mg/Kg	☼	05/08/23 06:30	05/08/23 16:23	1
Vanadium	30		0.64		mg/Kg	☼	05/08/23 06:30	05/08/23 16:23	1
Zinc	32		2.5		mg/Kg	☼	05/08/23 06:30	05/08/23 16:23	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Moisture (ASTM D 2216)	20.7		0.1		%			05/05/23 14:27	1
Percent Solids (ASTM D 2216)	79.3		0.1		%			05/05/23 14:27	1

General Chemistry - Soluble

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
pH adj. to 25 deg C (SW846 9045C)	7.3		0.1		SU			05/09/23 11:24	1

Client Sample ID: MRC-4

Date Collected: 05/04/23 10:59
Date Received: 05/04/23 19:30

Lab Sample ID: 320-99906-5

Matrix: Solid
Percent Solids: 75.3

Method: SW846 7199 - Chromium, Hexavalent (IC)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chromium, hexavalent	ND		270	250	ug/Kg	☼	05/09/23 02:00	05/09/23 11:44	10

Method: SW846 6010B - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	24		2.7		mg/Kg	☼	05/08/23 06:30	05/08/23 16:26	1
Barium	110		1.3		mg/Kg	☼	05/08/23 06:30	05/08/23 16:26	1
Beryllium	0.58		0.27		mg/Kg	☼	05/08/23 06:30	05/08/23 16:26	1
Aluminum	9800	^2	27		mg/Kg	☼	05/08/23 06:30	05/08/23 16:26	1
Chromium	87		0.66		mg/Kg	☼	05/08/23 06:30	05/08/23 16:26	1
Cobalt	16		0.66		mg/Kg	☼	05/08/23 06:30	05/08/23 16:26	1
Copper	36		2.0		mg/Kg	☼	05/08/23 06:30	05/08/23 16:26	1
Lead	23		1.3		mg/Kg	☼	05/08/23 06:30	05/08/23 16:26	1
Molybdenum	ND		2.7		mg/Kg	☼	05/08/23 06:30	05/08/23 16:26	1
Nickel	200		1.3		mg/Kg	☼	05/08/23 06:30	05/08/23 16:26	1
Selenium	ND		2.7		mg/Kg	☼	05/08/23 06:30	05/08/23 16:26	1
Vanadium	30		0.66		mg/Kg	☼	05/08/23 06:30	05/08/23 16:26	1
Zinc	56		2.7		mg/Kg	☼	05/08/23 06:30	05/08/23 16:26	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Moisture (ASTM D 2216)	24.7		0.1		%			05/05/23 14:27	1
Percent Solids (ASTM D 2216)	75.3		0.1		%			05/05/23 14:27	1

Client Sample ID: MRC-4

Lab Sample ID: 320-99906-5
Date Collected: 05/04/23 10:59
Matrix: Solid
Date Received: 05/04/23 19:30
Percent Solids: 75.3

General Chemistry - Soluble

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
pH adj. to 25 deg C (SW846 9045C)	6.9		0.1		SU			05/09/23 11:24	1

Client Sample ID: MRC-8

Lab Sample ID: 320-99906-6
Date Collected: 05/04/23 11:26
Matrix: Solid
Date Received: 05/04/23 19:30
Percent Solids: 84.5

Method: SW846 7199 - Chromium, Hexavalent (IC)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chromium, hexavalent	ND		230	220	ug/Kg	☼	05/09/23 02:00	05/09/23 11:56	10

Method: SW846 6010B - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	16		2.3		mg/Kg	☼	05/08/23 06:30	05/08/23 16:29	1
Barium	130		1.2		mg/Kg	☼	05/08/23 06:30	05/08/23 16:29	1
Beryllium	0.77		0.23		mg/Kg	☼	05/08/23 06:30	05/08/23 16:29	1
Aluminum	19000	^2	23		mg/Kg	☼	05/08/23 06:30	05/08/23 16:29	1
Chromium	64		0.58		mg/Kg	☼	05/08/23 06:30	05/08/23 16:29	1
Cobalt	15		0.58		mg/Kg	☼	05/08/23 06:30	05/08/23 16:29	1
Copper	48		1.7		mg/Kg	☼	05/08/23 06:30	05/08/23 16:29	1
Lead	32		1.2		mg/Kg	☼	05/08/23 06:30	05/08/23 16:29	1
Molybdenum	ND		2.3		mg/Kg	☼	05/08/23 06:30	05/08/23 16:29	1
Nickel	65		1.2		mg/Kg	☼	05/08/23 06:30	05/08/23 16:29	1
Selenium	ND		2.3		mg/Kg	☼	05/08/23 06:30	05/08/23 16:29	1
Vanadium	70		0.58		mg/Kg	☼	05/08/23 06:30	05/08/23 16:29	1
Zinc	88		2.3		mg/Kg	☼	05/08/23 06:30	05/08/23 16:29	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Moisture (ASTM D 2216)	15.5		0.1		%			05/05/23 14:27	1
Percent Solids (ASTM D 2216)	84.5		0.1		%			05/05/23 14:27	1

General Chemistry - Soluble

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
pH adj. to 25 deg C (SW846 9045C)	7.2		0.1		SU			05/09/23 11:24	1

Client Sample ID: MRC-3

Lab Sample ID: 320-99906-7
Date Collected: 05/04/23 12:00
Matrix: Solid
Date Received: 05/04/23 19:30
Percent Solids: 89.8

Method: SW846 7199 - Chromium, Hexavalent (IC)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chromium, hexavalent	ND		220	210	ug/Kg	☼	05/09/23 02:00	05/09/23 12:08	10

Method: SW846 6010B - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	11		2.1		mg/Kg	☼	05/08/23 06:30	05/08/23 16:32	1
Barium	150		1.1		mg/Kg	☼	05/08/23 06:30	05/08/23 16:32	1
Beryllium	0.93		0.21		mg/Kg	☼	05/08/23 06:30	05/08/23 16:32	1
Aluminum	17000	^2	21		mg/Kg	☼	05/08/23 06:30	05/08/23 16:32	1
Chromium	46		0.54		mg/Kg	☼	05/08/23 06:30	05/08/23 16:32	1
Cobalt	17		0.54		mg/Kg	☼	05/08/23 06:30	05/08/23 16:32	1

Client Sample ID: MRC-3

Date Collected: 05/04/23 12:00
Date Received: 05/04/23 19:30

Lab Sample ID: 320-99906-7

Matrix: Solid
Percent Solids: 89.8

Method: SW846 6010B - Metals (ICP) (Continued)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Copper	44		1.6		mg/Kg	☼	05/08/23 06:30	05/08/23 16:32	1
Lead	31		1.1		mg/Kg	☼	05/08/23 06:30	05/08/23 16:32	1
Molybdenum	ND		2.1		mg/Kg	☼	05/08/23 06:30	05/08/23 16:32	1
Nickel	50		1.1		mg/Kg	☼	05/08/23 06:30	05/08/23 16:32	1
Selenium	ND		2.1		mg/Kg	☼	05/08/23 06:30	05/08/23 16:32	1
Vanadium	60		0.54		mg/Kg	☼	05/08/23 06:30	05/08/23 16:32	1
Zinc	210		2.1		mg/Kg	☼	05/08/23 06:30	05/08/23 16:32	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Moisture (ASTM D 2216)	10.2		0.1		%			05/05/23 14:27	1
Percent Solids (ASTM D 2216)	89.8		0.1		%			05/05/23 14:27	1

General Chemistry - Soluble

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
pH adj. to 25 deg C (SW846 9045C)	6.9		0.1		SU			05/09/23 11:24	1

Client Sample ID: MRC-1

Date Collected: 05/04/23 12:28
Date Received: 05/04/23 19:30

Lab Sample ID: 320-99906-8

Matrix: Solid
Percent Solids: 80.9

Method: SW846 7199 - Chromium, Hexavalent (IC)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chromium, hexavalent	ND		250	230	ug/Kg	☼	05/09/23 02:00	05/09/23 12:20	10

Method: SW846 6010B - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	7.1		2.5		mg/Kg	☼	05/08/23 06:30	05/08/23 16:41	1
Barium	99		1.2		mg/Kg	☼	05/08/23 06:30	05/08/23 16:41	1
Beryllium	0.57		0.25		mg/Kg	☼	05/08/23 06:30	05/08/23 16:41	1
Aluminum	9200	^2	25		mg/Kg	☼	05/08/23 06:30	05/08/23 16:41	1
Chromium	22		0.62		mg/Kg	☼	05/08/23 06:30	05/08/23 16:41	1
Cobalt	7.1		0.62		mg/Kg	☼	05/08/23 06:30	05/08/23 16:41	1
Copper	20		1.9		mg/Kg	☼	05/08/23 06:30	05/08/23 16:41	1
Lead	82		1.2		mg/Kg	☼	05/08/23 06:30	05/08/23 16:41	1
Molybdenum	ND		2.5		mg/Kg	☼	05/08/23 06:30	05/08/23 16:41	1
Nickel	19		1.2		mg/Kg	☼	05/08/23 06:30	05/08/23 16:41	1
Selenium	ND		2.5		mg/Kg	☼	05/08/23 06:30	05/08/23 16:41	1
Vanadium	30		0.62		mg/Kg	☼	05/08/23 06:30	05/08/23 16:41	1
Zinc	160		2.5		mg/Kg	☼	05/08/23 06:30	05/08/23 16:41	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Moisture (ASTM D 2216)	19.1		0.1		%			05/05/23 14:27	1
Percent Solids (ASTM D 2216)	80.9		0.1		%			05/05/23 14:27	1

General Chemistry - Soluble

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
pH adj. to 25 deg C (SW846 9045C)	5.9		0.1		SU			05/09/23 11:24	1

Client Sample ID: MRC-13

Date Collected: 05/04/23 12:47
Date Received: 05/04/23 19:30

Lab Sample ID: 320-99906-9

Matrix: Solid
Percent Solids: 81.9

Method: SW846 7199 - Chromium, Hexavalent (IC)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chromium, hexavalent	ND		250	240	ug/Kg	☼	05/09/23 02:00	05/09/23 12:32	10

Method: SW846 6010B - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	**5.4**		2.4		mg/Kg	☼	05/08/23 06:30	05/08/23 16:44	1
Barium	**90**		1.2		mg/Kg	☼	05/08/23 06:30	05/08/23 16:44	1
Beryllium	**0.55**		0.24		mg/Kg	☼	05/08/23 06:30	05/08/23 16:44	1
Aluminum	**8900**	**^2**	24		mg/Kg	☼	05/08/23 06:30	05/08/23 16:44	1
Chromium	**16**		0.59		mg/Kg	☼	05/08/23 06:30	05/08/23 16:44	1
Cobalt	**6.5**		0.59		mg/Kg	☼	05/08/23 06:30	05/08/23 16:44	1
Copper	**11**		1.8		mg/Kg	☼	05/08/23 06:30	05/08/23 16:44	1
Lead	**18**		1.2		mg/Kg	☼	05/08/23 06:30	05/08/23 16:44	1
Molybdenum	ND		2.4		mg/Kg	☼	05/08/23 06:30	05/08/23 16:44	1
Nickel	**13**		1.2		mg/Kg	☼	05/08/23 06:30	05/08/23 16:44	1
Selenium	ND		2.4		mg/Kg	☼	05/08/23 06:30	05/08/23 16:44	1
Vanadium	**30**		0.59		mg/Kg	☼	05/08/23 06:30	05/08/23 16:44	1
Zinc	**41**		2.4		mg/Kg	☼	05/08/23 06:30	05/08/23 16:44	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Moisture (ASTM D 2216)	**18.1**		0.1		%			05/05/23 14:27	1
Percent Solids (ASTM D 2216)	**81.9**		0.1		%			05/05/23 14:27	1

General Chemistry - Soluble

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
pH adj. to 25 deg C (SW846 9045C)	**6.0**		0.1		SU			05/09/23 11:24	1

Client Sample ID: Equipment Blank

Date Collected: 05/04/23 12:58
Date Received: 05/04/23 19:30

Lab Sample ID: 320-99906-10

Matrix: Water

Method: SW846 7199 - Chromium, Hexavalent (IC)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chromium, hexavalent	ND		0.50		ug/L			05/05/23 10:53	1

Method: SW846 6010B - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Aluminum	ND		0.20		mg/L		05/09/23 06:15	05/09/23 15:42	1
Arsenic	ND		0.020		mg/L		05/09/23 06:15	05/09/23 15:42	1
Barium	ND		0.0050		mg/L		05/09/23 06:15	05/09/23 15:42	1
Beryllium	ND		0.0020		mg/L		05/09/23 06:15	05/09/23 15:42	1
Cobalt	ND		0.0050		mg/L		05/09/23 06:15	05/09/23 15:42	1
Chromium	ND		0.0080		mg/L		05/09/23 06:15	05/09/23 15:42	1
Copper	ND		0.010		mg/L		05/09/23 06:15	05/09/23 15:42	1
Lead	**0.0063**		0.0050		mg/L		05/09/23 06:15	05/09/23 15:42	1
Molybdenum	ND		0.020		mg/L		05/09/23 06:15	05/09/23 15:42	1
Nickel	ND		0.0050		mg/L		05/09/23 06:15	05/09/23 15:42	1
Selenium	ND		0.020		mg/L		05/09/23 06:15	05/09/23 15:42	1
Vanadium	ND		0.0050		mg/L		05/09/23 06:15	05/09/23 15:42	1
Zinc	ND		0.010		mg/L		05/09/23 06:15	05/09/23 15:42	1

Client Sample ID: Dup-1

Lab Sample ID: 320-99906-11

Date Collected: 05/04/23 00:00
Matrix: Solid
Date Received: 05/04/23 19:30
Percent Solids: 87.0

Method: SW846 7199 - Chromium, Hexavalent (IC)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chromium, hexavalent	ND		230	220	ug/Kg	☼	05/09/23 02:00	05/09/23 12:44	10

Method: SW846 6010B - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	**14**		2.3		mg/Kg	☼	05/08/23 06:30	05/08/23 16:47	1
Barium	**130**		1.1		mg/Kg	☼	05/08/23 06:30	05/08/23 16:47	1
Beryllium	**0.69**		0.23		mg/Kg	☼	05/08/23 06:30	05/08/23 16:47	1
Aluminum	**18000**	**^2**	23		mg/Kg	☼	05/08/23 06:30	05/08/23 16:47	1
Chromium	**56**		0.57		mg/Kg	☼	05/08/23 06:30	05/08/23 16:47	1
Cobalt	**15**		0.57		mg/Kg	☼	05/08/23 06:30	05/08/23 16:47	1
Copper	**43**		1.7		mg/Kg	☼	05/08/23 06:30	05/08/23 16:47	1
Lead	**25**		1.1		mg/Kg	☼	05/08/23 06:30	05/08/23 16:47	1
Molybdenum	ND		2.3		mg/Kg	☼	05/08/23 06:30	05/08/23 16:47	1
Nickel	**60**		1.1		mg/Kg	☼	05/08/23 06:30	05/08/23 16:47	1
Selenium	ND		2.3		mg/Kg	☼	05/08/23 06:30	05/08/23 16:47	1
Vanadium	**64**		0.57		mg/Kg	☼	05/08/23 06:30	05/08/23 16:47	1
Zinc	**82**		2.3		mg/Kg	☼	05/08/23 06:30	05/08/23 16:47	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Moisture (ASTM D 2216)	**13.0**		0.1		%			05/05/23 14:27	1
Percent Solids (ASTM D 2216)	**87.0**		0.1		%			05/05/23 14:27	1

General Chemistry - Soluble

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
pH adj. to 25 deg C (SW846 9045C)	**6.0**		0.1		SU			05/09/23 11:24	1

Client Sample ID: MRC-14

Lab Sample ID: 320-99906-12

Date Collected: 05/04/23 13:17
Matrix: Solid
Date Received: 05/04/23 19:30
Percent Solids: 88.1

Method: SW846 7199 - Chromium, Hexavalent (IC)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chromium, hexavalent	ND		230	220	ug/Kg	☼	05/09/23 02:00	05/09/23 12:56	10

Method: SW846 6010B - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	**8.5**		2.3		mg/Kg	☼	05/08/23 06:30	05/08/23 16:50	1
Barium	**86**		1.1		mg/Kg	☼	05/08/23 06:30	05/08/23 16:50	1
Beryllium	**0.88**		0.23		mg/Kg	☼	05/08/23 06:30	05/08/23 16:50	1
Aluminum	**14000**	**^2**	23		mg/Kg	☼	05/08/23 06:30	05/08/23 16:50	1
Chromium	**35**		0.57		mg/Kg	☼	05/08/23 06:30	05/08/23 16:50	1
Cobalt	**9.9**		0.57		mg/Kg	☼	05/08/23 06:30	05/08/23 16:50	1
Copper	**29**		1.7		mg/Kg	☼	05/08/23 06:30	05/08/23 16:50	1
Lead	**33**		1.1		mg/Kg	☼	05/08/23 06:30	05/08/23 16:50	1
Molybdenum	ND		2.3		mg/Kg	☼	05/08/23 06:30	05/08/23 16:50	1
Nickel	**32**		1.1		mg/Kg	☼	05/08/23 06:30	05/08/23 16:50	1
Selenium	ND		2.3		mg/Kg	☼	05/08/23 06:30	05/08/23 16:50	1
Vanadium	**54**		0.57		mg/Kg	☼	05/08/23 06:30	05/08/23 16:50	1
Zinc	**270**		2.3		mg/Kg	☼	05/08/23 06:30	05/08/23 16:50	1

Client: TRC Environmental Corporation
Project/Site: Martinez Refinery

Job ID: 320-99906-1

Client Sample ID: MRC-14
Date Collected: 05/04/23 13:17
Date Received: 05/04/23 19:30

Lab Sample ID: 320-99906-12
Matrix: Solid
Percent Solids: 88.1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Moisture (ASTM D 2216)	11.9		0.1		%			05/05/23 14:27	1
Percent Solids (ASTM D 2216)	88.1		0.1		%			05/05/23 14:27	1

General Chemistry - Soluble

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
pH adj. to 25 deg C (SW846 9045C)	5.7		0.1		SU			05/09/23 11:24	1

Method: 7199 - Chromium, Hexavalent (IC)

Lab Sample ID: MB 570-326646/1-A
Matrix: Solid
Analysis Batch: 327380

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 326646

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chromium, hexavalent	ND		210	200	ug/Kg		05/09/23 02:00	05/09/23 05:26	10

Lab Sample ID: LCS 570-326646/2-A
Matrix: Solid
Analysis Batch: 327380

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 326646

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits
Chromium, hexavalent	19800	19300		ug/Kg		97	80 - 120

Lab Sample ID: LCSD 570-326646/3-A
Matrix: Solid
Analysis Batch: 327380

Client Sample ID: Lab Control Sample Dup
Prep Type: Total/NA
Prep Batch: 326646

Analyte	Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec Limits	RPD	RPD Limit
Chromium, hexavalent	19700	18200		ug/Kg		92	80 - 120	6	20

Lab Sample ID: MB 320-672410/1-A
Matrix: Water
Analysis Batch: 672411

Client Sample ID: Method Blank
Prep Type: Total/NA

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chromium, hexavalent	ND		0.50		ug/L			05/05/23 10:26	1

Lab Sample ID: LCS 320-672410/2-A
Matrix: Water
Analysis Batch: 672411

Client Sample ID: Lab Control Sample
Prep Type: Total/NA

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits
Chromium, hexavalent	2.00	1.99		ug/L		100	90 - 110

Lab Sample ID: 320-99906-10 MS
Matrix: Water
Analysis Batch: 672411

Client Sample ID: Equipment Blank
Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec Limits
Chromium, hexavalent	ND		2.00	1.92		ug/L		96	80 - 120

Lab Sample ID: 320-99906-10 MSD
Matrix: Water
Analysis Batch: 672411

Client Sample ID: Equipment Blank
Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec Limits	RPD	RPD Limit
Chromium, hexavalent	ND		2.00	1.94		ug/L		97	80 - 120	1	20

Method: 6010B - Metals (ICP)

Lab Sample ID: MB 320-672930/1-A
Matrix: Solid
Analysis Batch: 673254

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 672930

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	ND		2.0		mg/Kg		05/08/23 06:30	05/08/23 15:51	1
Aluminum	ND		20		mg/Kg		05/08/23 06:30	05/08/23 15:51	1
Barium	ND		1.0		mg/Kg		05/08/23 06:30	05/08/23 15:51	1
Beryllium	ND		0.20		mg/Kg		05/08/23 06:30	05/08/23 15:51	1
Cobalt	ND		0.50		mg/Kg		05/08/23 06:30	05/08/23 15:51	1
Chromium	ND		0.50		mg/Kg		05/08/23 06:30	05/08/23 15:51	1
Copper	ND		1.5		mg/Kg		05/08/23 06:30	05/08/23 15:51	1
Lead	ND		1.0		mg/Kg		05/08/23 06:30	05/08/23 15:51	1
Molybdenum	ND		2.0		mg/Kg		05/08/23 06:30	05/08/23 15:51	1
Nickel	ND		1.0		mg/Kg		05/08/23 06:30	05/08/23 15:51	1
Selenium	ND		2.0		mg/Kg		05/08/23 06:30	05/08/23 15:51	1
Vanadium	ND		0.50		mg/Kg		05/08/23 06:30	05/08/23 15:51	1
Zinc	ND		2.0		mg/Kg		05/08/23 06:30	05/08/23 15:51	1

Lab Sample ID: LCS 320-672930/2-A
Matrix: Solid
Analysis Batch: 673254

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 672930

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits
Arsenic	50.0	44.8		mg/Kg		90	80 - 120
Aluminum	500	433		mg/Kg		87	80 - 120
Barium	50.0	43.0		mg/Kg		86	80 - 120
Beryllium	25.0	22.7		mg/Kg		91	80 - 120
Cobalt	25.0	22.8		mg/Kg		91	80 - 120
Chromium	25.0	22.8		mg/Kg		91	80 - 120
Copper	25.0	21.7		mg/Kg		87	80 - 120
Lead	25.0	23.5		mg/Kg		94	80 - 120
Molybdenum	25.0	23.2		mg/Kg		93	80 - 120
Nickel	25.0	23.1		mg/Kg		92	80 - 120
Selenium	50.0	44.3		mg/Kg		89	80 - 120
Vanadium	25.0	23.0		mg/Kg		92	80 - 120
Zinc	50.5	47.9		mg/Kg		95	80 - 120

Lab Sample ID: 320-99906-1 MS
Matrix: Solid
Analysis Batch: 673254

Client Sample ID: MRC-9
Prep Type: Total/NA
Prep Batch: 672930

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec Limits
Arsenic	6.1	F1	58.4	50.7	F1	mg/Kg	☼	76	80 - 120
Aluminum	9300		584	14900	4	mg/Kg	☼	960	80 - 120
Barium	100		58.4	160		mg/Kg	☼	98	80 - 120
Beryllium	0.73	F1	29.2	25.1		mg/Kg	☼	83	80 - 120
Cobalt	6.3		29.2	30.0		mg/Kg	☼	81	80 - 120
Chromium	24		29.2	54.7		mg/Kg	☼	105	80 - 120
Copper	14		29.2	37.7		mg/Kg	☼	82	80 - 120
Lead	15		29.2	40.6		mg/Kg	☼	86	80 - 120
Molybdenum	ND	F1	29.2	23.8	F1	mg/Kg	☼	78	80 - 120
Nickel	23		29.2	47.1		mg/Kg	☼	81	80 - 120
Selenium	ND	F1	58.4	46.8		mg/Kg	☼	80	80 - 120

Method: 6010B - Metals (ICP) (Continued)

Lab Sample ID: 320-99906-1 MS
Matrix: Solid
Analysis Batch: 673254

Client Sample ID: MRC-9
Prep Type: Total/NA
Prep Batch: 672930

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec Limits
Vanadium	29		29.2	62.6		mg/Kg	☼	114	80 - 120
Zinc	64	F1	59.0	122		mg/Kg	☼	98	80 - 120

Lab Sample ID: 320-99906-1 MSD
Matrix: Solid
Analysis Batch: 673254

Client Sample ID: MRC-9
Prep Type: Total/NA
Prep Batch: 672930

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec Limits	RPD	RPD Limit
Arsenic	6.1	F1	59.0	50.8	F1	mg/Kg	☼	76	80 - 120	0	35
Aluminum	9300		590	14000	4	mg/Kg	☼	796	80 - 120	6	35
Barium	100		59.0	152		mg/Kg	☼	83	80 - 120	5	35
Beryllium	0.73	F1	29.5	24.1	F1	mg/Kg	☼	79	80 - 120	4	35
Cobalt	6.3		29.5	30.9		mg/Kg	☼	83	80 - 120	3	35
Chromium	24		29.5	53.7		mg/Kg	☼	100	80 - 120	2	35
Copper	14		29.5	37.5		mg/Kg	☼	81	80 - 120	0	35
Lead	15		29.5	39.5		mg/Kg	☼	82	80 - 120	3	35
Molybdenum	ND	F1	29.5	23.9	F1	mg/Kg	☼	78	80 - 120	0	35
Nickel	23		29.5	48.5		mg/Kg	☼	85	80 - 120	3	35
Selenium	ND	F1	59.0	46.5	F1	mg/Kg	☼	79	80 - 120	1	35
Vanadium	29		29.5	60.1		mg/Kg	☼	104	80 - 120	4	35
Zinc	64	F1	59.5	110	F1	mg/Kg	☼	77	80 - 120	10	35

Lab Sample ID: MB 320-673248/1-A
Matrix: Water
Analysis Batch: 673489

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 673248

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	ND		0.020		mg/L		05/09/23 06:15	05/09/23 15:21	1
Aluminum	ND		0.20		mg/L		05/09/23 06:15	05/09/23 15:21	1
Barium	ND		0.0050		mg/L		05/09/23 06:15	05/09/23 15:21	1
Beryllium	ND		0.0020		mg/L		05/09/23 06:15	05/09/23 15:21	1
Cobalt	ND		0.0050		mg/L		05/09/23 06:15	05/09/23 15:21	1
Chromium	ND		0.0080		mg/L		05/09/23 06:15	05/09/23 15:21	1
Copper	ND		0.010		mg/L		05/09/23 06:15	05/09/23 15:21	1
Lead	ND		0.0050		mg/L		05/09/23 06:15	05/09/23 15:21	1
Molybdenum	ND		0.020		mg/L		05/09/23 06:15	05/09/23 15:21	1
Nickel	ND		0.0050		mg/L		05/09/23 06:15	05/09/23 15:21	1
Selenium	ND		0.020		mg/L		05/09/23 06:15	05/09/23 15:21	1
Vanadium	ND		0.0050		mg/L		05/09/23 06:15	05/09/23 15:21	1
Zinc	ND		0.010		mg/L		05/09/23 06:15	05/09/23 15:21	1

Lab Sample ID: LCS 320-673248/2-A
Matrix: Water
Analysis Batch: 673489

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 673248

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits
Arsenic	0.500	0.487		mg/L		97	80 - 120
Aluminum	5.00	4.81		mg/L		96	80 - 120
Barium	0.500	0.474		mg/L		95	80 - 120

Method: 6010B - Metals (ICP) (Continued)

Lab Sample ID: LCS 320-673248/2-A
Matrix: Water
Analysis Batch: 673489

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 673248

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits
Beryllium	0.250	0.249		mg/L		99	80 - 120
Cobalt	0.250	0.242		mg/L		97	80 - 120
Chromium	0.250	0.252		mg/L		101	80 - 120
Copper	0.250	0.235		mg/L		94	80 - 120
Lead	0.250	0.256		mg/L		103	80 - 120
Molybdenum	0.250	0.249		mg/L		99	80 - 120
Nickel	0.250	0.244		mg/L		98	80 - 120
Selenium	0.500	0.486		mg/L		97	80 - 120
Vanadium	0.250	0.247		mg/L		99	80 - 120
Zinc	0.505	0.499		mg/L		99	80 - 120

Method: 9045C - pH

Lab Sample ID: LCS 320-672979/2
Matrix: Solid
Analysis Batch: 672979

Client Sample ID: Lab Control Sample
Prep Type: Total/NA

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits
pH adj. to 25 deg C	8.00	8.0		SU		100	98 - 102

Lab Sample ID: 320-99906-1 DU
Matrix: Solid
Analysis Batch: 672979

Client Sample ID: MRC-9
Prep Type: Soluble

Analyte	Sample Result	Sample Qualifier	DU Result	DU Qualifier	Unit	D	RPD	RPD Limit
pH adj. to 25 deg C	6.5		6.6		SU		1	10

Method: D 2216 - Percent Moisture

Lab Sample ID: 320-99906-1 DU
Matrix: Solid
Analysis Batch: 672513

Client Sample ID: MRC-9
Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier	DU Result	DU Qualifier	Unit	D	RPD	RPD Limit
Percent Moisture	14.3		14.5		%		1	20
Percent Solids	85.7		85.5		%		0.2	20

HPLC/IC

Prep Batch: 326646

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
320-99906-1	MRC-9	Total/NA	Solid	3060A	
320-99906-2	MRC-10	Total/NA	Solid	3060A	
320-99906-3	MRC-11	Total/NA	Solid	3060A	
320-99906-4	MRC-12	Total/NA	Solid	3060A	
320-99906-5	MRC-4	Total/NA	Solid	3060A	
320-99906-6	MRC-8	Total/NA	Solid	3060A	
320-99906-7	MRC-3	Total/NA	Solid	3060A	
320-99906-8	MRC-1	Total/NA	Solid	3060A	
320-99906-9	MRC-13	Total/NA	Solid	3060A	
320-99906-11	Dup-1	Total/NA	Solid	3060A	
320-99906-12	MRC-14	Total/NA	Solid	3060A	
MB 570-326646/1-A	Method Blank	Total/NA	Solid	3060A	
LCS 570-326646/2-A	Lab Control Sample	Total/NA	Solid	3060A	
LCSD 570-326646/3-A	Lab Control Sample Dup	Total/NA	Solid	3060A	

Analysis Batch: 327380

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
320-99906-1	MRC-9	Total/NA	Solid	7199	326646
320-99906-2	MRC-10	Total/NA	Solid	7199	326646
320-99906-3	MRC-11	Total/NA	Solid	7199	326646
320-99906-4	MRC-12	Total/NA	Solid	7199	326646
320-99906-5	MRC-4	Total/NA	Solid	7199	326646
320-99906-6	MRC-8	Total/NA	Solid	7199	326646
320-99906-7	MRC-3	Total/NA	Solid	7199	326646
320-99906-8	MRC-1	Total/NA	Solid	7199	326646
320-99906-9	MRC-13	Total/NA	Solid	7199	326646
320-99906-11	Dup-1	Total/NA	Solid	7199	326646
320-99906-12	MRC-14	Total/NA	Solid	7199	326646
MB 570-326646/1-A	Method Blank	Total/NA	Solid	7199	326646
LCS 570-326646/2-A	Lab Control Sample	Total/NA	Solid	7199	326646
LCSD 570-326646/3-A	Lab Control Sample Dup	Total/NA	Solid	7199	326646

Filtration Batch: 672410

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
MB 320-672410/1-A	Method Blank	Total/NA	Water	Filtration	
LCS 320-672410/2-A	Lab Control Sample	Total/NA	Water	Filtration	

Analysis Batch: 672411

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
320-99906-10	Equipment Blank	Total/NA	Water	7199	
MB 320-672410/1-A	Method Blank	Total/NA	Water	7199	672410
LCS 320-672410/2-A	Lab Control Sample	Total/NA	Water	7199	672410
320-99906-10 MS	Equipment Blank	Total/NA	Water	7199	
320-99906-10 MSD	Equipment Blank	Total/NA	Water	7199	

Metals

Prep Batch: 672930

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
320-99906-1	MRC-9	Total/NA	Solid	3050B	
320-99906-2	MRC-10	Total/NA	Solid	3050B	

Metals (Continued)

Prep Batch: 672930 (Continued)

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
320-99906-3	MRC-11	Total/NA	Solid	3050B	
320-99906-4	MRC-12	Total/NA	Solid	3050B	
320-99906-5	MRC-4	Total/NA	Solid	3050B	
320-99906-6	MRC-8	Total/NA	Solid	3050B	
320-99906-7	MRC-3	Total/NA	Solid	3050B	
320-99906-8	MRC-1	Total/NA	Solid	3050B	
320-99906-9	MRC-13	Total/NA	Solid	3050B	
320-99906-11	Dup-1	Total/NA	Solid	3050B	
320-99906-12	MRC-14	Total/NA	Solid	3050B	
MB 320-672930/1-A	Method Blank	Total/NA	Solid	3050B	
LCS 320-672930/2-A	Lab Control Sample	Total/NA	Solid	3050B	
320-99906-1 MS	MRC-9	Total/NA	Solid	3050B	
320-99906-1 MSD	MRC-9	Total/NA	Solid	3050B	

Prep Batch: 673248

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
320-99906-10	Equipment Blank	Total/NA	Water	3010A	
MB 320-673248/1-A	Method Blank	Total/NA	Water	3010A	
LCS 320-673248/2-A	Lab Control Sample	Total/NA	Water	3010A	

Analysis Batch: 673254

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
320-99906-1	MRC-9	Total/NA	Solid	6010B	672930
320-99906-2	MRC-10	Total/NA	Solid	6010B	672930
320-99906-3	MRC-11	Total/NA	Solid	6010B	672930
320-99906-4	MRC-12	Total/NA	Solid	6010B	672930
320-99906-5	MRC-4	Total/NA	Solid	6010B	672930
320-99906-6	MRC-8	Total/NA	Solid	6010B	672930
320-99906-7	MRC-3	Total/NA	Solid	6010B	672930
320-99906-8	MRC-1	Total/NA	Solid	6010B	672930
320-99906-9	MRC-13	Total/NA	Solid	6010B	672930
320-99906-11	Dup-1	Total/NA	Solid	6010B	672930
320-99906-12	MRC-14	Total/NA	Solid	6010B	672930
MB 320-672930/1-A	Method Blank	Total/NA	Solid	6010B	672930
LCS 320-672930/2-A	Lab Control Sample	Total/NA	Solid	6010B	672930
320-99906-1 MS	MRC-9	Total/NA	Solid	6010B	672930
320-99906-1 MSD	MRC-9	Total/NA	Solid	6010B	672930

Analysis Batch: 673489

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
320-99906-10	Equipment Blank	Total/NA	Water	6010B	673248
MB 320-673248/1-A	Method Blank	Total/NA	Water	6010B	673248
LCS 320-673248/2-A	Lab Control Sample	Total/NA	Water	6010B	673248

General Chemistry

Analysis Batch: 672513

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
320-99906-1	MRC-9	Total/NA	Solid	D 2216	
320-99906-2	MRC-10	Total/NA	Solid	D 2216	
320-99906-3	MRC-11	Total/NA	Solid	D 2216	

General Chemistry (Continued)

Analysis Batch: 672513 (Continued)

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
320-99906-4	MRC-12	Total/NA	Solid	D 2216	
320-99906-5	MRC-4	Total/NA	Solid	D 2216	
320-99906-6	MRC-8	Total/NA	Solid	D 2216	
320-99906-7	MRC-3	Total/NA	Solid	D 2216	
320-99906-8	MRC-1	Total/NA	Solid	D 2216	
320-99906-9	MRC-13	Total/NA	Solid	D 2216	
320-99906-11	Dup-1	Total/NA	Solid	D 2216	
320-99906-12	MRC-14	Total/NA	Solid	D 2216	
320-99906-1 DU	MRC-9	Total/NA	Solid	D 2216	

Analysis Batch: 672979

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
320-99906-1	MRC-9	Soluble	Solid	9045C	673034
320-99906-2	MRC-10	Soluble	Solid	9045C	673034
320-99906-3	MRC-11	Soluble	Solid	9045C	673034
320-99906-4	MRC-12	Soluble	Solid	9045C	673034
320-99906-5	MRC-4	Soluble	Solid	9045C	673034
320-99906-6	MRC-8	Soluble	Solid	9045C	673034
320-99906-7	MRC-3	Soluble	Solid	9045C	673034
320-99906-8	MRC-1	Soluble	Solid	9045C	673034
320-99906-9	MRC-13	Soluble	Solid	9045C	673034
320-99906-11	Dup-1	Soluble	Solid	9045C	673034
320-99906-12	MRC-14	Soluble	Solid	9045C	673034
LCS 320-672979/2	Lab Control Sample	Total/NA	Solid	9045C	
320-99906-1 DU	MRC-9	Soluble	Solid	9045C	673034

Leach Batch: 673034

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
320-99906-1	MRC-9	Soluble	Solid	DI Leach	
320-99906-2	MRC-10	Soluble	Solid	DI Leach	
320-99906-3	MRC-11	Soluble	Solid	DI Leach	
320-99906-4	MRC-12	Soluble	Solid	DI Leach	
320-99906-5	MRC-4	Soluble	Solid	DI Leach	
320-99906-6	MRC-8	Soluble	Solid	DI Leach	
320-99906-7	MRC-3	Soluble	Solid	DI Leach	
320-99906-8	MRC-1	Soluble	Solid	DI Leach	
320-99906-9	MRC-13	Soluble	Solid	DI Leach	
320-99906-11	Dup-1	Soluble	Solid	DI Leach	
320-99906-12	MRC-14	Soluble	Solid	DI Leach	
320-99906-1 DU	MRC-9	Soluble	Solid	DI Leach	

Client Sample ID: MRC-9
Date Collected: 05/04/23 08:10
Date Received: 05/04/23 19:30

Lab Sample ID: 320-99906-1
Matrix: Solid

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Soluble	Leach	DI Leach			19.80 g	20 mL	673034	05/08/23 12:09	H1Z	EET SAC
Soluble	Analysis	9045C		1	20 mL	20 mL	672979	05/09/23 11:24	H1Z	EET SAC
Total/NA	Analysis	D 2216		1			672513	05/05/23 14:27	TCS	EET SAC

Client Sample ID: MRC-9
Date Collected: 05/04/23 08:10
Date Received: 05/04/23 19:30

Lab Sample ID: 320-99906-1
Matrix: Solid
Percent Solids: 85.7

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3060A			1.22 g	50 mL	326646	05/09/23 02:00	YO8L	EET CAL 4
Total/NA	Analysis	7199		10	4 mL	4 mL	327380	05/09/23 13:32	YO8L	EET CAL 4
Total/NA	Prep	3050B			0.99 g	100 mL	672930	05/08/23 06:30	NIM	EET SAC
Total/NA	Analysis	6010B		1			673254	05/08/23 15:57	SP	EET SAC

Client Sample ID: MRC-10
Date Collected: 05/04/23 08:48
Date Received: 05/04/23 19:30

Lab Sample ID: 320-99906-2
Matrix: Solid

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Soluble	Leach	DI Leach			20.40 g	20 mL	673034	05/08/23 12:09	H1Z	EET SAC
Soluble	Analysis	9045C		1	20 mL	20 mL	672979	05/09/23 11:24	H1Z	EET SAC
Total/NA	Analysis	D 2216		1			672513	05/05/23 14:27	TCS	EET SAC

Client Sample ID: MRC-10
Date Collected: 05/04/23 08:48
Date Received: 05/04/23 19:30

Lab Sample ID: 320-99906-2
Matrix: Solid
Percent Solids: 87.8

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3060A			1.28 g	50 mL	326646	05/09/23 02:00	YO8L	EET CAL 4
Total/NA	Analysis	7199		10	4 mL	4 mL	327380	05/09/23 11:08	YO8L	EET CAL 4
Total/NA	Prep	3050B			1.04 g	100 mL	672930	05/08/23 06:30	NIM	EET SAC
Total/NA	Analysis	6010B		1			673254	05/08/23 16:17	SP	EET SAC

Client Sample ID: MRC-11
Date Collected: 05/04/23 09:18
Date Received: 05/04/23 19:30

Lab Sample ID: 320-99906-3
Matrix: Solid

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Soluble	Leach	DI Leach			19.12 g	20 mL	673034	05/08/23 12:09	H1Z	EET SAC
Soluble	Analysis	9045C		1	20 mL	20 mL	672979	05/09/23 11:24	H1Z	EET SAC
Total/NA	Analysis	D 2216		1			672513	05/05/23 14:27	TCS	EET SAC

Client Sample ID: MRC-11
Date Collected: 05/04/23 09:18
Date Received: 05/04/23 19:30

Lab Sample ID: 320-99906-3
Matrix: Solid
Percent Solids: 81.3

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3060A			1.21 g	50 mL	326646	05/09/23 02:00	YO8L	EET CAL 4
Total/NA	Analysis	7199		10	4 mL	4 mL	327380	05/09/23 11:20	YO8L	EET CAL 4
Total/NA	Prep	3050B			0.99 g	100 mL	672930	05/08/23 06:30	NIM	EET SAC
Total/NA	Analysis	6010B		1			673254	05/08/23 16:20	SP	EET SAC

Client Sample ID: MRC-12
Date Collected: 05/04/23 09:57
Date Received: 05/04/23 19:30

Lab Sample ID: 320-99906-4
Matrix: Solid

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Soluble	Leach	DI Leach			19.08 g	20 mL	673034	05/08/23 12:09	H1Z	EET SAC
Soluble	Analysis	9045C		1	20 mL	20 mL	672979	05/09/23 11:24	H1Z	EET SAC
Total/NA	Analysis	D 2216		1			672513	05/05/23 14:27	TCS	EET SAC

Client Sample ID: MRC-12
Date Collected: 05/04/23 09:57
Date Received: 05/04/23 19:30

Lab Sample ID: 320-99906-4
Matrix: Solid
Percent Solids: 79.3

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3060A			1.23 g	50 mL	326646	05/09/23 02:00	YO8L	EET CAL 4
Total/NA	Analysis	7199		10	4 mL	4 mL	327380	05/09/23 11:32	YO8L	EET CAL 4
Total/NA	Prep	3050B			0.99 g	100 mL	672930	05/08/23 06:30	NIM	EET SAC
Total/NA	Analysis	6010B		1			673254	05/08/23 16:23	SP	EET SAC

Client Sample ID: MRC-4
Date Collected: 05/04/23 10:59
Date Received: 05/04/23 19:30

Lab Sample ID: 320-99906-5
Matrix: Solid

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Soluble	Leach	DI Leach			19.19 g	20 mL	673034	05/08/23 12:09	H1Z	EET SAC
Soluble	Analysis	9045C		1	20 mL	20 mL	672979	05/09/23 11:24	H1Z	EET SAC
Total/NA	Analysis	D 2216		1			672513	05/05/23 14:27	TCS	EET SAC

Client Sample ID: MRC-4
Date Collected: 05/04/23 10:59
Date Received: 05/04/23 19:30

Lab Sample ID: 320-99906-5
Matrix: Solid
Percent Solids: 75.3

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3060A			1.25 g	50 mL	326646	05/09/23 02:00	YO8L	EET CAL 4
Total/NA	Analysis	7199		10	4 mL	4 mL	327380	05/09/23 11:44	YO8L	EET CAL 4
Total/NA	Prep	3050B			1.00 g	100 mL	672930	05/08/23 06:30	NIM	EET SAC
Total/NA	Analysis	6010B		1			673254	05/08/23 16:26	SP	EET SAC

Client Sample ID: MRC-8
Date Collected: 05/04/23 11:26
Date Received: 05/04/23 19:30

Lab Sample ID: 320-99906-6
Matrix: Solid

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Soluble	Leach	DI Leach			19.67 g	20 mL	673034	05/08/23 12:09	H1Z	EET SAC
Soluble	Analysis	9045C		1	20 mL	20 mL	672979	05/09/23 11:24	H1Z	EET SAC
Total/NA	Analysis	D 2216		1			672513	05/05/23 14:27	TCS	EET SAC

Client Sample ID: MRC-8
Date Collected: 05/04/23 11:26
Date Received: 05/04/23 19:30

Lab Sample ID: 320-99906-6
Matrix: Solid
Percent Solids: 84.5

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3060A			1.27 g	50 mL	326646	05/09/23 02:00	YO8L	EET CAL 4
Total/NA	Analysis	7199		10	4 mL	4 mL	327380	05/09/23 11:56	YO8L	EET CAL 4
Total/NA	Prep	3050B			1.02 g	100 mL	672930	05/08/23 06:30	NIM	EET SAC
Total/NA	Analysis	6010B		1			673254	05/08/23 16:29	SP	EET SAC

Client Sample ID: MRC-3
Date Collected: 05/04/23 12:00
Date Received: 05/04/23 19:30

Lab Sample ID: 320-99906-7
Matrix: Solid

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Soluble	Leach	DI Leach			19.42 g	20 mL	673034	05/08/23 12:09	H1Z	EET SAC
Soluble	Analysis	9045C		1	20 mL	20 mL	672979	05/09/23 11:24	H1Z	EET SAC
Total/NA	Analysis	D 2216		1			672513	05/05/23 14:27	TCS	EET SAC

Client Sample ID: MRC-3
Date Collected: 05/04/23 12:00
Date Received: 05/04/23 19:30

Lab Sample ID: 320-99906-7
Matrix: Solid
Percent Solids: 89.8

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3060A			1.24 g	50 mL	326646	05/09/23 02:00	YO8L	EET CAL 4
Total/NA	Analysis	7199		10	4 mL	4 mL	327380	05/09/23 12:08	YO8L	EET CAL 4
Total/NA	Prep	3050B			1.04 g	100 mL	672930	05/08/23 06:30	NIM	EET SAC
Total/NA	Analysis	6010B		1			673254	05/08/23 16:32	SP	EET SAC

Client Sample ID: MRC-1
Date Collected: 05/04/23 12:28
Date Received: 05/04/23 19:30

Lab Sample ID: 320-99906-8
Matrix: Solid

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Soluble	Leach	DI Leach			19.09 g	20 mL	673034	05/08/23 12:09	H1Z	EET SAC
Soluble	Analysis	9045C		1	20 mL	20 mL	672979	05/09/23 11:24	H1Z	EET SAC
Total/NA	Analysis	D 2216		1			672513	05/05/23 14:27	TCS	EET SAC

Lab Chronicle

Client: TRC Environmental Corporation
Project/Site: Martinez Refinery

Job ID: 320-99906-1

Client Sample ID: MRC-1
Date Collected: 05/04/23 12:28
Date Received: 05/04/23 19:30

Lab Sample ID: 320-99906-8
Matrix: Solid
Percent Solids: 80.9

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3060A			1.26 g	50 mL	326646	05/09/23 02:00	YO8L	EET CAL 4
Total/NA	Analysis	7199		10	4 mL	4 mL	327380	05/09/23 12:20	YO8L	EET CAL 4
Total/NA	Prep	3050B			1.00 g	100 mL	672930	05/08/23 06:30	NIM	EET SAC
Total/NA	Analysis	6010B		1			673254	05/08/23 16:41	SP	EET SAC

Client Sample ID: MRC-13
Date Collected: 05/04/23 12:47
Date Received: 05/04/23 19:30

Lab Sample ID: 320-99906-9
Matrix: Solid

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Soluble	Leach	DI Leach			19.74 g	20 mL	673034	05/08/23 12:09	H1Z	EET SAC
Soluble	Analysis	9045C		1	20 mL	20 mL	672979	05/09/23 11:24	H1Z	EET SAC
Total/NA	Analysis	D 2216		1			672513	05/05/23 14:27	TCS	EET SAC

Client Sample ID: MRC-13
Date Collected: 05/04/23 12:47
Date Received: 05/04/23 19:30

Lab Sample ID: 320-99906-9
Matrix: Solid
Percent Solids: 81.9

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3060A			1.21 g	50 mL	326646	05/09/23 02:00	YO8L	EET CAL 4
Total/NA	Analysis	7199		10	4 mL	4 mL	327380	05/09/23 12:32	YO8L	EET CAL 4
Total/NA	Prep	3050B			1.03 g	100 mL	672930	05/08/23 06:30	NIM	EET SAC
Total/NA	Analysis	6010B		1			673254	05/08/23 16:44	SP	EET SAC

Client Sample ID: Equipment Blank
Date Collected: 05/04/23 12:58
Date Received: 05/04/23 19:30

Lab Sample ID: 320-99906-10
Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	7199		1	10 mL	10 mL	672411	05/05/23 10:53	JCB	EET SAC
Total/NA	Prep	3010A			50 mL	50 mL	673248	05/09/23 06:15	NIM	EET SAC
Total/NA	Analysis	6010B		1			673489	05/09/23 15:42	SP	EET SAC

Client Sample ID: Dup-1
Date Collected: 05/04/23 00:00
Date Received: 05/04/23 19:30

Lab Sample ID: 320-99906-11
Matrix: Solid

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Soluble	Leach	DI Leach			19.22 g	20 mL	673034	05/08/23 12:09	H1Z	EET SAC
Soluble	Analysis	9045C		1	20 mL	20 mL	672979	05/09/23 11:24	H1Z	EET SAC
Total/NA	Analysis	D 2216		1			672513	05/05/23 14:27	TCS	EET SAC

Lab Chronicle

Client: TRC Environmental Corporation
Project/Site: Martinez Refinery

Job ID: 320-99906-1

Client Sample ID: Dup-1

Lab Sample ID: 320-99906-11

Date Collected: 05/04/23 00:00
Matrix: Solid
Date Received: 05/04/23 19:30
Percent Solids: 87.0

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3060A			1.23 g	50 mL	326646	05/09/23 02:00	YO8L	EET CAL 4
Total/NA	Analysis	7199		10	4 mL	4 mL	327380	05/09/23 12:44	YO8L	EET CAL 4
Total/NA	Prep	3050B			1.01 g	100 mL	672930	05/08/23 06:30	NIM	EET SAC
Total/NA	Analysis	6010B		1			673254	05/08/23 16:47	SP	EET SAC

Client Sample ID: MRC-14

Lab Sample ID: 320-99906-12

Date Collected: 05/04/23 13:17
Matrix: Solid
Date Received: 05/04/23 19:30

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Soluble	Leach	DI Leach			20.01 g	20 mL	673034	05/08/23 12:09	H1Z	EET SAC
Soluble	Analysis	9045C		1	20 mL	20 mL	672979	05/09/23 11:24	H1Z	EET SAC
Total/NA	Analysis	D 2216		1			672513	05/05/23 14:27	TCS	EET SAC

Client Sample ID: MRC-14

Lab Sample ID: 320-99906-12

Date Collected: 05/04/23 13:17
Matrix: Solid
Date Received: 05/04/23 19:30
Percent Solids: 88.1

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3060A			1.25 g	50 mL	326646	05/09/23 02:00	YO8L	EET CAL 4
Total/NA	Analysis	7199		10	4 mL	4 mL	327380	05/09/23 12:56	YO8L	EET CAL 4
Total/NA	Prep	3050B			1.00 g	100 mL	672930	05/08/23 06:30	NIM	EET SAC
Total/NA	Analysis	6010B		1			673254	05/08/23 16:50	SP	EET SAC

Laboratory References:

EET CAL 4 = Eurofins Calscience Tustin, 2841 Dow Avenue, Tustin, CA 92780, TEL (714)895-5494

EET SAC = Eurofins Sacramento, 880 Riverside Parkway, West Sacramento, CA 95605, TEL (916)373-5600

Accreditation/Certification Summary

Client: TRC Environmental Corporation
Job ID: 320-99906-1
Project/Site: Martinez Refinery

Laboratory: Eurofins Sacramento

Unless otherwise noted, all analytes for this laboratory were covered under each accreditation/certification below.

Authority	Program	Identification Number	Expiration Date
California	State	2897	01-22-24

The following analytes are included in this report, but the laboratory is not certified by the governing authority. This list may include analytes for which the agency does not offer certification.

Analysis Method	Prep Method	Matrix	Analyte
D 2216		Solid	Percent Moisture
D 2216		Solid	Percent Solids

Laboratory: Eurofins Calscience

The accreditations/certifications listed below are applicable to this report.

Authority	Program	Identification Number	Expiration Date
California	State	3082	07-31-24

Method Summary

Client: TRC Environmental Corporation
Project/Site: Martinez Refinery

Job ID: 320-99906-1

Method	Method Description	Protocol	Laboratory
7199	Chromium, Hexavalent (IC)	SW846	EET CAL 4
7199	Chromium, Hexavalent (IC)	SW846	EET SAC
6010B	Metals (ICP)	SW846	EET SAC
9045C	pH	SW846	EET SAC
D 2216	Percent Moisture	ASTM	EET SAC
3010A	Preparation, Total Metals	SW846	EET SAC
3050B	Preparation, Metals	SW846	EET SAC
3060A	Alkaline Digestion (Chromium, Hexavalent)	SW846	EET CAL 4
DI Leach	Deionized Water Leaching Procedure	ASTM	EET SAC

Protocol References:

ASTM = ASTM International

SW846 = "Test Methods For Evaluating Solid Waste, Physical/Chemical Methods", Third Edition, November 1986 And Its Updates.

Laboratory References:

EET CAL 4 = Eurofins Calscience Tustin, 2841 Dow Avenue, Tustin, CA 92780, TEL (714)895-5494

EET SAC = Eurofins Sacramento, 880 Riverside Parkway, West Sacramento, CA 95605, TEL (916)373-5600

Sample Summary

Client: TRC Environmental Corporation
Project/Site: Martinez Refinery

Job ID: 320-99906-1

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
320-99906-1	MRC-9	Solid	05/04/23 08:10	05/04/23 19:30
320-99906-2	MRC-10	Solid	05/04/23 08:48	05/04/23 19:30
320-99906-3	MRC-11	Solid	05/04/23 09:18	05/04/23 19:30
320-99906-4	MRC-12	Solid	05/04/23 09:57	05/04/23 19:30
320-99906-5	MRC-4	Solid	05/04/23 10:59	05/04/23 19:30
320-99906-6	MRC-8	Solid	05/04/23 11:26	05/04/23 19:30
320-99906-7	MRC-3	Solid	05/04/23 12:00	05/04/23 19:30
320-99906-8	MRC-1	Solid	05/04/23 12:28	05/04/23 19:30
320-99906-9	MRC-13	Solid	05/04/23 12:47	05/04/23 19:30
320-99906-10	Equipment Blank	Water	05/04/23 12:58	05/04/23 19:30
320-99906-11	Dup-1	Solid	05/04/23 00:00	05/04/23 19:30
320-99906-12	MRC-14	Solid	05/04/23 13:17	05/04/23 19:30

204652

Eurofins Sacramento
880 Riverside Parkway
West Sacramento, CA 95605
Phone (916) 373-5600

Chain of Custody Record

eurofins | Environment Testing

Client Information	Sampler: L. Tait	Lab PM:	Carrier Tracking No(s):	COC No
Client Contact: Laura Tait	Phone: 925-494-4385	E-Mail: LTait@etrccompanies.com	State of Origin:	Page: Page 1 of 2
Company: TRC	PWSID:			Job #:
Address: 1850 Gateway Blvd, Suite 1000	Due Date Requested:			
City: Concord	TAT Requested (days): 5-day TAT			
State, Zip: CA 94520	Compliance Project: Δ Yes Δ No			
Phone:	PO #: 200244			
Email:	WO #:			
Project Name: Martinez Refinery	Project #: 537895/01			
Site:	SSOW#:			

Analysis Requested

Preservation Codes:
A - HCL
M - Hexane
N - None
O - AsNaO2
P - Na2O4S
Q - Na2SO3
R - Na2S2O3
S - H2SO4
T - TSP Dodecahydrate
U - Acetone
V - MCAA
W - pH 4-5
Y - Trizma
Z - other (specify)
L - EDA
Other:

320-99906 Chain of Custody

Sample Identification	Sample Date	Sample Time	Sample Type (C=comp, G=grab)	Matrix (W=water, S=solid, O=waste/oil, BT=Tissue, A=Air)	Field Filtered Sample (Yes or No)	Perform MS/MSD (Yes or No)	CAM 17 metals *	Aluminum	Hexavalent Chromium	pH	Total Number of containers	Special Instructions/Note:
			Preservation Code:									
MRC-9	5/4/23	8:10	G	S			X	X	X	X	2	* Do Not Report: Antimony Cadmium Mercury Silver Thallium
MRC-10	5/4/23	8:48	G	S			X	X	X	X	2	
MRC-11	5/4/23	9:18	G	S			X	X	X	X	2	
MRC-12	5/4/23	9:57	G	S			X	X	X	X	2	
MRC-4	5/4/23	10:59	G	S			X	X	X	X	2	
MRC-8	5/4/23	11:26	G	S			X	X	X	X	2	
MRC-3	5/4/23	12:00	G	S			X	X	X	X	2	
MRC-1	5/4/23	12:28	G	S			X	X	X	X	2	
MRC-13	5/4/23	12:47	G	S			X	X	X	X	2	
Equipment Blank	5/4/23	12:58	G	W			X	X	X		2	
Dup-1	5/4/23	—	G	S			X	X	X	X	2	

Possible Hazard Identification
☐ Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☐ Unknown ☐ Radiological

Deliverable Requested: I, II, III, IV, Other (specify)

Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)
☐ Return To Client ☐ Disposal By Lab ☐ Archive For _____ Months

Special Instructions/QC Requirements:

Empty Kit Relinquished by:	Date:	Time:	Method of Shipment:
Relinquished by:	Date/Time: 5/4/23 13:42	Company: TRC	Received by: Jesse Reeves
Relinquished by:	Date/Time: 5/4/23 19:30	Company:	Received by:
Relinquished by:	Date/Time:	Company:	Received by:

Date/Time	Company
5/04/23 13:42	
5-4-23 19:30	EETSAC
Date/Time:	Company

Custody Seals Intact: Δ Yes Δ No | Custody Seal No.:

Cooler Temperature(s) °C and Other Remarks: 2.7 C

Ver: 01/16/2019

#204652

Eurofins Sacramento
880 Riverside Parkway
West Sacramento, CA 95605
Phone (916) 373-5600

Chain of Custody Record

eurofins | Environment Testing

Client Information	Sampler: L. Tait	Lab PM:	Carrier Tracking No(s):	COC No:
Client Contact: [redacted] Laura Tait	Phone: 925-494-4385	E-Mail: LTait@trccompanies.com	State of Origin:	Page: Page 2 of 2
Company: TRC	PWSID:			Job #:
Address: 1850 Gateway Blvd, Suite 1000	Due Date Requested:	Analysis Requested		
City: Concord	TAT Requested (days): 5-day TAT			
State, Zip: CA 94520	Compliance Project: Δ Yes Δ No			
Phone:	PO #: 200244			
Email:	WO #:			
Project Name: Martinez Refinery	Project #: 537895/01			
Site:	SSOW#:			

Preservation Codes:
A - HCL, B - NaOH, C - Zn Acetate, D - Nitric Acid, E - NaHSO4, F - MeOH, G - Amchlor, H - Ascorbic Acid, I - Ice, J - DI Water, K - EDTA, L - EDA, M - Hexane, N - None, O - AsNaO2, P - Na2O4S, Q - Na2SO3, R - Na2S2O3, S - H2SO4, T - TSP Dodecahydrate, U - Acetone, V - MCAA, W - pH 4-5, Y - Trizma, Z - other (specify)
Other:

Sample Identification	Sample Date	Sample Time	Sample Type (C=Comp, G=grab)	Matrix (W=water, S=solid, O=waste/oil, BT=Tissue, A=Air)	Field Filtered Sample (Yes or No)	Perform MS/MSD (Yes or No)	CAM 17 metals *	Aluminum	Hexavalent Chromium	pH	Total Number of containers	Special Instructions/Note:
			Preservation Code:									
MRC-14	5/4/23	13:17	G	S			X	X	X	X	2	* Do Not Report: Antimony, Cadmium, Mercury, Silver, Thallium

Possible Hazard Identification
☐ Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☐ Unknown ☐ Radiological

Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)
☐ Return To Client ☐ Disposal By Lab ☐ Archive For _____ Months

Deliverable Requested: I, II, III, IV, Other (specify)

Special Instructions/QC Requirements:

Empty Kit Relinquished by:	Date:	Time:	Method of Shipment:

	Date/Time	Company	Received by	Date/Time	Company
Relinquished by:	5/4/23 13:42	TRC	Jesse Reeves	5/4/23 19:30	SJ
Relinquished by:	5/4/23 19:30	SJ		5-4-23 19:30	ELETSAC
Relinquished by:	Date/Time:	Company	Received by:	Date/Time: NC 5-4-23	Company

Custody Seals Intact: Δ Yes Δ No | Custody Seal No.:

Cooler Temperature(s) °C and Other Remarks: 2.7C

Ver: 01/16/2019

Eurofins Sacramento
880 Riverside Parkway
West Sacramento, CA 95605
Phone: 916-373-5600 Fax: 916-372-1059

Chain of Custody Record

eurofins | Environment Testing

Client Information (Sub Contract Lab)	Sampler:	Lab PM: Smith, Micah	Carrier Tracking No(s):	COC No: 320-306786.1
Client Contact: Shipping/Receiving	Phone:	E-Mail: Micah.Smith@et.eurofinsus.com	State of Origin: California	Page: Page 1 of 2
Company: Eurofins Environment Testing Southwest,		Accreditations Required (See note): State - California		Job #: 320-99906-1
Address: 2841 Dow Avenue, Suite 100, ,	Due Date Requested: 5/15/2023			
City: Tustin	TAT Requested (days):			
State, Zip: CA, 92780				
Phone: 714-895-5494(Tel)	PO #:			
Email:	WO #:			
Project Name: Martinez Refinery	Project #: 32022029			
Site:	SSOW#:			

Analysis Requested

Preservation Codes:
A - HCL, B - NaOH, C - Zn Acetate, D - Nitric Acid, E - NaHSO4, F - MeOH, G - Amchlor, H - Ascorbic Acid, I - Ice, J - DI Water, K - EDTA, L - EDA, M - Hexane, N - None, O - AsNaO2, P - Na2O4S, Q - Na2SO3, R - Na2S2O3, S - H2SO4, T - TSP Dodecahydrate, U - Acetone, V - MCAA, W - pH 4-5, Y - Trizma, Z - other (specify)
Other:

Sample Identification - Client ID (Lab ID)	Sample Date	Sample Time	Sample Type (C=Comp, G=grab)	Matrix (W=water, S=solid, O=waste/oil, BT=Tissue, A=Air)	Field Filtered Sample (Yes or No)	Perform MS/MSD (Yes or No)	7199_ORGFM/3060A_IC Hexavalent Chromium	Total Number of containers	Special Instructions/Note:
			Preservation Code:						
MRC-9 (320-99906-1)	5/4/23	08:10 Pacific		Solid			X	1	
MRC-10 (320-99906-2)	5/4/23	08:48 Pacific		Solid			X	1	
MRC-11 (320-99906-3)	5/4/23	09:18 Pacific		Solid			X	1	
MRC-12 (320-99906-4)	5/4/23	09:57 Pacific		Solid			X	1	
MRC-4 (320-99906-5)	5/4/23	10:59 Pacific		Solid			X	1	
MRC-8 (320-99906-6)	5/4/23	11:26 Pacific		Solid			X		
MRC-3 (320-99906-7)	5/4/23	12:00 Pacific		Solid			X	1	
MRC-1 (320-99906-8)	5/4/23	12:28 Pacific		Solid			X	1	
MRC-13 (320-99906-9)	5/4/23	12:47 Pacific		Solid			X		

Note: Since laboratory accreditations are subject to change, Eurofins Environment Testing Northern California, LLC places the ownership of method, analyte & accreditation compliance upon our subcontract laboratories. This sample shipment is forwarded under chain-of-custody. If the laboratory does not currently maintain accreditation in the State of Origin listed above for analysis/tests/matrix being analyzed, the samples must be shipped back to the Eurofins Environment Testing Northern California, LLC laboratory or other instructions will be provided. Any changes to accreditation status should be brought to Eurofins Environment Testing Northern California, LLC attention immediately. If all requested accreditations are current to date, return the signed Chain of Custody attesting to said compliance to Eurofins Environment Testing Northern California, LLC.

Possible Hazard Identification *Unconfirmed*	***Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)*** ☐ *Return To Client* ☐ *Disposal By Lab* ☐ *Archive For* _____ *Months*
Deliverable Requested: I, II, III, IV, Other (specify) Primary Deliverable Rank: 1	Special Instructions/QC Requirements:

Empty Kit Relinquished by:	Date:	Time:	Method of Shipment:
Relinquished by: [signature]	Date/Time: 5-5-23 16:30	Company: EETSAC	Received by:	Date/Time:	Company
Relinquished by: (FedEx)	Date:		Received by: [signature]	Date/Time: 5-6-23 10:30	Company EC
Relinquished by:	Date:		Received by:	Date/Time:	Company

Custody Seals Intact: △ Yes △ No | Custody Seal No.:

320-99906 Chain of Custody

Cooler Temperature(s) °C and Other Remarks: 2-3 / 2-2 SC12

Ver: 06/08/2021

Eurofins Sacramento
880 Riverside Parkway
West Sacramento, CA 95605
Phone: 916-373-5600 Fax: 916-372-1059

Chain of Custody Record

eurofins | Environment Testing

Client Information (Sub Contract Lab)	Sampler:	Lab PM: Smith, Micah	Carrier Tracking No(s):	COC No: 320-306786.2
Client Contact: Shipping/Receiving	Phone:	E-Mail: Micah.Smith@et.eurofinsus.com	State of Origin: California	Page: Page 2 of 2
Company: Eurofins Environment Testing Southwest,		Accreditations Required (See note): State - California		Job #: 320-99906-1
Address: 2841 Dow Avenue, Suite 100, ,	Due Date Requested: 5/15/2023			
City: Tustin	TAT Requested (days):			
State, Zip: CA, 92780				
Phone: 714-895-5494(Tel)	PO #:			
Email:	WO #:			
Project Name: Martinez Refinery	Project #: 32022029			
Site:	SSOW#:			

Analysis Requested

Preservation Codes:

A - HCL, B - NaOH, C - Zn Acetate, D - Nitric Acid, E - NaHSO4, F - MeOH, G - Amchlor, H - Ascorbic Acid, I - Ice, J - DI Water, K - EDTA, L - EDA, M - Hexane, N - None, O - AsNaO2, P - Na2O4S, Q - Na2SO3, R - Na2S2O3, S - H2SO4, T - TSP Dodecahydrate, U - Acetone, V - MCAA, W - pH 4-5, Y - Trizma, Z - other (specify)

Other:

Sample Identification - Client ID (Lab ID)	Sample Date	Sample Time	Sample Type (C=Comp, G=grab)	Matrix (W=water, S=solid, O=waste/oil, BT=Tissue, A=Air)	Field Filtered Sample (Yes or No)	Perform MS/MSD (Yes or No)	7199_ORGFM/3060A_IC Hexavalent Chromium	Total Number of containers	Special Instructions/Note:
			Preservation Code:						
Dup-1 (320-99906-11)	5/4/23	Pacific		Solid			X	1	
MRC-14 (320-99906-12)	5/4/23	13:17 Pacific		Solid			X	1	

Note: Since laboratory accreditations are subject to change, Eurofins Environment Testing Northern California, LLC places the ownership of method, analyte & accreditation compliance upon our subcontract laboratories. This sample shipment is forwarded under chain-of-custody. If the laboratory does not currently maintain accreditation in the State of Origin listed above for analysis/tests/matrix being analyzed, the samples must be shipped back to the Eurofins Environment Testing Northern California, LLC laboratory or other instructions will be provided. Any changes to accreditation status should be brought to Eurofins Environment Testing Northern California, LLC attention immediately. If all requested accreditations are current to date, return the signed Chain of Custody attesting to said compliance to Eurofins Environment Testing Northern California, LLC.

Possible Hazard Identification: Unconfirmed	Sample Disposal (A fee may be assessed if samples are retained longer than 1 month): ☐ Return To Client ☐ Disposal By Lab ☐ Archive For _____ Months
Deliverable Requested: I, II, III, IV, Other (specify) Primary Deliverable Rank: 1	Special Instructions/QC Requirements:

Empty Kit Relinquished by:	Date:	Time:	Method of Shipment:

Relinquished by:	Date/Time:	Company	Received by:	Date/Time:	Company
(FedEX)	5-5-23 16:30	EETSAC			
Relinquished by:	Date/Time:	Company	Received by:	Date/Time: 5-6-23 10:30	Company EC
Relinquished by:	Date/Time:	Company	Received by:	Date/Time:	Company

Custody Seals Intact: ∆ Yes ∆ No	Custody Seal No.:	Cooler Temperature(s) °C and Other Remarks:

Ver: 06/08/2021

Login Sample Receipt Checklist

Client: TRC Environmental Corporation

Job Number: 320-99906-1

Login Number: 99906
List Number: 1
Creator: Pratali, Sandra A

List Source: Eurofins Sacramento

Question	Answer	Comment
Radioactivity wasn't checked or is </= background as measured by a survey meter.	True	
The cooler's custody seal, if present, is intact.	N/A	
Sample custody seals, if present, are intact.	N/A	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	True	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	True	
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time (excluding tests with immediate HTs)	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	N/A	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	True	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

Login Sample Receipt Checklist

Client: TRC Environmental Corporation

Job Number: 320-99906-1

Login Number: 99906
List Number: 2
Creator: Yu, Tiffany

List Source: Eurofins Calscience
List Creation: 05/06/23 01:45 PM

Question	Answer	Comment
Radioactivity wasn't checked or is </= background as measured by a survey meter.	N/A	
The cooler's custody seal, if present, is intact.	True	
Sample custody seals, if present, are intact.	True	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	True	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	2.2
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	False	Received project as a subcontract.
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time (excluding tests with immediate HTs)	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	True	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	True	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

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ANALYTICAL REPORT

PREPARED FOR

Attn: Laura Tait
TRC Environmental Corporation
1850 Gateway Blvd
Suite 1000
Concord, California 94520

Generated 5/25/2023 3:38:57 PM Revision 1

JOB DESCRIPTION

Martinez Refinery

JOB NUMBER

320-99962-1

Eurofins Sacramento
880 Riverside Parkway
West Sacramento CA 95605

See page two for job notes and contact information.

Job Notes

This report may not be reproduced except in full, and with written approval from the laboratory. The results relate only to the samples tested. For questions please contact the Project Manager at the e-mail address or telephone number listed on this page.

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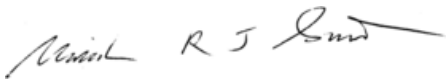
Authorization



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Revision 1

Authorized for release by
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Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
¤	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CFL	Contains Free Liquid
CFU	Colony Forming Unit
CNF	Contains No Free Liquid
DER	Duplicate Error Ratio (normalized absolute difference)
Dil Fac	Dilution Factor
DL	Detection Limit (DoD/DOE)
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision Level Concentration (Radiochemistry)
EDL	Estimated Detection Limit (Dioxin)
LOD	Limit of Detection (DoD/DOE)
LOQ	Limit of Quantitation (DoD/DOE)
MCL	EPA recommended "Maximum Contaminant Level"
MDA	Minimum Detectable Activity (Radiochemistry)
MDC	Minimum Detectable Concentration (Radiochemistry)
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
MPN	Most Probable Number
MQL	Method Quantitation Limit
NC	Not Calculated
ND	Not Detected at the reporting limit (or MDL or EDL if shown)
NEG	Negative / Absent
POS	Positive / Present
PQL	Practical Quantitation Limit
PRES	Presumptive
QC	Quality Control
RER	Relative Error Ratio (Radiochemistry)
RL	Reporting Limit or Requested Limit (Radiochemistry)
RPD	Relative Percent Difference, a measure of the relative difference between two points
TEF	Toxicity Equivalent Factor (Dioxin)
TEQ	Toxicity Equivalent Quotient (Dioxin)
TNTC	Too Numerous To Count

Job ID: 320-99962-1

Laboratory: Eurofins Sacramento

Narrative

Job Narrative
320-99962-1

Comments
No additional comments.

Revision
The report being provided is a revision of the original report sent on 5/15/2023. The report (revision 1) was revised for Method 7199 (soil) to accommodate the client's request for a nominal reporting limit (RL) of 200 ug/kg in lieu of the laboratory's default RL (400 ug/kg).

Receipt
The samples were received on 5/5/2023 6:30 PM. Unless otherwise noted below, the samples arrived in good condition, and where required, properly preserved and on ice. The temperature of the cooler at receipt was 1.3º C.

HPLC/IC
No analytical or quality issues were noted, other than those described in the Definitions/Glossary page.

Metals
Method 6010B: The post digestion spike % recovery for Antimony associated with batch 320-673758 was outside of control limits. The associated sample is: (320-99252-B-1-C PDS).

Method 6010B: The matrix spike / matrix spike duplicate (MS/MSD) recoveries for preparation batch 320-673459 and analytical batch 320-673758 were outside control limits for one or more analytes. See QC Sample Results for detail. Sample matrix interference and/or non-homogeneity are suspected because the associated laboratory control sample (LCS) recovery is within acceptance limits.

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

General Chemistry
No analytical or quality issues were noted, other than those described in the Definitions/Glossary page.

Detection Summary

Client: TRC Environmental Corporation
Project/Site: Martinez Refinery

Job ID: 320-99962-1

Client Sample ID: MRC-2 — Lab Sample ID: 320-99962-1

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Arsenic	28		2.4		mg/Kg	1	☼	6010B	Total/NA
Barium	110		1.2		mg/Kg	1	☼	6010B	Total/NA
Beryllium	0.53		0.24		mg/Kg	1	☼	6010B	Total/NA
Aluminum	19000		24		mg/Kg	1	☼	6010B	Total/NA
Chromium	57		0.59		mg/Kg	1	☼	6010B	Total/NA
Cobalt	19		0.59		mg/Kg	1	☼	6010B	Total/NA
Copper	53		1.8		mg/Kg	1	☼	6010B	Total/NA
Lead	79		1.2		mg/Kg	1	☼	6010B	Total/NA
Nickel	56		1.2		mg/Kg	1	☼	6010B	Total/NA
Vanadium	70		0.59		mg/Kg	1	☼	6010B	Total/NA
Zinc	82		2.4		mg/Kg	1	☼	6010B	Total/NA
pH adj. to 25 deg C	6.1		0.1		SU	1		9045C	Soluble

Client Sample ID: MRC-5 — Lab Sample ID: 320-99962-2

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Arsenic	7.5		2.4		mg/Kg	1	☼	6010B	Total/NA
Barium	600		1.2		mg/Kg	1	☼	6010B	Total/NA
Beryllium	0.61		0.24		mg/Kg	1	☼	6010B	Total/NA
Aluminum	23000		24		mg/Kg	1	☼	6010B	Total/NA
Chromium	46		0.61		mg/Kg	1	☼	6010B	Total/NA
Cobalt	15		0.61		mg/Kg	1	☼	6010B	Total/NA
Copper	44		1.8		mg/Kg	1	☼	6010B	Total/NA
Lead	11		1.2		mg/Kg	1	☼	6010B	Total/NA
Nickel	44		1.2		mg/Kg	1	☼	6010B	Total/NA
Vanadium	69		0.61		mg/Kg	1	☼	6010B	Total/NA
Zinc	65		2.4		mg/Kg	1	☼	6010B	Total/NA
pH adj. to 25 deg C	6.8		0.1		SU	1		9045C	Soluble

Client Sample ID: MRC-7 — Lab Sample ID: 320-99962-3

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Arsenic	8.8		2.4		mg/Kg	1	☼	6010B	Total/NA
Barium	560		1.2		mg/Kg	1	☼	6010B	Total/NA
Beryllium	0.62		0.24		mg/Kg	1	☼	6010B	Total/NA
Aluminum	21000		24		mg/Kg	1	☼	6010B	Total/NA
Chromium	51		0.61		mg/Kg	1	☼	6010B	Total/NA
Cobalt	18		0.61		mg/Kg	1	☼	6010B	Total/NA
Copper	63		1.8		mg/Kg	1	☼	6010B	Total/NA
Lead	31		1.2		mg/Kg	1	☼	6010B	Total/NA
Nickel	60		1.2		mg/Kg	1	☼	6010B	Total/NA
Vanadium	64		0.61		mg/Kg	1	☼	6010B	Total/NA
Zinc	110		2.4		mg/Kg	1	☼	6010B	Total/NA
pH adj. to 25 deg C	7.2		0.1		SU	1		9045C	Soluble

Client Sample ID: MRC-6 — Lab Sample ID: 320-99962-4

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Arsenic	6.8		2.5		mg/Kg	1	☼	6010B	Total/NA
Barium	170		1.2		mg/Kg	1	☼	6010B	Total/NA
Beryllium	0.48		0.25		mg/Kg	1	☼	6010B	Total/NA
Aluminum	17000		25		mg/Kg	1	☼	6010B	Total/NA

This Detection Summary does not include radiochemical test results.

Client Sample ID: MRC-6 (Continued)

Lab Sample ID: 320-99962-4

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Chromium	43		0.62		mg/Kg	1	☼	6010B	Total/NA
Cobalt	12		0.62		mg/Kg	1	☼	6010B	Total/NA
Copper	28		1.9		mg/Kg	1	☼	6010B	Total/NA
Lead	31		1.2		mg/Kg	1	☼	6010B	Total/NA
Nickel	40		1.2		mg/Kg	1	☼	6010B	Total/NA
Vanadium	59		0.62		mg/Kg	1	☼	6010B	Total/NA
Zinc	66		2.5		mg/Kg	1	☼	6010B	Total/NA
pH adj. to 25 deg C	7.1		0.1		SU	1		9045C	Soluble

This Detection Summary does not include radiochemical test results.

Client Sample ID: MRC-2

Date Collected: 05/04/23 14:10
Date Received: 05/05/23 18:30

Lab Sample ID: 320-99962-1

Matrix: Solid
Percent Solids: 81.5

Method: SW846 7199 - Chromium, Hexavalent (IC)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chromium, hexavalent	ND		250	240	ug/Kg	☼	05/11/23 05:00	05/11/23 14:45	10

Method: SW846 6010B - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	**28**		2.4		mg/Kg	☼	05/10/23 06:15	05/10/23 15:06	1
Barium	**110**		1.2		mg/Kg	☼	05/10/23 06:15	05/10/23 15:06	1
Beryllium	**0.53**		0.24		mg/Kg	☼	05/10/23 06:15	05/10/23 15:06	1
Aluminum	**19000**		24		mg/Kg	☼	05/10/23 06:15	05/10/23 15:06	1
Chromium	**57**		0.59		mg/Kg	☼	05/10/23 06:15	05/10/23 15:06	1
Cobalt	**19**		0.59		mg/Kg	☼	05/10/23 06:15	05/10/23 15:06	1
Copper	**53**		1.8		mg/Kg	☼	05/10/23 06:15	05/10/23 15:06	1
Lead	**79**		1.2		mg/Kg	☼	05/10/23 06:15	05/10/23 15:06	1
Molybdenum	ND		2.4		mg/Kg	☼	05/10/23 06:15	05/10/23 15:06	1
Nickel	**56**		1.2		mg/Kg	☼	05/10/23 06:15	05/10/23 15:06	1
Selenium	ND		2.4		mg/Kg	☼	05/10/23 06:15	05/10/23 15:06	1
Vanadium	**70**		0.59		mg/Kg	☼	05/10/23 06:15	05/10/23 15:06	1
Zinc	**82**		2.4		mg/Kg	☼	05/10/23 06:15	05/10/23 15:06	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Moisture (ASTM D 2216)	**18.5**		0.1		%			05/08/23 20:10	1
Percent Solids (ASTM D 2216)	**81.5**		0.1		%			05/08/23 20:10	1

General Chemistry - Soluble

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
pH adj. to 25 deg C (SW846 9045C)	**6.1**		0.1		SU			05/09/23 11:24	1

Client Sample ID: MRC-5

Date Collected: 05/04/23 14:49
Date Received: 05/05/23 18:30

Lab Sample ID: 320-99962-2

Matrix: Solid
Percent Solids: 81.7

Method: SW846 7199 - Chromium, Hexavalent (IC)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chromium, hexavalent	ND		240	230	ug/Kg	☼	05/11/23 05:00	05/11/23 14:56	10

Method: SW846 6010B - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	**7.5**		2.4		mg/Kg	☼	05/10/23 06:15	05/10/23 15:15	1
Barium	**600**		1.2		mg/Kg	☼	05/10/23 06:15	05/10/23 15:15	1
Beryllium	**0.61**		0.24		mg/Kg	☼	05/10/23 06:15	05/10/23 15:15	1
Aluminum	**23000**		24		mg/Kg	☼	05/10/23 06:15	05/10/23 15:15	1
Chromium	**46**		0.61		mg/Kg	☼	05/10/23 06:15	05/10/23 15:15	1
Cobalt	**15**		0.61		mg/Kg	☼	05/10/23 06:15	05/10/23 15:15	1
Copper	**44**		1.8		mg/Kg	☼	05/10/23 06:15	05/10/23 15:15	1
Lead	**11**		1.2		mg/Kg	☼	05/10/23 06:15	05/10/23 15:15	1
Molybdenum	ND		2.4		mg/Kg	☼	05/10/23 06:15	05/10/23 15:15	1
Nickel	**44**		1.2		mg/Kg	☼	05/10/23 06:15	05/10/23 15:15	1
Selenium	ND		2.4		mg/Kg	☼	05/10/23 06:15	05/10/23 15:15	1
Vanadium	**69**		0.61		mg/Kg	☼	05/10/23 06:15	05/10/23 15:15	1
Zinc	**65**		2.4		mg/Kg	☼	05/10/23 06:15	05/10/23 15:15	1

Client Sample ID: MRC-5

Lab Sample ID: 320-99962-2
Date Collected: 05/04/23 14:49
Matrix: Solid
Date Received: 05/05/23 18:30
Percent Solids: 81.7

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Moisture (ASTM D 2216)	18.3		0.1		%			05/08/23 20:10	1
Percent Solids (ASTM D 2216)	81.7		0.1		%			05/08/23 20:10	1

General Chemistry - Soluble

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
pH adj. to 25 deg C (SW846 9045C)	6.8		0.1		SU			05/09/23 11:24	1

Client Sample ID: MRC-7

Lab Sample ID: 320-99962-3
Date Collected: 05/05/23 09:18
Matrix: Solid
Date Received: 05/05/23 18:30
Percent Solids: 86.4

Method: SW846 7199 - Chromium, Hexavalent (IC)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chromium, hexavalent	ND		230	220	ug/Kg	☼	05/15/23 03:00	05/15/23 09:16	10

Method: SW846 6010B - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	8.8		2.4		mg/Kg	☼	05/10/23 06:15	05/10/23 15:18	1
Barium	560		1.2		mg/Kg	☼	05/10/23 06:15	05/10/23 15:18	1
Beryllium	0.62		0.24		mg/Kg	☼	05/10/23 06:15	05/10/23 15:18	1
Aluminum	21000		24		mg/Kg	☼	05/10/23 06:15	05/10/23 15:18	1
Chromium	51		0.61		mg/Kg	☼	05/10/23 06:15	05/10/23 15:18	1
Cobalt	18		0.61		mg/Kg	☼	05/10/23 06:15	05/10/23 15:18	1
Copper	63		1.8		mg/Kg	☼	05/10/23 06:15	05/10/23 15:18	1
Lead	31		1.2		mg/Kg	☼	05/10/23 06:15	05/10/23 15:18	1
Molybdenum	ND		2.4		mg/Kg	☼	05/10/23 06:15	05/10/23 15:18	1
Nickel	60		1.2		mg/Kg	☼	05/10/23 06:15	05/10/23 15:18	1
Selenium	ND		2.4		mg/Kg	☼	05/10/23 06:15	05/10/23 15:18	1
Vanadium	64		0.61		mg/Kg	☼	05/10/23 06:15	05/10/23 15:18	1
Zinc	110		2.4		mg/Kg	☼	05/10/23 06:15	05/10/23 15:18	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Moisture (ASTM D 2216)	13.6		0.1		%			05/08/23 20:10	1
Percent Solids (ASTM D 2216)	86.4		0.1		%			05/08/23 20:10	1

General Chemistry - Soluble

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
pH adj. to 25 deg C (SW846 9045C)	7.2		0.1		SU			05/09/23 11:24	1

Client Sample ID: MRC-6

Lab Sample ID: 320-99962-4
Date Collected: 05/05/23 09:43
Matrix: Solid
Date Received: 05/05/23 18:30
Percent Solids: 84.6

Method: SW846 7199 - Chromium, Hexavalent (IC)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chromium, hexavalent	ND		230	220	ug/Kg	☼	05/15/23 03:00	05/15/23 09:28	10

Method: SW846 6010B - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	6.8		2.5		mg/Kg	☼	05/10/23 06:15	05/10/23 15:21	1
Barium	170		1.2		mg/Kg	☼	05/10/23 06:15	05/10/23 15:21	1

Client: TRC Environmental Corporation
Project/Site: Martinez Refinery

Job ID: 320-99962-1

Client Sample ID: MRC-6
Date Collected: 05/05/23 09:43
Date Received: 05/05/23 18:30

Lab Sample ID: 320-99962-4
Matrix: Solid
Percent Solids: 84.6

Method: SW846 6010B - Metals (ICP) (Continued)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Beryllium	0.48		0.25		mg/Kg	☼	05/10/23 06:15	05/10/23 15:21	1
Aluminum	17000		25		mg/Kg	☼	05/10/23 06:15	05/10/23 15:21	1
Chromium	43		0.62		mg/Kg	☼	05/10/23 06:15	05/10/23 15:21	1
Cobalt	12		0.62		mg/Kg	☼	05/10/23 06:15	05/10/23 15:21	1
Copper	28		1.9		mg/Kg	☼	05/10/23 06:15	05/10/23 15:21	1
Lead	31		1.2		mg/Kg	☼	05/10/23 06:15	05/10/23 15:21	1
Molybdenum	ND		2.5		mg/Kg	☼	05/10/23 06:15	05/10/23 15:21	1
Nickel	40		1.2		mg/Kg	☼	05/10/23 06:15	05/10/23 15:21	1
Selenium	ND		2.5		mg/Kg	☼	05/10/23 06:15	05/10/23 15:21	1
Vanadium	59		0.62		mg/Kg	☼	05/10/23 06:15	05/10/23 15:21	1
Zinc	66		2.5		mg/Kg	☼	05/10/23 06:15	05/10/23 15:21	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Moisture (ASTM D 2216)	15.4		0.1		%			05/08/23 20:10	1
Percent Solids (ASTM D 2216)	84.6		0.1		%			05/08/23 20:10	1

General Chemistry - Soluble

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
pH adj. to 25 deg C (SW846 9045C)	7.1		0.1		SU			05/09/23 11:24	1

Method: 7199 - Chromium, Hexavalent (IC)

Lab Sample ID: MB 570-327749/1-A
Matrix: Solid
Analysis Batch: 328103

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 327749

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chromium, hexavalent	ND		200	200	ug/Kg		05/11/23 05:00	05/11/23 10:12	10

Lab Sample ID: LCS 570-327749/2-A
Matrix: Solid
Analysis Batch: 328103

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 327749

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits
Chromium, hexavalent	20300	21200		ug/Kg		104	80 - 120

Lab Sample ID: LCSD 570-327749/3-A
Matrix: Solid
Analysis Batch: 328103

Client Sample ID: Lab Control Sample Dup
Prep Type: Total/NA
Prep Batch: 327749

Analyte	Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec Limits	RPD	RPD Limit
Chromium, hexavalent	20000	20400		ug/Kg		102	80 - 120	4	20

Lab Sample ID: MB 570-328544/1-A
Matrix: Solid
Analysis Batch: 328865

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 328544

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chromium, hexavalent	ND		200	190	ug/Kg		05/15/23 03:00	05/15/23 07:28	10

Lab Sample ID: LCS 570-328544/2-A
Matrix: Solid
Analysis Batch: 328865

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 328544

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits
Chromium, hexavalent	20300	19700		ug/Kg		97	80 - 120

Lab Sample ID: LCSD 570-328544/3-A
Matrix: Solid
Analysis Batch: 328865

Client Sample ID: Lab Control Sample Dup
Prep Type: Total/NA
Prep Batch: 328544

Analyte	Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec Limits	RPD	RPD Limit
Chromium, hexavalent	19700	22000		ug/Kg		112	80 - 120	11	20

Method: 6010B - Metals (ICP)

Lab Sample ID: MB 320-673459/1-A
Matrix: Solid
Analysis Batch: 673758

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 673459

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	ND		2.0		mg/Kg		05/10/23 06:15	05/10/23 14:30	1
Barium	ND		1.0		mg/Kg		05/10/23 06:15	05/10/23 14:30	1
Beryllium	ND		0.20		mg/Kg		05/10/23 06:15	05/10/23 14:30	1
Aluminum	ND		20		mg/Kg		05/10/23 06:15	05/10/23 14:30	1
Chromium	ND		0.50		mg/Kg		05/10/23 06:15	05/10/23 14:30	1
Cobalt	ND		0.50		mg/Kg		05/10/23 06:15	05/10/23 14:30	1

Method: 6010B - Metals (ICP) (Continued)

Lab Sample ID: MB 320-673459/1-A
Matrix: Solid
Analysis Batch: 673758

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 673459

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Copper	ND		1.5		mg/Kg		05/10/23 06:15	05/10/23 14:30	1
Lead	ND		1.0		mg/Kg		05/10/23 06:15	05/10/23 14:30	1
Molybdenum	ND		2.0		mg/Kg		05/10/23 06:15	05/10/23 14:30	1
Nickel	ND		1.0		mg/Kg		05/10/23 06:15	05/10/23 14:30	1
Selenium	ND		2.0		mg/Kg		05/10/23 06:15	05/10/23 14:30	1
Vanadium	ND		0.50		mg/Kg		05/10/23 06:15	05/10/23 14:30	1
Zinc	ND		2.0		mg/Kg		05/10/23 06:15	05/10/23 14:30	1

Lab Sample ID: LCS 320-673459/2-A
Matrix: Solid
Analysis Batch: 673758

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 673459

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits
Arsenic	50.0	47.4		mg/Kg		95	80 - 120
Barium	50.0	46.8		mg/Kg		94	80 - 120
Beryllium	25.0	24.2		mg/Kg		97	80 - 120
Aluminum	500	483		mg/Kg		97	80 - 120
Chromium	25.0	24.9		mg/Kg		100	80 - 120
Cobalt	25.0	23.8		mg/Kg		95	80 - 120
Copper	25.0	22.3		mg/Kg		89	80 - 120
Lead	25.0	25.3		mg/Kg		101	80 - 120
Molybdenum	25.0	20.2		mg/Kg		81	80 - 120
Nickel	25.0	23.1		mg/Kg		92	80 - 120
Selenium	50.0	51.3		mg/Kg		103	80 - 120
Vanadium	25.0	24.8		mg/Kg		99	80 - 120
Zinc	50.5	51.1		mg/Kg		101	80 - 120

Method: 9045C - pH

Lab Sample ID: LCS 320-672979/2
Matrix: Solid
Analysis Batch: 672979

Client Sample ID: Lab Control Sample
Prep Type: Total/NA

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits
pH adj. to 25 deg C	8.00	8.0		SU		100	98 - 102

HPLC/IC

Prep Batch: 327749

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
320-99962-1	MRC-2	Total/NA	Solid	3060A	
320-99962-2	MRC-5	Total/NA	Solid	3060A	
MB 570-327749/1-A	Method Blank	Total/NA	Solid	3060A	
LCS 570-327749/2-A	Lab Control Sample	Total/NA	Solid	3060A	
LCSD 570-327749/3-A	Lab Control Sample Dup	Total/NA	Solid	3060A	

Analysis Batch: 328103

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
320-99962-1	MRC-2	Total/NA	Solid	7199	327749
320-99962-2	MRC-5	Total/NA	Solid	7199	327749
MB 570-327749/1-A	Method Blank	Total/NA	Solid	7199	327749
LCS 570-327749/2-A	Lab Control Sample	Total/NA	Solid	7199	327749
LCSD 570-327749/3-A	Lab Control Sample Dup	Total/NA	Solid	7199	327749

Prep Batch: 328544

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
320-99962-3	MRC-7	Total/NA	Solid	3060A	
320-99962-4	MRC-6	Total/NA	Solid	3060A	
MB 570-328544/1-A	Method Blank	Total/NA	Solid	3060A	
LCS 570-328544/2-A	Lab Control Sample	Total/NA	Solid	3060A	
LCSD 570-328544/3-A	Lab Control Sample Dup	Total/NA	Solid	3060A	

Analysis Batch: 328865

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
320-99962-3	MRC-7	Total/NA	Solid	7199	328544
320-99962-4	MRC-6	Total/NA	Solid	7199	328544
MB 570-328544/1-A	Method Blank	Total/NA	Solid	7199	328544
LCS 570-328544/2-A	Lab Control Sample	Total/NA	Solid	7199	328544
LCSD 570-328544/3-A	Lab Control Sample Dup	Total/NA	Solid	7199	328544

Metals

Prep Batch: 673459

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
320-99962-1	MRC-2	Total/NA	Solid	3050B	
320-99962-2	MRC-5	Total/NA	Solid	3050B	
320-99962-3	MRC-7	Total/NA	Solid	3050B	
320-99962-4	MRC-6	Total/NA	Solid	3050B	
MB 320-673459/1-A	Method Blank	Total/NA	Solid	3050B	
LCS 320-673459/2-A	Lab Control Sample	Total/NA	Solid	3050B	

Analysis Batch: 673758

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
320-99962-1	MRC-2	Total/NA	Solid	6010B	673459
320-99962-2	MRC-5	Total/NA	Solid	6010B	673459
320-99962-3	MRC-7	Total/NA	Solid	6010B	673459
320-99962-4	MRC-6	Total/NA	Solid	6010B	673459
MB 320-673459/1-A	Method Blank	Total/NA	Solid	6010B	673459
LCS 320-673459/2-A	Lab Control Sample	Total/NA	Solid	6010B	673459

QC Association Summary

Client: TRC Environmental Corporation
Project/Site: Martinez Refinery

Job ID: 320-99962-1

General Chemistry

Analysis Batch: 672979

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
320-99962-1	MRC-2	Soluble	Solid	9045C	673034
320-99962-2	MRC-5	Soluble	Solid	9045C	673034
320-99962-3	MRC-7	Soluble	Solid	9045C	673034
320-99962-4	MRC-6	Soluble	Solid	9045C	673034
LCS 320-672979/2	Lab Control Sample	Total/NA	Solid	9045C	

Leach Batch: 673034

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
320-99962-1	MRC-2	Soluble	Solid	DI Leach	
320-99962-2	MRC-5	Soluble	Solid	DI Leach	
320-99962-3	MRC-7	Soluble	Solid	DI Leach	
320-99962-4	MRC-6	Soluble	Solid	DI Leach	

Analysis Batch: 673224

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
320-99962-1	MRC-2	Total/NA	Solid	D 2216	
320-99962-2	MRC-5	Total/NA	Solid	D 2216	
320-99962-3	MRC-7	Total/NA	Solid	D 2216	
320-99962-4	MRC-6	Total/NA	Solid	D 2216	

Lab Chronicle

Client: TRC Environmental Corporation
Project/Site: Martinez Refinery

Job ID: 320-99962-1

Client Sample ID: MRC-2
Date Collected: 05/04/23 14:10
Date Received: 05/05/23 18:30

Lab Sample ID: 320-99962-1
Matrix: Solid

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Soluble	Leach	DI Leach			19.56 g	20 mL	673034	05/08/23 16:03	H1Z	EET SAC
Soluble	Analysis	9045C		1	20 mL	20 mL	672979	05/09/23 11:24	H1Z	EET SAC
Total/NA	Analysis	D 2216		1			673224	05/08/23 20:10	JP	EET SAC

Client Sample ID: MRC-2
Date Collected: 05/04/23 14:10
Date Received: 05/05/23 18:30

Lab Sample ID: 320-99962-1
Matrix: Solid
Percent Solids: 81.5

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3060A			1.25 g	50 mL	327749	05/11/23 05:00	YO8L	EET CAL 4
Total/NA	Analysis	7199		10	4 mL	4 mL	328103	05/11/23 14:45	YO8L	EET CAL 4
Total/NA	Prep	3050B			1.04 g	100 mL	673459	05/10/23 06:15	NIM	EET SAC
Total/NA	Analysis	6010B		1			673758	05/10/23 15:06	SP	EET SAC

Client Sample ID: MRC-5
Date Collected: 05/04/23 14:49
Date Received: 05/05/23 18:30

Lab Sample ID: 320-99962-2
Matrix: Solid

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Soluble	Leach	DI Leach			19.52 g	20 mL	673034	05/08/23 16:03	H1Z	EET SAC
Soluble	Analysis	9045C		1	20 mL	20 mL	672979	05/09/23 11:24	H1Z	EET SAC
Total/NA	Analysis	D 2216		1			673224	05/08/23 20:10	JP	EET SAC

Client Sample ID: MRC-5
Date Collected: 05/04/23 14:49
Date Received: 05/05/23 18:30

Lab Sample ID: 320-99962-2
Matrix: Solid
Percent Solids: 81.7

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3060A			1.27 g	50 mL	327749	05/11/23 05:00	YO8L	EET CAL 4
Total/NA	Analysis	7199		10	4 mL	4 mL	328103	05/11/23 14:56	YO8L	EET CAL 4
Total/NA	Prep	3050B			1.00 g	100 mL	673459	05/10/23 06:15	NIM	EET SAC
Total/NA	Analysis	6010B		1			673758	05/10/23 15:15	SP	EET SAC

Client Sample ID: MRC-7
Date Collected: 05/05/23 09:18
Date Received: 05/05/23 18:30

Lab Sample ID: 320-99962-3
Matrix: Solid

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Soluble	Leach	DI Leach			20.26 g	20 mL	673034	05/08/23 16:03	H1Z	EET SAC
Soluble	Analysis	9045C		1	20 mL	20 mL	672979	05/09/23 11:24	H1Z	EET SAC
Total/NA	Analysis	D 2216		1			673224	05/08/23 20:10	JP	EET SAC

Lab Chronicle

Client: TRC Environmental Corporation
Project/Site: Martinez Refinery

Job ID: 320-99962-1

Client Sample ID: MRC-7

Date Collected: 05/05/23 09:18
Date Received: 05/05/23 18:30

Lab Sample ID: 320-99962-3

Matrix: Solid
Percent Solids: 86.4

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3060A			1.24 g	50 mL	328544	05/15/23 03:00	YO8L	EET CAL 4
Total/NA	Analysis	7199		10	4 mL	4 mL	328865	05/15/23 09:16	YO8L	EET CAL 4
Total/NA	Prep	3050B			0.95 g	100 mL	673459	05/10/23 06:15	NIM	EET SAC
Total/NA	Analysis	6010B		1			673758	05/10/23 15:18	SP	EET SAC

Client Sample ID: MRC-6

Date Collected: 05/05/23 09:43
Date Received: 05/05/23 18:30

Lab Sample ID: 320-99962-4

Matrix: Solid

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Soluble	Leach	DI Leach			19.93 g	20 mL	673034	05/08/23 16:03	H1Z	EET SAC
Soluble	Analysis	9045C		1	20 mL	20 mL	672979	05/09/23 11:24	H1Z	EET SAC
Total/NA	Analysis	D 2216		1			673224	05/08/23 20:10	JP	EET SAC

Client Sample ID: MRC-6

Date Collected: 05/05/23 09:43
Date Received: 05/05/23 18:30

Lab Sample ID: 320-99962-4

Matrix: Solid
Percent Solids: 84.6

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3060A			1.26 g	50 mL	328544	05/15/23 03:00	YO8L	EET CAL 4
Total/NA	Analysis	7199		10	4 mL	4 mL	328865	05/15/23 09:28	YO8L	EET CAL 4
Total/NA	Prep	3050B			0.95 g	100 mL	673459	05/10/23 06:15	NIM	EET SAC
Total/NA	Analysis	6010B		1			673758	05/10/23 15:21	SP	EET SAC

Laboratory References:

EET CAL 4 = Eurofins Calscience Tustin, 2841 Dow Avenue, Tustin, CA 92780, TEL (714)895-5494

EET SAC = Eurofins Sacramento, 880 Riverside Parkway, West Sacramento, CA 95605, TEL (916)373-5600

Accreditation/Certification Summary

Client: TRC Environmental Corporation
Job ID: 320-99962-1
Project/Site: Martinez Refinery

Laboratory: Eurofins Sacramento

Unless otherwise noted, all analytes for this laboratory were covered under each accreditation/certification below.

Authority	Program	Identification Number	Expiration Date
California	State	2897	01-22-24

The following analytes are included in this report, but the laboratory is not certified by the governing authority. This list may include analytes for which the agency does not offer certification.

Analysis Method	Prep Method	Matrix	Analyte
D 2216		Solid	Percent Moisture
D 2216		Solid	Percent Solids

Laboratory: Eurofins Calscience

The accreditations/certifications listed below are applicable to this report.

Authority	Program	Identification Number	Expiration Date
California	State	3082	07-31-24

Method Summary

Client: TRC Environmental Corporation
Project/Site: Martinez Refinery

Job ID: 320-99962-1

Method	Method Description	Protocol	Laboratory
7199	Chromium, Hexavalent (IC)	SW846	EET CAL 4
6010B	Metals (ICP)	SW846	EET SAC
9045C	pH	SW846	EET SAC
D 2216	Percent Moisture	ASTM	EET SAC
3050B	Preparation, Metals	SW846	EET SAC
3060A	Alkaline Digestion (Chromium, Hexavalent)	SW846	EET CAL 4
DI Leach	Deionized Water Leaching Procedure	ASTM	EET SAC

Protocol References:

ASTM = ASTM International

SW846 = "Test Methods For Evaluating Solid Waste, Physical/Chemical Methods", Third Edition, November 1986 And Its Updates.

Laboratory References:

EET CAL 4 = Eurofins Calscience Tustin, 2841 Dow Avenue, Tustin, CA 92780, TEL (714)895-5494

EET SAC = Eurofins Sacramento, 880 Riverside Parkway, West Sacramento, CA 95605, TEL (916)373-5600

Sample Summary

Client: TRC Environmental Corporation
Project/Site: Martinez Refinery

Job ID: 320-99962-1

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
320-99962-1	MRC-2	Solid	05/04/23 14:10	05/05/23 18:30
320-99962-2	MRC-5	Solid	05/04/23 14:49	05/05/23 18:30
320-99962-3	MRC-7	Solid	05/05/23 09:18	05/05/23 18:30
320-99962-4	MRC-6	Solid	05/05/23 09:43	05/05/23 18:30

Eurofins Sacramento
880 Riverside Parkway
West Sacramento, CA 95605
Phone (916) 373-5600

Chain of Custody Record

204638

eurofins | Environment Testing

Client Information	Sampler: L. Tait	Lab PM:	Carrier Tracking No(s):	COC No:
Client Contact: Lara Tait	Phone: 925-944-4385	E-Mail: LTait@trccompanies.com	State of Origin:	Page: Page 1 of 1
Company: TRC	PWSID:	Analysis Requested		Job #:
Address: 1850 Gateway Blvd, Suite 1000	Due Date Requested:			Preservation Codes:
City: Concord	TAT Requested (days): 5-day TAT			A - HCL, B - NaOH, C - Zn Acetate, D - Nitric Acid, E - NaHSO4, F - MeOH, G - Amchlor, H - Ascorbic Acid, I - Ice, J - DI Water, K - EDTA, L - EDA, M - Hexane, N - None, O - AsNaO2, P - Na2O4S, Q - Na2SO3, R - Na2S2O3, S - H2SO4, T - TSP Dodecahydrate, U - Acetone, V - MCAA, W - pH 4-5, Y - Trizma, Z - other (specify)
State, Zip: CA 94520	Compliance Project: Δ Yes Δ No			
Phone:	PO #: 200244			Other:
Email:	WO #:			
Project Name: Martinez Refinery	Project #: 537895/01			
Site:	SSOW#:			

Sample Identification	Sample Date	Sample Time	Sample Type (C=Comp, G=grab)	Matrix (W=water, S=solid, O=waste/oil, BT=Tissue, A=Air)	Field Filtered Sample (Yes or No)	Perform MS/MSD (Yes or No)	CAM 17 metals *	Aluminum	Hexavalent Chromium	pH	Total Number of containers	Special Instructions/Note:
			Preservation Code:									
MRC-2	5/4/23	14:40	G	S			X	X	X	X	2	* Do Not Report: Antimony, Cadmium, Mercury, Silver, Thallium
MRC-5	5/4/23	14:49	G	S			X	X	X	X	2	
MRC-7	5/5/23	9:18	G	S			X	X	X	X	2	
MRC-6	5/5/23	9:43	G	S			X	X	X	X	2	

320-99962 Chain of Custody

Possible Hazard Identification
☐ Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☐ Unknown ☐ Radiological

Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)
☐ Return To Client ☐ Disposal By Lab ☐ Archive For _____ Months

Deliverable Requested: I, II, III, IV, Other (specify)

Special Instructions/QC Requirements:

Empty Kit Relinquished by:	Date:	Time:	Method of Shipment:

	Relinquished by:	Date/Time:	Company	Received by:	Date/Time:	Company
1	[signature]	5/5/23 11:50	TRC	[signature]	5/5/23 11:50	
2	[signature]	5/5/23 18:30		[signature]	5-5-23 1830	ECTA
3	Relinquished by:	Date/Time:	Company	Received by:	Date/Time:	Company

Custody Seals Intact: Δ Yes Δ No | Custody Seal No.:

Cooler Temperature(s) °C and Other Remarks: 1.3

3.8 C°

Ver: 01/16/2019

Eurofins Sacramento
880 Riverside Parkway
West Sacramento, CA 95605
Phone: 916-373-5600 Fax: 916-372-1059

Chain of Custody Record

eurofins | Env

Loc: 320
99962

Client Information (Sub Contract Lab)	Sampler:	Lab PM: Smith, Micah	Carrier Tracking No(s):	COC No: 320-306989.1
Client Contact: Shipping/Receiving	Phone:	E-Mail: Micah.Smith@et.eurofinsus.com	State of Origin: California	Page: Page 1 of 1
Company: Eurofins Environment Testing Southwest,		Accreditations Required (See note): State - California		Job #: 320-99962-1
Address: 2841 Dow Avenue, Suite 100, ,	Due Date Requested: 5/15/2023			
City: Tustin	TAT Requested (days):			
State, Zip: CA, 92780				
Phone: 714-895-5494(Tel)	PO #:			
Email:	WO #:			
Project Name: Martinez Refinery	Project #: 32022029			
Site:	SSOW#:			

Analysis Requested

Preservation Cod
A - HCL
B - NaOH
C - Zn Acetate
D - Nitric Acid
E - NaHSO4
F - MeOH
G - Amchlor
H - Ascorbic Acid
I - Ice
J - DI Water
K - EDTA
L - EDA
Other:

320-99962 Chain of Custody

Sample Identification - Client ID (Lab ID)	Sample Date	Sample Time	Sample Type (C=comp, G=grab)	Matrix (W=water, S=solid, O=waste/oil, BT=Tissue, A=Air)	Field Filtered Sample (Yes or No)	Perform MS/MSD (Yes or No)	7199_ORGFM/3060A_IC Hexavalent Chromium	Total Number of containers	Special Instr
			Preservation Code:						
MRC-2 (320-99962-1)	5/4/23	14:10 Pacific		Solid			X	1	
MRC-5 (320-99962-2)	5/4/23	14:49 Pacific		Solid			X	1	
MRC-7 (320-99962-3)	5/5/23	09:18 Pacific		Solid			X	1	
MRC-6 (320-99962-4)	5/5/23	09:43 Pacific		Solid			X	1	

Note: Since laboratory accreditations are subject to change, Eurofins Environment Testing Northern California, LLC places the ownership of method, analyte & accreditation compliance upon our subcontract laboratories. This sample shipment is forwarded under chain-of-custody. If the laboratory does not currently maintain accreditation in the State of Origin listed above for analysis/tests/matrix being analyzed, the samples must be shipped back to the Eurofins Environment Testing Northern California, LLC laboratory or other instructions will be provided. Any changes to accreditation status should be brought to Eurofins Environment Testing Northern California, LLC attention immediately. If all requested accreditations are current to date, return the signed Chain of Custody attesting to said compliance to Eurofins Environment Testing Northern California, LLC.

Possible Hazard Identification *Unconfirmed*	***Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)*** ☐ *Return To Client* ☐ *Disposal By Lab* ☐ *Archive For* _____ *Months*
Deliverable Requested: I, II, III, IV, Other (specify) Primary Deliverable Rank: 1	Special Instructions/QC Requirements:

Empty Kit Relinquished by:	Date:	Time:	Method of Shipment:

Relinquished by:	Date/Time:	Company	Received by:	Date/Time:	Company
	5-8-23 1630	ETCA		5/9/23 0940	ET
Relinquished by:	Date/Time:	Company	Received by:	Date/Time:	Company
Relinquished by:	Date/Time:	Company	Received by:	Date/Time:	Company

Custody Seals Intact: Δ Yes Δ No	Custody Seal No.:	Cooler Temperature(s) °C and Other Remarks: 1.0/1.2 IR6

Ver: 06/08/2021

5/25/2023 (Rev. 1)

Login Sample Receipt Checklist

Client: TRC Environmental Corporation

Job Number: 320-99962-1

Login Number: 99962
List Number: 1
Creator: Pratali, Sandra A

List Source: Eurofins Sacramento

Question	Answer	Comment
Radioactivity wasn't checked or is </= background as measured by a survey meter.	True	
The cooler's custody seal, if present, is intact.	N/A	
Sample custody seals, if present, are intact.	N/A	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	True	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	True	
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time (excluding tests with immediate HTs)	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	N/A	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	True	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

Login Sample Receipt Checklist

Client: TRC Environmental Corporation

Job Number: 320-99962-1

Login Number: 99962
List Number: 2
Creator: Kasianchuk, Ivanna

List Source: Eurofins Calscience
List Creation: 05/09/23 02:43 PM

Question	Answer	Comment
Radioactivity wasn't checked or is </= background as measured by a survey meter.	N/A	
The cooler's custody seal, if present, is intact.	True	1517464
Sample custody seals, if present, are intact.	N/A	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	True	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	1.2
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	False	Received project as a subcontract.
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time (excluding tests with immediate HTs)	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	True	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	True	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

Appendix E. May 2023 Soil Data Validation Report

Data Validation Report

Site: Martinez Refinery Company
Laboratory: Eurofins-West Sacramento, California (pH and Metals; Hexavalent Chromium Aqueous) and Eurofins/Calscience-Tustin, California (Hexavalent Chromium Soil)
SDG Numbers: 320-99906-1 (Revision 1) and 320-99962-1 (Revision 1)
Parameters: Hexavalent Chromium, Select Metals, pH
Reviewer: Elizabeth Denly/TRC
Peer Reviewer: Kristen Morin/TRC
Date: May 26, 2023

Samples Reviewed and Evaluation Summary

320-99906-1 (Revision 1):

MRC-1	MRC-3	MRC-4
MRC-8	MRC-9	MRC-10
MRC-11	MRC-12	MRC-13
MRC-14	DUP-1[1]	Equipment Blank

320-99962-1 (Revision 1):

MRC-2	MRC-5	MRC-6
MRC-7		

[1]Field duplicate of MRC-8

The above-listed soil samples and equipment blank were collected on May 4 and 5, 2023 and were analyzed for the following parameters:

- Hexavalent chromium using SW-846 Method 7199
- Select metals using SW-846 Method 6010B
- pH using SW-846 Method 9045C

Limited data validation was performed in accordance with the following data validation guidelines modified for the SW-846 methodologies utilized.

- *USEPA National Functional Guidelines for Inorganic Superfund Methods Data Review* (EPA-542-R-20-006), November 2020

The data were evaluated based on the following parameters:

- Overall Evaluation of Data and Potential Usability Issues
* • Data Completeness
- Holding Times and Sample Preservation
- Blanks
- Matrix Spike/Matrix Spike Duplicate (MS/MSD) Results
* • Laboratory Control Sample (LCS)/LCS Duplicate (LCSD) Results
* • Laboratory Duplicate Results
* • Field Duplicate Results
* • Percent Solids Results
- Sample Results and Reported Quantitation Limits (QLs)

* - All criteria were met.

Overall Evaluation of Data and Potential Usability Issues

All results are usable for project objectives. Qualification of the data due to sampling error was not required. Qualifications applied to the data as a result of analytical error are discussed below.

- The results for pH in all soil samples were qualified as estimated (J) due to a holding time exceedance. These results can be used for project objectives as estimated values, which may have a minor impact on the data usability.

Data Completeness

The data packages were complete Level II data deliverable packages.

Holding Times and Sample Preservation

Holding time and preservation criteria were met for all hexavalent chromium and metals analyses. All soil samples were analyzed four to five days after collection for pH. The pH results in all soil samples were qualified as estimated (J) due to the holding time exceedance.

Blanks

There were no target compounds detected in the method blanks for all analyses. Lead was detected in the equipment blank associated with all soil samples at a concentration of 0.0063 mg/L. Qualification of the data on this basis was not required since the results for lead in all soil samples were >10x the equipment blank concentration.

It should be noted that the narrative for data package 320-99906-1 discussed the detection of aluminum in the calibration blank at a concentration above one-half the QL. The narrative states that samples were not affected as concentrations of aluminum in the samples were >10x the calibration blank concentration.

MS/MSD Results

The laboratory performed MS/MSD analyses on sample Equipment Blank for hexavalent chromium and sample MRC-9 for metals. All criteria were met in the MS/MSD analyses performed on sample Equipment Blank. The recoveries of aluminum (960%/796%) were outside of the 75-125% acceptance criteria in the MS/MSD analyses performed on sample MRC-9. Since the concentration of aluminum in the unspiked sample was >4x the spike amount, qualification of the data on this basis was not required.

LCS/LCSD Results

All criteria were met.

Laboratory Duplicate Results

Laboratory duplicate analysis was performed on sample MRC-9 for pH; all criteria were met.

Field Duplicate Results

Samples MRC-8 and Dup-1 were submitted as the field duplicate pair with this sample set. The

relative percent difference (RPD) acceptance limit for field duplicates in soils is ≤50%. The RPD is not applicable for comparison of results if either concentration is <5× the QL; instead, comparison is based on the absolute difference (AbsD), which must be <2x the QL for soil samples. The following table summarizes the RPDs and AbsDs, as applicable, for the detected analytes in the field duplicate pair and the resulting validation actions. All criteria were met; therefore, no qualifications were required.

Analyte	QL (mg/kg)	MRC-8 (mg/kg)	Dup-1 (mg/kg)	RPD (%) or AbsD (mg/kg)	Validation Actions
Arsenic	2.3	16	14	RPD = 13.3	None; criteria met.
Barium	1.2/1.1	130	130	RPD = 0	
Beryllium	0.23	0.77	0.69	AbsD = 0.08	
Aluminum	23	19,000	18,000	RPD = 5.4	
Chromium	0.58/0.57	64	56	RPD = 13.3	
Cobalt	0.58/0.57	15	15	RPD = 0	
Copper	1.7	48	43	RPD = 11.0	
Lead	1.2/1.1	32	25	RPD = 24.6	
Nickel	1.2/1.1	65	60	RPD = 8.0	
Vanadium	0.58/0.57	70	64	RPD = 9.0	
Zinc	2.3	88	82	RPD = 7.1	
pH	0.1 SU	7.2 SU	6.0 SU	RPD = 18.2	

Percent Solids Results

All criteria were met.

Sample Results and Reported Quantitation Limits

The hexavalent chromium analyses of all soil samples were performed at a 10-fold dilution. The laboratory stated that the dilutions were required due to the nature of the analysis; QLs in these samples were elevated accordingly.

QUALIFIED FORM 1s

Client Sample ID: MRC-9

Date Collected: 05/04/23 08:10
Date Received: 05/04/23 19:30

Lab Sample ID: 320-99906-1

Matrix: Solid
Percent Solids: 85.7

Method: SW846 7199 - Chromium, Hexavalent (IC)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chromium, hexavalent	ND		240	230	ug/Kg	☼	05/09/23 02:00	05/09/23 13:32	10

Method: SW846 6010B - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	6.1	F1	2.4		mg/Kg	☼	05/08/23 06:30	05/08/23 15:57	1
Barium	100		1.2		mg/Kg	☼	05/08/23 06:30	05/08/23 15:57	1
Beryllium	0.73	F1	0.24		mg/Kg	☼	05/08/23 06:30	05/08/23 15:57	1
Aluminum	9300		24		mg/Kg	☼	05/08/23 06:30	05/08/23 15:57	1
Chromium	24		0.59		mg/Kg	☼	05/08/23 06:30	05/08/23 15:57	1
Cobalt	6.3		0.59		mg/Kg	☼	05/08/23 06:30	05/08/23 15:57	1
Copper	14		1.8		mg/Kg	☼	05/08/23 06:30	05/08/23 15:57	1
Lead	15		1.2		mg/Kg	☼	05/08/23 06:30	05/08/23 15:57	1
Molybdenum	ND	F1	2.4		mg/Kg	☼	05/08/23 06:30	05/08/23 15:57	1
Nickel	23		1.2		mg/Kg	☼	05/08/23 06:30	05/08/23 15:57	1
Selenium	ND	F1	2.4		mg/Kg	☼	05/08/23 06:30	05/08/23 15:57	1
Vanadium	29		0.59		mg/Kg	☼	05/08/23 06:30	05/08/23 15:57	1
Zinc	64	F1	2.4		mg/Kg	☼	05/08/23 06:30	05/08/23 15:57	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Moisture (ASTM D 2216)	14.3		0.1		%			05/05/23 14:27	1
Percent Solids (ASTM D 2216)	85.7		0.1		%			05/05/23 14:27	1

General Chemistry - Soluble

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
pH adj. to 25 deg C (SW846 9045C)	6.5	J	0.1		SU			05/09/23 11:24	1

Client Sample ID: MRC-10

Date Collected: 05/04/23 08:48
Date Received: 05/04/23 19:30

Lab Sample ID: 320-99906-2

Matrix: Solid
Percent Solids: 87.8

Method: SW846 7199 - Chromium, Hexavalent (IC)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chromium, hexavalent	ND		220	210	ug/Kg	☼	05/09/23 02:00	05/09/23 11:08	10

Method: SW846 6010B - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	5.1		2.2		mg/Kg	☼	05/08/23 06:30	05/08/23 16:17	1
Barium	130		1.1		mg/Kg	☼	05/08/23 06:30	05/08/23 16:17	1
Beryllium	1.2		0.22		mg/Kg	☼	05/08/23 06:30	05/08/23 16:17	1
Aluminum	15000	^2	22		mg/Kg	☼	05/08/23 06:30	05/08/23 16:17	1
Chromium	27		0.55		mg/Kg	☼	05/08/23 06:30	05/08/23 16:17	1
Cobalt	11		0.55		mg/Kg	☼	05/08/23 06:30	05/08/23 16:17	1
Copper	30		1.6		mg/Kg	☼	05/08/23 06:30	05/08/23 16:17	1
Lead	10		1.1		mg/Kg	☼	05/08/23 06:30	05/08/23 16:17	1
Molybdenum	ND		2.2		mg/Kg	☼	05/08/23 06:30	05/08/23 16:17	1
Nickel	30		1.1		mg/Kg	☼	05/08/23 06:30	05/08/23 16:17	1
Selenium	ND		2.2		mg/Kg	☼	05/08/23 06:30	05/08/23 16:17	1
Vanadium	59		0.55		mg/Kg	☼	05/08/23 06:30	05/08/23 16:17	1
Zinc	79		2.2		mg/Kg	☼	05/08/23 06:30	05/08/23 16:17	1

Client Sample ID: MRC-10

Lab Sample ID: 320-99906-2
Date Collected: 05/04/23 08:48
Matrix: Solid
Date Received: 05/04/23 19:30
Percent Solids: 87.8

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Moisture (ASTM D 2216)	12.2		0.1		%			05/05/23 14:27	1
Percent Solids (ASTM D 2216)	87.8		0.1		%			05/05/23 14:27	1

General Chemistry - Soluble

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
pH adj. to 25 deg C (SW846 9045C)	6.9	J	0.1		SU			05/09/23 11:24	1

Client Sample ID: MRC-11

Lab Sample ID: 320-99906-3
Date Collected: 05/04/23 09:18
Matrix: Solid
Date Received: 05/04/23 19:30
Percent Solids: 81.3

Method: SW846 7199 - Chromium, Hexavalent (IC)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chromium, hexavalent	ND		250	240	ug/Kg	☼	05/09/23 02:00	05/09/23 11:20	10

Method: SW846 6010B - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	5.7		2.5		mg/Kg	☼	05/08/23 06:30	05/08/23 16:20	1
Barium	98		1.2		mg/Kg	☼	05/08/23 06:30	05/08/23 16:20	1
Beryllium	0.64		0.25		mg/Kg	☼	05/08/23 06:30	05/08/23 16:20	1
Aluminum	10000	~~^2~~	25		mg/Kg	☼	05/08/23 06:30	05/08/23 16:20	1
Chromium	29		0.62		mg/Kg	☼	05/08/23 06:30	05/08/23 16:20	1
Cobalt	7.9		0.62		mg/Kg	☼	05/08/23 06:30	05/08/23 16:20	1
Copper	23		1.9		mg/Kg	☼	05/08/23 06:30	05/08/23 16:20	1
Lead	13		1.2		mg/Kg	☼	05/08/23 06:30	05/08/23 16:20	1
Molybdenum	ND		2.5		mg/Kg	☼	05/08/23 06:30	05/08/23 16:20	1
Nickel	31		1.2		mg/Kg	☼	05/08/23 06:30	05/08/23 16:20	1
Selenium	ND		2.5		mg/Kg	☼	05/08/23 06:30	05/08/23 16:20	1
Vanadium	34		0.62		mg/Kg	☼	05/08/23 06:30	05/08/23 16:20	1
Zinc	59		2.5		mg/Kg	☼	05/08/23 06:30	05/08/23 16:20	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Moisture (ASTM D 2216)	18.7		0.1		%			05/05/23 14:27	1
Percent Solids (ASTM D 2216)	81.3		0.1		%			05/05/23 14:27	1

General Chemistry - Soluble

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
pH adj. to 25 deg C (SW846 9045C)	7.1	J	0.1		SU			05/09/23 11:24	1

Client Sample ID: MRC-12

Lab Sample ID: 320-99906-4
Date Collected: 05/04/23 09:57
Matrix: Solid
Date Received: 05/04/23 19:30
Percent Solids: 79.3

Method: SW846 7199 - Chromium, Hexavalent (IC)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chromium, hexavalent	ND		260	250	ug/Kg	☼	05/09/23 02:00	05/09/23 11:32	10

Method: SW846 6010B - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	3.9		2.5		mg/Kg	☼	05/08/23 06:30	05/08/23 16:23	1
Barium	86		1.3		mg/Kg	☼	05/08/23 06:30	05/08/23 16:23	1

Client Sample ID: MRC-12

Date Collected: 05/04/23 09:57
Date Received: 05/04/23 19:30

Lab Sample ID: 320-99906-4

Matrix: Solid
Percent Solids: 79.3

Method: SW846 6010B - Metals (ICP) (Continued)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Beryllium	0.65		0.25		mg/Kg	☼	05/08/23 06:30	05/08/23 16:23	1
Aluminum	15000	^2	25		mg/Kg	☼	05/08/23 06:30	05/08/23 16:23	1
Chromium	20		0.64		mg/Kg	☼	05/08/23 06:30	05/08/23 16:23	1
Cobalt	5.1		0.64		mg/Kg	☼	05/08/23 06:30	05/08/23 16:23	1
Copper	7.9		1.9		mg/Kg	☼	05/08/23 06:30	05/08/23 16:23	1
Lead	6.6		1.3		mg/Kg	☼	05/08/23 06:30	05/08/23 16:23	1
Molybdenum	ND		2.5		mg/Kg	☼	05/08/23 06:30	05/08/23 16:23	1
Nickel	14		1.3		mg/Kg	☼	05/08/23 06:30	05/08/23 16:23	1
Selenium	ND		2.5		mg/Kg	☼	05/08/23 06:30	05/08/23 16:23	1
Vanadium	30		0.64		mg/Kg	☼	05/08/23 06:30	05/08/23 16:23	1
Zinc	32		2.5		mg/Kg	☼	05/08/23 06:30	05/08/23 16:23	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Moisture (ASTM D 2216)	20.7		0.1		%			05/05/23 14:27	1
Percent Solids (ASTM D 2216)	79.3		0.1		%			05/05/23 14:27	1

General Chemistry - Soluble

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
pH adj. to 25 deg C (SW846 9045C)	7.3	J	0.1		SU			05/09/23 11:24	1

Client Sample ID: MRC-4

Date Collected: 05/04/23 10:59
Date Received: 05/04/23 19:30

Lab Sample ID: 320-99906-5

Matrix: Solid
Percent Solids: 75.3

Method: SW846 7199 - Chromium, Hexavalent (IC)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chromium, hexavalent	ND		270	250	ug/Kg	☼	05/09/23 02:00	05/09/23 11:44	10

Method: SW846 6010B - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	24		2.7		mg/Kg	☼	05/08/23 06:30	05/08/23 16:26	1
Barium	110		1.3		mg/Kg	☼	05/08/23 06:30	05/08/23 16:26	1
Beryllium	0.58		0.27		mg/Kg	☼	05/08/23 06:30	05/08/23 16:26	1
Aluminum	9800	^2	27		mg/Kg	☼	05/08/23 06:30	05/08/23 16:26	1
Chromium	87		0.66		mg/Kg	☼	05/08/23 06:30	05/08/23 16:26	1
Cobalt	16		0.66		mg/Kg	☼	05/08/23 06:30	05/08/23 16:26	1
Copper	36		2.0		mg/Kg	☼	05/08/23 06:30	05/08/23 16:26	1
Lead	23		1.3		mg/Kg	☼	05/08/23 06:30	05/08/23 16:26	1
Molybdenum	ND		2.7		mg/Kg	☼	05/08/23 06:30	05/08/23 16:26	1
Nickel	200		1.3		mg/Kg	☼	05/08/23 06:30	05/08/23 16:26	1
Selenium	ND		2.7		mg/Kg	☼	05/08/23 06:30	05/08/23 16:26	1
Vanadium	30		0.66		mg/Kg	☼	05/08/23 06:30	05/08/23 16:26	1
Zinc	56		2.7		mg/Kg	☼	05/08/23 06:30	05/08/23 16:26	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Moisture (ASTM D 2216)	24.7		0.1		%			05/05/23 14:27	1
Percent Solids (ASTM D 2216)	75.3		0.1		%			05/05/23 14:27	1

Client Sample ID: MRC-4

Date Collected: 05/04/23 10:59
Date Received: 05/04/23 19:30

Lab Sample ID: 320-99906-5

Matrix: Solid
Percent Solids: 75.3

General Chemistry - Soluble

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
pH adj. to 25 deg C (SW846 9045C)	6.9	J	0.1		SU			05/09/23 11:24	1

Client Sample ID: MRC-8

Date Collected: 05/04/23 11:26
Date Received: 05/04/23 19:30

Lab Sample ID: 320-99906-6

Matrix: Solid
Percent Solids: 84.5

Method: SW846 7199 - Chromium, Hexavalent (IC)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chromium, hexavalent	ND		230	220	ug/Kg	☼	05/09/23 02:00	05/09/23 11:56	10

Method: SW846 6010B - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	16		2.3		mg/Kg	☼	05/08/23 06:30	05/08/23 16:29	1
Barium	130		1.2		mg/Kg	☼	05/08/23 06:30	05/08/23 16:29	1
Beryllium	0.77		0.23		mg/Kg	☼	05/08/23 06:30	05/08/23 16:29	1
Aluminum	19000	^2	23		mg/Kg	☼	05/08/23 06:30	05/08/23 16:29	1
Chromium	64		0.58		mg/Kg	☼	05/08/23 06:30	05/08/23 16:29	1
Cobalt	15		0.58		mg/Kg	☼	05/08/23 06:30	05/08/23 16:29	1
Copper	48		1.7		mg/Kg	☼	05/08/23 06:30	05/08/23 16:29	1
Lead	32		1.2		mg/Kg	☼	05/08/23 06:30	05/08/23 16:29	1
Molybdenum	ND		2.3		mg/Kg	☼	05/08/23 06:30	05/08/23 16:29	1
Nickel	65		1.2		mg/Kg	☼	05/08/23 06:30	05/08/23 16:29	1
Selenium	ND		2.3		mg/Kg	☼	05/08/23 06:30	05/08/23 16:29	1
Vanadium	70		0.58		mg/Kg	☼	05/08/23 06:30	05/08/23 16:29	1
Zinc	88		2.3		mg/Kg	☼	05/08/23 06:30	05/08/23 16:29	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Moisture (ASTM D 2216)	15.5		0.1		%			05/05/23 14:27	1
Percent Solids (ASTM D 2216)	84.5		0.1		%			05/05/23 14:27	1

General Chemistry - Soluble

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
pH adj. to 25 deg C (SW846 9045C)	7.2	J	0.1		SU			05/09/23 11:24	1

Client Sample ID: MRC-3

Date Collected: 05/04/23 12:00
Date Received: 05/04/23 19:30

Lab Sample ID: 320-99906-7

Matrix: Solid
Percent Solids: 89.8

Method: SW846 7199 - Chromium, Hexavalent (IC)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chromium, hexavalent	ND		220	210	ug/Kg	☼	05/09/23 02:00	05/09/23 12:08	10

Method: SW846 6010B - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	11		2.1		mg/Kg	☼	05/08/23 06:30	05/08/23 16:32	1
Barium	150		1.1		mg/Kg	☼	05/08/23 06:30	05/08/23 16:32	1
Beryllium	0.93		0.21		mg/Kg	☼	05/08/23 06:30	05/08/23 16:32	1
Aluminum	17000	^2	21		mg/Kg	☼	05/08/23 06:30	05/08/23 16:32	1
Chromium	46		0.54		mg/Kg	☼	05/08/23 06:30	05/08/23 16:32	1
Cobalt	17		0.54		mg/Kg	☼	05/08/23 06:30	05/08/23 16:32	1

Client Sample ID: MRC-3

Date Collected: 05/04/23 12:00
Date Received: 05/04/23 19:30

Lab Sample ID: 320-99906-7

Matrix: Solid
Percent Solids: 89.8

Method: SW846 6010B - Metals (ICP) (Continued)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Copper	44		1.6		mg/Kg	☼	05/08/23 06:30	05/08/23 16:32	1
Lead	31		1.1		mg/Kg	☼	05/08/23 06:30	05/08/23 16:32	1
Molybdenum	ND		2.1		mg/Kg	☼	05/08/23 06:30	05/08/23 16:32	1
Nickel	50		1.1		mg/Kg	☼	05/08/23 06:30	05/08/23 16:32	1
Selenium	ND		2.1		mg/Kg	☼	05/08/23 06:30	05/08/23 16:32	1
Vanadium	60		0.54		mg/Kg	☼	05/08/23 06:30	05/08/23 16:32	1
Zinc	210		2.1		mg/Kg	☼	05/08/23 06:30	05/08/23 16:32	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Moisture (ASTM D 2216)	10.2		0.1		%			05/05/23 14:27	1
Percent Solids (ASTM D 2216)	89.8		0.1		%			05/05/23 14:27	1

General Chemistry - Soluble

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
pH adj. to 25 deg C (SW846 9045C)	6.9	J	0.1		SU			05/09/23 11:24	1

Client Sample ID: MRC-1

Date Collected: 05/04/23 12:28
Date Received: 05/04/23 19:30

Lab Sample ID: 320-99906-8

Matrix: Solid
Percent Solids: 80.9

Method: SW846 7199 - Chromium, Hexavalent (IC)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chromium, hexavalent	ND		250	230	ug/Kg	☼	05/09/23 02:00	05/09/23 12:20	10

Method: SW846 6010B - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	7.1		2.5		mg/Kg	☼	05/08/23 06:30	05/08/23 16:41	1
Barium	99		1.2		mg/Kg	☼	05/08/23 06:30	05/08/23 16:41	1
Beryllium	0.57		0.25		mg/Kg	☼	05/08/23 06:30	05/08/23 16:41	1
Aluminum	9200	^2	25		mg/Kg	☼	05/08/23 06:30	05/08/23 16:41	1
Chromium	22		0.62		mg/Kg	☼	05/08/23 06:30	05/08/23 16:41	1
Cobalt	7.1		0.62		mg/Kg	☼	05/08/23 06:30	05/08/23 16:41	1
Copper	20		1.9		mg/Kg	☼	05/08/23 06:30	05/08/23 16:41	1
Lead	82		1.2		mg/Kg	☼	05/08/23 06:30	05/08/23 16:41	1
Molybdenum	ND		2.5		mg/Kg	☼	05/08/23 06:30	05/08/23 16:41	1
Nickel	19		1.2		mg/Kg	☼	05/08/23 06:30	05/08/23 16:41	1
Selenium	ND		2.5		mg/Kg	☼	05/08/23 06:30	05/08/23 16:41	1
Vanadium	30		0.62		mg/Kg	☼	05/08/23 06:30	05/08/23 16:41	1
Zinc	160		2.5		mg/Kg	☼	05/08/23 06:30	05/08/23 16:41	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Moisture (ASTM D 2216)	19.1		0.1		%			05/05/23 14:27	1
Percent Solids (ASTM D 2216)	80.9		0.1		%			05/05/23 14:27	1

General Chemistry - Soluble

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
pH adj. to 25 deg C (SW846 9045C)	5.9	J	0.1		SU			05/09/23 11:24	1

Client Sample ID: MRC-13

Lab Sample ID: 320-99906-9

Date Collected: 05/04/23 12:47
Matrix: Solid
Date Received: 05/04/23 19:30
Percent Solids: 81.9

Method: SW846 7199 - Chromium, Hexavalent (IC)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chromium, hexavalent	ND		250	240	ug/Kg	☼	05/09/23 02:00	05/09/23 12:32	10

Method: SW846 6010B - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	**5.4**		2.4		mg/Kg	☼	05/08/23 06:30	05/08/23 16:44	1
Barium	**90**		1.2		mg/Kg	☼	05/08/23 06:30	05/08/23 16:44	1
Beryllium	**0.55**		0.24		mg/Kg	☼	05/08/23 06:30	05/08/23 16:44	1
Aluminum	**8900**	~~^2~~	24		mg/Kg	☼	05/08/23 06:30	05/08/23 16:44	1
Chromium	**16**		0.59		mg/Kg	☼	05/08/23 06:30	05/08/23 16:44	1
Cobalt	**6.5**		0.59		mg/Kg	☼	05/08/23 06:30	05/08/23 16:44	1
Copper	**11**		1.8		mg/Kg	☼	05/08/23 06:30	05/08/23 16:44	1
Lead	**18**		1.2		mg/Kg	☼	05/08/23 06:30	05/08/23 16:44	1
Molybdenum	ND		2.4		mg/Kg	☼	05/08/23 06:30	05/08/23 16:44	1
Nickel	**13**		1.2		mg/Kg	☼	05/08/23 06:30	05/08/23 16:44	1
Selenium	ND		2.4		mg/Kg	☼	05/08/23 06:30	05/08/23 16:44	1
Vanadium	**30**		0.59		mg/Kg	☼	05/08/23 06:30	05/08/23 16:44	1
Zinc	**41**		2.4		mg/Kg	☼	05/08/23 06:30	05/08/23 16:44	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Moisture (ASTM D 2216)	**18.1**		0.1		%			05/05/23 14:27	1
Percent Solids (ASTM D 2216)	**81.9**		0.1		%			05/05/23 14:27	1

General Chemistry - Soluble

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
pH adj. to 25 deg C (SW846 9045C)	**6.0**	J	0.1		SU			05/09/23 11:24	1

Client Sample ID: Equipment Blank

Lab Sample ID: 320-99906-10

Date Collected: 05/04/23 12:58
Matrix: Water
Date Received: 05/04/23 19:30

Method: SW846 7199 - Chromium, Hexavalent (IC)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chromium, hexavalent	ND		0.50		ug/L			05/05/23 10:53	1

Method: SW846 6010B - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Aluminum	ND		0.20		mg/L		05/09/23 06:15	05/09/23 15:42	1
Arsenic	ND		0.020		mg/L		05/09/23 06:15	05/09/23 15:42	1
Barium	ND		0.0050		mg/L		05/09/23 06:15	05/09/23 15:42	1
Beryllium	ND		0.0020		mg/L		05/09/23 06:15	05/09/23 15:42	1
Cobalt	ND		0.0050		mg/L		05/09/23 06:15	05/09/23 15:42	1
Chromium	ND		0.0080		mg/L		05/09/23 06:15	05/09/23 15:42	1
Copper	ND		0.010		mg/L		05/09/23 06:15	05/09/23 15:42	1
Lead	**0.0063**		0.0050		mg/L		05/09/23 06:15	05/09/23 15:42	1
Molybdenum	ND		0.020		mg/L		05/09/23 06:15	05/09/23 15:42	1
Nickel	ND		0.0050		mg/L		05/09/23 06:15	05/09/23 15:42	1
Selenium	ND		0.020		mg/L		05/09/23 06:15	05/09/23 15:42	1
Vanadium	ND		0.0050		mg/L		05/09/23 06:15	05/09/23 15:42	1
Zinc	ND		0.010		mg/L		05/09/23 06:15	05/09/23 15:42	1

Client Sample ID: Dup-1

Lab Sample ID: 320-99906-11

Date Collected: 05/04/23 00:00
Matrix: Solid
Date Received: 05/04/23 19:30
Percent Solids: 87.0

Method: SW846 7199 - Chromium, Hexavalent (IC)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chromium, hexavalent	ND		230	220	ug/Kg	☼	05/09/23 02:00	05/09/23 12:44	10

Method: SW846 6010B - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	**14**		2.3		mg/Kg	☼	05/08/23 06:30	05/08/23 16:47	1
Barium	**130**		1.1		mg/Kg	☼	05/08/23 06:30	05/08/23 16:47	1
Beryllium	**0.69**		0.23		mg/Kg	☼	05/08/23 06:30	05/08/23 16:47	1
Aluminum	**18000**	^2	23		mg/Kg	☼	05/08/23 06:30	05/08/23 16:47	1
Chromium	**56**		0.57		mg/Kg	☼	05/08/23 06:30	05/08/23 16:47	1
Cobalt	**15**		0.57		mg/Kg	☼	05/08/23 06:30	05/08/23 16:47	1
Copper	**43**		1.7		mg/Kg	☼	05/08/23 06:30	05/08/23 16:47	1
Lead	**25**		1.1		mg/Kg	☼	05/08/23 06:30	05/08/23 16:47	1
Molybdenum	ND		2.3		mg/Kg	☼	05/08/23 06:30	05/08/23 16:47	1
Nickel	**60**		1.1		mg/Kg	☼	05/08/23 06:30	05/08/23 16:47	1
Selenium	ND		2.3		mg/Kg	☼	05/08/23 06:30	05/08/23 16:47	1
Vanadium	**64**		0.57		mg/Kg	☼	05/08/23 06:30	05/08/23 16:47	1
Zinc	**82**		2.3		mg/Kg	☼	05/08/23 06:30	05/08/23 16:47	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Moisture (ASTM D 2216)	**13.0**		0.1		%			05/05/23 14:27	1
Percent Solids (ASTM D 2216)	**87.0**		0.1		%			05/05/23 14:27	1

General Chemistry - Soluble

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
pH adj. to 25 deg C (SW846 9045C)	**6.0**	J	0.1		SU			05/09/23 11:24	1

Client Sample ID: MRC-14

Lab Sample ID: 320-99906-12

Date Collected: 05/04/23 13:17
Matrix: Solid
Date Received: 05/04/23 19:30
Percent Solids: 88.1

Method: SW846 7199 - Chromium, Hexavalent (IC)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chromium, hexavalent	ND		230	220	ug/Kg	☼	05/09/23 02:00	05/09/23 12:56	10

Method: SW846 6010B - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	**8.5**		2.3		mg/Kg	☼	05/08/23 06:30	05/08/23 16:50	1
Barium	**86**		1.1		mg/Kg	☼	05/08/23 06:30	05/08/23 16:50	1
Beryllium	**0.88**		0.23		mg/Kg	☼	05/08/23 06:30	05/08/23 16:50	1
Aluminum	**14000**	^2	23		mg/Kg	☼	05/08/23 06:30	05/08/23 16:50	1
Chromium	**35**		0.57		mg/Kg	☼	05/08/23 06:30	05/08/23 16:50	1
Cobalt	**9.9**		0.57		mg/Kg	☼	05/08/23 06:30	05/08/23 16:50	1
Copper	**29**		1.7		mg/Kg	☼	05/08/23 06:30	05/08/23 16:50	1
Lead	**33**		1.1		mg/Kg	☼	05/08/23 06:30	05/08/23 16:50	1
Molybdenum	ND		2.3		mg/Kg	☼	05/08/23 06:30	05/08/23 16:50	1
Nickel	**32**		1.1		mg/Kg	☼	05/08/23 06:30	05/08/23 16:50	1
Selenium	ND		2.3		mg/Kg	☼	05/08/23 06:30	05/08/23 16:50	1
Vanadium	**54**		0.57		mg/Kg	☼	05/08/23 06:30	05/08/23 16:50	1
Zinc	**270**		2.3		mg/Kg	☼	05/08/23 06:30	05/08/23 16:50	1

Client Sample Results

Client: TRC Environmental Corporation
Project/Site: Martinez Refinery

Job ID: 320-99906-1

Client Sample ID: MRC-14
Date Collected: 05/04/23 13:17
Date Received: 05/04/23 19:30

Lab Sample ID: 320-99906-12
Matrix: Solid
Percent Solids: 88.1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Moisture (ASTM D 2216)	11.9		0.1		%			05/05/23 14:27	1
Percent Solids (ASTM D 2216)	88.1		0.1		%			05/05/23 14:27	1

General Chemistry - Soluble

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
pH adj. to 25 deg C (SW846 9045C)	5.7	J	0.1		SU			05/09/23 11:24	1

Client Sample ID: MRC-2

Lab Sample ID: 320-99962-1

Date Collected: 05/04/23 14:10

Matrix: Solid

Date Received: 05/05/23 18:30

Percent Solids: 81.5

Method: SW846 7199 - Chromium, Hexavalent (IC)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chromium, hexavalent	ND		250	240	ug/Kg	☼	05/11/23 05:00	05/11/23 14:45	10

Method: SW846 6010B - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	**28**		2.4		mg/Kg	☼	05/10/23 06:15	05/10/23 15:06	1
Barium	**110**		1.2		mg/Kg	☼	05/10/23 06:15	05/10/23 15:06	1
Beryllium	**0.53**		0.24		mg/Kg	☼	05/10/23 06:15	05/10/23 15:06	1
Aluminum	**19000**		24		mg/Kg	☼	05/10/23 06:15	05/10/23 15:06	1
Chromium	**57**		0.59		mg/Kg	☼	05/10/23 06:15	05/10/23 15:06	1
Cobalt	**19**		0.59		mg/Kg	☼	05/10/23 06:15	05/10/23 15:06	1
Copper	**53**		1.8		mg/Kg	☼	05/10/23 06:15	05/10/23 15:06	1
Lead	**79**		1.2		mg/Kg	☼	05/10/23 06:15	05/10/23 15:06	1
Molybdenum	ND		2.4		mg/Kg	☼	05/10/23 06:15	05/10/23 15:06	1
Nickel	**56**		1.2		mg/Kg	☼	05/10/23 06:15	05/10/23 15:06	1
Selenium	ND		2.4		mg/Kg	☼	05/10/23 06:15	05/10/23 15:06	1
Vanadium	**70**		0.59		mg/Kg	☼	05/10/23 06:15	05/10/23 15:06	1
Zinc	**82**		2.4		mg/Kg	☼	05/10/23 06:15	05/10/23 15:06	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Moisture (ASTM D 2216)	**18.5**		0.1		%			05/08/23 20:10	1
Percent Solids (ASTM D 2216)	**81.5**		0.1		%			05/08/23 20:10	1

General Chemistry - Soluble

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
pH adj. to 25 deg C (SW846 9045C)	**6.1**	J	0.1		SU			05/09/23 11:24	1

Client Sample ID: MRC-5

Lab Sample ID: 320-99962-2

Date Collected: 05/04/23 14:49

Matrix: Solid

Date Received: 05/05/23 18:30

Percent Solids: 81.7

Method: SW846 7199 - Chromium, Hexavalent (IC)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chromium, hexavalent	ND		240	230	ug/Kg	☼	05/11/23 05:00	05/11/23 14:56	10

Method: SW846 6010B - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	**7.5**		2.4		mg/Kg	☼	05/10/23 06:15	05/10/23 15:15	1
Barium	**600**		1.2		mg/Kg	☼	05/10/23 06:15	05/10/23 15:15	1
Beryllium	**0.61**		0.24		mg/Kg	☼	05/10/23 06:15	05/10/23 15:15	1
Aluminum	**23000**		24		mg/Kg	☼	05/10/23 06:15	05/10/23 15:15	1
Chromium	**46**		0.61		mg/Kg	☼	05/10/23 06:15	05/10/23 15:15	1
Cobalt	**15**		0.61		mg/Kg	☼	05/10/23 06:15	05/10/23 15:15	1
Copper	**44**		1.8		mg/Kg	☼	05/10/23 06:15	05/10/23 15:15	1
Lead	**11**		1.2		mg/Kg	☼	05/10/23 06:15	05/10/23 15:15	1
Molybdenum	ND		2.4		mg/Kg	☼	05/10/23 06:15	05/10/23 15:15	1
Nickel	**44**		1.2		mg/Kg	☼	05/10/23 06:15	05/10/23 15:15	1
Selenium	ND		2.4		mg/Kg	☼	05/10/23 06:15	05/10/23 15:15	1
Vanadium	**69**		0.61		mg/Kg	☼	05/10/23 06:15	05/10/23 15:15	1
Zinc	**65**		2.4		mg/Kg	☼	05/10/23 06:15	05/10/23 15:15	1

Client Sample ID: MRC-5

Lab Sample ID: 320-99962-2
Date Collected: 05/04/23 14:49
Matrix: Solid
Date Received: 05/05/23 18:30
Percent Solids: 81.7

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Moisture (ASTM D 2216)	18.3		0.1		%			05/08/23 20:10	1
Percent Solids (ASTM D 2216)	81.7		0.1		%			05/08/23 20:10	1

General Chemistry - Soluble

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
pH adj. to 25 deg C (SW846 9045C)	6.8	J	0.1		SU			05/09/23 11:24	1

Client Sample ID: MRC-7

Lab Sample ID: 320-99962-3
Date Collected: 05/05/23 09:18
Matrix: Solid
Date Received: 05/05/23 18:30
Percent Solids: 86.4

Method: SW846 7199 - Chromium, Hexavalent (IC)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chromium, hexavalent	ND		230	220	ug/Kg	☼	05/15/23 03:00	05/15/23 09:16	10

Method: SW846 6010B - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	8.8		2.4		mg/Kg	☼	05/10/23 06:15	05/10/23 15:18	1
Barium	560		1.2		mg/Kg	☼	05/10/23 06:15	05/10/23 15:18	1
Beryllium	0.62		0.24		mg/Kg	☼	05/10/23 06:15	05/10/23 15:18	1
Aluminum	21000		24		mg/Kg	☼	05/10/23 06:15	05/10/23 15:18	1
Chromium	51		0.61		mg/Kg	☼	05/10/23 06:15	05/10/23 15:18	1
Cobalt	18		0.61		mg/Kg	☼	05/10/23 06:15	05/10/23 15:18	1
Copper	63		1.8		mg/Kg	☼	05/10/23 06:15	05/10/23 15:18	1
Lead	31		1.2		mg/Kg	☼	05/10/23 06:15	05/10/23 15:18	1
Molybdenum	ND		2.4		mg/Kg	☼	05/10/23 06:15	05/10/23 15:18	1
Nickel	60		1.2		mg/Kg	☼	05/10/23 06:15	05/10/23 15:18	1
Selenium	ND		2.4		mg/Kg	☼	05/10/23 06:15	05/10/23 15:18	1
Vanadium	64		0.61		mg/Kg	☼	05/10/23 06:15	05/10/23 15:18	1
Zinc	110		2.4		mg/Kg	☼	05/10/23 06:15	05/10/23 15:18	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Moisture (ASTM D 2216)	13.6		0.1		%			05/08/23 20:10	1
Percent Solids (ASTM D 2216)	86.4		0.1		%			05/08/23 20:10	1

General Chemistry - Soluble

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
pH adj. to 25 deg C (SW846 9045C)	7.2	J	0.1		SU			05/09/23 11:24	1

Client Sample ID: MRC-6

Lab Sample ID: 320-99962-4
Date Collected: 05/05/23 09:43
Matrix: Solid
Date Received: 05/05/23 18:30
Percent Solids: 84.6

Method: SW846 7199 - Chromium, Hexavalent (IC)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chromium, hexavalent	ND		230	220	ug/Kg	☼	05/15/23 03:00	05/15/23 09:28	10

Method: SW846 6010B - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	6.8		2.5		mg/Kg	☼	05/10/23 06:15	05/10/23 15:21	1
Barium	170		1.2		mg/Kg	☼	05/10/23 06:15	05/10/23 15:21	1

Client: TRC Environmental Corporation
Project/Site: Martinez Refinery

Job ID: 320-99962-1

Client Sample ID: MRC-6
Date Collected: 05/05/23 09:43
Date Received: 05/05/23 18:30

Lab Sample ID: 320-99962-4
Matrix: Solid
Percent Solids: 84.6

Method: SW846 6010B - Metals (ICP) (Continued)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Beryllium	0.48		0.25		mg/Kg	☼	05/10/23 06:15	05/10/23 15:21	1
Aluminum	17000		25		mg/Kg	☼	05/10/23 06:15	05/10/23 15:21	1
Chromium	43		0.62		mg/Kg	☼	05/10/23 06:15	05/10/23 15:21	1
Cobalt	12		0.62		mg/Kg	☼	05/10/23 06:15	05/10/23 15:21	1
Copper	28		1.9		mg/Kg	☼	05/10/23 06:15	05/10/23 15:21	1
Lead	31		1.2		mg/Kg	☼	05/10/23 06:15	05/10/23 15:21	1
Molybdenum	ND		2.5		mg/Kg	☼	05/10/23 06:15	05/10/23 15:21	1
Nickel	40		1.2		mg/Kg	☼	05/10/23 06:15	05/10/23 15:21	1
Selenium	ND		2.5		mg/Kg	☼	05/10/23 06:15	05/10/23 15:21	1
Vanadium	59		0.62		mg/Kg	☼	05/10/23 06:15	05/10/23 15:21	1
Zinc	66		2.5		mg/Kg	☼	05/10/23 06:15	05/10/23 15:21	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Moisture (ASTM D 2216)	15.4		0.1		%			05/08/23 20:10	1
Percent Solids (ASTM D 2216)	84.6		0.1		%			05/08/23 20:10	1

General Chemistry - Soluble

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
pH adj. to 25 deg C (SW846 9045C)	7.1	J	0.1		SU			05/09/23 11:24	1

Appendix F. Compositional Pie Charts for Soil, Bulk, and Dust Data

Figure F-1 Composition of MRC-1 Soil Sample with Aluminum

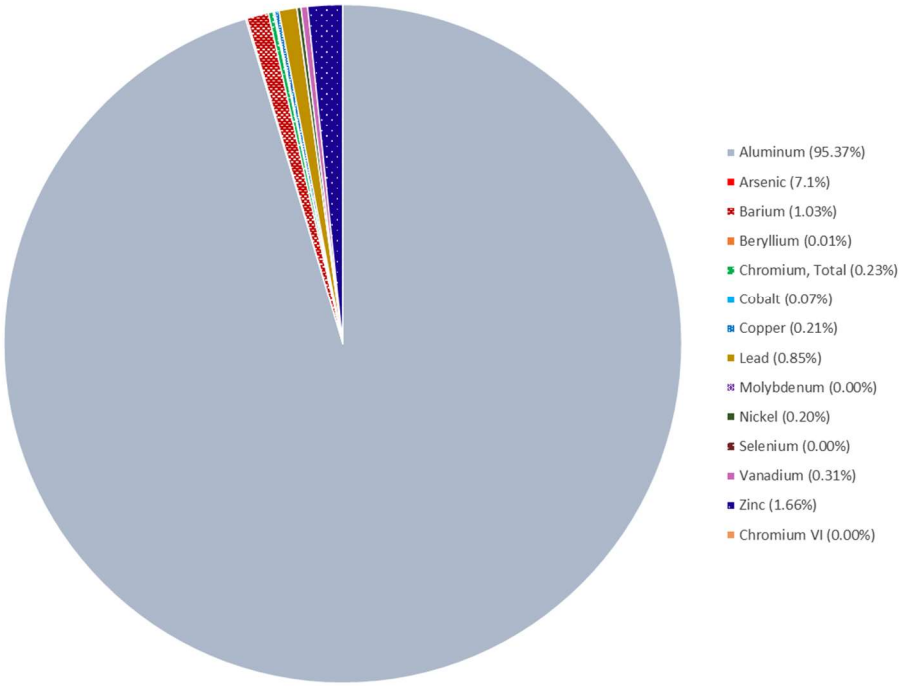


Figure F-1 Composition of MRC-1 Soil Sample without Aluminum

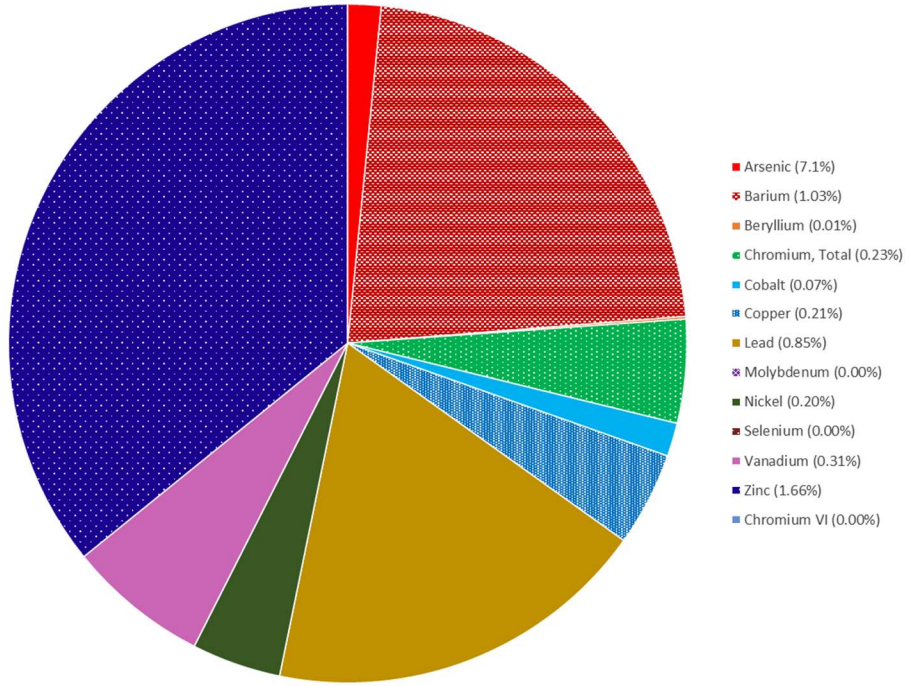


Figure F-2 Composition of MCR-2 Soil sample with Aluminum

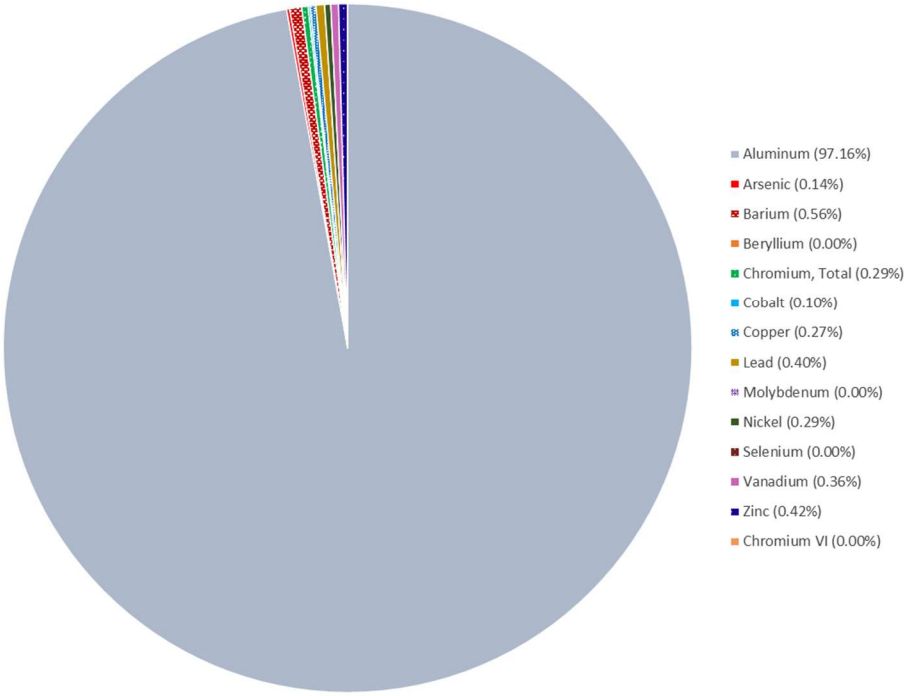
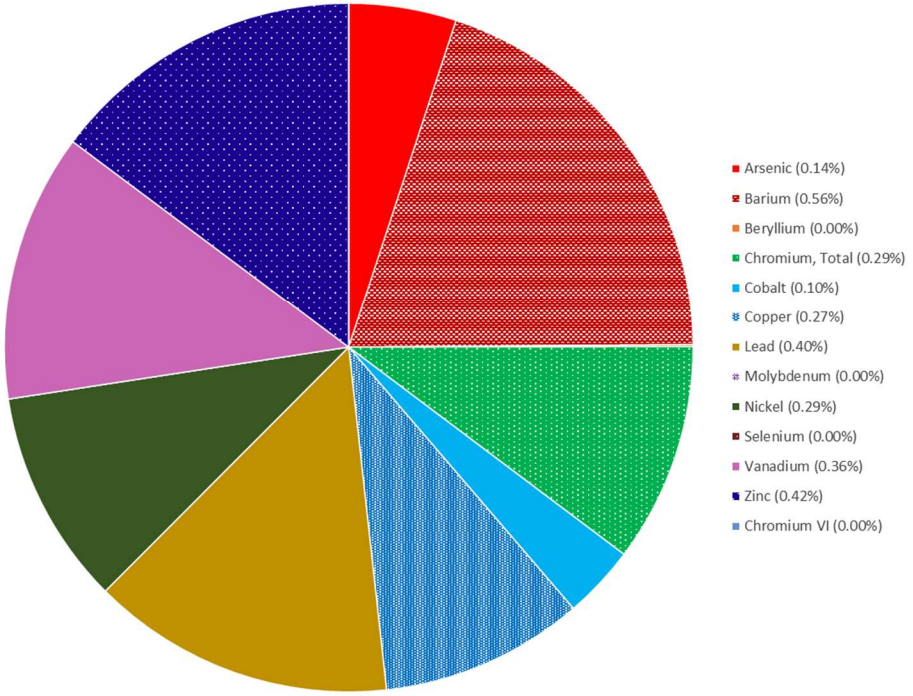


Figure F-2 Composition of MCR-2 Soil Sample without Aluminum



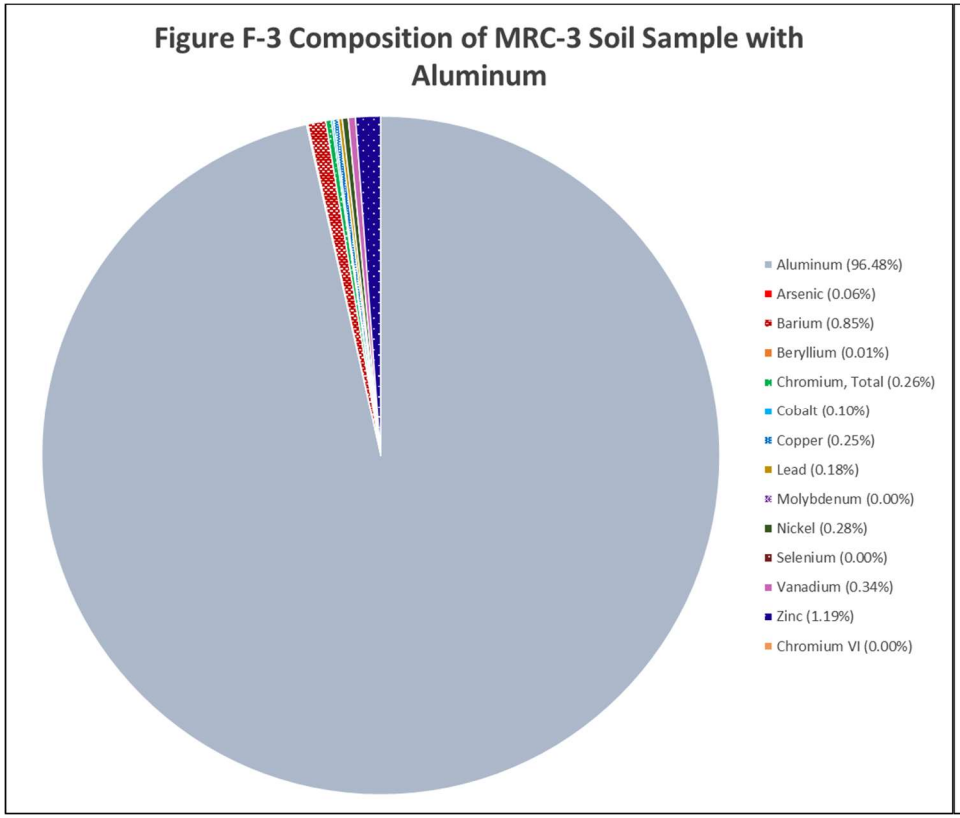


Figure F-3 Composition of MRC-3 Soil Sample with Aluminum
Aluminum (96.48%)
Arsenic (0.06%)
Barium (0.85%)
Beryllium (0.01%)
Chromium, Total (0.26%)
Cobalt (0.10%)
Copper (0.25%)
Lead (0.18%)
Molybdenum (0.00%)
Nickel (0.28%)
Selenium (0.00%)
Vanadium (0.34%)
Zinc (1.19%)
Chromium VI (0.00%)

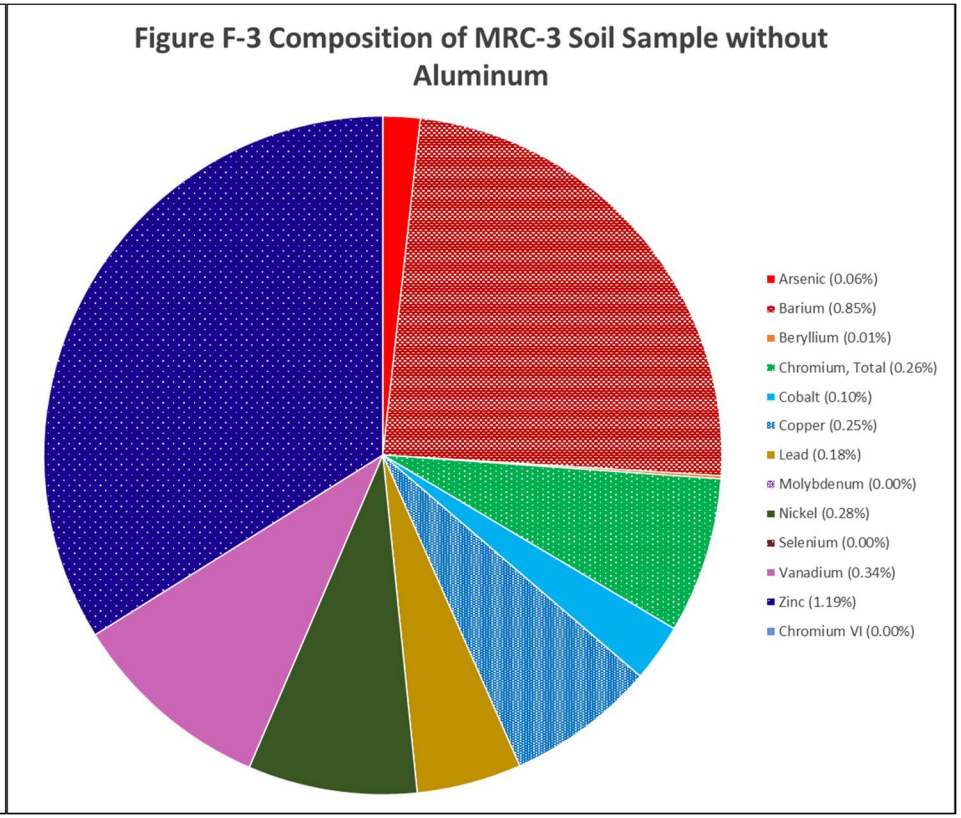


Figure F-3 Composition of MRC-3 Soil Sample without Aluminum
Arsenic (0.06%)
Barium (0.85%)
Beryllium (0.01%)
Chromium, Total (0.26%)
Cobalt (0.10%)
Copper (0.25%)
Lead (0.18%)
Molybdenum (0.00%)
Nickel (0.28%)
Selenium (0.00%)
Vanadium (0.34%)
Zinc (1.19%)
Chromium VI (0.00%)

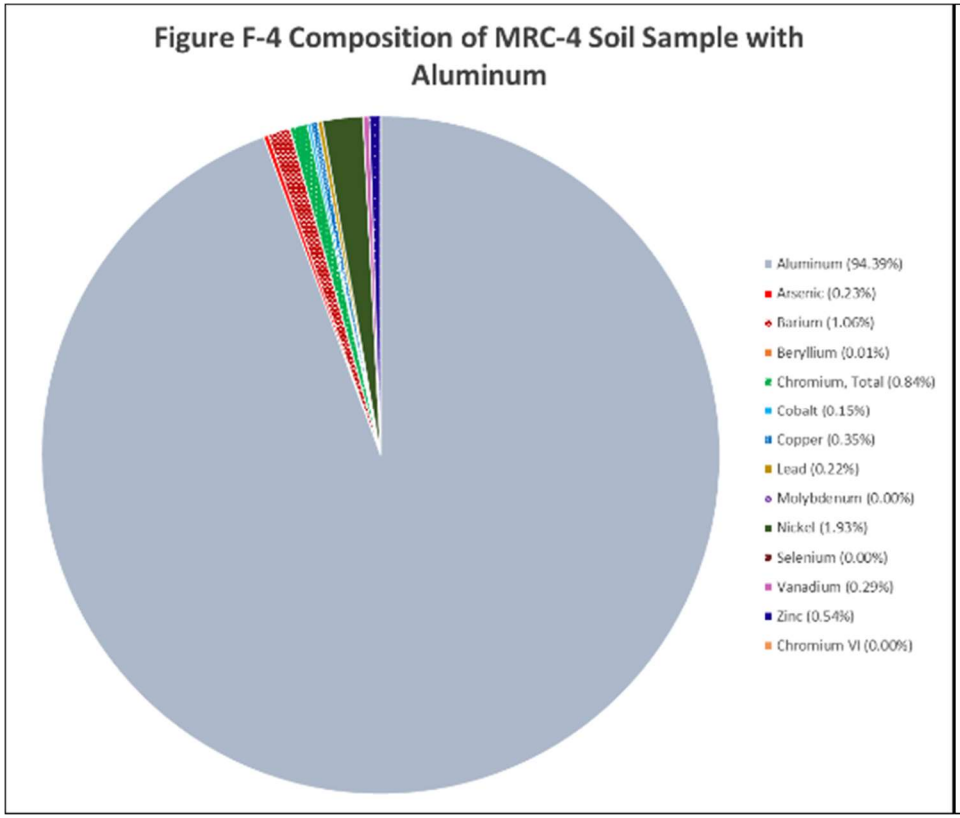


Figure F-4 Composition of MRC-4 Soil Sample with Aluminum
Aluminum (94.39%)
Arsenic (0.23%)
Barium (1.06%)
Beryllium (0.01%)
Chromium, Total (0.84%)
Cobalt (0.15%)
Copper (0.35%)
Lead (0.22%)
Molybdenum (0.00%)
Nickel (1.93%)
Selenium (0.00%)
Vanadium (0.29%)
Zinc (0.54%)
Chromium VI (0.00%)

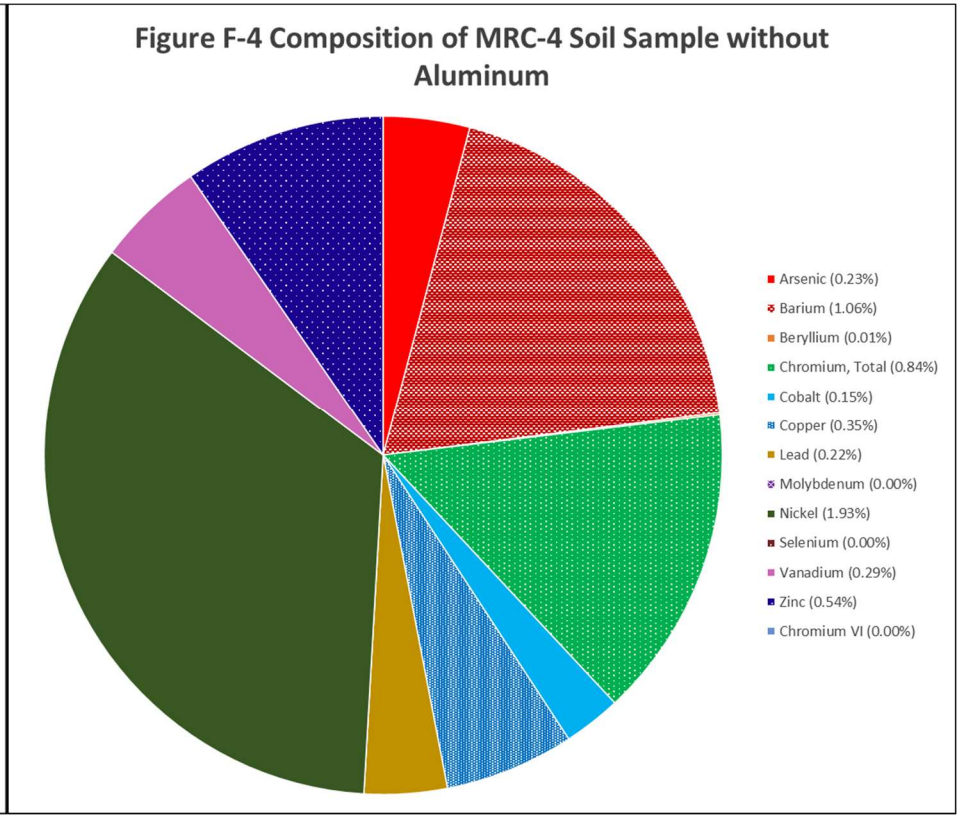


Figure F-4 Composition of MRC-4 Soil Sample without Aluminum
Arsenic (0.23%)
Barium (1.06%)
Beryllium (0.01%)
Chromium, Total (0.84%)
Cobalt (0.15%)
Copper (0.35%)
Lead (0.22%)
Molybdenum (0.00%)
Nickel (1.93%)
Selenium (0.00%)
Vanadium (0.29%)
Zinc (0.54%)
Chromium VI (0.00%)

Figure F-5 Composition of MRC-5 Soil Sample with Aluminum

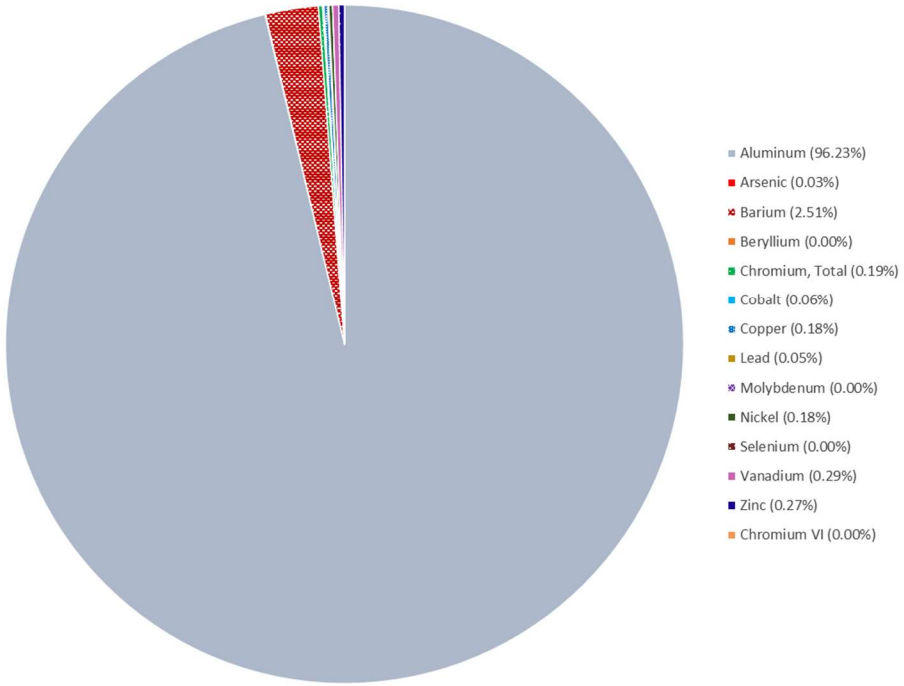
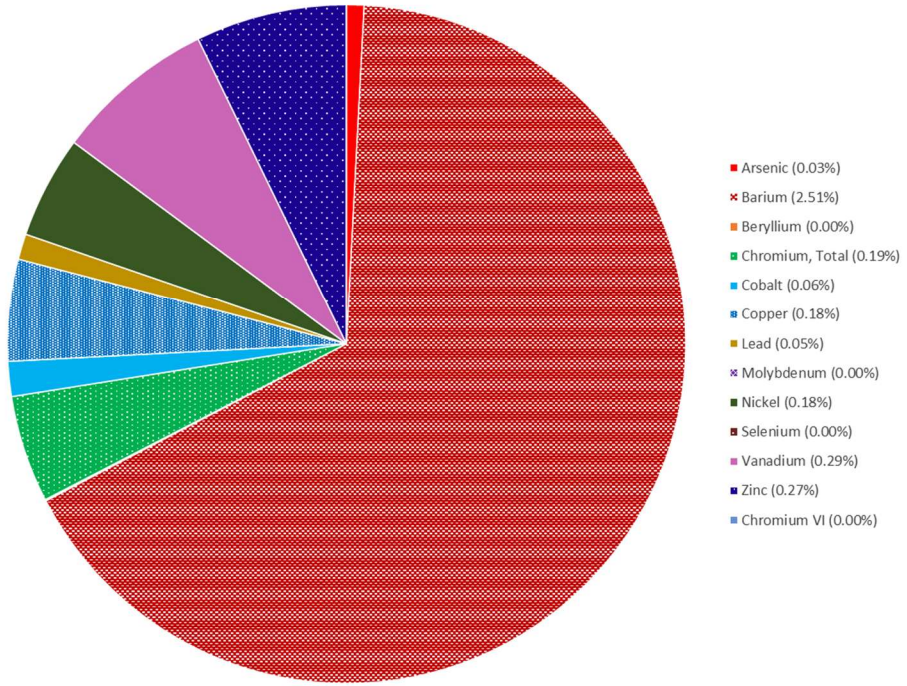


Figure F-5 Composition of MRC-5 Soil Sample without Aluminum



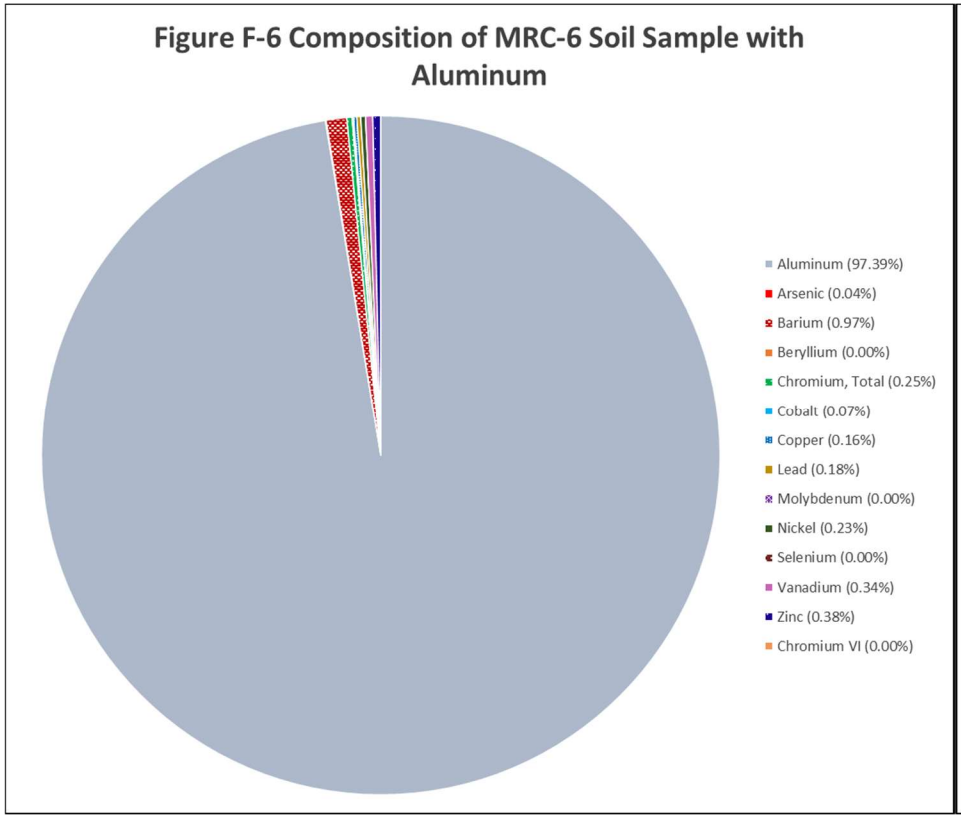


Figure F-6 Composition of MRC-6 Soil Sample with Aluminum
Aluminum (97.39%)
Arsenic (0.04%)
Barium (0.97%)
Beryllium (0.00%)
Chromium, Total (0.25%)
Cobalt (0.07%)
Copper (0.16%)
Lead (0.18%)
Molybdenum (0.00%)
Nickel (0.23%)
Selenium (0.00%)
Vanadium (0.34%)
Zinc (0.38%)
Chromium VI (0.00%)

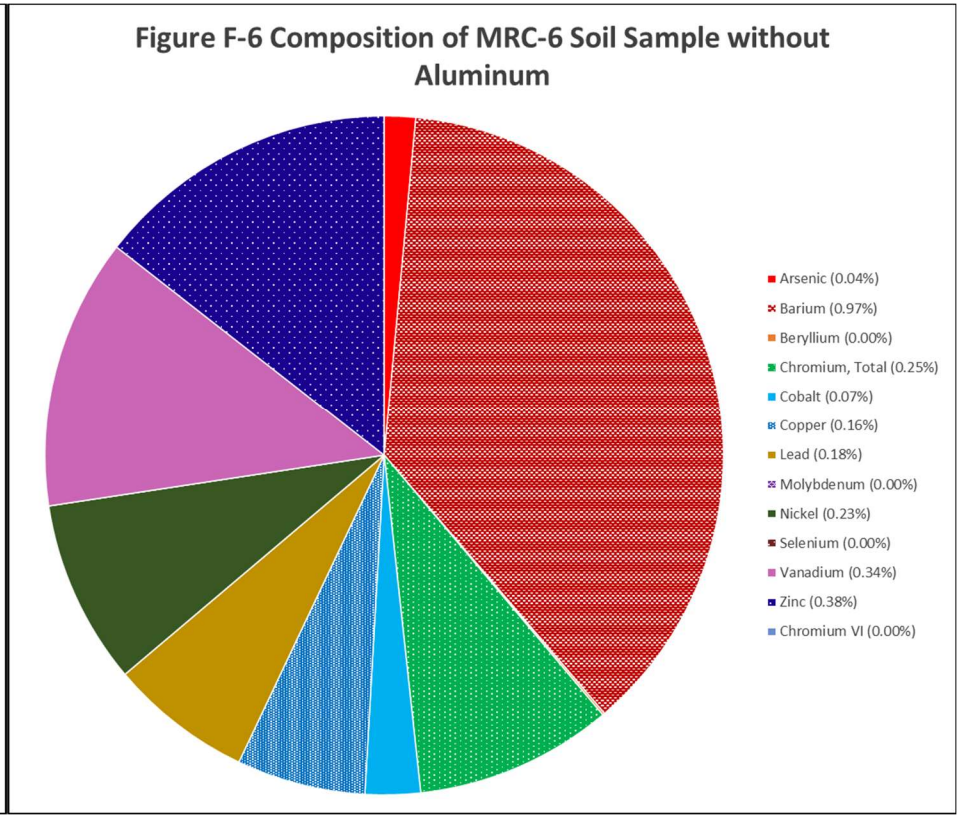


Figure F-6 Composition of MRC-6 Soil Sample without Aluminum
Arsenic (0.04%)
Barium (0.97%)
Beryllium (0.00%)
Chromium, Total (0.25%)
Cobalt (0.07%)
Copper (0.16%)
Lead (0.18%)
Molybdenum (0.00%)
Nickel (0.23%)
Selenium (0.00%)
Vanadium (0.34%)
Zinc (0.38%)
Chromium VI (0.00%)

Figure F-7 Composition of MRC-7 Soil Sample with Aluminum

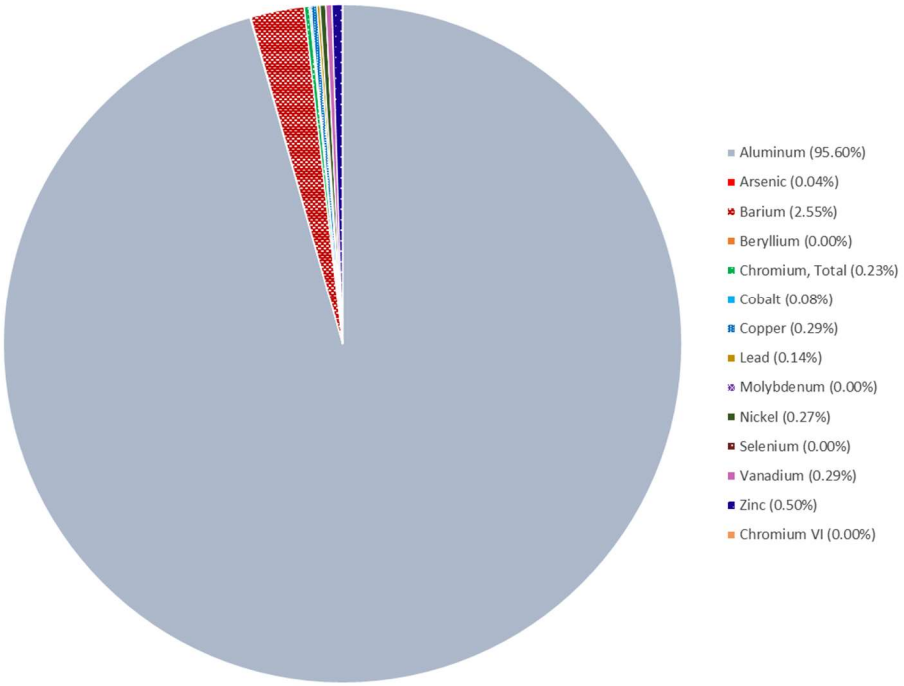
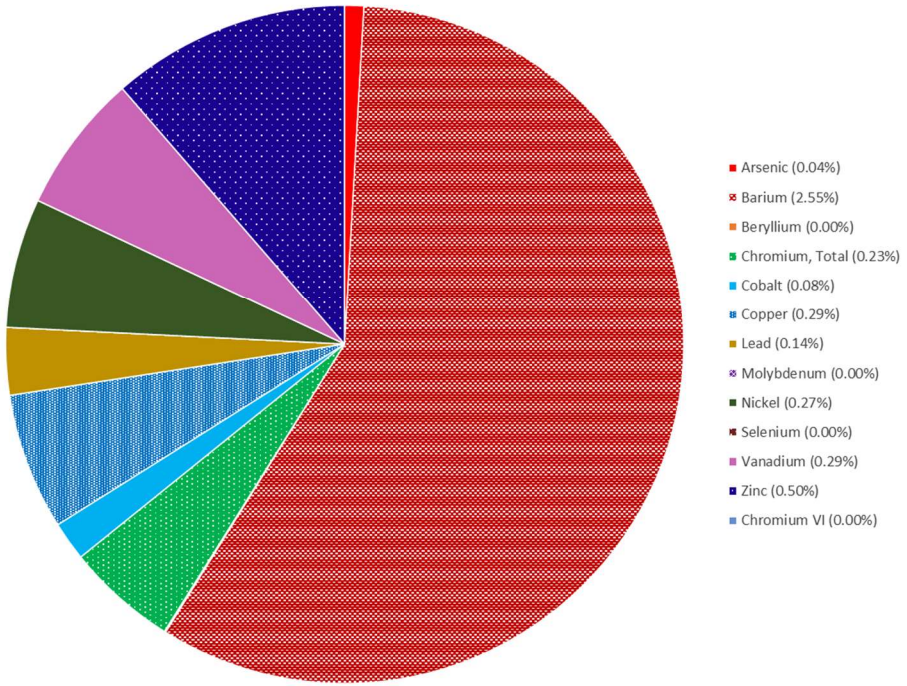


Figure F-7 Composition of MRC-7 Soil Sample without Aluminum



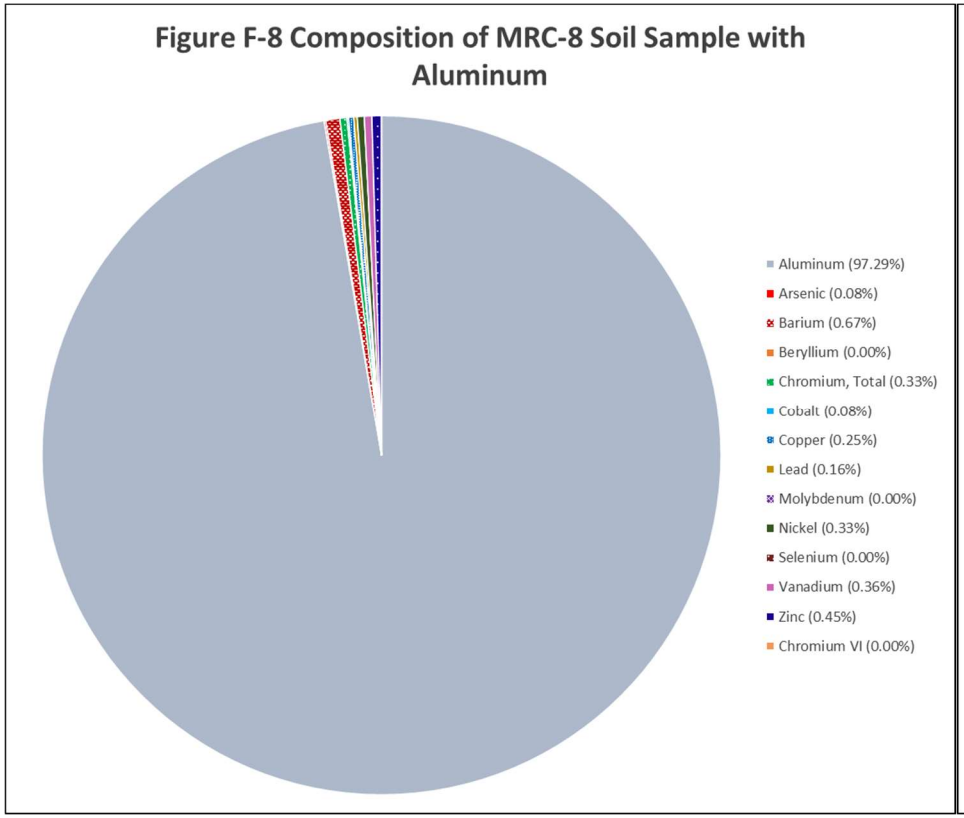


Figure F-8 Composition of MRC-8 Soil Sample with Aluminum
Aluminum (97.29%)
Arsenic (0.08%)
Barium (0.67%)
Beryllium (0.00%)
Chromium, Total (0.33%)
Cobalt (0.08%)
Copper (0.25%)
Lead (0.16%)
Molybdenum (0.00%)
Nickel (0.33%)
Selenium (0.00%)
Vanadium (0.36%)
Zinc (0.45%)
Chromium VI (0.00%)

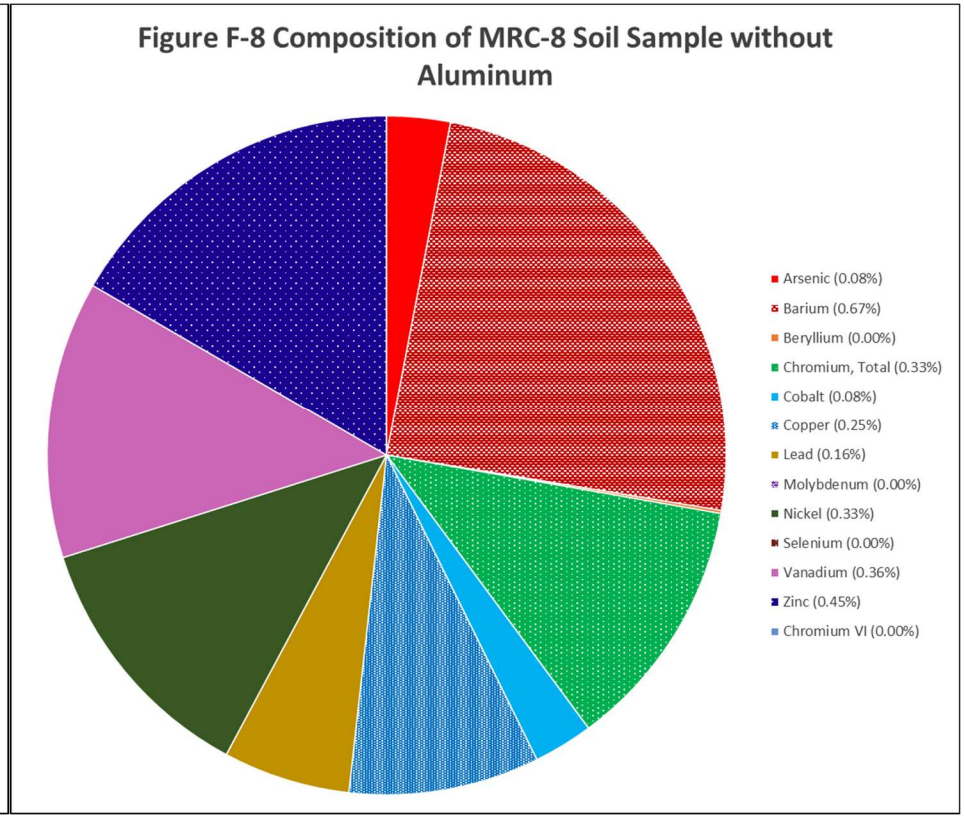


Figure F-8 Composition of MRC-8 Soil Sample without Aluminum
Arsenic (0.08%)
Barium (0.67%)
Beryllium (0.00%)
Chromium, Total (0.33%)
Cobalt (0.08%)
Copper (0.25%)
Lead (0.16%)
Molybdenum (0.00%)
Nickel (0.33%)
Selenium (0.00%)
Vanadium (0.36%)
Zinc (0.45%)
Chromium VI (0.00%)

Figure F-9 Composition of MRC-8 /Dup-1 Soil Sample with Aluminum

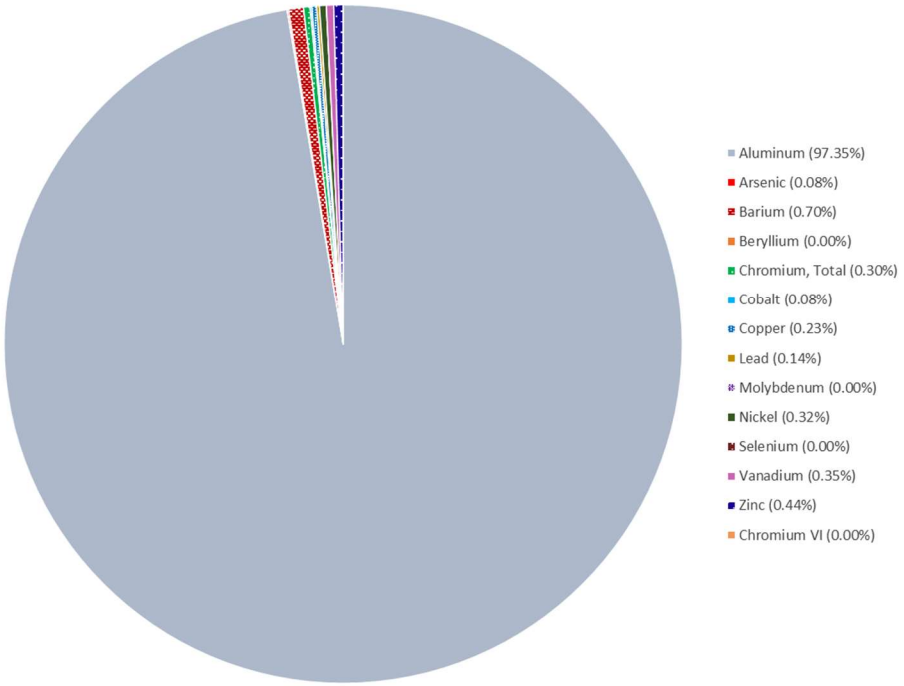


Figure F-9 Composition of MRC-8/Dup-1 Soil Sample with and without Aluminum

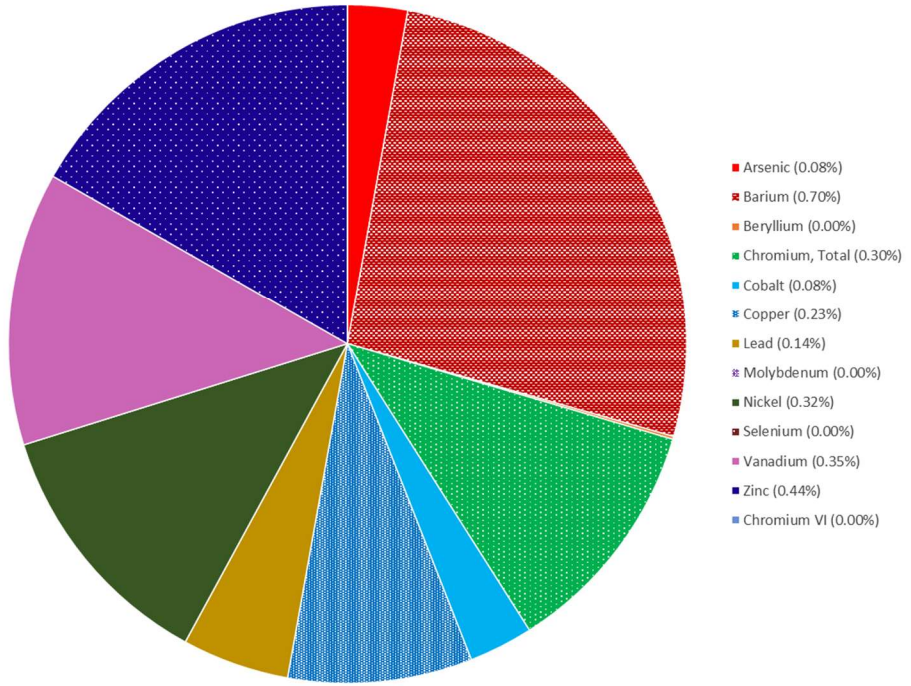


Figure F-10 Composition of MRC-9 Soil Sample with Aluminum

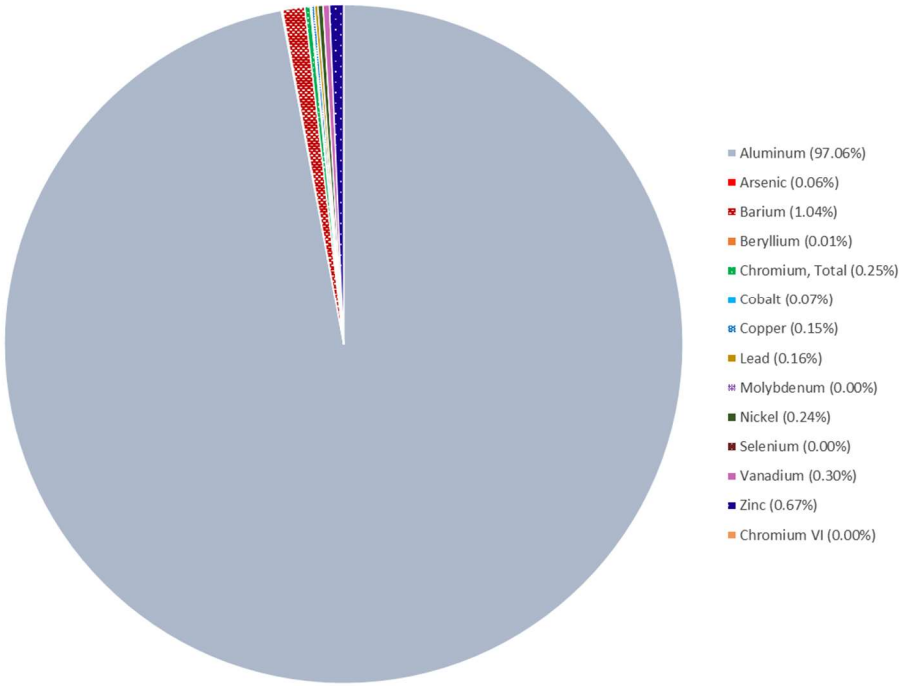


Figure F-10 Composition of MRC-9 Soil Sample without Aluminum

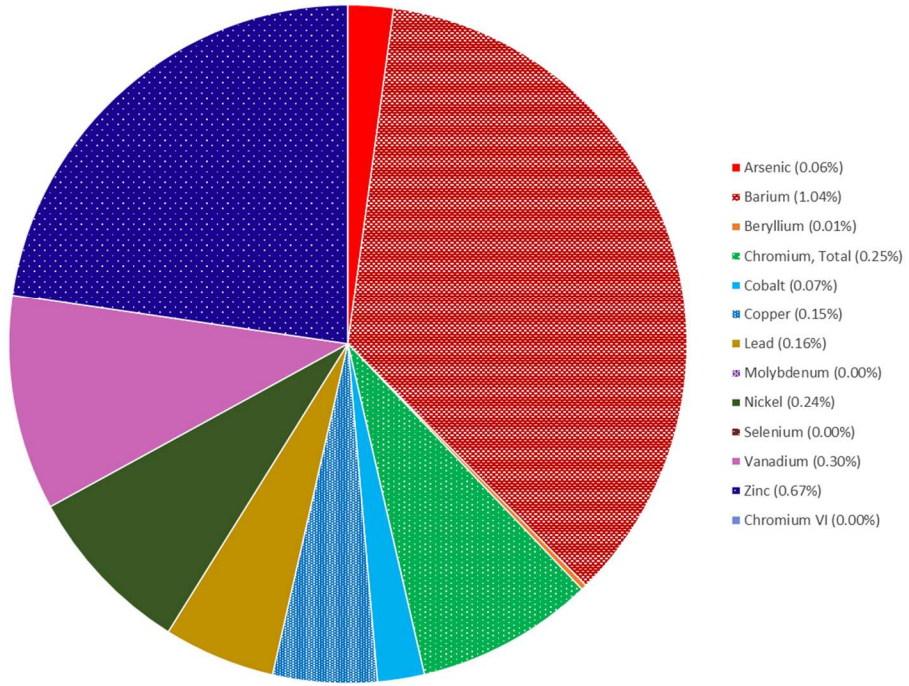


Figure F-11 Composition of MRC-10 Soil Sample with Aluminum

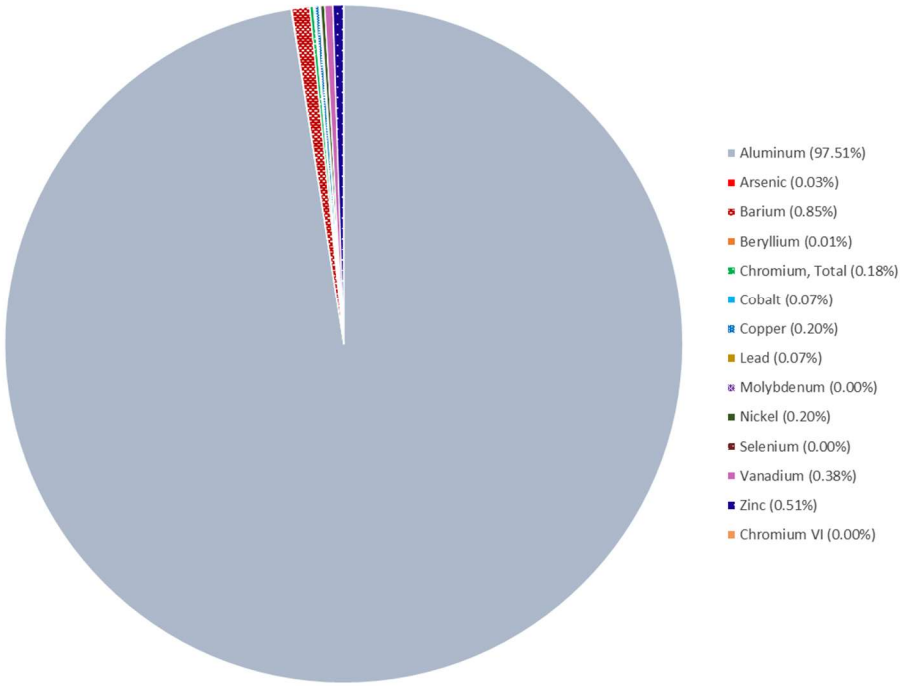
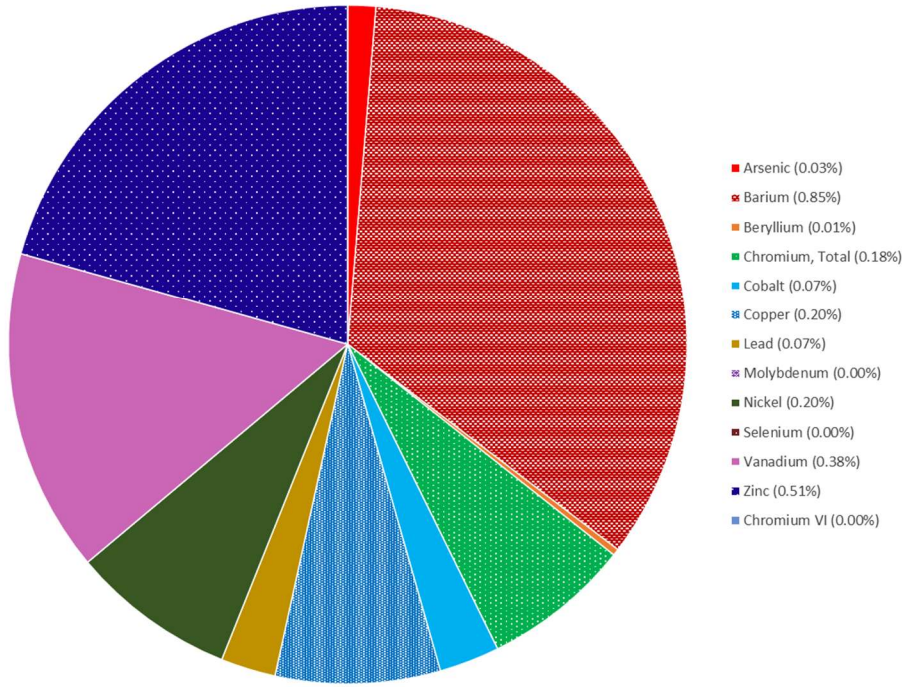


Figure F-11 Composition of MRC-10 Soil Sample without Aluminum



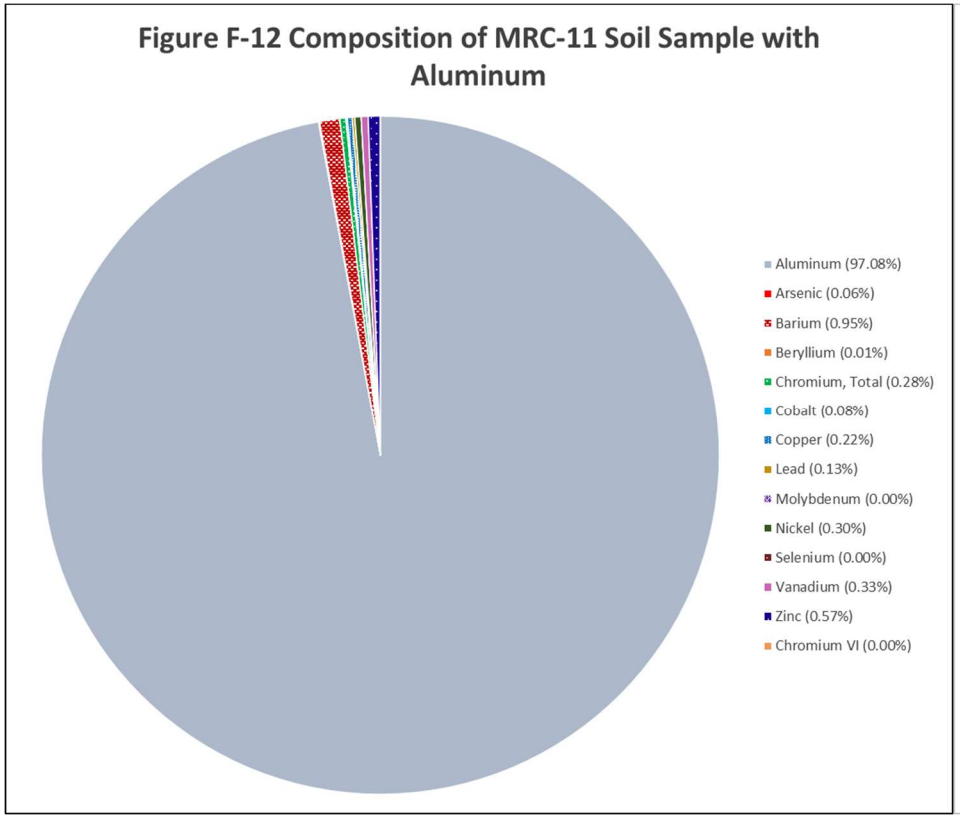


Figure F-12 Composition of MRC-11 Soil Sample with Aluminum
Aluminum (97.08%)
Arsenic (0.06%)
Barium (0.95%)
Beryllium (0.01%)
Chromium, Total (0.28%)
Cobalt (0.08%)
Copper (0.22%)
Lead (0.13%)
Molybdenum (0.00%)
Nickel (0.30%)
Selenium (0.00%)
Vanadium (0.33%)
Zinc (0.57%)
Chromium VI (0.00%)

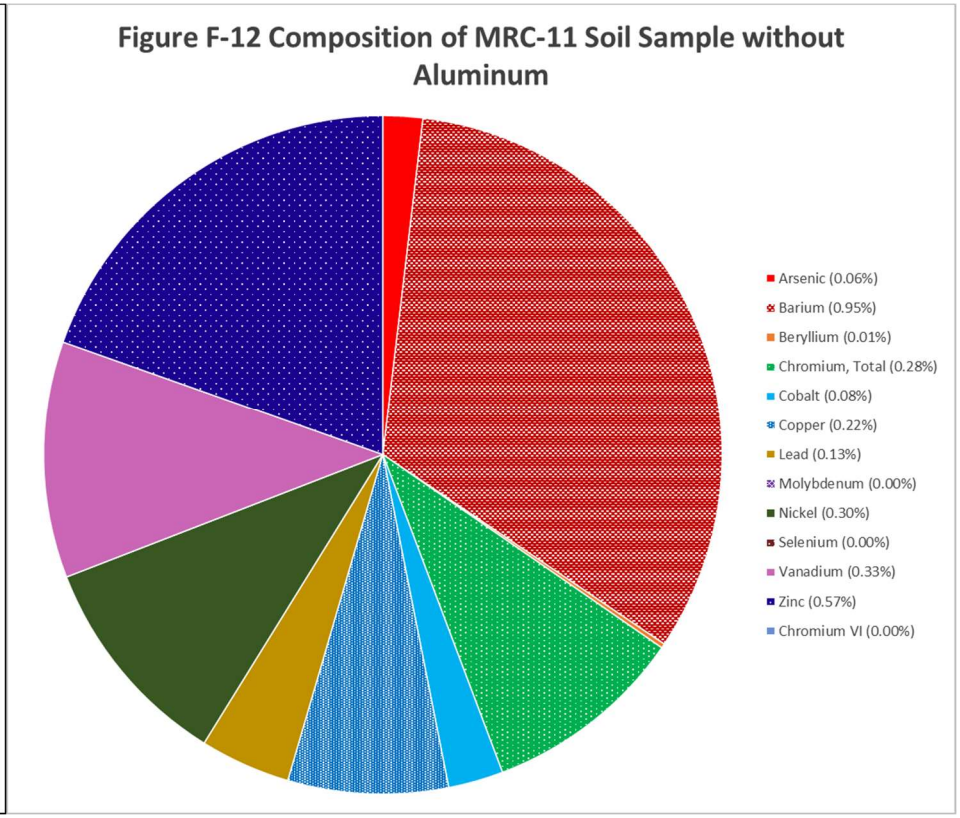


Figure F-12 Composition of MRC-11 Soil Sample without Aluminum
Arsenic (0.06%)
Barium (0.95%)
Beryllium (0.01%)
Chromium, Total (0.28%)
Cobalt (0.08%)
Copper (0.22%)
Lead (0.13%)
Molybdenum (0.00%)
Nickel (0.30%)
Selenium (0.00%)
Vanadium (0.33%)
Zinc (0.57%)
Chromium VI (0.00%)

Figure F-13 Composition of MRC-12 Soil Sample with Aluminum

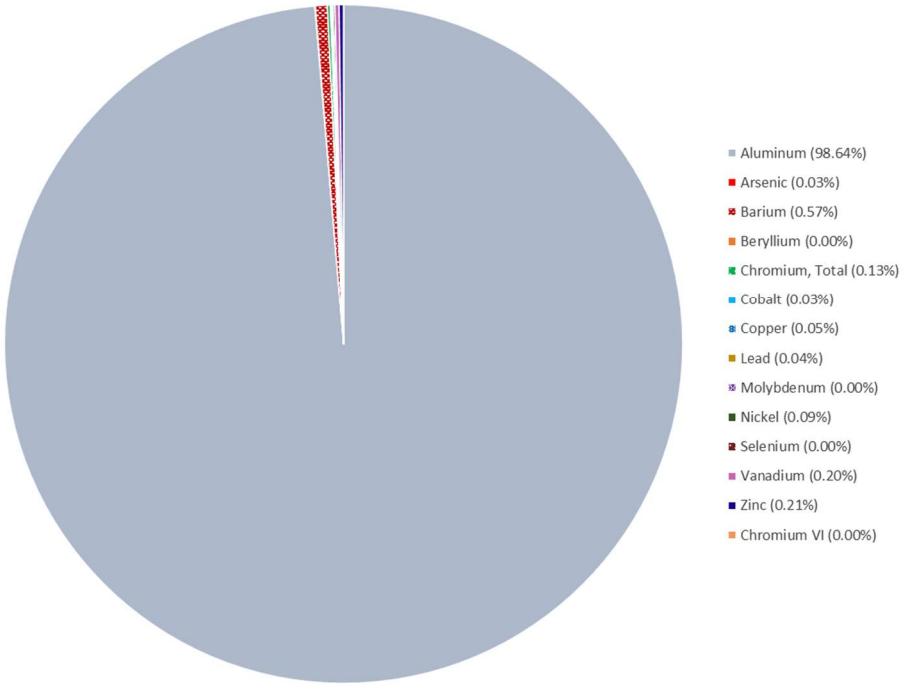


Figure F-13 Composition of MRC-12 Soil Sample without Aluminum

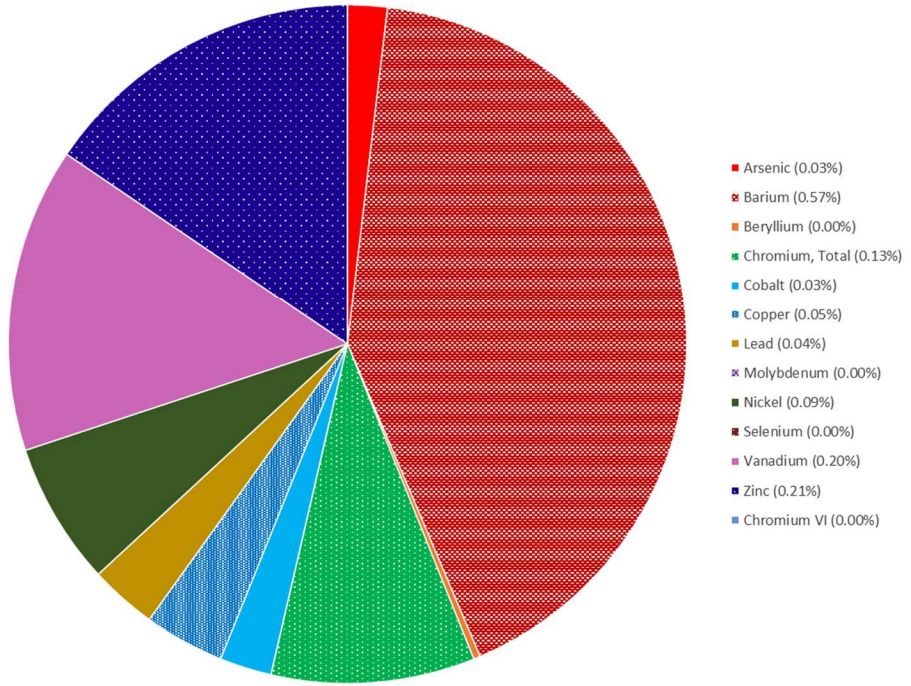


Figure F-14 Composition of MRC-13 Soil Sample with Aluminum

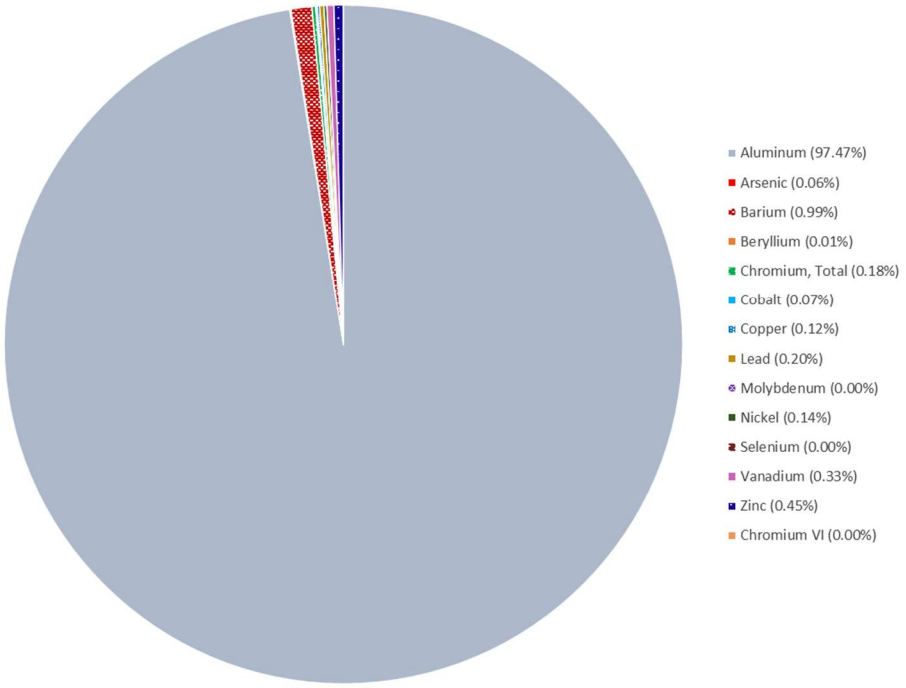


Figure F-14 Composition of MRC-13 Soil Sample without Aluminum

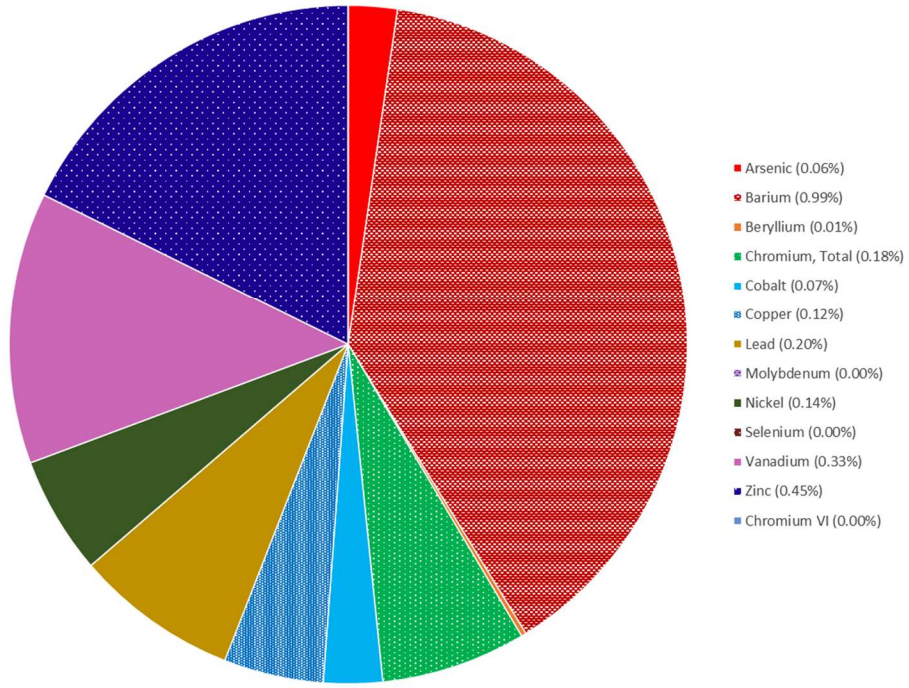


Figure F-15 Composition of MRC-14 Soil Sample with Aluminum

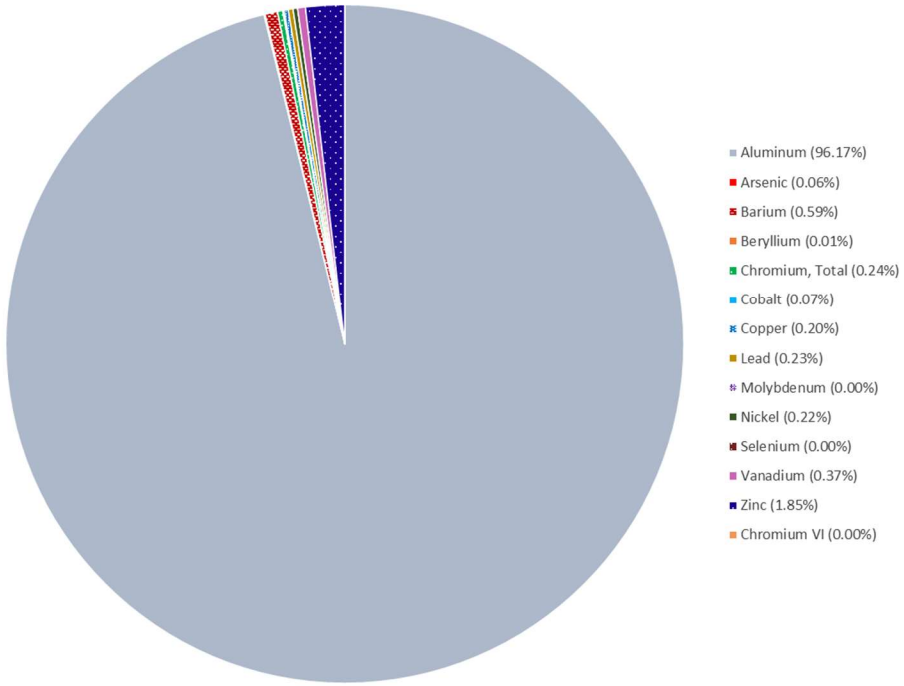


Figure F-15 Composition of MRC-14 Soil Sample without Aluminum

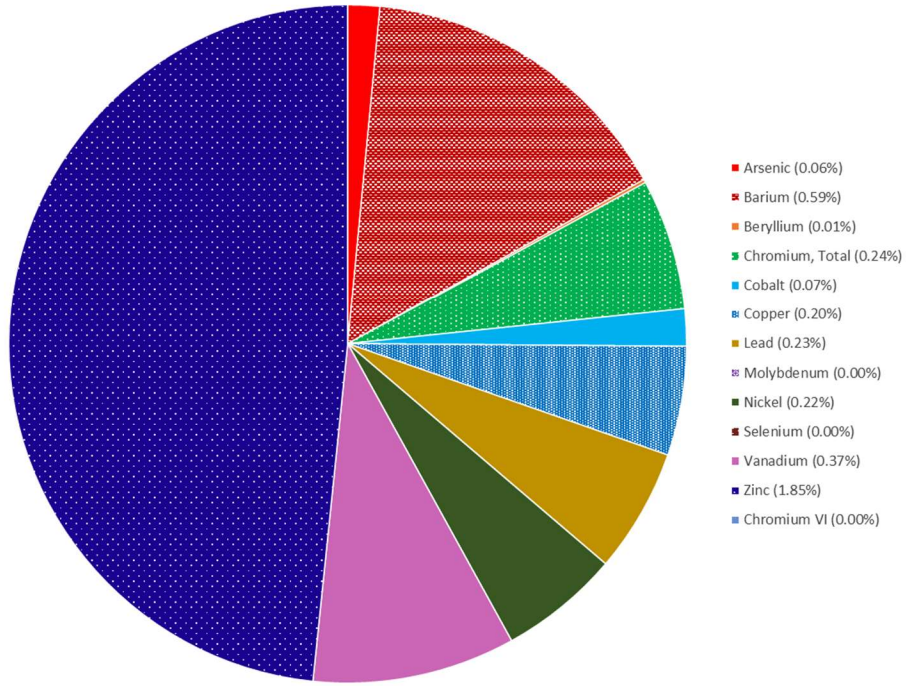
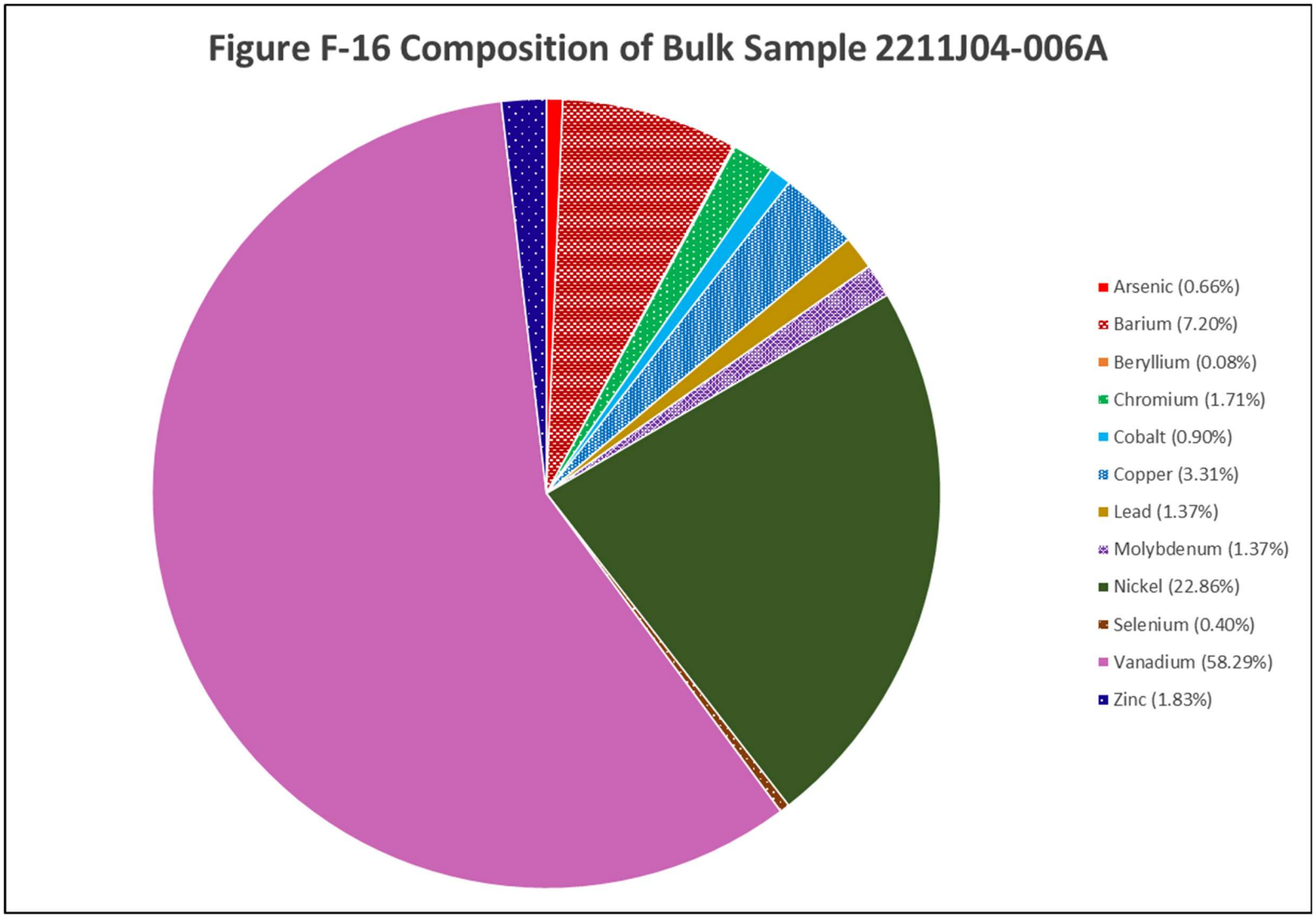


Figure F-16 Composition of Bulk Sample 2211J04-006A



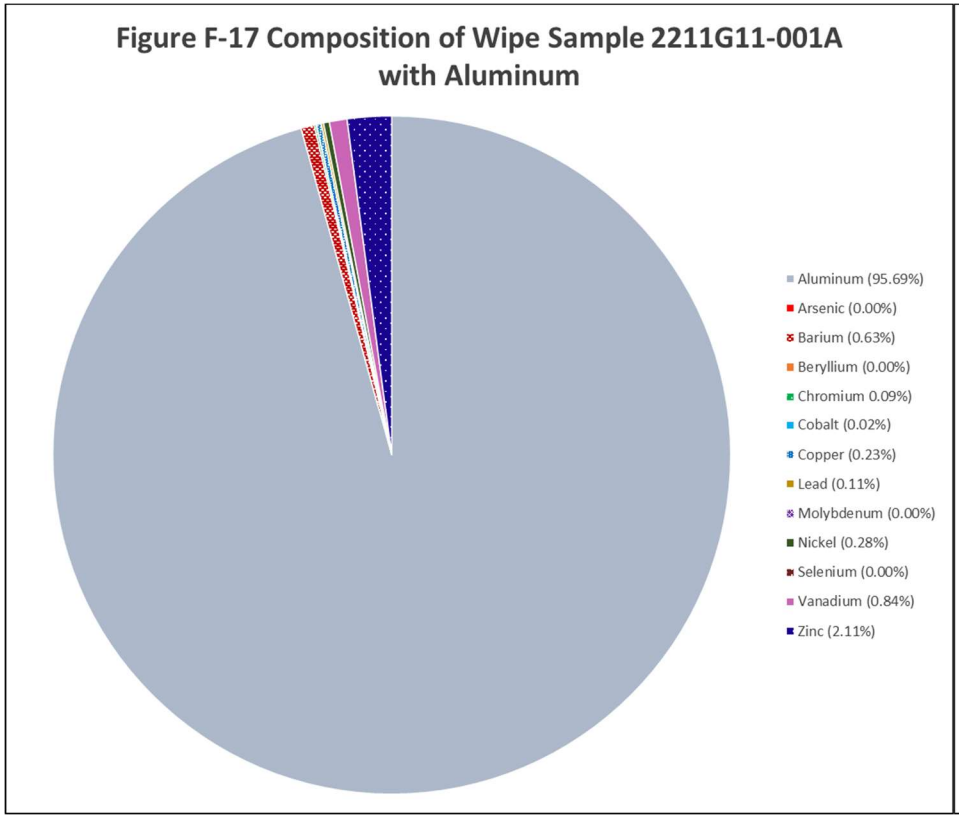


Figure F-17 Composition of Wipe Sample 2211G11-001A with Aluminum
Aluminum (95.69%)
Arsenic (0.00%)
Barium (0.63%)
Beryllium (0.00%)
Chromium 0.09%)
Cobalt (0.02%)
Copper (0.23%)
Lead (0.11%)
Molybdenum (0.00%)
Nickel (0.28%)
Selenium (0.00%)
Vanadium (0.84%)
Zinc (2.11%)

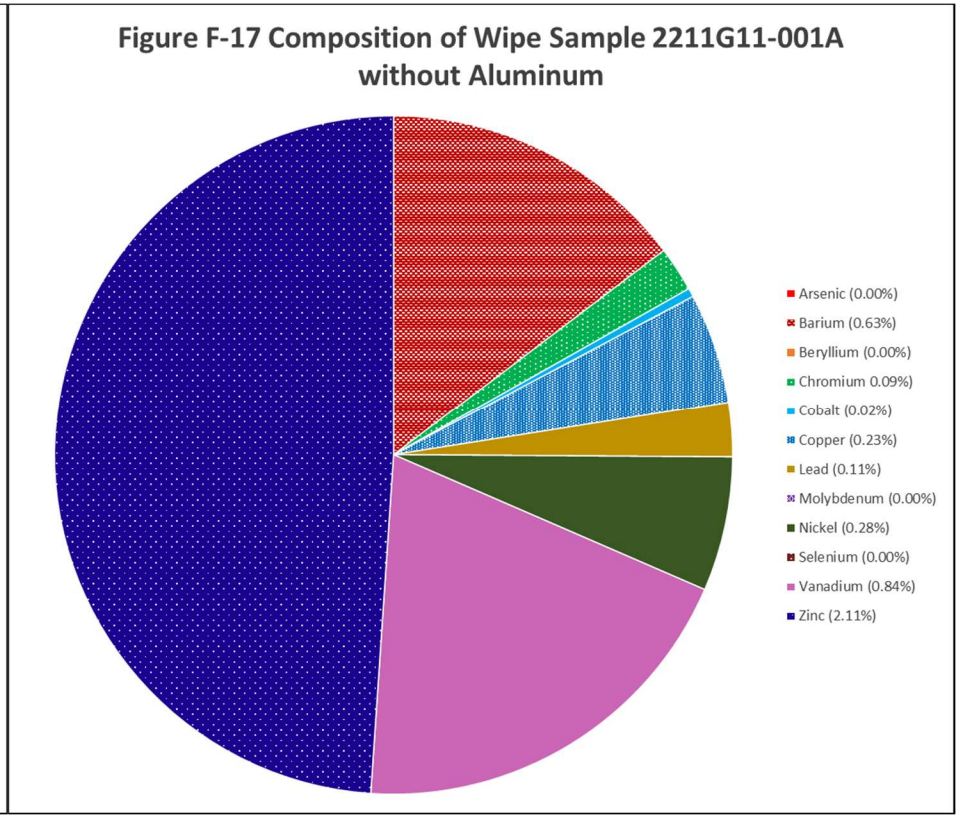


Figure F-17 Composition of Wipe Sample 2211G11-001A without Aluminum
Arsenic (0.00%)
Barium (0.63%)
Beryllium (0.00%)
Chromium 0.09%)
Cobalt (0.02%)
Copper (0.23%)
Lead (0.11%)
Molybdenum (0.00%)
Nickel (0.28%)
Selenium (0.00%)
Vanadium (0.84%)
Zinc (2.11%)

Figure F-18 Composition of Wipe Sample 2211G11-002A with Aluminum

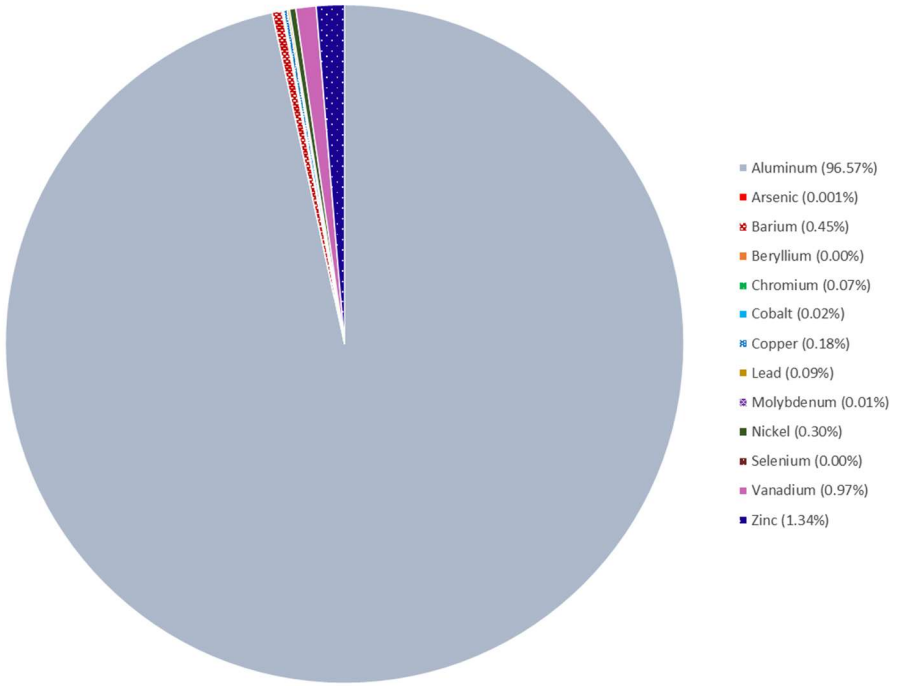
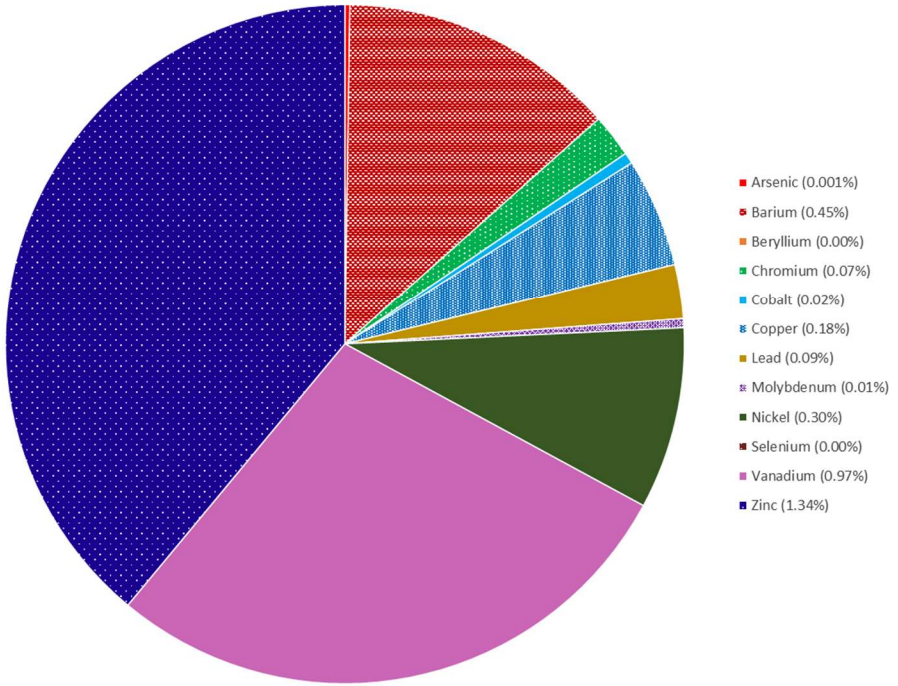


Figure F-18 Composition of Wipe Sample 2211G11-002A without Aluminum



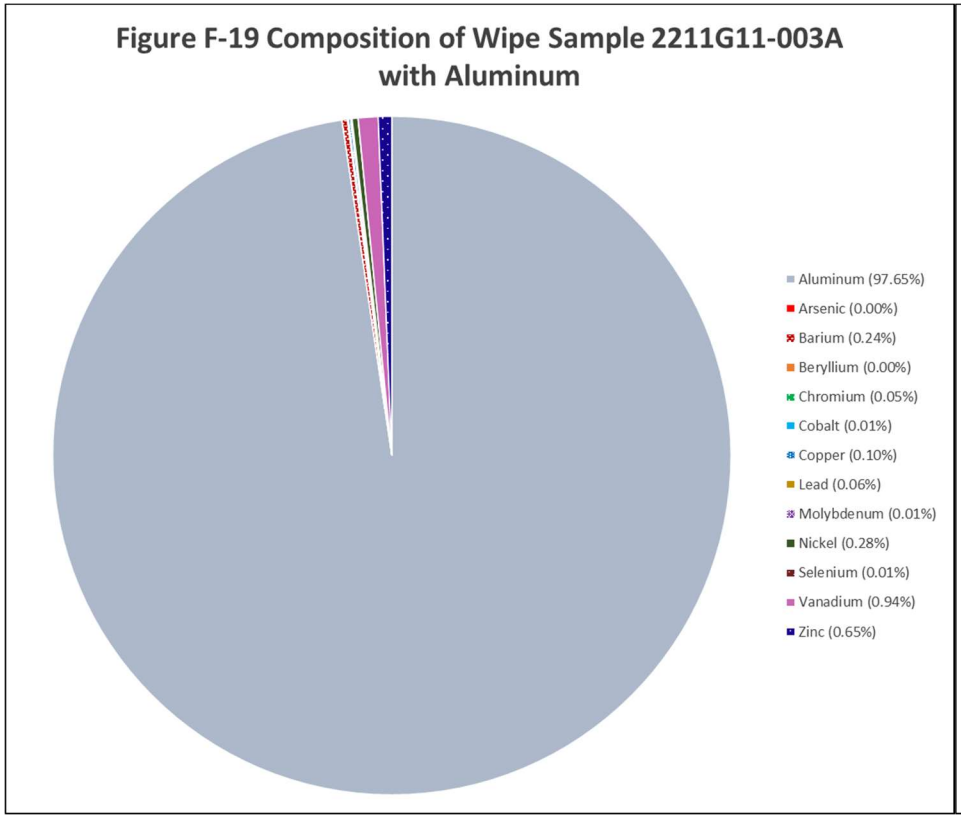


Figure F-19 Composition of Wipe Sample 2211G11-003A with Aluminum
Aluminum (97.65%)
Arsenic (0.00%)
Barium (0.24%)
Beryllium (0.00%)
Chromium (0.05%)
Cobalt (0.01%)
Copper (0.10%)
Lead (0.06%)
Molybdenum (0.01%)
Nickel (0.28%)
Selenium (0.01%)
Vanadium (0.94%)
Zinc (0.65%)

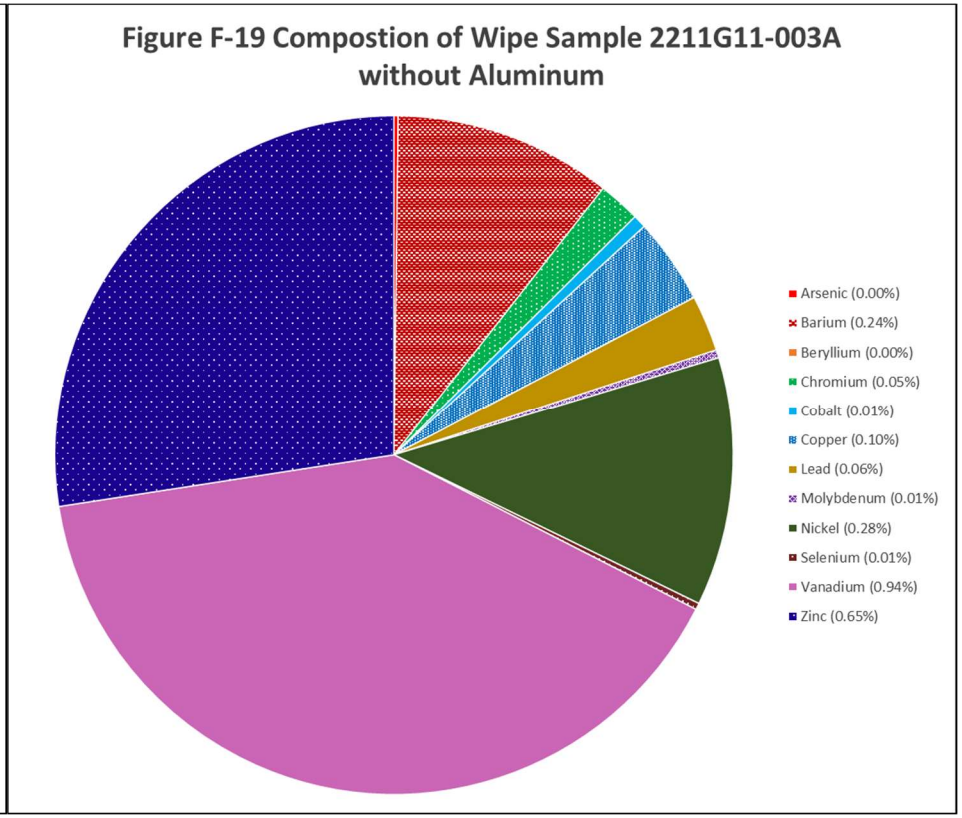


Figure F-19 Compostion of Wipe Sample 2211G11-003A without Aluminum
Arsenic (0.00%)
Barium (0.24%)
Beryllium (0.00%)
Chromium (0.05%)
Cobalt (0.01%)
Copper (0.10%)
Lead (0.06%)
Molybdenum (0.01%)
Nickel (0.28%)
Selenium (0.01%)
Vanadium (0.94%)
Zinc (0.65%)

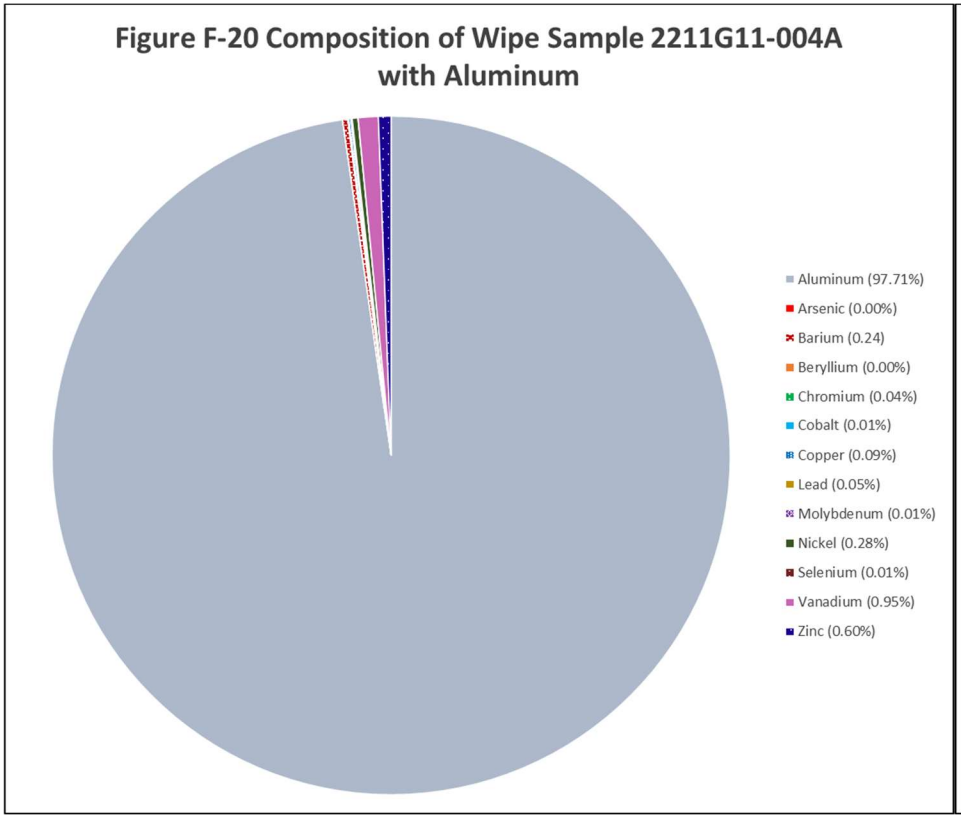


Figure F-20 Composition of Wipe Sample 2211G11-004A with Aluminum
Aluminum (97.71%)
Arsenic (0.00%)
Barium (0.24)
Beryllium (0.00%)
Chromium (0.04%)
Cobalt (0.01%)
Copper (0.09%)
Lead (0.05%)
Molybdenum (0.01%)
Nickel (0.28%)
Selenium (0.01%)
Vanadium (0.95%)
Zinc (0.60%)

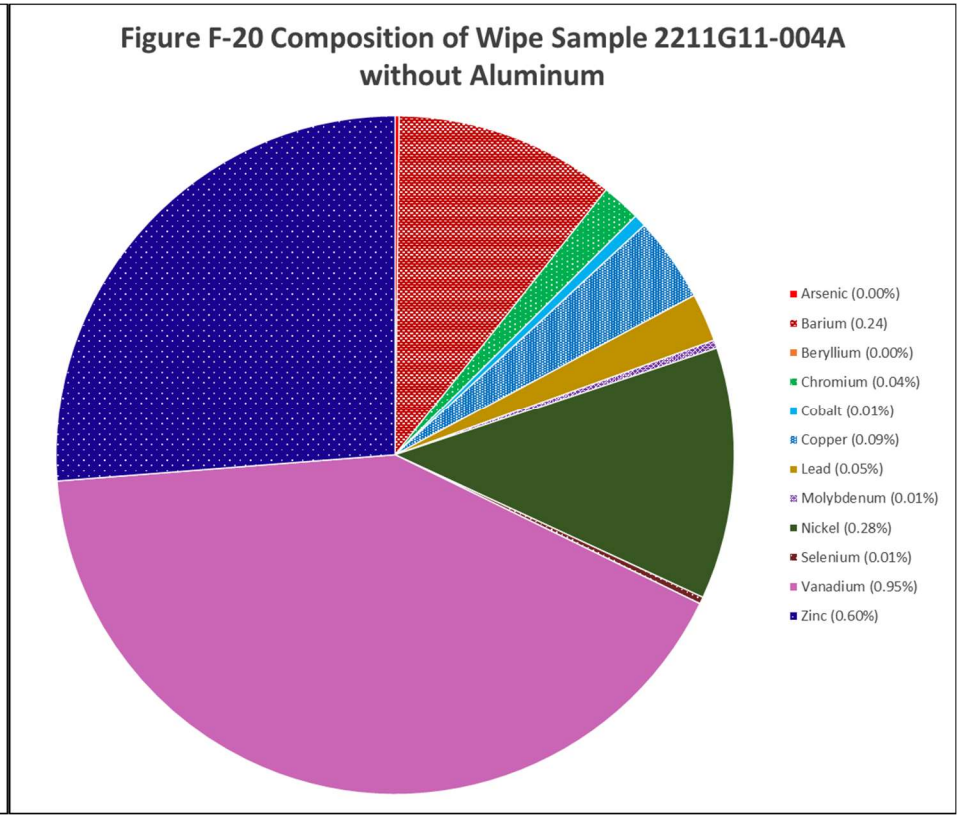


Figure F-20 Composition of Wipe Sample 2211G11-004A without Aluminum
Arsenic (0.00%)
Barium (0.24)
Beryllium (0.00%)
Chromium (0.04%)
Cobalt (0.01%)
Copper (0.09%)
Lead (0.05%)
Molybdenum (0.01%)
Nickel (0.28%)
Selenium (0.01%)
Vanadium (0.95%)
Zinc (0.60%)

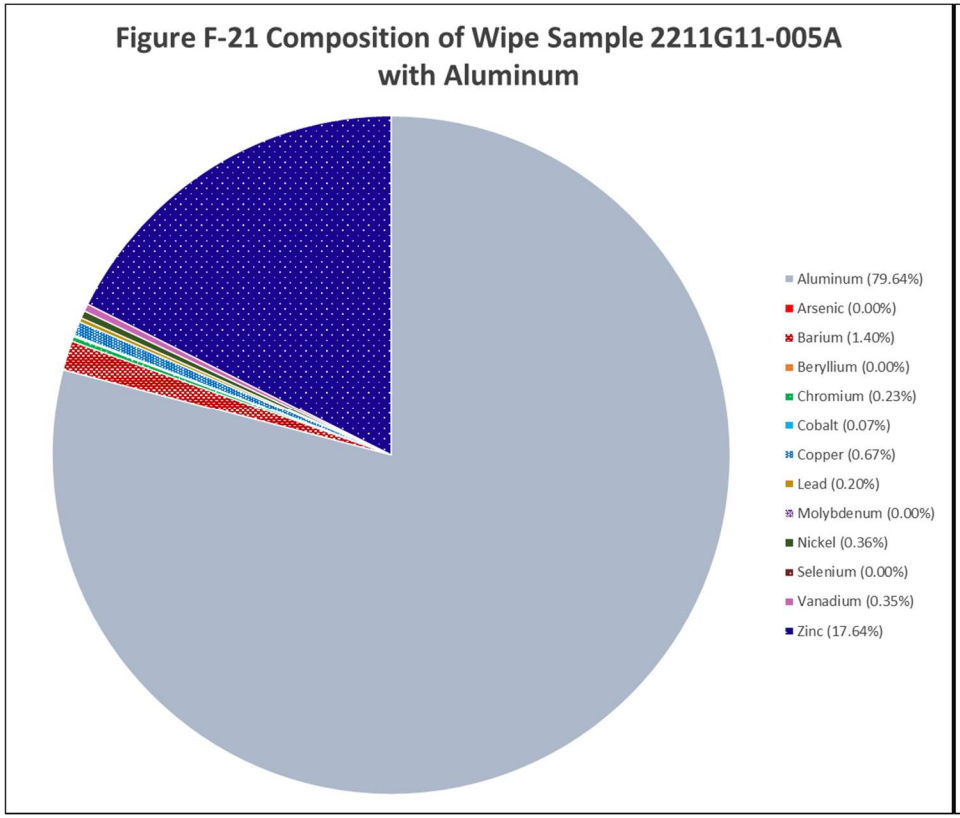


Figure F-21 Composition of Wipe Sample 2211G11-005A with Aluminum
Aluminum (79.64%)
Arsenic (0.00%)
Barium (1.40%)
Beryllium (0.00%)
Chromium (0.23%)
Cobalt (0.07%)
Copper (0.67%)
Lead (0.20%)
Molybdenum (0.00%)
Nickel (0.36%)
Selenium (0.00%)
Vanadium (0.35%)
Zinc (17.64%)

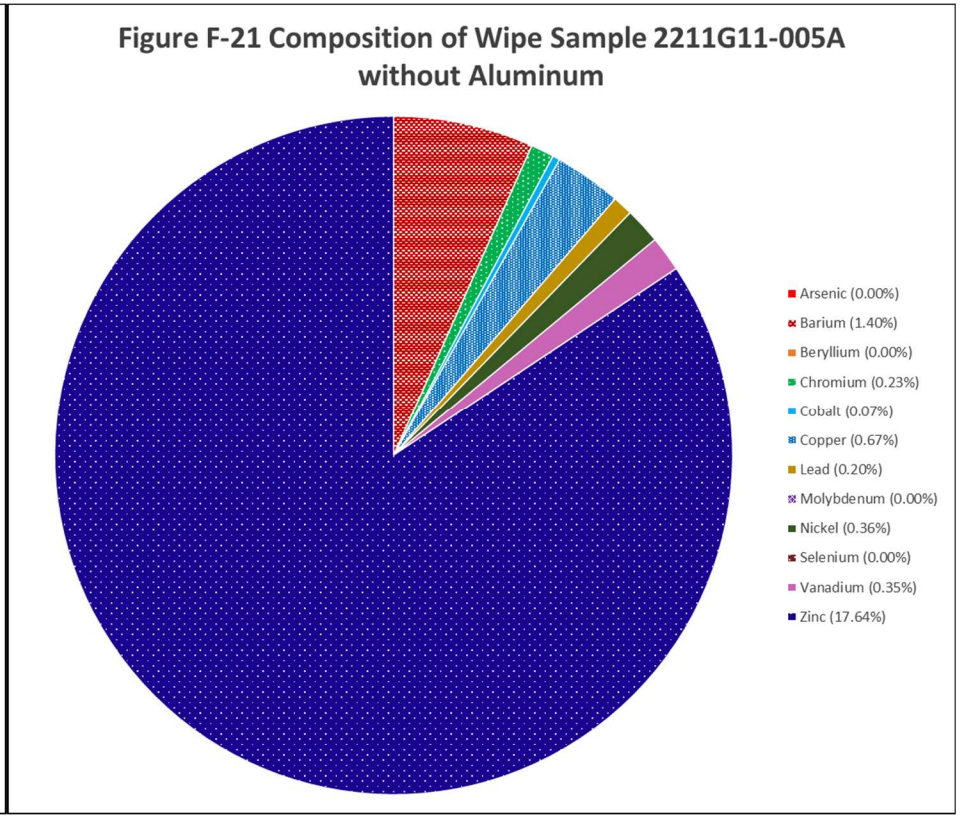


Figure F-21 Composition of Wipe Sample 2211G11-005A without Aluminum
Arsenic (0.00%)
Barium (1.40%)
Beryllium (0.00%)
Chromium (0.23%)
Cobalt (0.07%)
Copper (0.67%)
Lead (0.20%)
Molybdenum (0.00%)
Nickel (0.36%)
Selenium (0.00%)
Vanadium (0.35%)
Zinc (17.64%)

Appendix G. Human Health Risk Evaluation

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Table G-1
Individual Sample Residential Soil Risks from Ingestion, Dermal Contact, and Inhalation of Airborne Soil Particulates
Spent Catalyst Release from Martinez Refining Company

COPC	MRC-1			MRC-2			MRC-3			MRC-4			MRC-5			MRC-6			MRC-7			MRC-8			MRC-8 /Dup-1			MRC-9			MRC-10			MRC-11			MRC-12			MRC-13			MRC-14			Residential Soil Health Standard (mg/kg)	
	Conc (mg/kg)	C Risk	NC HQ	Conc (mg/kg)	C Risk	NC HQ	Conc (mg/kg)	C Risk	NC HQ	Conc (mg/kg)	C Risk	NC HQ	Conc (mg/kg)	C Risk	NC HQ	Conc (mg/kg)	C Risk	NC HQ	Conc (mg/kg)	C Risk	NC HQ	Conc (mg/kg)	C Risk	NC HQ	Conc (mg/kg)	C Risk	NC HQ	Conc (mg/kg)	C Risk	NC HQ	Conc (mg/kg)	C Risk	NC HQ	Conc (mg/kg)	C Risk	NC HQ	Conc (mg/kg)	C Risk	NC HQ	Conc (mg/kg)	C Risk	NC HQ	Conc (mg/kg)	C Risk	NC HQ		
Aluminum	**9,200**	--	0.12	**19,000**	--	0.25	**17,000**	--	0.22	**9,800**	--	0.13	**23,000**	--	0.30	**17,000**	--	0.22	**21,000**	--	0.27	**19,000**	--	0.25	**18,000**	--	0.23	**9,300**	--	0.12	**15,000**	--	0.19	**10,000**	--	0.13	**15,000**	--	0.19	**8,900**	--	0.12	**14,000**	--	0.18	77,000	NC
Arsenic	**7.1**	6.5E-05	17.32	**28**	2.5E-04	68.29	**11**	1.0E-04	26.83	**24**	2.2E-04	58.54	**7.5**	6.8E-05	18.29	**6.8**	6.2E-05	16.59	**8.8**	8.0E-05	21.46	**16.0**	1.5E-04	39.02	**14.0**	1.3E-04	34.15	**6.1**	5.5E-05	14.88	**5.1**	4.6E-05	12.44	**5.7**	5.2E-05	13.90	**3.9**	3.5E-05	9.51	**5.4**	4.9E-05	13.17	**8.5**	7.7E-05	20.73	0.11	C [NC = 0.41]
Barium	**99**	--	0.01	**110**	--	0.01	**150**	--	0.01	**110**	--	0.01	**600**	--	0.04	**170**	--	0.01	**560**	--	0.04	**130**	--	0.01	**130**	--	0.01	**100**	--	0.01	**130**	--	0.01	**98**	--	0.01	**86**	--	0.01	**90**	--	0.01	**86**	--	0.01	15,000	NC
Beryllium	**0.57**	--	0.04	**0.53**	--	0.03	**0.93**	--	0.06	**0.58**	--	0.04	**0.61**	--	0.04	**0.48**	--	0.03	**0.62**	--	0.04	**0.77**	--	0.05	**0.69**	--	0.04	**0.73**	--	0.05	**1.2**	--	0.08	**0.64**	--	0.04	**0.65**	--	0.04	**0.55**	--	0.03	**0.88**	--	0.06	16	NC
Chromium, Total	**22**	--	0.0002	**57**	--	0.0005	**46**	--	0.0004	**87**	--	0.0007	**46**	--	0.0004	**43**	--	0.0004	**51**	--	0.0004	**64**	--	0.0005	**56**	--	0.00	**24**	--	0.0002	**27**	--	0.0002	**29**	--	0.0002	**20**	--	0.0002	**16**	--	0.0001	**35**	--	0.0003	120,000	NC
Cobalt	**7.1**	--	0.31	**19**	--	0.83	**17**	--	0.74	**16**	--	0.70	**15**	--	0.65	**12**	--	0.52	**18**	--	0.78	**15**	--	0.65	**15**	--	0.65	**6.3**	--	0.27	**11**	--	0.48	**7.9**	--	0.34	**5.1**	--	0.22	**6.5**	--	0.28	**9.9**	--	0.43	23	NC
Copper	**20**	--	0.01	**53**	--	0.02	**44**	--	0.01	**36**	--	0.01	**44**	--	0.01	**28**	--	0.01	**63**	--	0.02	**48**	--	0.02	**43**	--	0.01	**14**	--	0.00	**30**	--	0.01	**23**	--	0.01	**7.9**	--	0.00	**11**	--	0.004	**29**	--	0.01	3,100	NC
Lead	**82**	--	1.03	**79**	--	0.99	**31**	--	0.39	**23**	--	0.29	**11**	--	0.14	**31**	--	0.39	**31**	--	0.39	**32**	--	0.40	**25**	--	0.31	**15**	--	0.19	**10**	--	0.13	**13**	--	0.16	**6.6**	--	0.08	**18**	--	0.23	**33**	--	0.41	80	NC
Nickel	**19**	--	0.02	**56**	--	0.07	**50**	--	0.06	**200**	--	0.24	**44**	--	0.05	**40**	--	0.05	**60**	--	0.07	**65**	--	0.08	**60**	--	0.07	**23**	--	0.03	**30**	--	0.04	**31**	--	0.04	**14**	--	0.02	**13**	--	0.02	**32**	--	0.04	820	NC
Vanadium	**30**	--	0.08	**70**	--	0.18	**60**	--	0.15	**30**	--	0.08	**69**	--	0.18	**59**	--	0.15	**64**	--	0.16	**70**	--	0.18	**64**	--	0.16	**29**	--	0.07	**59**	--	0.15	**34**	--	0.09	**30**	--	0.08	**30**	--	0.08	**54**	--	0.14	390	NC
Zinc	**160**	--	0.01	**82**	--	0.004	**210**	--	0.009	**56**	--	0.002	**65**	--	0.003	**66**	--	0.003	**110**	--	0.005	**88**	--	0.004	**82**	--	0.004	**64**	--	0.003	**79**	--	0.003	**59**	--	0.003	**32**	--	0.001	**41**	--	0.002	**270**	--	0.012	23,000	NC
Total C Risk & NC HI		**6.E-05**	**18.9**		**3.E-04**	**70.7**		**1.E-04**	**28.5**		**2.E-04**	**60.0**		**7.E-05**	**19.7**		**6.E-05**	**18.0**		**8.E-05**	**23.2**		**1.E-04**	**40.7**		**1.E-04**	**35.7**		**6.E-05**	**15.6**		**5.E-05**	**13.5**		**5.E-05**	**14.7**		**4.E-05**	**10.2**		**5.E-05**	**13.9**		**8.E-05**	**22.0**		

Notes:
all soil concentrations and screening levels in mg/kg
Bold indicates detection above laboratory reporting limit.

< = not detected at or above specified laboratory reporting limit
C = cancer based on a Target Risk Level = 1E-06
COPC = chemical of potential concern
HI = noncancer Hazard Index = ∑HQ
HQ = noncancer Hazard Quotient
mg/kg = milligrams per kilogram
NC = noncancer based on a Target Hazard Quotient = 1.0
ND = not detected in soil
RSL = Regional Screening Level

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Table G-2
Adjusted Soil Concentration (Removal of Background Concentration)
Spent Catalyst Release from Martinez Refining Company

Analyte	Sample ID (mg/kg)																												Upperbound Expected Background Range (mg/kg)
	MRC-1		MRC-2		MRC-3		MRC-4		MRC-5		MRC-6		MRC-7		MRC-8		MRC-8 /Dup-1		MRC-9		MRC-10		MRC-11		MRC-12		MRC-13		MRC-14		
	Original	Adjusted	Original	Adjusted	Original	Adjusted	Original	Adjusted	Original	Adjusted	Original	Adjusted	Original	Adjusted	Original	Adjusted	Original	Adjusted	Original	Adjusted	Original	Adjusted	Original	Adjusted	Original	Adjusted	Original	Adjusted	Original	Adjusted	
Aluminum	**9,200**	**-61800**	**19,000**	**-52000**	**17,000**	**-54000.00**	**9,800**	**-61200**	**23,000**	**-48000.0**	**17,000**	**-54000**	**21,000**	**-50000**	**19,000**	**-52000**	**18,000**	**-53000**	**9,300**	**-61700.0**	**15,000**	**-56000**	**10,000**	**-61000**	**15,000**	**-56000**	**8,900**	**-62100**	**14,000**	**-57000.0**	71,000
Arsenic	**7.1**	**-23.9**	**28**	**-3**	**11**	**-20.00**	**24**	**-7**	**7.5**	**-23.5**	**6.8**	**-24.2**	**8.8**	**-22.2**	**16.0**	**-15**	**14.0**	**-17**	**6.1**	**-24.9**	**5.1**	**-25.9**	**5.7**	**-25.3**	**3.9**	**-27.1**	**5.4**	**-25.6**	**8.5**	**-22.5**	31
Barium	**99**	**-1401**	**110**	**-1390**	**150**	**-1350**	**110**	**-1390**	**600**	**-900**	**170**	**-1330**	**560**	**-940**	**130**	**-1370**	**130**	**-1370**	**100**	**-1400**	**130**	**-1370**	**98**	**-1402**	**86**	**-1414**	**90**	**-1410**	**86**	**-1414**	1,500
Beryllium	**0.57**	**-2.43**	**0.53**	**-2.47**	**0.93**	**-2.07**	**0.58**	**-2.42**	**0.61**	**-2.39**	**0.48**	**-2.52**	**0.62**	**-2.38**	**0.77**	**-2.23**	**0.69**	**-2.31**	**0.73**	**-2.27**	**1.2**	**-1.8**	**0.64**	**-2.36**	**0.65**	**-2.35**	**0.55**	**-2.45**	**0.88**	**-2.12**	3
Chromium, Tota	**22**	**-1668**	**57**	**-1633**	**46**	**-1644**	**87**	**-1603**	**46**	**-1644**	**43**	**-1647**	**51**	**-1639**	**64**	**-1626**	**56**	**-1634**	**24**	**-1666**	**27**	**-1663**	**29**	**-1661**	**20**	**-1670**	**16**	**-1674**	**35**	**-1655**	1,690
Cobalt	**7.1**	**-128.9**	**19**	**-117**	**17**	**-119**	**16**	**-120**	**15**	**-121**	**12**	**-124**	**18**	**-118**	**15**	**-121**	**15**	**-121**	**6.3**	**-129.7**	**11**	**-125**	**7.9**	**-128.1**	**5.1**	**-130.9**	**6.5**	**-129.5**	**9.9**	**-126.1**	136
Copper	**20**	**-79.7**	**53**	**-46.7**	**44**	**-55.7**	**36**	**-63.7**	**44**	**-55.7**	**28**	**-71.7**	**63**	**-36.7**	**48**	**-51.7**	**43**	**-56.7**	**14**	**-85.7**	**30**	**-69.7**	**23**	**-76.7**	**7.9**	**-91.8**	**11**	**-88.7**	**29**	**-70.7**	99.7
Lead	**82**	**-165**	**79**	**-168**	**31**	**-216**	**23**	**-224**	**11**	**-236**	**31**	**-216**	**31**	**-216**	**32**	**-215**	**25**	**-222**	**15**	**-232**	**10**	**-237**	**13**	**-234**	**6.6**	**-240.4**	**18**	**-229**	**33**	**-214**	247
Molybdenum	<2.5	ND	<2.4	ND	<2.1	ND	<2.7	ND	<2.4	ND	<2.5	ND	<2.4	ND	<2.3	ND	<2.3	ND	<2.4	ND	<2.2	ND	<2.5	ND	<2.5	ND	<2.4	ND	<2.3	ND	3.3
Nickel	**19**	**-2221**	**56**	**-2184**	**50**	**-2190**	**200**	**-2040**	**44**	**-2196**	**40**	**-2200**	**60**	**-2180**	**65**	**-2175**	**60**	**-2180**	**23**	**-2217**	**30**	**-2210**	**31**	**-2209**	**14**	**-2226**	**13**	**-2227**	**32**	**-2208**	2,240
Selenium	<2.5	ND	<2.4	ND	<2.1	ND	<2.7	ND	<2.4	ND	<2.5	ND	<2.4	ND	<2.3	ND	<2.3	ND	<2.4	ND	<2.2	ND	<2.5	ND	<2.5	ND	<2.4	ND	<2.3	ND	7
Vanadium	**30**	**-200**	**70**	**-160**	**60**	**-170**	**30**	**-200**	**69**	**-161**	**59**	**-171**	**64**	**-166**	**70**	**-160**	**64**	**-166**	**29**	**-201**	**59**	**-171**	**34**	**-196**	**30**	**-200**	**30**	**-200**	**54**	**-176**	230
Zinc	**160**	**-314**	**82**	**-392**	**210**	**-264**	**56**	**-418**	**65**	**-409**	**66**	**-408**	**110**	**-364**	**88**	**-386**	**82**	**-392**	**64**	**-410**	**79**	**-395**	**59**	**-415**	**32**	**-442**	**41**	**-433**	**270**	**-204**	474
Chromium VI	<0.25	ND	<0.25	ND	<0.22	ND	<0.27	ND	<0.24	ND	<0.23	ND	<0.23	ND	<0.23	ND	<0.23	ND	<0.24	ND	<0.22	ND	<0.25	ND	<0.26	ND	<0.25	ND	<0.23	ND	NA

Notes:

Bold indicates detection above laboratory reporting limit.

< = not detected at or above specified laboratory reporting limit

Adjusted soil concentration = measured soil concentration - upperbound expected background range

mg/kg = milligrams per kilogram

NA = Not applicable

ND = not detected

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Table G-3
Individual Sample Residential Soil Risks from Ingestion, Dermal Contact, and Inhalation of Airborne Soil Particulates (Excluding Background)
Spent Catalyst Release from Martinez Refining Company

COPC	MRC-1			MRC-2			MRC-3			MRC-4			MRC-5			MRC-6			MRC-7			MRC-8			MRC-8 /Dup-1			MRC-9			MRC-10			MRC-11			MRC-12			MRC-13			MRC-14			**Residential Soil Health Standard (mg/kg)**	
	Adj Conc (mg/kg)	C Risk	NC HQ	Adj Conc (mg/kg)	C Risk	NC HQ	Adj Conc (mg/kg)	C Risk	NC HQ	Adj Conc (mg/kg)	C Risk	NC HQ	Adj Conc (mg/kg)	C Risk	NC HQ	Adj Conc (mg/kg)	C Risk	NC HQ	Adj Conc (mg/kg)	C Risk	NC HQ	Adj Conc (mg/kg)	C Risk	NC HQ	Adj Conc (mg/kg)	C Risk	NC HQ	Adj Conc (mg/kg)	C Risk	NC HQ	Adj Conc (mg/kg)	C Risk	NC HQ	Adj Conc (mg/kg)	C Risk	NC HQ	Adj Conc (mg/kg)	C Risk	NC HQ	Adj Conc (mg/kg)	C Risk	NC HQ	Adj Conc (mg/kg)	C Risk	NC HQ		
Aluminum	**-61,800**	--	0.00	**-52,000**	--	0.00	**-54,000**	--	0.00	**-61,200**	--	0.00	**-48,000**	--	0.00	**-54,000**	--	0.00	**-50,000**	--	0.00	**-52,000**	--	0.00	**-53,000**	--	0.00	**-61,700**	--	0.00	**-56,000**	--	0.00	**-61,000**	--	0.00	**-56,000**	--	0.00	**-62,100**	--	0.00	**-57,000**	--	0.00	77,000	NC
Arsenic	**-23.9**	0.0E+00	0.00	**-3**	0.0E+00	0.00	**-20**	0.0E+00	0.00	**-7**	0.0E+00	0.00	**-24**	0.0E+00	0.00	**-24**	0.0E+00	0.00	**-22**	0.0E+00	0.00	**-15**	0.0E+00	0.00	**-17**	0.0E+00	0.00	**-25**	0.0E+00	0.00	**-26**	0.0E+00	0.00	**-25**	0.0E+00	0.00	**-27**	0.0E+00	0.00	**-26**	0.0E+00	0.00	**-23**	0.0E+00	0.00	0.11	C [NC = 0.41]
Barium	**-1,401**	--	0.00	**-1,390**	--	0.00	**-1,350**	--	0.00	**-1,390**	--	0.00	**-900**	--	0.00	**-1,330**	--	0.00	**-940**	--	0.00	**-1,370**	--	0.00	**-1,370**	--	0.00	**-1,400**	--	0.00	**-1,370**	--	0.00	**-1,402**	--	0.00	**-1,414**	--	0.00	**-1,410**	--	0.00	**-1,414**	--	0.00	15,000	NC
Beryllium	**-2.43**	--	0.00	**-2.47**	--	0.00	**-2.07**	--	0.00	**-2.42**	--	0.00	**-2.39**	--	0.00	**-2.52**	--	0.00	**-2.38**	--	0.00	**-2.23**	--	0.00	**-2.31**	--	0.00	**-2.27**	--	0.00	**-1.80**	--	0.00	**-2.36**	--	0.00	**-2.35**	--	0.00	**-2.45**	--	0.00	**-2.12**	--	0.00	16	NC
Chromium, Total	**-1,668**	--	0.00	**-1,633**	--	0.00	**-1,644**	--	0.00	**-1,603**	--	0.00	**-1,644**	--	0.00	**-1,647**	--	0.00	**-1,639**	--	0.00	**-1,626**	--	0.00	**-1,634**	--	--	**-1,666**	--	0.00	**-1,663**	--	0.00	**-1,661**	--	0.00	**-1,670**	--	0.00	**-1,674**	--	0.00	**-1,655**	--	0.00	120,000	NC
Cobalt	**-128.9**	--	0.00	**-117**	--	0.00	**-119**	--	0.00	**-120**	--	0.00	**-121**	--	0.00	**-124**	--	0.00	**-118**	--	0.00	**-121**	--	0.00	**-121**	--	0.00	**-130**	--	0.00	**-125**	--	0.00	**-128**	--	0.00	**-131**	--	0.00	**-130**	--	0.00	**-126**	--	0.00	23	NC
Copper	**-79.7**	--	0.00	**-47**	--	0.00	**-56**	--	0.00	**-64**	--	0.00	**-56**	--	0.00	**-72**	--	0.00	**-37**	--	0.00	**-52**	--	0.00	**-57**	--	0.00	**-86**	--	0.00	**-70**	--	0.00	**-77**	--	0.00	**-92**	--	0.00	**-89**	--	0.00	**-71**	--	0.00	3,100	NC
Lead	**-165**	--	0.00	**-168**	--	0.00	**-216**	--	0.00	**-224**	--	0.00	**-236**	--	0.00	**-216**	--	0.00	**-216**	--	0.00	**-215**	--	0.00	**-222**	--	0.00	**-232**	--	0.00	**-237**	--	0.00	**-234**	--	0.00	**-240**	--	0.00	**-229**	--	0.00	**-214**	--	0.00	80	NC
Nickel	**-2,221**	--	0.00	**-2,184**	--	0.00	**-2,190**	--	0.00	**-2,040**	--	0.00	**-2,196**	--	0.00	**-2,200**	--	0.00	**-2,180**	--	0.00	**-2,175**	--	0.00	**-2,180**	--	0.00	**-2,217**	--	0.00	**-2,210**	--	0.00	**-2,209**	--	0.00	**-2,226**	--	0.00	**-2,227**	--	0.00	**-2,208**	--	0.00	820	NC
Vanadium	**-200**	--	0.00	**-160**	--	0.00	**-170**	--	0.00	**-200**	--	0.00	**-161**	--	0.00	**-171**	--	0.00	**-166**	--	0.00	**-160**	--	0.00	**-166**	--	0.00	**-201**	--	0.00	**-171**	--	0.00	**-196**	--	0.00	**-200**	--	0.00	**-200**	--	0.00	**-176**	--	0.00	390	NC
Zinc	**-314**	--	0.00	**-392**	--	0.00	**-264**	--	0.00	**-418**	--	0.00	**-409**	--	0.00	**-408**	--	0.00	**-364**	--	0.00	**-386**	--	0.00	**-392**	--	0.00	**-410**	--	0.00	**-395**	--	0.00	**-415**	--	0.00	**-442**	--	0.00	**-433**	--	0.00	**-204**	--	0.00	23,000	NC
Total C Risk & NC HI		**0.E+00**	**0.0**		**0.E+00**	**0.0**		**0.E+00**	**0.0**		**0.E+00**	**0.0**		**0.E+00**	**0.0**		**0.E+00**	**0.0**		**0.E+00**	**0.0**		**0.E+00**	**0.0**		**0.E+00**	**0.0**		**0.E+00**	**0.0**		**0.E+00**	**0.0**		**0.E+00**	**0.0**		**0.E+00**	**0.0**		**0.E+00**	**0.0**		**0.E+00**	**0.0**		

Notes:

all soil concentrations and screening levels in mg/kg
Bold indicates detection above laboratory reporting limit.

< = not detected at or above specified laboratory reporting limit
C = cancer based on a Target Risk Level = 1E-06
HI = noncancer Hazard Index = ∑HQ
HQ = noncancer Hazard Quotient
mg/kg = milligrams per kilogram
NC = noncancer based on a Target Hazard Quotient = 1.0
ND = not detected in soil
RSL = Regional Screening Level

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Table G-4
Summary of Residential Soil Risks from Ingestion, Dermal Contact, and Inhalation of Airborne Soil Particulates
Spent Catalyst Release from Martinez Refining Company

Exposure Pathways	Background Contribution Included?	MRC-1		MRC-2		MRC-3		MRC-4		MRC-5		MRC-6		MRC-7		MRC-8		MRC-8 /Dup-1		MRC-9		MRC-10		MRC-11		MRC-12		MRC-13		MRC-14	
		C Risk	NC HQ	C Risk	NC HQ	C Risk	NC HQ	C Risk	NC HQ	C Risk	NC HQ	C Risk	NC HQ	C Risk	NC HQ	C Risk	NC HQ	C Risk	NC HQ	C Risk	NC HQ	C Risk	NC HQ	C Risk	NC HQ	C Risk	NC HQ	C Risk	NC HQ	C Risk	NC HQ
Soil Ingestion, Dermal, Inhalation (Table G-1)	YES	6.5E-05	18.9	2.5E-04	70.7	1.0E-04	28.5	2.2E-04	60.0	6.8E-05	19.7	6.2E-05	18.0	8.0E-05	23.2	1.5E-04	40.7	1.3E-04	35.7	5.5E-05	15.6	4.6E-05	13.5	5.2E-05	14.7	3.5E-05	10.2	4.9E-05	13.9	7.7E-05	22.0
Soil Ingestion, Dermal, Inhalation (Table G-3)	NO	0.0E+00	0.0	0.0E+00	0.0	0.0E+00	0.0	0.0E+00	0.0	0.0E+00	0.0	0.0E+00	0.0	0.0E+00	0.0	0.0E+00	0.0	0.0E+00	0.0	0.0E+00	0.0	0.0E+00	0.0	0.0E+00	0.0	0.0E+00	0.0	0.0E+00	0.0	0.0E+00	0.0

Notes:

all soil concentrations and screening levels in mg/kg

C = cancer based on a Target Risk Level = 1E-06
HI = noncancer Hazard Index = ∑HQ
HQ = noncancer Hazard Quotient
NA = Not applicable
NC = noncancer based on a Target Hazard Quotient = 1.0

Appendix H. Homegrown Produce Risk Evaluation

Homegrown Produce Evaluation

1.0 Methodology

Constituent concentrations in plants were calculated based on the potential root uptake of constituents from soil. These calculations are based on the equations provided in USEPA's Human Health Risk Assessment Protocol for Hazardous Waste Combustion Facilities (Combustion Guidance, EPA 2005a) and outlined below.

2.0 Concentration in Aboveground Vegetation

Potential concentrations in plant tissue due to root uptake in exposed and protected aboveground produce were estimated by:

$$Pr_{ag} = Sc \times Br_{ag}$$

Where:

PR_{ag} = concentration of constituent in aboveground produce due to root uptake (mg/kg)
Sc = soil concentration over exposure duration (mg/kg)
Br_{ag} = plant-soil bioconcentration factor for aboveground produce [mg COPC/kg dry weight (DW) plant]/[mg COPC/kg soil]

Br_{ag} for inorganics was obtained from Baes et al. (1984) and from the companion Combustion Guidance database (EPA 2005b).

3.0 Concentration in Belowground Vegetation

Potential concentrations in belowground vegetation were estimated by:

$$PR_{bg} = Sc \times Br_{bg} \times VG_{bg}$$

Where:

PR_{bg} = concentration of constituent in belowground vegetables (mg/kg)
Sc = soil concentration over exposure duration (mg/kg)
Br_{bg} = plant-soil bioconcentration factor for belowground produce [mg COPC/kg dry weight (DW) plant]/[mg COPC/kg soil]

Br_{bg} for inorganics was obtained from Baes et al. (1984) and from the companion Combustion Guidance database (EPA 2005b).

Daily constituent intake from produce is calculated based on the amount of produce ingested per day, the estimated concentration of constituents in the produce, and the percentage of produce ingested that is homegrown as shown in the following equation:

$$CDI_{veg} = \frac{[(PR_{ag} \text{ x } IR_{ag}) + [(PR_{bg} \text{ x } IR_{bg}) \text{ x } F_{veg} \text{ x ED x EF x UC}}{BW \text{ x AT}}$$

Where:

CDI_{veg} = chronic daily intake of COPCs from homegrown vegetables (mg/kg-d)
PR_{ag} = concentration of COPCs in homegrown aboveground vegetables due to root uptake (mg/kg)
IR_{ag} = consumption rate of homegrown aboveground vegetables (mg/d)
PR_{bg} = concentration of COPCs in homegrown belowground vegetables due to root uptake (mg/kg)
IR_{bg} = consumption rate of homegrown belowground vegetables (mg/d)
F_{veg} = fraction of homegrown vegetables that are contaminated (unitless)
EF = Exposure Frequency (d/yr)
ED = Exposure Duration (yr)
UC = Units Conversion, 1E-06 (kg/mg)
AT = Averaging time (d)
BW = Body Weight (kg)

Consumption rates of the two plant groups (aboveground and belowground) and fractions contaminated are based on information presented in Chapter 13 of EPA's 2011 Exposure Factors Handbook (EPA, 2011).

4.0 References

Baes, C.F., R.D. Sharp, A.L. Sjoreen, and R.W. Shor. (1984). *A Review and Analysis of Parameters for Assessing Transport of Environmentally Released Radionuclides through Agriculture*. Prepared by the Oak Ridge National Laboratory, Oak Ridge, Tennessee for the U.S. Department of Energy. September.

U.S. Environmental Protection Agency (USEPA). (2005a). *Human Health Risk Assessment Protocol for Hazardous Waste Combustion Facilities*. Final. EPA 530-R-05-006. September.

U.S. Environmental Protection Agency (USEPA). (2005b). *The Hazardous Waste Companion Database*. Available at: http://www.epa.gov/epaoswer/hazwaste/combust/risk.htm.

U.S. Environmental Protection Agency (USEPA). (2011). *Exposure Factors Handbook.* 2011 Edition. Chapter 13: Intake of Home-Produced Foods. Washington, DC: Office of Research and Development, National Center for Environmental Assessment. EPA/600/R-09/052F. September.

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Table H-1
Individual Sample Residential Soil Risks from Home-Grown Produce Ingestion
Spent Catalyst Release from Martinez Refining Company

COPC	MRC-1			MRC-2			MRC-3			MRC-4			MRC-5			MRC-6			MRC-7			MRC-8			MRC-8 /Dup-1			MRC-9			MRC-10			MRC-11			MRC-12			MRC-13			MRC-14			Residential Soil Produce Risk-Based Goal (mg/kg) [a]	
	Conc (mg/kg)	C Risk	NC HQ	Conc (mg/kg)	C Risk	NC HQ	Conc (mg/kg)	C Risk	NC HQ	Conc (mg/kg)	C Risk	NC HQ	Conc (mg/kg)	C Risk	NC HQ	Conc (mg/kg)	C Risk	NC HQ	Conc (mg/kg)	C Risk	NC HQ	Conc (mg/kg)	C Risk	NC HQ	Conc (mg/kg)	C Risk	NC HQ	Conc (mg/kg)	C Risk	NC HQ	Conc (mg/kg)	C Risk	NC HQ	Conc (mg/kg)	C Risk	NC HQ	Conc (mg/kg)	C Risk	NC HQ	Conc (mg/kg)	C Risk	NC HQ	Conc (mg/kg)	C Risk	NC HQ		
Aluminum	**9,200**	--	0.31	**19,000**	--	0.63	**17,000**	--	0.57	**9,800**	--	0.33	**23,000**	--	0.77	**17,000**	--	0.57	**21,000**	--	0.70	**19,000**	--	0.63	**18,000**	--	0.60	**9,300**	--	0.31	**15,000**	--	0.50	**10,000**	--	0.33	**15,000**	--	0.50	**8,900**	--	0.30	**14,000**	--	0.47	30,053	NC
Arsenic	**7.1**	2.3E-04	1.37	**28**	9.0E-04	5.39	**11**	3.5E-04	2.12	**24**	7.7E-04	4.62	**7.5**	2.4E-04	1.45	**6.8**	2.2E-04	1.31	**8.8**	2.8E-04	1.70	**16.0**	5.2E-04	3.08	**14.0**	4.5E-04	2.70	**6.1**	2.0E-04	1.18	**5.1**	1.6E-04	0.98	**5.7**	1.8E-04	1.10	**3.9**	1.3E-04	0.75	**5.4**	1.7E-04	1.04	**8.5**	2.7E-04	1.64	0.03	C [NC = 5.19]
Barium	**99**	--	0.14	**110**	--	0.15	**150**	--	0.21	**110**	--	0.15	**600**	--	0.83	**170**	--	0.23	**560**	--	0.77	**130**	--	0.18	**130**	--	0.18	**100**	--	0.14	**130**	--	0.18	**98**	--	0.13	**86**	--	0.12	**90**	--	0.12	**86**	--	0.12	727	NC
Beryllium	**0.57**	--	0.01	**0.53**	--	0.01	**0.93**	--	0.01	**0.58**	--	0.01	**0.61**	--	0.01	**0.48**	--	0.01	**0.62**	--	0.01	**0.77**	--	0.01	**0.69**	--	0.01	**0.73**	--	0.01	**1.2**	--	0.01	**0.64**	--	0.01	**0.65**	--	0.01	**0.55**	--	0.01	**0.88**	--	0.01	89.8	NC
Chromium, Total	**22**	--	0.001	**57**	--	0.002	**46**	--	0.001	**87**	--	0.003	**46**	--	0.001	**43**	--	0.001	**51**	--	0.001	**64**	--	0.002	**56**	--	0.002	**24**	--	0.001	**27**	--	0.001	**29**	--	0.001	**20**	--	0.001	**16**	--	0.0005	**35**	--	0.001	34,617	NC
Cobalt	**7.1**	--	4.00	**19**	--	10.71	**17**	--	9.58	**16**	--	9.02	**15**	--	8.46	**12**	--	6.77	**18**	--	10.15	**15**	--	8.46	**15**	--	8.46	**6.3**	--	3.55	**11**	--	6.20	**7.9**	--	4.45	**5.1**	--	2.88	**6.5**	--	3.66	**9.9**	--	5.58	1.8	NC
Copper	**20**	--	1.73	**53**	--	4.59	**44**	--	3.81	**36**	--	3.12	**44**	--	3.81	**28**	--	2.42	**63**	--	5.46	**48**	--	4.16	**43**	--	3.72	**14**	--	1.21	**30**	--	2.60	**23**	--	1.99	**7.9**	--	0.68	**11**	--	0.953	**29**	--	2.51	11.5	NC
Lead	**82**	--	--	**79**	--	--	**31**	--	--	**23**	--	--	**11**	--	--	**31**	--	--	**31**	--	--	**32**	--	--	**25**	--	--	**15**	--	--	**10**	--	--	**13**	--	--	**6.6**	--	--	**18**	--	--	**33**	--	--	NA	
Nickel	**19**	--	0.08	**56**	--	0.23	**50**	--	0.21	**200**	--	0.82	**44**	--	0.18	**40**	--	0.16	**60**	--	0.25	**65**	--	0.27	**60**	--	0.25	**23**	--	0.09	**30**	--	0.12	**31**	--	0.13	**14**	--	0.06	**13**	--	0.05	**32**	--	0.13	243	NC
Vanadium	**30**	--	0.28	**70**	--	0.66	**60**	--	0.57	**30**	--	0.28	**69**	--	0.65	**59**	--	0.56	**64**	--	0.61	**70**	--	0.66	**64**	--	0.61	**29**	--	0.27	**59**	--	0.56	**34**	--	0.32	**30**	--	0.28	**30**	--	0.28	**54**	--	0.51	106	NC
Zinc	**160**	--	0.78	**82**	--	0.399	**210**	--	1.022	**56**	--	0.272	**65**	--	0.316	**66**	--	0.321	**110**	--	0.535	**88**	--	0.428	**82**	--	0.399	**64**	--	0.311	**79**	--	0.384	**59**	--	0.287	**32**	--	0.156	**41**	--	0.200	**270**	--	1.314	206	NC
Total C Risk & NC HI		**2.E-04**	**8.7**		**9.E-04**	**22.8**		**4.E-04**	**18.1**		**8.E-04**	**18.6**		**2.E-04**	**16.5**		**2.E-04**	**12.4**		**3.E-04**	**20.2**		**5.E-04**	**17.9**		**5.E-04**	**16.9**		**2.E-04**	**7.1**		**2.E-04**	**11.5**		**2.E-04**	**8.8**		**1.E-04**	**5.4**		**2.E-04**	**6.6**		**3.E-04**	**12.3**			

Notes:

all soil concentrations and screening levels in mg/kg

Bold indicates detection above laboratory reporting limit.

[a] All soil concentrations protective of produce ingestion assume daily ingestion of home-grown produce consisting of aboveground and belowground fruits and vegetables, as presented in USEPA's Exposure Factors Handbook (USEPA, 2011).

< = not detected at or above specified laboratory reporting limit
C = cancer based on a Target Risk Level = 1E-06
HI = noncancer Hazard Index = ∑HQ
HQ = noncancer Hazard Quotient
mg/kg = milligrams per kilogram
NC = noncancer based on a Target Hazard Quotient = 1.0
ND = not detected in soil
USEPA = United States Environmental Protection Agency

Reference:

USEPA, 2011. Exposure Factors Handbook, Chapter 13. Intake of Home-Produced Foods. National Center for Environmental Assessment, Office of Research and Development, Washington, D.C. EPA/600/R-09/052F. September. Available online at: https://www.epa.gov/expobox/about-exposure-factors-handbook

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Table H-2
Adjusted Soil Concentration (Removal of Background Concentration)
Spent Catalyst Release from Martinez Refining Company

Analyte	Sample ID (mg/kg)																												Upperbound Expected Background Range (mg/kg)
	MRC-1		MRC-2		MRC-3		MRC-4		MRC-5		MRC-6		MRC-7		MRC-8		MRC-8 /Dup-1		MRC-9		MRC-10		MRC-11		MRC-12		MRC-13		MRC-14		
	Original	Adjusted	Original	Adjusted	Original	Adjusted	Original	Adjusted	Original	Adjusted	Original	Adjusted	Original	Adjusted	Original	Adjusted	Original	Adjusted	Original	Adjusted	Original	Adjusted	Original	Adjusted	Original	Adjusted	Original	Adjusted	Original	Adjusted	
Aluminum	**9,200**	**-61800**	**19,000**	**-52000**	**17,000**	**-54000.00**	**9,800**	**-61200**	**23,000**	**-48000.0**	**17,000**	**-54000**	**21,000**	**-50000**	**19,000**	**-52000**	**18,000**	**-53000**	**9,300**	**-61700.0**	**15,000**	**-56000**	**10,000**	**-61000**	**15,000**	**-56000**	**8,900**	**-62100**	**14,000**	**-57000.0**	71,000
Arsenic	**7.1**	**-23.9**	**28**	**-3**	**11**	**-20.00**	**24**	**-7**	**7.5**	**-23.5**	**6.8**	**-24.2**	**8.8**	**-22.2**	**16.0**	**-15**	**14.0**	**-17**	**6.1**	**-24.9**	**5.1**	**-25.9**	**5.7**	**-25.3**	**3.9**	**-27.1**	**5.4**	**-25.6**	**8.5**	**-22.5**	31
Barium	**99**	**-1401**	**110**	**-1390**	**150**	**-1350**	**110**	**-1390**	**600**	**-900**	**170**	**-1330**	**560**	**-940**	**130**	**-1370**	**130**	**-1370**	**100**	**-1400**	**130**	**-1370**	**98**	**-1402**	**86**	**-1414**	**90**	**-1410**	**86**	**-1414**	1,500
Beryllium	**0.57**	**-2.43**	**0.53**	**-2.47**	**0.93**	**-2.07**	**0.58**	**-2.42**	**0.61**	**-2.39**	**0.48**	**-2.52**	**0.62**	**-2.38**	**0.77**	**-2.23**	**0.69**	**-2.31**	**0.73**	**-2.27**	**1.2**	**-1.8**	**0.64**	**-2.36**	**0.65**	**-2.35**	**0.55**	**-2.45**	**0.88**	**-2.12**	3
Chromium, Total	**22**	**-1668**	**57**	**-1633**	**46**	**-1644**	**87**	**-1603**	**46**	**-1644**	**43**	**-1647**	**51**	**-1639**	**64**	**-1626**	**56**	**-1634**	**24**	**-1666**	**27**	**-1663**	**29**	**-1661**	**20**	**-1670**	**16**	**-1674**	**35**	**-1655**	1,690
Cobalt	**7.1**	**-128.9**	**19**	**-117**	**17**	**-119**	**16**	**-120**	**15**	**-121**	**12**	**-124**	**18**	**-118**	**15**	**-121**	**15**	**-121**	**6.3**	**-129.7**	**11**	**-125**	**7.9**	**-128.1**	**5.1**	**-130.9**	**6.5**	**-129.5**	**9.9**	**-126.1**	136
Copper	**20**	**-79.7**	**53**	**-46.7**	**44**	**-55.7**	**36**	**-63.7**	**44**	**-55.7**	**28**	**-71.7**	**63**	**-36.7**	**48**	**-51.7**	**43**	**-56.7**	**14**	**-85.7**	**30**	**-69.7**	**23**	**-76.7**	**7.9**	**-91.8**	**11**	**-88.7**	**29**	**-70.7**	99.7
Lead	**82**	**-165**	**79**	**-168**	**31**	**-216**	**23**	**-224**	**11**	**-236**	**31**	**-216**	**31**	**-216**	**32**	**-215**	**25**	**-222**	**15**	**-232**	**10**	**-237**	**13**	**-234**	**6.6**	**-240.4**	**18**	**-229**	**33**	**-214**	247
Molybdenum	<2.5	ND	<2.4	ND	<2.1	ND	<2.7	ND	<2.4	ND	<2.5	ND	<2.4	ND	<2.3	ND	<2.3	ND	<2.4	ND	<2.2	ND	<2.5	ND	<2.5	ND	<2.4	ND	<2.3	ND	3.3
Nickel	**19**	**-2221**	**56**	**-2184**	**50**	**-2190**	**200**	**-2040**	**44**	**-2196**	**40**	**-2200**	**60**	**-2180**	**65**	**-2175**	**60**	**-2180**	**23**	**-2217**	**30**	**-2210**	**31**	**-2209**	**14**	**-2226**	**13**	**-2227**	**32**	**-2208**	2,240
Selenium	<2.5	ND	<2.4	ND	<2.1	ND	<2.7	ND	<2.4	ND	<2.5	ND	<2.4	ND	<2.3	ND	<2.3	ND	<2.4	ND	<2.2	ND	<2.5	ND	<2.5	ND	<2.4	ND	<2.3	ND	7
Vanadium	**30**	**-200**	**70**	**-160**	**60**	**-170**	**30**	**-200**	**69**	**-161**	**59**	**-171**	**64**	**-166**	**70**	**-160**	**64**	**-166**	**29**	**-201**	**59**	**-171**	**34**	**-196**	**30**	**-200**	**30**	**-200**	**54**	**-176**	230
Zinc	**160**	**-314**	**82**	**-392**	**210**	**-264**	**56**	**-418**	**65**	**-409**	**66**	**-408**	**110**	**-364**	**88**	**-386**	**82**	**-392**	**64**	**-410**	**79**	**-395**	**59**	**-415**	**32**	**-442**	**41**	**-433**	**270**	**-204**	474
Chromium VI	<0.25	ND	<0.25	ND	<0.22	ND	<0.27	ND	<0.24	ND	<0.23	ND	<0.23	ND	<0.23	ND	<0.23	ND	<0.24	ND	<0.22	ND	<0.25	ND	<0.26	ND	<0.25	ND	<0.23	ND	NA

Notes:

Bold indicates detection above laboratory reporting limit.
< = not detected at or above specified laboratory reporting limit
Adjusted soil concentration = measured soil concentration - upperbound expected background range

mg/kg = milligrams per kilogram
NA = Not applicable
ND = not detected

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Table H-3
Individual Sample Residential Soil Risks from Ingestion of Homegrown Produce (Excluding Background)
Spent Catalyst Release from Martinez Refining Company

COPC	MRC-1			MRC-2			MRC-3			MRC-4			MRC-5			MRC-6			MRC-7			MRC-8			MRC-8 /Dup-1			MRC-9			MRC-10			MRC-11			MRC-12			MRC-13			MRC-14			Residential Soil Produce Risk-Based Goal (mg/kg) [a]	
	Adj Conc (mg/kg)	C Risk	NC HQ	Adj Conc (mg/kg)	C Risk	NC HQ	Adj Conc (mg/kg)	C Risk	NC HQ	Adj Conc (mg/kg)	C Risk	NC HQ	Adj Conc (mg/kg)	C Risk	NC HQ	Adj Conc (mg/kg)	C Risk	NC HQ	Adj Conc (mg/kg)	C Risk	NC HQ	Adj Conc (mg/kg)	C Risk	NC HQ	Adj Conc (mg/kg)	C Risk	NC HQ	Adj Conc (mg/kg)	C Risk	NC HQ	Adj Conc (mg/kg)	C Risk	NC HQ	Adj Conc (mg/kg)	C Risk	NC HQ	Adj Conc (mg/kg)	C Risk	NC HQ	Adj Conc (mg/kg)	C Risk	NC HQ	Adj Conc (mg/kg)	C Risk	NC HQ		
Aluminum	**-61,800**	--	0.00	**-52,000**	--	0.00	**-54,000**	--	0.00	**-61,200**	--	0.00	**-48,000**	--	0.00	**-54,000**	--	0.00	**-50,000**	--	0.00	**-52,000**	--	0.00	**-53,000**	--	0.00	**-61,700**	--	0.00	**-56,000**	--	0.00	**-61,000**	--	0.00	**-56,000**	--	0.00	**-62,100**	--	0.00	**-57,000**	--	0.00	30,053	NC
Arsenic	**-23.9**	0.0E+00	0.00	**-3**	0.0E+00	0.00	**-20**	0.0E+00	0.00	**-7**	0.0E+00	0.00	**-24**	0.0E+00	0.00	**-24**	0.0E+00	0.00	**-22**	0.0E+00	0.00	**-15**	0.0E+00	0.00	**-17**	0.0E+00	0.00	**-25**	0.0E+00	0.00	**-26**	0.0E+00	0.00	**-25**	0.0E+00	0.00	**-27**	0.0E+00	0.00	**-26**	0.0E+00	0.00	**-23**	0.0E+00	0.00	0.03	C [NC = 5.19]
Barium	**-1,401**	--	0.00	**-1,390**	--	0.00	**-1,350**	--	0.00	**-1,390**	--	0.00	**-900**	--	0.00	**-1,330**	--	0.00	**-940**	--	0.00	**-1,370**	--	0.00	**-1,370**	--	0.00	**-1,400**	--	0.00	**-1,370**	--	0.00	**-1,402**	--	0.00	**-1,414**	--	0.00	**-1,410**	--	0.00	**-1,414**	--	0.00	727	NC
Beryllium	**-2.43**	--	0.00	**-2.47**	--	0.00	**-2.07**	--	0.00	**-2.42**	--	0.00	**-2.39**	--	0.00	**-2.52**	--	0.00	**-2.38**	--	0.00	**-2.23**	--	0.00	**-2.31**	--	0.00	**-2.27**	--	0.00	**-1.80**	--	0.00	**-2.36**	--	0.00	**-2.35**	--	0.00	**-2.45**	--	0.00	**-2.12**	--	0.00	89.8	NC
Chromium, Total	**-1,668**	--	0.00	**-1,633**	--	0.00	**-1,644**	--	0.00	**-1,603**	--	0.00	**-1,644**	--	0.00	**-1,647**	--	0.00	**-1,639**	--	0.00	**-1,626**	--	0.00	**-1,634**	--	--	**-1,666**	--	0.00	**-1,663**	--	0.00	**-1,661**	--	0.00	**-1,670**	--	0.00	**-1,674**	--	0.00	**-1,655**	--	0.00	34,617	NC
Cobalt	**-128.9**	--	0.00	**-117**	--	0.00	**-119**	--	0.00	**-120**	--	0.00	**-121**	--	0.00	**-124**	--	0.00	**-118**	--	0.00	**-121**	--	0.00	**-121**	--	0.00	**-130**	--	0.00	**-125**	--	0.00	**-128**	--	0.00	**-131**	--	0.00	**-130**	--	0.00	**-126**	--	0.00	1.8	NC
Copper	**-79.7**	--	0.00	**-47**	--	0.00	**-56**	--	0.00	**-64**	--	0.00	**-56**	--	0.00	**-72**	--	0.00	**-37**	--	0.00	**-52**	--	0.00	**-57**	--	0.00	**-86**	--	0.00	**-70**	--	0.00	**-77**	--	0.00	**-92**	--	0.00	**-89**	--	0.00	**-71**	--	0.00	11.5	NC
Lead	**-165**	--	NA	**-168**	--	NA	**-216**	--	NA	**-224**	--	NA	**-236**	--	NA	**-216**	--	NA	**-216**	--	NA	**-215**	--	NA	**-222**	--	NA	**-232**	--	NA	**-237**	--	NA	**-234**	--	NA	**-240**	--	NA	**-229**	--	NA	**-214**	--	NA	NA	
Nickel	**-2,221**	--	0.00	**-2,184**	--	0.00	**-2,190**	--	0.00	**-2,040**	--	0.00	**-2,196**	--	0.00	**-2,200**	--	0.00	**-2,180**	--	0.00	**-2,175**	--	0.00	**-2,180**	--	0.00	**-2,217**	--	0.00	**-2,210**	--	0.00	**-2,209**	--	0.00	**-2,226**	--	0.00	**-2,227**	--	0.00	**-2,208**	--	0.00	243	NC
Vanadium	**-200**	--	0.00	**-160**	--	0.00	**-170**	--	0.00	**-200**	--	0.00	**-161**	--	0.00	**-171**	--	0.00	**-166**	--	0.00	**-160**	--	0.00	**-166**	--	0.00	**-201**	--	0.00	**-171**	--	0.00	**-196**	--	0.00	**-200**	--	0.00	**-200**	--	0.00	**-176**	--	0.00	106	NC
Zinc	**-314**	--	0.00	**-392**	--	0.00	**-264**	--	0.00	**-418**	--	0.00	**-409**	--	0.00	**-408**	--	0.00	**-364**	--	0.00	**-386**	--	0.00	**-392**	--	0.00	**-410**	--	0.00	**-395**	--	0.00	**-415**	--	0.00	**-442**	--	0.00	**-433**	--	0.00	**-204**	--	0.00	206	NC
Total C Risk & NC HI		**0.E+00**	**0.0**		**0.E+00**	**0.0**		**0.E+00**	**0.0**		**0.E+00**	**0.0**		**0.E+00**	**0.0**		**0.E+00**	**0.0**		**0.E+00**	**0.0**		**0.E+00**	**0.0**		**0.E+00**	**0.0**		**0.E+00**	**0.0**		**0.E+00**	**0.0**		**0.E+00**	**0.0**		**0.E+00**	**0.0**		**0.E+00**	**0.0**		**0.E+00**	**0.0**		

Notes:

all soil concentrations and screening levels in mg/kg

Bold indicates detection above laboratory reporting limit.

< = not detected at or above specified laboratory reporting limit
C = cancer based on a Target Risk Level = 1E-06
HI = noncancer Hazard Index = ∑HQ
HQ = noncancer Hazard Quotient
mg/kg = milligrams per kilogram
NC = noncancer based on a Target Hazard Quotient = 1.0
ND = not detected in soil
RSL = Regional Screening Level

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Table H-4
Summary of Residential Soil Risks from Ingestion of Homegrown Produce
Spent Catalyst Release from Martinez Refining Company

Exposure Pathways	Background Contribution Included?	MRC-1		MRC-2		MRC-3		MRC-4		MRC-5		MRC-6		MRC-7		MRC-8		MRC-8 /Dup-1		MRC-9		MRC-10		MRC-11		MRC-12		MRC-13		MRC-14	
		C Risk	NC HQ	C Risk	NC HQ	C Risk	NC HQ	C Risk	NC HQ	C Risk	NC HQ	C Risk	NC HQ	C Risk	NC HQ	C Risk	NC HQ	C Risk	NC HQ	C Risk	NC HQ	C Risk	NC HQ	C Risk	NC HQ	C Risk	NC HQ	C Risk	NC HQ	C Risk	NC HQ
Home-Grown Produce Ingestion (Table H-1)	YES	2.3E-04	8.7	9.0E-04	22.8	3.5E-04	18.1	7.7E-04	18.6	2.4E-04	16.5	2.2E-04	12.4	2.8E-04	20.2	5.2E-04	17.9	4.5E-04	16.9	2.0E-04	7.1	1.6E-04	11.5	1.8E-04	8.8	1.3E-04	5.4	1.7E-04	6.6	2.7E-04	12.3
Home-Grown Produce Ingestion (Table H-3)	NO	0.0E+00	0.0	0.0E+00	0.0	0.0E+00	0.0	0.0E+00	0.0	0.0E+00	0.0	0.0E+00	0.0	0.0E+00	0.0	0.0E+00	0.0	0.0E+00	0.0	0.0E+00	0.0	0.0E+00	0.0	0.0E+00	0.0	0.0E+00	0.0	0.0E+00	0.0	0.0E+00	0.0

Notes:
all soil concentrations and screening levels in mg/kg

C = cancer based on a Target Risk Level = 1E-06
HI = noncancer Hazard Index = ∑HQ
HQ = noncancer Hazard Quotient
NA = Not applicable
NC = noncancer based on a Target Hazard Quotient = 1.0

Appendix I. Ecological Risk Evaluation

Table I-1
Individual Sample Ecological Soil Risks
Spent Catalyst Release from Martinez Refining Company

Analyte	MRC-1		MRC-2		MRC-3		MRC-4		MRC-5		MRC-6		MRC-7		MRC-8		MRC-8 /Dup-1		MRC-9		MRC-10		MRC-11		MRC-12		MRC-13		MRC-14		Ecological Soil Screening Level [a]	
	Conc	HQ	Conc	HQ	Conc	HQ	Conc	HQ	Conc	HQ	Conc	HQ	Conc	HQ	Conc	HQ	Conc	HQ	Conc	HQ	Conc	HQ	Conc	HQ	Conc	HQ	Conc	HQ	Conc	HQ		
Aluminum	**9,200**	--	**19,000**	--	**17,000**	--	**9,800**	--	**23,000**	--	**17,000**	--	**21,000**	--	**19,000**	--	**18,000**	--	**9,300**	--	**15,000**	--	**10,000**	--	**15,000**	--	**8,900**	--	**14,000**	--	OK when pH ≥ 5.5 [b]	
Arsenic	**7.1**	0.28	**28.0**	1.12	**11.0**	0.44	**24.0**	0.96	**7.5**	0.30	**6.8**	0.27	**8.8**	0.35	**16.0**	0.64	**14.0**	0.56	**6.1**	0.24	**5.1**	0.20	**5.7**	0.23	**3.9**	0.16	**5.4**	0.22	**8.5**	0.34	25	NC
Barium	**99.0**	0.25	**110.0**	0.28	**150.0**	0.38	**110.0**	0.28	**600.0**	1.54	**170.0**	0.44	**560.0**	1.44	**130.0**	0.33	**130.0**	0.33	**100.0**	0.26	**130.0**	0.33	**98.0**	0.25	**86.0**	0.22	**90.0**	0.23	**86.0**	0.22	390	NC
Beryllium	**0.6**	0.11	**0.5**	0.11	**0.9**	0.19	**0.6**	0.12	**0.6**	0.12	**0.5**	0.10	**0.6**	0.12	**0.8**	0.15	**0.7**	0.14	**0.7**	0.15	**1.2**	0.24	**0.6**	0.13	**0.7**	0.13	**0.6**	0.11	**0.9**	0.18	5.0	NC
Chromium, Total	**22.0**	--	**57.0**	--	**46.0**	--	**87.0**	--	**46.0**	--	**43.0**	--	**51.0**	--	**64.0**	--	**56.0**	--	**24.0**	--	**27.0**	--	**29.0**	--	**20.0**	--	**16.0**	--	**35.0**	--	160	NA
Cobalt	**7.1**	0.14	**19.0**	0.38	**17.0**	0.34	**16.0**	0.32	**15.0**	0.30	**12.0**	0.24	**18.0**	0.36	**15.0**	0.30	**15.0**	0.30	**6.3**	0.13	**11.0**	0.22	**7.9**	0.16	**5.1**	0.10	**6.5**	0.13	**9.9**	0.20	50	NC
Copper	**20.0**	0.11	**53.0**	0.29	**44.0**	0.24	**36.0**	0.20	**44.0**	0.24	**28.0**	0.16	**63.0**	0.35	**48.0**	0.27	**43.0**	0.24	**14.0**	0.08	**30.0**	0.17	**23.0**	0.13	**7.9**	0.04	**11.0**	0.06	**29.0**	0.16	180	NC
Lead	**82.0**	2.56	**79.0**	2.47	**31.0**	0.97	**23.0**	0.72	**11.0**	0.34	**31.0**	0.97	**31.0**	0.97	**32.0**	1.00	**25.0**	0.78	**15.0**	0.47	**10.0**	0.31	**13.0**	0.41	**6.6**	0.21	**18.0**	0.56	**33.0**	1.03	32	NC
Molybdenum	<2.5	ND	<2.4	ND	<2.1	ND	<2.7	ND	<2.4	ND	<2.5	ND	<2.4	ND	<2.3	ND	<2.3	ND	<2.4	ND	<2.2	ND	<2.5	ND	<2.5	ND	<2.4	ND	<2.3	ND	6.9	NC
Nickel	**19.0**	0.15	**56.0**	0.43	**50.0**	0.38	**200.0**	1.54	**44.0**	0.34	**40.0**	0.31	**60.0**	0.46	**65.0**	0.50	**60.0**	0.46	**23.0**	0.18	**30.0**	0.23	**31.0**	0.24	**14.0**	0.11	**13.0**	0.10	**32.0**	0.25	130	NC
Selenium	<2.5	ND	<2.4	ND	<2.1	ND	<2.7	ND	<2.4	ND	<2.5	ND	<2.4	ND	<2.3	ND	<2.3	ND	<2.4	ND	<2.2	ND	<2.5	ND	<2.5	ND	<2.4	ND	<2.3	ND	2.4	NC
Vanadium	**30.0**	1.67	**70.0**	3.89	**60.0**	3.33	**30.0**	1.67	**69.0**	3.83	**59.0**	3.28	**64.0**	3.56	**70.0**	3.89	**64.0**	3.56	**29.0**	1.61	**59.0**	3.28	**34.0**	1.89	**30.0**	1.67	**30.0**	1.67	**54.0**	3.00	18	NC
Zinc	**160.0**	0.47	**82.0**	0.24	**210.0**	0.62	**56.0**	0.16	**65.0**	0.19	**66.0**	0.19	**110.0**	0.32	**88.0**	0.26	**82.0**	0.24	**64.0**	0.19	**79.0**	0.23	**59.0**	0.17	**32.0**	0.09	**41.0**	0.12	**270.0**	0.79	340	NC
Chromium VI	<0.25	ND	<0.25	ND	<0.22	<0.23	<0.27	ND	<0.24	ND	<0.23	ND	<0.23	ND	<0.23	ND	<0.23	ND	<0.24	ND	<0.22	ND	<0.25	ND	<0.26	ND	<0.25	ND	<0.23	ND	10	NC
Total NC HI		**5.8**		**9.2**		**6.9**		**6.0**		**7.2**		**5.9**		**7.9**		**7.3**		**6.6**		**3.3**		**5.2**		**3.6**		**2.7**		**3.2**		**6.2**			

Notes:

all soil concentrations and screening levels in mg/kg
Bold indicates detection above laboratory reporting limit.
[a] All ecological screening levels taken from San Francisco Bay Summary of Environmental Screening Levels (ESLs) for Terrestrial Habitat Levels in Significantly Vegetated Area, except aluminum.
[b] As recommended in USEPA's EcoSSL for aluminum.

< = not detected at or above specified laboratory reporting limit
HI = noncancer Hazard Index = ∑HQ
HQ = noncancer Hazard Quotient
mg/kg = milligrams per kilogram
ND = not detected in soil

Table I-2
Adjusted Soil Concentration (Removal of Background Concentration)
Spent Catalyst Release from Martinez Refining Company

Analyte	Sample ID																												Upperbound Expected Background Range
	MRC-1		MRC-2		MRC-3		MRC-4		MRC-5		MRC-6		MRC-7		MRC-8		MRC-8 /Dup-1		MRC-9		MRC-10		MRC-11		MRC-12		MRC-13		MRC-14		
	Original	Adjusted	Original	Adjusted	Original	Adjusted	Original	Adjusted	Original	Adjusted	Original	Adjusted	Original	Adjusted	Original	Adjusted	Original	Adjusted	Original	Adjusted	Original	Adjusted	Original	Adjusted	Original	Adjusted	Original	Adjusted	Original	Adjusted	
Aluminum	**9,200**	**-61800**	**19,000**	**-52000**	**17,000**	**-54000.00**	**9,800**	**-61200**	**23,000**	**-48000.0**	**17,000**	**-54000**	**21,000**	**-50000**	**19,000**	**-52000**	**18,000**	**-53000**	**9,300**	**-61700.0**	**15,000**	**-56000**	**10,000**	**-61000**	**15,000**	**-56000**	**8,900**	**-62100**	**14,000**	**-57000.0**	71,000
Arsenic	**7.1**	**-23.9**	**28**	**-3**	**11**	**-20.00**	**24**	**-7**	**7.5**	**-23.5**	**6.8**	**-24.2**	**8.8**	**-22.2**	**16.0**	**-15**	**14.0**	**-17**	**6.1**	**-24.9**	**5.1**	**-25.9**	**5.7**	**-25.3**	**3.9**	**-27.1**	**5.4**	**-25.6**	**8.5**	**-22.5**	31
Barium	**99**	**-1401**	**110**	**-1390**	**150**	**-1350**	**110**	**-1390**	**600**	**-900**	**170**	**-1330**	**560**	**-940**	**130**	**-1370**	**130**	**-1370**	**100**	**-1400**	**130**	**-1370**	**98**	**-1402**	**86**	**-1414**	**90**	**-1410**	**86**	**-1414**	1,500
Beryllium	**0.57**	**-2.43**	**0.53**	**-2.47**	**0.93**	**-2.07**	**0.58**	**-2.42**	**0.61**	**-2.39**	**0.48**	**-2.52**	**0.62**	**-2.38**	**0.77**	**-2.23**	**0.69**	**-2.31**	**0.73**	**-2.27**	**1.2**	**-1.8**	**0.64**	**-2.36**	**0.65**	**-2.35**	**0.55**	**-2.45**	**0.88**	**-2.12**	3
Chromium, Total	**22**	**-1668**	**57**	**-1633**	**46**	**-1644**	**87**	**-1603**	**46**	**-1644**	**43**	**-1647**	**51**	**-1639**	**64**	**-1626**	**56**	**-1634**	**24**	**-1666**	**27**	**-1663**	**29**	**-1661**	**20**	**-1670**	**16**	**-1674**	**35**	**-1655**	1,690
Cobalt	**7.1**	**-128.9**	**19**	**-117**	**17**	**-119**	**16**	**-120**	**15**	**-121**	**12**	**-124**	**18**	**-118**	**15**	**-121**	**15**	**-121**	**6.3**	**-129.7**	**11**	**-125**	**7.9**	**-128.1**	**5.1**	**-130.9**	**6.5**	**-129.5**	**9.9**	**-126.1**	136
Copper	**20**	**-79.7**	**53**	**-46.7**	**44**	**-55.7**	**36**	**-63.7**	**44**	**-55.7**	**28**	**-71.7**	**63**	**-36.7**	**48**	**-51.7**	**43**	**-56.7**	**14**	**-85.7**	**30**	**-69.7**	**23**	**-76.7**	**7.9**	**-91.8**	**11**	**-88.7**	**29**	**-70.7**	99.7
Lead	**82**	**-165**	**79**	**-168**	**31**	**-216**	**23**	**-224**	**11**	**-236**	**31**	**-216**	**31**	**-216**	**32**	**-215**	**25**	**-222**	**15**	**-232**	**10**	**-237**	**13**	**-234**	**6.6**	**-240.4**	**18**	**-229**	**33**	**-214**	247
Molybdenum	<2.5	ND	<2.4	ND	<2.1	ND	<2.7	ND	<2.4	ND	<2.5	ND	<2.4	ND	<2.3	ND	<2.3	ND	<2.4	ND	<2.2	ND	<2.5	ND	<2.5	ND	<2.4	ND	<2.3	ND	3.3
Nickel	**19**	**-2221**	**56**	**-2184**	**50**	**-2190**	**200**	**-2040**	**44**	**-2196**	**40**	**-2200**	**60**	**-2180**	**65**	**-2175**	**60**	**-2180**	**23**	**-2217**	**30**	**-2210**	**31**	**-2209**	**14**	**-2226**	**13**	**-2227**	**32**	**-2208**	2,240
Selenium	<2.5	ND	<2.4	ND	<2.1	ND	<2.7	ND	<2.4	ND	<2.5	ND	<2.4	ND	<2.3	ND	<2.3	ND	<2.4	ND	<2.2	ND	<2.5	ND	<2.5	ND	<2.4	ND	<2.3	ND	7
Vanadium	**30**	**-200**	**70**	**-160**	**60**	**-170**	**30**	**-200**	**69**	**-161**	**59**	**-171**	**64**	**-166**	**70**	**-160**	**64**	**-166**	**29**	**-201**	**59**	**-171**	**34**	**-196**	**30**	**-200**	**30**	**-200**	**54**	**-176**	230
Zinc	**160**	**-314**	**82**	**-392**	**210**	**-264**	**56**	**-418**	**65**	**-409**	**66**	**-408**	**110**	**-364**	**88**	**-386**	**82**	**-392**	**64**	**-410**	**79**	**-395**	**59**	**-415**	**32**	**-442**	**41**	**-433**	**270**	**-204**	474
Chromium VI	<0.25	ND	<0.25	ND	<0.22	ND	<0.27	ND	<0.24	ND	<0.23	ND	<0.23	ND	<0.23	ND	<0.23	ND	<0.24	ND	<0.22	ND	<0.25	ND	<0.26	ND	<0.25	ND	<0.23	ND	NA

Notes:

Bold indicates detection above laboratory reporting limit.

< = not detected at or above specified laboratory reporting limit

Adjusted soil concentration = measured soil concentration - upperbound expected background range

mg/kg = milligrams per kilogram

NA = Not applicable

ND = not detected

Table I-3
Individual Sample Ecological Soil Risks (Excluding Background)
Spent Catalyst Release from Martinez Refining Company

Analyte	MRC-1		MRC-2		MRC-3		MRC-4		MRC-5		MRC-6		MRC-7		MRC-8		MRC-8 /Dup-1		MRC-9		MRC-10		MRC-11		MRC-12		MRC-13		MRC-14		Ecological Soil Screening Level [a]	
	Adj Conc	NC HQ	Adj Conc	NC HQ	Adj Conc	NC HQ	Adj Conc	NC HQ	Adj Conc	NC HQ	Adj Conc	NC HQ	Adj Conc	NC HQ	Adj Conc	NC HQ	Adj Conc	NC HQ	Adj Conc	NC HQ	Adj Conc	NC HQ	Adj Conc	NC HQ	Adj Conc	NC HQ	Adj Conc	NC HQ	Adj Conc	NC HQ		
Aluminum	**-61,800**	--	**-52,000**	--	**-54,000**	--	**-61,200**	--	**-48,000**	--	**-54,000**	--	**-50,000**	--	**-52,000**	--	**-53,000**	--	**-61,700**	--	**-56,000**	--	**-61,000**	--	**-56,000**	--	**-62,100**	--	**-57,000**	--	OK when pH $\geq$ 5.5	
Arsenic	**-24**	0.00	**-3**	0.00	**-20**	0.00	**-7**	0.00	**-24**	0.00	**-24**	0.00	**-22**	0.00	**-15**	0.00	**-17**	0.00	**-25**	0.00	**-26**	0.00	**-25**	0.00	**-27**	0.00	**-26**	0.00	**-23**	0.00	25	NC
Barium	**-1,401**	0.00	**-1,390**	0.00	**-1,350**	0.00	**-1,390**	0.00	**-900**	0.00	**-1,330**	0.00	**-940**	0.00	**-1,370**	0.00	**-1,370**	0.00	**-1,400**	0.00	**-1,370**	0.00	**-1,402**	0.00	**-1,414**	0.00	**-1,410**	0.00	**-1,414**	0.00	390	NC
Beryllium	**-2**	0.00	**-2**	0.00	**-2**	0.00	**-2**	0.00	**-2**	0.00	**-3**	0.00	**-2**	0.00	**-2**	0.00	**-2**	0.00	**-2**	0.00	**-2**	0.00	**-2**	0.00	**-2**	0.00	**-2**	0.00	**-2**	0.00	5.0	NC
Chromium, Total	**-1,668**	--	**-1,633**	--	**-1,644**	--	**-1,603**	--	**-1,644**	--	**-1,647**	--	**-1,639**	--	**-1,626**	--	**-1,634**	--	**-1,666**	--	**-1,663**	--	**-1,661**	--	**-1,670**	--	**-1,674**	--	**-1,655**	--	160	NA
Cobalt	**-129**	0.00	**-117**	0.00	**-119**	0.00	**-120**	0.00	**-121**	0.00	**-124**	0.00	**-118**	0.00	**-121**	0.00	**-121**	0.00	**-130**	0.00	**-125**	0.00	**-128**	0.00	**-131**	0.00	**-130**	0.00	**-126**	0.00	50	NC
Copper	**-80**	0.00	**-47**	0.00	**-56**	0.00	**-64**	0.00	**-56**	0.00	**-72**	0.00	**-37**	0.00	**-52**	0.00	**-57**	0.00	**-86**	0.00	**-70**	0.00	**-77**	0.00	**-92**	0.00	**-89**	0.00	**-71**	0.00	180	NC
Lead	**-165**	0.00	**-168**	0.00	**-216**	0.00	**-224**	0.00	**-236**	0.00	**-216**	0.00	**-216**	0.00	**-215**	0.00	**-222**	0.00	**-232**	0.00	**-237**	0.00	**-234**	0.00	**-240**	0.00	**-229**	0.00	**-214**	0.00	32	NC
Nickel	**-2,221**	0.00	**-2,184**	0.00	**-2,190**	0.00	**-2,040**	0.00	**-2,196**	0.00	**-2,200**	0.00	**-2,180**	0.00	**-2,175**	0.00	**-2,180**	0.00	**-2,217**	0.00	**-2,210**	0.00	**-2,209**	0.00	**-2,226**	0.00	**-2,227**	0.00	**-2,208**	0.00	130	NC
Vanadium	**-200**	0.00	**-160**	0.00	**-170**	0.00	**-200**	0.00	**-161**	0.00	**-171**	0.00	**-166**	0.00	**-160**	0.00	**-166**	0.00	**-201**	0.00	**-171**	0.00	**-196**	0.00	**-200**	0.00	**-200**	0.00	**-176**	0.00	18	NC
Zinc	**-314**	0.00	**-392**	0.00	**-264**	0.00	**-418**	0.00	**-409**	0.00	**-408**	0.00	**-364**	0.00	**-386**	0.00	**-392**	0.00	**-410**	0.00	**-395**	0.00	**-415**	0.00	**-442**	0.00	**-433**	0.00	**-204**	0.00	340	NC
Total NC HI		**0.0**		**0.0**		**0.0**		**0.0**		**0.0**		**0.0**		**0.00**		**0.0**		**0.0**		**0.0**		**0.0**		**0.0**		**0.0**		**0.0**		**0.0**			

Notes:

all soil concentrations and screening levels in mg/kg
Bold indicates detection above laboratory reporting limit.

< = not detected at or above specified laboratory reporting limit
HI = noncancer Hazard Index = ∑HQ
HQ = noncancer Hazard Quotient
mg/kg = milligrams per kilogram
NC = noncancer based on a Target Hazard Quotient = 1.0
ND = not detected in soil

Table I-4

Summary of Ecological Soil Risks

Spent Catalyst Release from Martinez Refining Company

Exposure Pathways	Background Contribution Included?	MRC-1	MRC-2	MRC-3	MRC-4	MRC-5	MRC-6	MRC-7	MRC-8	MRC-8 /Dup-1	MRC-9	MRC-10	MRC-11	MRC-12	MRC-13	MRC-14
		NC HQ	NC HQ	NC HQ	NC HQ	NC HQ	NC HQ	NC HQ	NC HQ	NC HQ	NC HQ	NC HQ	NC HQ	NC HQ	NC HQ	NC HQ
Ecological Exposure to Soil (Table I-1)	YES	5.75	9.21	6.90	5.97	7.21	5.95	7.93	7.34	6.61	3.30	5.22	3.60	2.73	3.20	6.17
Ecological Exposure to Soil (Table I-3)	NO	0.00	0.00	0.00	0.00	0.00	0.00	0.000	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Notes:

all soil concentrations and screening levels in mg/kg

C = cancer based on a Target Risk Level = 1E-06
HI = noncancer Hazard Index = ∑HQ
HQ = noncancer Hazard Quotient
NA = Not applicable
NC = noncancer based on a Target Hazard Quotient = 1.0

Appendix J. Responses to MRC Oversight Committee Comments

Response to MRC Oversight Committee Comments on Draft SLHHERA

Comment	Section of Report	TRC Response	Date Verified	CCH / Oversight Committee Reply to Response
CCH Comment: The draft report as given to CCH was in multiple pieces and parts. CCH is requesting that the final report be combined into one PDF. Additionally when the PDF is compiled CCH is requesting that all tables etc. be reviewed for formatting. The current PDF that CCH put together is very hard to read as print is small on some pages to have the entire table fit. CCH also recommends the tables be reviewed and internal TRC comments be scrubbed. Only relevant information should be presented. Please review entire report to ensure consistent font, labeling, etc.	Overall Report	Entire report will be reviewed, comments scrubbed, and pdf'd into one file.	8/21/2023	No Further Action Required. Oversight Committee Accepts Change
On table 3 add mg/kg and the last cell on the top right has “are” instead of area. [NH note, I believe Are is correct vs Area TRC please confirm]	Table 3	"mg/kg" has been added to the data column headers and screening level column headers in Table 3, and other tables in the report. No change required re top right cell; use of "are" is correct.	8/21/2023	No Further Action Required. Oversight Committee Accepts Change
My only concern comes from my experience discussing the preliminary findings with neighbors in the area, and is that the layman may need some assistance in the form of a flowchart that describes the sampling and testing process. Or maybe a simple accompanying document that would provide a guide to the report.	General Comment	TRC created a project timeline/flowchart which describes the site investigation events, which is labeled Chart 1: Site Investigation Timeline.	8/21/2023	No Further Action Required. Oversight Committee Accepts Change
The report should address further the decision for 6" depth of sampling and why samples were not taken deeper	Section 2.1.2	Will add the following text to Section 2.1.2: According to the California Department of Toxic Substances Control (DTSC), Human and Ecological Risk Office (HERO) Human Health Risk Assessment (HHRA) Note Number 4: Guidance for Screening Level Human Health Risk Assessments issued March 29, 2022, "*discrete soil samples should be collected from the surface (0 to 6 inches bgs),...which is particularly important for contaminants such as lead which generally have limited vertical mobility in the soil column*". The analytes in spent catalyst are metals, similar to lead, that have limited vertical mobility in the soil column. Therefore, collecting 0 to 6 inches bgs soil samples best captures the soil impacts from deposition of airborne spent catalyst; collection of samples from a 0 to 1.0 ft bgs could potentially “dilute” determination of impacts expected to be largely present in the upper 6 inches bgs.	8/21/2023	No Further Action Required. Oversight Committee Accepts Change
On page vi and page 1, the catalyst dust is described as “metallic” dust: is “metallic” a good descriptor of the dust? On page 10, there appears to be a problem with a range described as “zero $2x10^{-4}$ to $1x10^{-3}$.” Also, the period is missing.	Pages vi, 1, and 10	The composition of the spent catalyst dust is made up of metals; therefore, the adjective "metallic" is appropriate. No text change needed. Formatting errors noted will be corrected, including removal of the word "zero" and addition of a missing period.	8/21/2023	No Further Action Required. Oversight Committee Accepts Change
I don’t understand how the levels of Arsenic and Lead exceed the residential soil health standard, then when the background is taken out they are deemed ok (within the range of *background*)?This seems contradictory. Does this mean the recent release isn’t adding to anything that isn’t already there??	General Comment	As stated in Section 3.1, metals occur naturally in soil. Therefore, it is important to understand this natural occurrence and what range of concentrations occur naturally, which is called the expected background range, which can sometimes occur at concentrations greater than what would be acceptable for ecological and human health soil standards. Therefore, when evaluating the nature and extent of the November 2022 release and assessing risks related to this release, USEPA and DTSC allows for the removal of the expected background range when assessing risks. Based on the screening level assessment of the soil data, which includes a comparison to an expected background range, TRC concluded the following: •None of the metals analyzed exceed the expected regional background range, •Two metals (arsenic and lead) exceed residential direct contact screening levels, however these exceedances are not likely associated with the spent catalyst material, as the proportions of the metals found was inconsistent with that of the spent catalyst composition in the bulk material or dust (wipe samples). Based on these findings, TRC does not recommend additional sampling or further evaluation. No text change required.	8/21/2023	No Further Action Required. Oversight Committee Accepts Change
4.1 includes additional consideration of background soil concentrations in the risk evaluation – is this a judgement call by TRC to say this is an industrial location and that somehow has reduced findings?	General Comment, please adjust report if deemed necessary to clarify	See Response to Comment #7. In addition, "about appropriate land uses" will be removed from the following statement "This information is useful for risk management decisions about appropriate land uses and for public transparency." in Section 4.1.1. Determination of expected background soil range is independent of land use and is based on multiple literature studies conducted in the region.	8/21/2023	No Further Action Required. Oversight Committee Accepts Change

Comment	Section of Report	TRC Response	Date Verified	CCH / Oversight Committee Reply to Response
The description for 4.1 Methodology last paragraph says, "If any calculation of risk exceeds the point of departure, current and future risk evaluation and/or risk management decisions may be warranted" Is this a judgment call by TRC or has the data truly shown there is no risk… "both qualitative and quantitative "The same concerns as above for the findings in 4.3 concerning exceedances for Arsenic, Barium, Lead, Nickel, and Vanadium…I believe we have identified soil that is unhealthy to the community – what is our course of action? Also, is there a way to implore them to sample more?	General Comment, please adjust report if deemed necessary to clarify	The purpose of this report is to focus on health and environmental impacts related to airborne deposition of spent catalyst using a screening level risk assessment process which is adopted and utilized by both USEPA and DTSC. Based on the screening level assessment of the soil data, which includes a comparison to an expected background range, TRC concluded the following: •None of the metals analyzed exceed the expected regional background range, •Two metals (arsenic and lead) exceed residential direct contact screening levels, however these exceedances are not likely associated with the spent catalyst material, as the proportions of the metals found did not match that of the spent catalyst composition in the bulk material or dust (wipe samples). Based on these findings, TRC does not recommend additional sampling or further evaluation. No text change required.	8/21/2023	No Further Action Required. Oversight Committee Accepts Change

Commenter Name	PDF Page #	Comment	Section of Report	Response Category	TRC Response
Tameji Eames	3-4	**1a.** The scientific explanation for why the 14 sites were picked was not clearly articulated. Sure, the sample sites were informed by the BAAQMD model. However, that model, as presented at the city meeting, was based on assumptions that have significant effects on the model's output. Mainly, plume and weather maps rely on a large data set to make informed conclusions – they had a limited dataset (2 days of weather) to inform the model which means the model's predictions could be vastly different from reality. **My suggestion is that 14 spots all detecting no notable increases, is not a sufficient sample size to properly conclude there is no health risk.** 14 samples lack the statistical power to properly report a lack of risk. Finding zero everywhere is not a good answer. We would want to find data that supports that the model is correct in predicting plume and fallout. Then we can assess for risk. "No visible dust was observed at any of the sample locations." No surprise here. Samples were taken May 4-5 when the release was in November 2022 after the heaviest rainfall in CA in a decade. Maybe soil samples aren't going to be sufficient to assess the risk. [County to respond re timing of investigation]	2.0 Soil Investigation	MR-1; Timing of Investigation	See MR-1 Soil sampling locations were determined based on the BAAQMD dispersion modeling and associated plume map as well as input from the community (e.g., reports of observed dust deposition). The modeling inputs, assumptions and model results developed by the BAAQMD were critically reviewed by TRC's Certified Consulting Meteorologist, Gale Hoffnagle, who has previously provided expert witness input for three other catalyst dust releases by refineries within the United States. As articulated in MR-1, the locations selected for collection of soil samples should provide a representative data set to serve as inputs for the subject "worst-case" screening level risk assessment. The identified release zone, as determined by both physical observations provided by the affected community and the BAAQMD's dispersion modeling, constitutes the most technically sound area for selection of soil sample locations for this screening level assessment. County Input re Timing of Investigation CCH acknowledges that the timeline from the incident to obtaining soil sampling results was quite long. MRC's initial failure to notify the county delayed the determination of this incident as a Major Chemical Accident or Release (MCAR) by about 3 weeks. This designation was crucial to the development of an Oversight Committee. The process of forming the oversight committee, selecting a contractor, and initiating the work contributed to the delay. The process itself is set very intentionally to have a very strong focus on environmental justice by having a transparent and public process. CCH is working to be more nimble when incidents of this severity occur. CCH has heard the concerns from the community and will be instituting changes to our procedure for the future.
		1b. "the soil samples do not appear to have the same composition as the spent catalyst dust or bulk samples." I would not expect the soil samples to have the same composition. The soil samples should have other things plus elevated levels of the release dust. Different ratios of the chemicals of interest would be expected. We do not have a sample of the soil prior to the release so there is not a good understanding of baseline.	3.0 Data Evaluation	Sample Composition	The report acknowledges that "*while it is possible that some catalyst dust is mixed in with soil in the community, the soil samples do not appear to have the same composition as the spent catalyst dust or bulk samples.* " The catalyst dust is comprised predominantly of aluminum and vanadium; however, vanadium was not found in significant quantities in any of the May 2023 soil samples. If catalyst dust was present in these soil samples, vanadium would be detected at higher concentrations. No text change required.
		1c. "However, aerated garden soils in neighborhoods surrounding MRC would generally contain the less soluble, less mobile, and less phytoavailable pentavalent arsenic. – There needs to be a citation for this – how are you sure this is true? Provide a reference for this statement.	4.2.1 Arsenic Uptake by Plants	Arsenic Uptake	Reduced states of arsenic (more mobile, soluble, and phytoavailable in soil) require garden soil to be under water (e.g., flooded rice paddy), which is unlikely in the neighborhoods surrounding MRC. No text change required.
		1d. "None of the metals analyzed exceed the expected regional background range," – What is the background range for an area not proximate to a refinery? Say Danville… Saying that the soil samples do not exceed background levels is not the same as saying there is a healthy concentration of trace elements (listed on page 5) in the soil where sampled.	5.0 Conclusions	Background	Although anthropogenic sources of metals can not be clearly distinguished from naturally-occurring background levels, elevated arsenic concentrations at MRC-2, MRC-4, and MRC-8 compared to all other samples (see **Response Figure 1**) can be attributed to a geologic classification called the Great Valley Formation (see **Response Figure 2**), where arsenic "*concentrations measured in the Great Valley Formation are about double those of other units* " (LBNL, 2009). The term "healthy concentration of trace elements" is never used in the Draft SLHHERA. The purpose of this report is to focus on health and environmental impacts related to airborne deposition of spent catalyst using a screening level risk assessment process which is adopted and utilized by both USEPA and DTSC. Based on the screening level assessment of the soil data, which includes a comparison to an expected background range, TRC concluded the following: • None of the metals analyzed exceed the expected regional background range, • Two metals (arsenic and lead) exceed residential direct contact screening levels, however these exceedances are not likely associated with the spent catalyst material, as the proportions of the metals found did not match that of the spent catalyst composition in the bulk material or dust (wipe samples). Based on these findings, TRC does not recommend additional sampling or further evaluation. No text change required.
		1e. "Two metals (arsenic and lead) exceed residential direct contact screening levels, however these exceedances are not likely associated with the spent catalyst material, as the proportions of the metals found did not match the spent catalyst composition in the bulk material or dust (wipe samples)." – This statement does not make sense. The lead in the ground could have come from the catalyst. Why would you expect the proportions of metals in the soil to match the proportions of the catalyst exactly? MRC has released chemicals for years so the soil is already contaminated. There would not be equal ratios if there were already high lead concentration contaminated soil. We do not have a baseline lead measurement for this soil *prior* to the catalyst release so how can you say this is a non-issue when the levels exceed the residential direct screening levels? And the term "not likely." This should come with a confidence interval. How "non-likely?" This is not a quantifiable measure and the whole point of testing is to quantify! I am disappointed with the superficial effort put forth with this sampling paradigm and report. I would like to see a significantly larger breadth and depth of testing to 1) support the BAAQMD plume model (nothing in the risk assessment report confirms or denies the model was well-informed), and 2) to ensure that the food I eat out of my garden is safe because this report does neither.	5.0 Conclusions	Background	The purpose of this report is to focus on health and environmental impacts related to airborne deposition of spent catalyst using a screening level risk assessment process which is adopted and utilized by both USEPA and DTSC. The focus of this report was on soil conditions due only to the airborne deposition of spent catalyst that occurred in November 2022, not on baseline soil concentrations prior to the release, which may be due to anthropogenic (including prior MRC operations) or naturally-occurring background conditions. The bulk sample collected from MRC appears to mostly contain vanadium, followed by nickel, and then barium. The lead concentration of the bulk sample collected from MRC (12 mg/kg) is below its residential soil health standard (80 mg/kg) and much lower than many of the soil samples collected in May 2023, as shown in **Table 4** of the Draft SLHHERA. The statement will be modified as follows "Two metals (arsenic and lead) exceed residential direct contact screening levels, however these exceedances do not represent the spent catalyst material, as the proportions of the metals found did not match the spent catalyst composition in the bulk material or dust (wipe samples)." The depth of sampling was determined based on California DTSC, HERO Human Health Risk Assessment (HHRA) Note Number 4: *Guidance for Screening Level Human Health Risk Assessments* issued March 29, 2022, in which "discrete soil samples should be collected from the surface (0 to 6 inches bgs),...which is particularly important for contaminants such as lead and other metals which generally have limited vertical mobility in the soil column". The analytes in spent catalyst are metals that have limited vertical mobility in the soil column. Therefore, collecting 0 to 6 inches bgs soil samples best captures the soil impacts from deposition of airborne spent catalyst; collection of samples from a 0 to 1.0 ft bgs depth or deeper could potentially "dilute" determination of impacts expected to be largely present in the upper 6 inches bgs.

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Thomas Kellogg	12	**2.0** How did you conclude that the release did not exceed regional background levels when they are expressed in concentrations, e.g., ug/L, and your analyses are expressed in ug/wipe.	General Comment	Background	Although wipe samples use different units (µg/wipe), they indicated a presence of several metals (as shown in **Table 1** of the Draft SLHHERA), which were compared to their proportion in both the source bulk sample (B-6) and bulk samples collected from the community. The bulk sample collected from MRC appears to mostly contain vanadium, followed by nickel, and then barium. Other metals analyzed, but not found in large quantities were copper, zinc, total chromium, lead, molybdenum, arsenic, selenium, and beryllium. A comparison between bulk samples and expected background range was not conducted, as that was not the focus of the Draft SLHHERA (wipe and bulk samples helped to identify the chemical composition of the catalyst dust, and thereby informed the analytical scope of testing for soil samples). No text change required.
Michael Dorsey	14-15	**3a.** Old data is being used and it is an overall average of a large area of different environments. There is no reference to verify what areas were even used as various locations around the State of CA the Western U.S. I searched more recent data from the Berkeley Lawrence National Laboratory, NIOSH, OSHHA, OSHA, and the US Environmental Protection Agency for specific levels of health risk of different components of elements in the samples of the 14 locations in the MRC area. ARSENIC The EPA has stated that levels of arsenic in soil from 5 ppm up to 20 ppm are generally viewed as safe, even if contact with arsenic at these levels continues for many years. The report states that arsenic exceeded ecological soil of 25 mg/kg at MRC sample site 7 at 28mg/kg. LEAD The National Institute of Occupational Safety and Health (NIOSH) at CDC has set a Recommended Exposure Limit (REL) of 50 µg/m3 for a Time Weighted Average (TWA) of 8 hours to be maintained so that worker blood lead remains <60 µg/dL of whole blood. The report states 32/mg/kg level of safety, yet 2 locations MRC-1 at 82/mg/kg and MRG-2 at 130 mg/kg greatly exceed the healthy safe target. 4 community sample wipes vary considerably in different types of metals.	General Comment	Background	Older literature background studies were incorporated to help round out some analytes that were not evaluated in more recent studies (e.g., aluminum). These older studies may actually reflect less anthropogenic contributions than more recent studies. The 2009 LBNL study does specifically identify where their 1,400 samples were collected; however, in the case of arsenic, the 2009 LBNL study differentiates samples collected in the Great Value Formation and other geologic units. As shown in **Response Figure 1**, elevated arsenic concentrations detected at MRC-2, MRC-4, and MRC-8 compared to all other MRC samples can be attributed to the Great Valley Formation (see **Response Figure 2**), where arsenic "*concentrations measured in the Great Valley Formation are about double those of other units*" (LBNL, 2009). The maximum detected arsenic soil concentration among MRC samples (28 mg/kg) occurred at MRC-2, which is equivalent to the 99th percentile of all arsenic soil samples and 95th percentile of Great Valley Formation soil samples in the LBNL soil background dataset (LBNL, 2009; Table 4). The maximum detected lead soil concentration among MRC samples (82 mg/kg) is just slightly above the SFRWQCB Environmental Screening Level (ESL) protective of residential exposure (80 mg/kg), which is the California-specific health standard. The MRC-2 soil lead concentration is 79 mg/kg, not 130 mg/kg. There is no lead soil concentration of 130 mg/kg. It is important to understand this natural occurrence and what range of concentrations occur naturally, which is called the expected background range, and which can sometimes occur at concentrations greater than what would be acceptable for ecological and human health soil standards. Therefore, when evaluating the nature and extent of the November 2022 release and assessing risks related to this release, USEPA and DTSC guidance allows for the removal of the expected background range when assessing risks. Based on the screening level assessment of the soil data, which includes a comparison to an expected background range, TRC concluded the following: •None of the metals analyzed exceed the expected regional background range, •Two metals (arsenic and lead) exceed residential direct contact screening levels, however these exceedances are not likely associated with the spent catalyst material, as the proportions of the metals found were inconsistent with that of the spent catalyst composition in the bulk material or dust (wipe samples). Although some variability in community wipe samples is expected, the four community samples tend to be show composition trends (e.g., elevated vanadium) compared to the background wipe sample, as shown in **Table 1** of the Draft SLHHERA. No text change required.
		3b. The report states that the soil samples were taken anywhere from 0-6". I would like to see the same element compared from the same depth at the different locations. It isn't stated and there is no identification at what level the samples were taken. That doesn't seem scientific to me. I object to comparisons of actual samples taken near MRC being compared against average old data instead of taking actual samples from real areas that can be identified.	General Comment	MR-1 SAP	It is noted that some surficial soils may have been physically transported from an initial deposition location by heavy rains in the '22-'23 wet season. The SAP was developed to provide a representative snapshot of soils in the dispersion area. See response to comment 1e. above for justification of surface soil sampling.
Kathy Petricca	19-20	**4a.** A determination of the nature and extent of the release. The nature is a broad term, but the proposed extent of the release is the Plume Model produced by the Bay Area Air Quality Management District (BAAQMD), released the following Spring.	Executive Summary	MR-1: AQMD Plume Map; SAP	Comment noted; the extent of dust deposition was indeed based on the BAAQMD's dispersion (plume) modeling.
		4b. The chemical composition of the dust. The McCampbell sampling and analysis was requested by the Contra Costa County Health Department (CCH) and BAAQMD on 11/26/2023 on a RUSH basis. The TRC Report refers to the evidence of the dust as including dust particles from "vehicles, trash cans, and residential garden areas within the community". The rest of the TRC soil sampling uses different sites in central and eastern areas of the county. The 5 locations of the McCampbell are all in the City of Martinez. (See Appendix A, page 13/16, or page 62 of the whole report.) The TRC sampling map is based on the BAAQMD Plume Distribution model and includes central and eastern areas of the county. It lists 2 City of Martinez sampling sites (Susana Park and Highland Avenue Park), and a close-by site (Camino Del Sol. (See Figure 1, page 34 of the whole report. See also Attachment E and page 127 of the whole report.) By May, when TRC sampling was done, that no dust was found that seemed like catalyst is not surprising. [County to respond re timing of investigation]	Executive Summary; Figure 1; Appendix A; Attachment E of Appendix C	MR-1: AQMD Plume Map; SAP Timing of Investigation	As stated in MR-1, soil sampling locations were determined based on the BAAQMD dispersion modeling and associated plume map as well as input from the community (e.g., reports of observed dust deposition). County Input re Timing of Investigation CCH acknowledges that the timeline from the incident to obtaining soil sampling results was quite long. MRC's initial failure to notify the county delayed the determination of this incident as a Major Chemical Accident or Release (MCAR) by about 3 weeks. This designation was crucial to the development of an Oversight Committee. The process of forming the oversight committee, selecting a contractor, and initiating the work contributed to the delay. The process itself is set very intentionally to have a very strong focus on environmental justice by having a transparent and public process. CCH is working to be more nimble when incidents of this severity occur. CCH has heard the concerns from the community and will be instituting changes to our procedure for the future.
		4c. The extent of dust in the soils within the release area is based on the larger area of the Plume Model and doesn't refer to the catalyst analysis of McCampbell analysis. TRC's commentary is on what would be expected and what would not be expected, and which level is not likely to be associated with catalyst dust. (See Executive Summary, page vi, and page 7 of the whole report.) TRC states "Soil samples did not appear to have typical make-up of spent catalyst dust.' (See page vi.). The samples of the catalyst analyses by McCampbell is not mentioned.	Executive Summary; Section 3.2; Table 1; Appendices, A, B, and F	Bulk and Wipe Samples	A detailed discussion of the bulk and wipe samples analyzed by McCampbell Analytical, Inc. is presented in Section 1.2 Background, in which the bulk and wipe samples are summarized in **Table 1** and the lab reports presented as **Appendices A and B**. Comparison of the bulk and wipe samples to May 2023 soil samples is presented in Section 3.2 Data Composition and Comparison to Spent Catalyst Dust and Bulk Samples, with composition comparison pie charts presented as **Appendix F** of the Draft SLHHERA. No text change required.

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		4d. Sample D-6 of the McCampbell work order was collected on 11/28/2022, three days after the release. Eighteen test names are listed. (page 80) Sample D-6 is the background sample. (page 9/16 and page 75.) BAAQMD wrote a request for lab analysis of the samples of November, including a sample taken from COBS main hopper, which also has field comments about a sample of spent catalyst from the main hopper at COBS. (page 14/16, and page 63) BAAQMD also requested an analysis of samples 1-6 with sites D-1 to D-5 being compared to D-6. D-6's location is listed as 3487 Pacheco Blvd, the address of Martinez Refining Company. Contra Costa News of 11/29/2022 printed a statement from the Martinez Refining Company: "The tests confirm the samples are 'spent catalyst' that originated from the refinery's Fluidized Catalytic Cracking Unit and the catalyst had been incinerated at high temperatures to remove impurities for reuse in the refinery process and was accidentally released during overnight hours on Thanksgiving night." The above omissions of the actual and timely sample of the actual catalyst, and the residential samples in Martinez make conclusions based on far-flung sampling of other county soils questionable. Plus, TRC's discussion of even more far-flung soils in Napa County and Union City, Alameda County is a distraction and a comparison of Contra Costa soils to them is also questionable for the purpose at hand.	General Comment	MR-1; Purpose of Dust sample analyses ; Fingerprinting	See MR-1: As noted in the SAP, bulk samples of dust and wipe samples collected by the County were analyzed to determine the nature of the released material and to therefore subsequently compare with soil samples collected based on the dispersion modeling and community reports of dust deposition. Wipe sample, D-6, is indeed a background sample. The only address on the wipe sample laboratory report (presented as **Appendix B** in the Draft SLHHERA) is the address of the Contra Costa County Hazardous Materials Program, 4585 Pacheco Blvd, Martinez, CA. A comparison between bulk samples and expected background range was not conducted, as that was not the focus of the Draft SLHHERA (wipe and bulk samples helped to identify the chemical composition of the catalyst dust, which was used to determine which chemicals to analyze for during the May 2023 soil investigation). The background literature studies selected were meant to derive a regional background range, which may include samples collected from the San Francisco Bay area, and which presents unique geological formations, as shown in **Response Figure 2**. Based on the screening level assessment of the soil data, which includes a comparison to an expected background range, TRC concluded the following: •None of the metals analyzed exceed the expected regional background range, •Two metals (arsenic and lead) exceed residential direct contact screening levels, however these exceedances are not likely associated with the spent catalyst material, as the proportions of the metals found did not match that of the spent catalyst composition in the bulk material or dust (wipe samples).
Charles Davidson	21-22	**5a.** **Inadequate Sampling Locations**: The TRC study indicated only two out of the 14 sample locations were from areas that experienced visible deposition from the MRC event. This is concerning, especially when TRC's Gale Hoffnagle acknowledges the likely heavy deposition nearby the refinery. Sampling Methodology: TRC's Jonathan Scheiner noted that their sampling locations were determined by the BAAQMD's plume model. However, if the goal was to evaluate the "worst case" scenarios, then basing the study on only two visibly affected locations (nearby and downwind of) the refinery seems counterintuitive out of a total of 14 locations (with the majority of sample locations from between 5 and 15 miles to the west). Depth of Soil Samples: The depth at which the samples were taken is questionable, especially considering the samples were taken almost three quarters of a year post-event and after multiple atmospheric river winter storms. A mere 6-inch depth at only two affected sites makes the scientific relevance of such samples highly suspect.	General Comment	MR-1 SAP	As stated in MR-1, soil sampling locations were determined based on the BAAQMD dispersion modeling and associated plume map as well as input from the community (e.g., reports of observed dust deposition). As referenced in **Table 5** of the Draft SLHHERA Report, the screening level risk assessment presented health risks associated with potential exposure to affected soils on a "per sample location" basis, summing the risks from each exposure pathway at that location. Each quantified risk presented in this summary table is based on a comparison with published screening levels, and therefore presents a "worst-case" risk (i.e., due to the conservative exposure and toxicity assumptions inherent in the derivation of the published screening levels.
		5b. Air District's Role: My discussions with the Air District revealed that they neither provided specific advice to TRC nor CC Health on utilizing the provided map for sampling. It appears the map was more of a starting point rather than an exact guide, raising further questions about the selected sample locations. Clarification on Air District's Role: Per my communications with BAAQMD: "The Air District did not provide specific advice to TRC or CC Health on how to use the map" And The Air District, in both remote meetings and written documents, clarified that this map provided modeled deposition values as a starting point for purposes of informing the soil sampling program; this modeling map was not developed to identify where residents are impacted by catalyst materials."	General Comment	MR-1 SAP	As noted in MR-1, and as confirmation, the BAAQMD did not provide any instructions or guidance on "how to use the map". TRC's certified meteorologist conducted a technical peer review of the Air District's modeling, and per findings that the modeling was properly conducted, the plume map was used to inform the determination of soil sample locations. Dust deposition is most likely to be located in locations within the plume provided by the BAAQMD.
		5c. Recommended Sampling Approach: For a more robust and credible study, TRC should have begun their sampling from the center of the visible deposition area near the MRC refinery and then expanded outward.	General Comment	MR-1 SAP	A basic premise of the SAP is that meteorological conditions (e.g., wind patterns) would most accurately govern the deposition of released dust. There is no scientific reason to believe that the dust would be distributed in a pattern independent of meteorological conditions at the time of the release (e.g., a circular distribution pattern).
		5d. Role of the County: The county's delay in conducting a comprehensive sampling post the incident, especially ahead of the winter storms, raises concerns. Immediate sampling would have been more informative and credible, even if a consultant like TRC was to be engaged later.	General Comment	Timing of Investigation	County Response re delay in timing of investigation CCH acknowledges that the timeline from the incident to obtaining soil sampling results was quite long. MRC's initial failure to notify the county delayed the determination of this incident as a Major Chemical Accident or Release (MCAR) by about 3 weeks. This designation was crucial to the development of an Oversight Committee. The process of forming the oversight committee, selecting a contractor, and initiating the work contributed to the delay. The process itself is set very intentionally to have a very strong focus on environmental justice by having a transparent and public process. CCH is working to be more nimble when incidents of this severity occur. CCH has heard the concerns from the community and will be instituting changes to our procedure for the future.
		5e. Historical Context: The very notion that there was no rise in soil heavy metals around a century-old heavy crude refinery seems improbable. Historical data suggests such refineries have been sources of airborne contamination.	General Comment	MR-1 SAP	As noted in MR-1 and detailed in the SAP, the objective of the Draft SLHHERA was to determine - on a worst-case preliminary basis - the health and ecological risks posed by this release of catalyst dust; it is noted that the subject area is not a natural, "pristine" area.
		5f. Concerns about Ongoing Emissions: Beyond this event, there is a broader concern about the continued emission of PM2.5 particulate matter, which has known severe health implications due to its ability to deeply penetrate lungs and carry toxic heavy metals.	General Comment	Ongoing Emissions	County Response CCH does not have jurisdiction over ongoing emissions, however CCH continues to work closely with BAAQMD on this matter.
		5g. Recommendation: It's imperative that comprehensive heavy metal sampling be conducted not just in the soil but also inside nearby residential areas, particularly inside homes. In light of the above concerns, **I strongly urge a re-evaluation of the current findings and an in depth**, scientifically sound study to ensure the health and safety of our community.	General Comment	MR-1 SAP	The Draft SLHHERA was conducted to evaluate potential risks posed by exposure to catalyst dust from this particular release - on a "worst-case" basis - and incorporated residential areas. Uncovered soils in the plume area represent the worst case for identifying dust samples in the local environment; re-deposition of dust into homes would represent a lesser exposure than "outdoor" samples and certainly not a "worst-case" exposure.

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Katie Keenan	23-25	**6.0** Both my husband and I coughed for 2 weeks following the incident. **Regardless of the findings I disagree.** I have 6 fruit trees which yearly produced fruit except after 11/2022! The leaves were wilted and white. It is 9/13/23 and not one piece of fruit! I've since dug up Topsoil surrounding the trees and placed new compost. Yet this damage after the spent catalyst which from rains penetrated the soil. Do not tell me they were "safe levels" You write ONLY arsenic and lead exceeded screening levels! BOTH ARE TOXIC to humans and animals! **What is the District Attorney doing?**	General Comment	General MR-1 SAP	Unfortunately, the atmospheric conditions immediately after the release were not captured and could not be evaluated as part of this Draft SLHHERA. Although anthropogenic sources of metals can not be clearly distinguished from naturally-occurring background levels, elevated arsenic concentrations at MRC-2, MRC-4, and MRC-8 compared to all other samples (see Response Figure 1) can be attributed to a geologic classification called the Great Valley Formation (see Response Figure 2), where arsenic "concentrations measured in the Great Valley Formation are about double those of other units" (LBNL, 2009). As stated in Draft SLHHERA Section 4.2.1 (Arsenic Update by Plants), "The Agency for Toxic Substances and Disease Registry (ATSDR) published a pamphlet in 2015 called *Safe Gardening, Safe Play, and a Safe Home* , which looks at exposure and risk when arsenic in soil is greater than 20 mg/kg, similar to May 2023 soil samples, MRC-2 and MRC-4. The ATSDR study concluded that "*even for those areas showing elevated levels of arsenic, the uptake into home grown vegetables or fruits, is not likely to be sufficient to cause any health effects to persons gardening in the soil or eating vegetables grown in the garden* ." It should be noted that the source bulk sample (B-6) reported only 5.8 mg/kg of arsenic and 12 mg/kg of lead. The lead concentration at B-6 is below the SFRWQCB Environmental Screening Level (ESL) protective of residential exposure (80 mg/kg), which is the California-specific health standard. The Draft SLHHERA was conducted to evaluate - on a "worst-case" basis, and incorporated residential areas. Uncovered soils in the plume area represent the worst case for identifying dust samples in the local environment.
Kathleen Claney	27	**7.0** Jenny Phillips comment specific focus was on soil samples collected from the surface to 6" down only because this type catalyst does not leach into water and is not diluted by heavy rain. When it rains often the top layer is carried away by the rain/water into sewer drains. Is not water affected.	General Comment	Sample Deposition	It is noted that some surficial soils may have been physically transported from an initial deposition location by heavy rains in the '22-'23 wet season. The SAP was developed to provide a representative snapshot of soils in the dispersion area.
Maureen Brennan	32	**8a.** These TRC studies are skewing background numbers. They have cherry-picked other sources to ratchet up current background levels. This TRC study introduces numbers that are outliers, and should not be considered as background. Zinc The mean for Berkeley Lawrence Labs (BLL) is 64. Yet, TRC looked at 8 sites in other countries, and most were below 100, as was Berkeley Labs. The outlier in Union city (474mg/kg) which became the high normal for background levels is geographically too far away for comparison. That number is an outlier and should be ignored. Chromium At BLL, the background of Chromium is 100 mg/kg. Our new high normal is 1690 mg/kg. The Napa fire 2017 data is another outlier because of the extensive incineration that occurred. It skews numbers considered background, and real contamination hides behind those numbers. DTSC calls this an Error II mistake, or a false negative. We cannot set background levels so very high for our communities. DTSC also recommends studies for legacy pollution to include a "coring" of soil, as they do in the ocean. Recommend hat this is performed As a reminder, this is a risk assessment document. I've only seen numbers from soil sampling. However, a true risk assessment would include the repercussions of contamination of heavy metals for health conditions. Including background contamination. Demographics of who is affected, old and young typically. Cancer? or non-cancer repercussions. Heavy metals tested, and what are symptoms? We are still at risk, especially since these numbers are set at an unusually high level.	General Comment	Background	The background literature studies selected were meant to derive a regional background range. The upperbound background concentration for zinc was collected within the San Francisco Bay region as part of a City of Oakland Survey of Studies of Naturally-occurring Metals Concentrations conducted in 2016. If the City of Oakland and its source study acknowledges the upperbound zinc background value, there is no reason to remove it from the background dataset. Similarly, if the 2017 Napa County background study acknowledges the upperbound chromium background value, there is no reason to remove it from the background dataset. The purpose of this report is to focus on health and environmental impacts related to airborne deposition of spent catalyst using a screening level risk assessment process which is adopted and utilized by both USEPA and DTSC. The focus of this report was on soil conditions due only to the airborne deposition of spent catalyst, not on baseline soil concentrations prior to the release, which may be due to anthropogenic or naturally-occurring background conditions. Based on the screening level assessment of the soil data, which includes a comparison to an expected background range, TRC concluded the following: • None of the metals analyzed exceed the expected regional background range, • Two metals (arsenic and lead) exceed residential direct contact screening levels, however these exceedances are not likely associated with the spent catalyst material, as the proportions of the metals found did not match that of the spent catalyst composition in the bulk material or dust (wipe samples). Based on these findings, TRC does not recommend additional sampling or further evaluation. No text change required.
		8b. The May 2023 analysis is too late for a November 2022 event (after 6 atmospheric rivers). Of 14 samplings, only 3 were close to the site of release, This is not good science. [County to respond re timing of investigation]	General Comment	Timing of Investigation	County Input re Timing of Investigation CCH acknowledges that the timeline from the incident to obtaining soil sampling results was quite long. MRC's initial failure to notify the county delayed the determination of this incident as a Major Chemical Accident or Release (MCAR) by about 3 weeks. This designation was crucial to the development of an Oversight Committee. The process of forming the oversight committee, selecting a contractor, and initiating the work contributed to the delay. The process itself is set very intentionally to have a very strong focus on environmental justice by having a transparent and public process. CCH is working to be more nimble when incidents of this severity occur. CCH has heard the concerns from the community and will be instituting changes to our procedure for the future.

Notes:

ATSDR = Agency for Toxic Substances and Disease Registry
BAAQMD = Bay Area Air Quality Management District
DTSC = California Department of Toxic Substances Control
ESL = Environmental Screening Level
HERO = Human and Ecological Risk Office
HHRA = Human Health Risk Assessment
MR-1 = Master Response 1 to Public Comments Regarding Soil Sampling Logistics
MRC = Martinez Refining Company
SAP = Sampling and Analysis Plan
SLHHERA = Screening Level Human Health and Ecological Risk Assessment
SFRWQCB = San Francisco Bay Regional Water Quality Control Board
USEPA = United States Environmental Protection Agency

Reference:

Lawrence Berkeley National Laboratory Analysis of Background Distributions of Metals in the Soil at Lawrence Berkeley National Laboratory, D. Diamond, D. Baskin, D. Brown, L. Lund, J. Najita, and I Javandel, June 2002 Revised April 2009

Appendix K. Responses to Public Comments

Commenter Name	PDF Page #	Comment	Section of Report	Response Category	TRC Response
Tameji Eames	3-4	**1a.** The scientific explanation for why the 14 sites were picked was not clearly articulated. Sure, the sample sites were informed by the BAAQMD model. However, that model, as presented at the city meeting, was based on assumptions that have significant effects on the model's output. Mainly, plume and weather maps rely on a large data set to make informed conclusions – they had a limited dataset (2 days of weather) to inform the model which means the model's predictions could be vastly different from reality. **My suggestion is that 14 spots all detecting no notable increases, is not a sufficient sample size to properly conclude there is no health risk.** 14 samples lack the statistical power to properly report a lack of risk. Finding zero everywhere is not a good answer. We would want to find data that supports that the model is correct in predicting plume and fallout. Then we can assess for risk. "No visible dust was observed at any of the sample locations." No surprise here. Samples were taken May 4-5 when the release was in November 2022 after the heaviest rainfall in CA in a decade. Maybe soil samples aren't going to be sufficient to assess the risk. [County to respond re timing of investigation]	2.0 Soil Investigation	MR-1; Timing of Investigation	See MR-1 Soil sampling locations were determined based on the BAAQMD dispersion modeling and associated plume map as well as input from the community (e.g., reports of observed dust deposition). The modeling inputs, assumptions and model results developed by the BAAQMD were critically reviewed by TRC's Certified Consulting Meteorologist, Gale Hoffnagle, who has previously provided expert witness input for three other catalyst dust releases by refineries within the United States. As articulated in MR-1, the locations selected for collection of soil samples should provide a representative data set to serve as inputs for the subject "worst-case" screening level risk assessment. The identified release zone, as determined by both physical observations provided by the affected community and the BAAQMD's dispersion modeling, constitutes the most technically sound area for selection of soil sample locations for this screening level assessment. County Input re Timing of Investigation CCH acknowledges that the timeline from the incident to obtaining soil sampling results was quite long. MRC's initial failure to notify the county delayed the determination of this incident as a Major Chemical Accident or Release (MCAR) by about 3 weeks. This designation was crucial to the development of an Oversight Committee. The process of forming the oversight committee, selecting a contractor, and initiating the work contributed to the delay. The process itself is set very intentionally to have a very strong focus on environmental justice by having a transparent and public process. CCH is working to be more nimble when incidents of this severity occur. CCH has heard the concerns from the community and will be instituting changes to our procedure for the future.
		1b. "the soil samples do not appear to have the same composition as the spent catalyst dust or bulk samples." I would not expect the soil samples to have the same composition. The soil samples should have other things plus elevated levels of the release dust. Different ratios of the chemicals of interest would be expected. We do not have a sample of the soil prior to the release so there is not a good understanding of baseline.	3.0 Data Evaluation	Sample Composition	The report acknowledges that "*while it is possible that some catalyst dust is mixed in with soil in the community, the soil samples do not appear to have the same composition as the spent catalyst dust or bulk samples.* " The catalyst dust is comprised predominantly of aluminum and vanadium; however, vanadium was not found in significant quantities in any of the May 2023 soil samples. If catalyst dust was present in these soil samples, vanadium would be detected at higher concentrations. No text change required.
		1c. "However, aerated garden soils in neighborhoods surrounding MRC would generally contain the less soluble, less mobile, and less phytoavailable pentavalent arsenic. – There needs to be a citation for this – how are you sure this is true? Provide a reference for this statement.	4.2.1 Arsenic Uptake by Plants	Arsenic Uptake	Reduced states of arsenic (more mobile, soluble, and phytoavailable in soil) require garden soil to be under water (e.g., flooded rice paddy), which is unlikely in the neighborhoods surrounding MRC. No text change required.
		1d. "None of the metals analyzed exceed the expected regional background range," – What is the background range for an area not proximate to a refinery? Say Danville… Saying that the soil samples do not exceed background levels is not the same as saying there is a healthy concentration of trace elements (listed on page 5) in the soil where sampled.	5.0 Conclusions	Background	Although anthropogenic sources of metals can not be clearly distinguished from naturally-occurring background levels, elevated arsenic concentrations at MRC-2, MRC-4, and MRC-8 compared to all other samples (see **Response Figure 1**) can be attributed to a geologic classification called the Great Valley Formation (see **Response Figure 2**), where arsenic "*concentrations measured in the Great Valley Formation are about double those of other units* " (LBNL, 2009). The term "healthy concentration of trace elements" is never used in the Draft SLHHERA. The purpose of this report is to focus on health and environmental impacts related to airborne deposition of spent catalyst using a screening level risk assessment process which is adopted and utilized by both USEPA and DTSC. Based on the screening level assessment of the soil data, which includes a comparison to an expected background range, TRC concluded the following: • None of the metals analyzed exceed the expected regional background range, • Two metals (arsenic and lead) exceed residential direct contact screening levels, however these exceedances are not likely associated with the spent catalyst material, as the proportions of the metals found did not match that of the spent catalyst composition in the bulk material or dust (wipe samples). Based on these findings, TRC does not recommend additional sampling or further evaluation. No text change required.
		1e. "Two metals (arsenic and lead) exceed residential direct contact screening levels, however these exceedances are not likely associated with the spent catalyst material, as the proportions of the metals found did not match the spent catalyst composition in the bulk material or dust (wipe samples)." – This statement does not make sense. The lead in the ground could have come from the catalyst. Why would you expect the proportions of metals in the soil to match the proportions of the catalyst exactly? MRC has released chemicals for years so the soil is already contaminated. There would not be equal ratios if there were already high lead concentration contaminated soil. We do not have a baseline lead measurement for this soil *prior* to the catalyst release so how can you say this is a non-issue when the levels exceed the residential direct screening levels? And the term "not likely." This should come with a confidence interval. How "non-likely?" This is not a quantifiable measure and the whole point of testing is to quantify! I am disappointed with the superficial effort put forth with this sampling paradigm and report. I would like to see a significantly larger breadth and depth of testing to 1) support the BAAQMD plume model (nothing in the risk assessment report confirms or denies the model was well-informed), and 2) to ensure that the food I eat out of my garden is safe because this report does neither.	5.0 Conclusions	Background	The purpose of this report is to focus on health and environmental impacts related to airborne deposition of spent catalyst using a screening level risk assessment process which is adopted and utilized by both USEPA and DTSC. The focus of this report was on soil conditions due only to the airborne deposition of spent catalyst that occurred in November 2022, not on baseline soil concentrations prior to the release, which may be due to anthropogenic (including prior MRC operations) or naturally-occurring background conditions. The bulk sample collected from MRC appears to mostly contain vanadium, followed by nickel, and then barium. The lead concentration of the bulk sample collected from MRC (12 mg/kg) is below its residential soil health standard (80 mg/kg) and much lower than many of the soil samples collected in May 2023, as shown in **Table 4** of the Draft SLHHERA. The statement will be modified as follows "Two metals (arsenic and lead) exceed residential direct contact screening levels, however these exceedances do not represent the spent catalyst material, as the proportions of the metals found did not match the spent catalyst composition in the bulk material or dust (wipe samples)." The depth of sampling was determined based on California DTSC, HERO Human Health Risk Assessment (HHRA) Note Number 4: *Guidance for Screening Level Human Health Risk Assessments* issued March 29, 2022, in which "discrete soil samples should be collected from the surface (0 to 6 inches bgs),...which is particularly important for contaminants such as lead and other metals which generally have limited vertical mobility in the soil column". The analytes in spent catalyst are metals that have limited vertical mobility in the soil column. Therefore, collecting 0 to 6 inches bgs soil samples best captures the soil impacts from deposition of airborne spent catalyst; collection of samples from a 0 to 1.0 ft bgs depth or deeper could potentially "dilute" determination of impacts expected to be largely present in the upper 6 inches bgs.

Commenter Name	PDF Page #	Comment	Section of Report	Response Category	TRC Response
Thomas Kellogg	12	**2.0** How did you conclude that the release did not exceed regional background levels when they are expressed in concentrations, e.g., ug/L, and your analyses are expressed in ug/wipe.	General Comment	Background	Although wipe samples use different units (µg/wipe), they indicated a presence of several metals (as shown in **Table 1** of the Draft SLHHERA), which were compared to their proportion in both the source bulk sample (B-6) and bulk samples collected from the community. The bulk sample collected from MRC appears to mostly contain vanadium, followed by nickel, and then barium. Other metals analyzed, but not found in large quantities were copper, zinc, total chromium, lead, molybdenum, arsenic, selenium, and beryllium. A comparison between bulk samples and expected background range was not conducted, as that was not the focus of the Draft SLHHERA (wipe and bulk samples helped to identify the chemical composition of the catalyst dust, and thereby informed the analytical scope of testing for soil samples). No text change required.
Michael Dorsey	14-15	**3a.** Old data is being used and it is an overall average of a large area of different environments. There is no reference to verify what areas were even used as various locations around the State of CA the Western U.S. I searched more recent data from the Berkeley Lawrence National Laboratory, NIOSH, OSHHA, OSHA, and the US Environmental Protection Agency for specific levels of health risk of different components of elements in the samples of the 14 locations in the MRC area. ARSENIC The EPA has stated that levels of arsenic in soil from 5 ppm up to 20 ppm are generally viewed as safe, even if contact with arsenic at these levels continues for many years. The report states that arsenic exceeded ecological soil of 25 mg/kg at MRC sample site 7 at 28mg/kg. LEAD The National Institute of Occupational Safety and Health (NIOSH) at CDC has set a Recommended Exposure Limit (REL) of 50 µg/m3 for a Time Weighted Average (TWA) of 8 hours to be maintained so that worker blood lead remains <60 µg/dL of whole blood. The report states 32/mg/kg level of safety, yet 2 locations MRC-1 at 82/mg/kg and MRG-2 at 130 mg/kg greatly exceed the healthy safe target. 4 community sample wipes vary considerably in different types of metals.	General Comment	Background	Older literature background studies were incorporated to help round out some analytes that were not evaluated in more recent studies (e.g., aluminum). These older studies may actually reflect less anthropogenic contributions than more recent studies. The 2009 LBNL study does specifically identify where their 1,400 samples were collected; however, in the case of arsenic, the 2009 LBNL study differentiates samples collected in the Great Value Formation and other geologic units. As shown in **Response Figure 1**, elevated arsenic concentrations detected at MRC-2, MRC-4, and MRC-8 compared to all other MRC samples can be attributed to the Great Valley Formation (see **Response Figure 2**), where arsenic "*concentrations measured in the Great Valley Formation are about double those of other units*" (LBNL, 2009). The maximum detected arsenic soil concentration among MRC samples (28 mg/kg) occurred at MRC-2, which is equivalent to the 99th percentile of all arsenic soil samples and 95th percentile of Great Valley Formation soil samples in the LBNL soil background dataset (LBNL, 2009; Table 4). The maximum detected lead soil concentration among MRC samples (82 mg/kg) is just slightly above the SFRWQCB Environmental Screening Level (ESL) protective of residential exposure (80 mg/kg), which is the California-specific health standard. The MRC-2 soil lead concentration is 79 mg/kg, not 130 mg/kg. There is no lead soil concentration of 130 mg/kg. It is important to understand this natural occurrence and what range of concentrations occur naturally, which is called the expected background range, and which can sometimes occur at concentrations greater than what would be acceptable for ecological and human health soil standards. Therefore, when evaluating the nature and extent of the November 2022 release and assessing risks related to this release, USEPA and DTSC guidance allows for the removal of the expected background range when assessing risks. Based on the screening level assessment of the soil data, which includes a comparison to an expected background range, TRC concluded the following: •None of the metals analyzed exceed the expected regional background range, •Two metals (arsenic and lead) exceed residential direct contact screening levels, however these exceedances are not likely associated with the spent catalyst material, as the proportions of the metals found were inconsistent with that of the spent catalyst composition in the bulk material or dust (wipe samples). Although some variability in community wipe samples is expected, the four community samples tend to be show composition trends (e.g., elevated vanadium) compared to the background wipe sample, as shown in **Table 1** of the Draft SLHHERA. No text change required.
		3b. The report states that the soil samples were taken anywhere from 0-6". I would like to see the same element compared from the same depth at the different locations. It isn't stated and there is no identification at what level the samples were taken. That doesn't seem scientific to me. I object to comparisons of actual samples taken near MRC being compared against average old data instead of taking actual samples from real areas that can be identified.	General Comment	MR-1 SAP	It is noted that some surficial soils may have been physically transported from an initial deposition location by heavy rains in the '22-'23 wet season. The SAP was developed to provide a representative snapshot of soils in the dispersion area. See response to comment 1e. above for justification of surface soil sampling.
Kathy Petricca	19-20	**4a.** A determination of the nature and extent of the release. The nature is a broad term, but the proposed extent of the release is the Plume Model produced by the Bay Area Air Quality Management District (BAAQMD), released the following Spring.	Executive Summary	MR-1: AQMD Plume Map; SAP	Comment noted; the extent of dust deposition was indeed based on the BAAQMD's dispersion (plume) modeling.
		4b. The chemical composition of the dust. The McCampbell sampling and analysis was requested by the Contra Costa County Health Department (CCH) and BAAQMD on 11/26/2023 on a RUSH basis. The TRC Report refers to the evidence of the dust as including dust particles from "vehicles, trash cans, and residential garden areas within the community". The rest of the TRC soil sampling uses different sites in central and eastern areas of the county. The 5 locations of the McCampbell are all in the City of Martinez. (See Appendix A, page 13/16, or page 62 of the whole report.) The TRC sampling map is based on the BAAQMD Plume Distribution model and includes central and eastern areas of the county. It lists 2 City of Martinez sampling sites (Susana Park and Highland Avenue Park), and a close-by site (Camino Del Sol. (See Figure 1, page 34 of the whole report. See also Attachment E and page 127 of the whole report.) By May, when TRC sampling was done, that no dust was found that seemed like catalyst is not surprising. [County to respond re timing of investigation]	Executive Summary; Figure 1; Appendix A; Attachment E of Appendix C	MR-1: AQMD Plume Map; SAP Timing of Investigation	As stated in MR-1, soil sampling locations were determined based on the BAAQMD dispersion modeling and associated plume map as well as input from the community (e.g., reports of observed dust deposition). County Input re Timing of Investigation CCH acknowledges that the timeline from the incident to obtaining soil sampling results was quite long. MRC's initial failure to notify the county delayed the determination of this incident as a Major Chemical Accident or Release (MCAR) by about 3 weeks. This designation was crucial to the development of an Oversight Committee. The process of forming the oversight committee, selecting a contractor, and initiating the work contributed to the delay. The process itself is set very intentionally to have a very strong focus on environmental justice by having a transparent and public process. CCH is working to be more nimble when incidents of this severity occur. CCH has heard the concerns from the community and will be instituting changes to our procedure for the future.
		4c. The extent of dust in the soils within the release area is based on the larger area of the Plume Model and doesn't refer to the catalyst analysis of McCampbell analysis. TRC's commentary is on what would be expected and what would not be expected, and which level is not likely to be associated with catalyst dust. (See Executive Summary, page vi, and page 7 of the whole report.) TRC states "Soil samples did not appear to have typical make-up of spent catalyst dust.' (See page vi.). The samples of the catalyst analyses by McCampbell is not mentioned.	Executive Summary; Section 3.2; Table 1; Appendices, A, B, and F	Bulk and Wipe Samples	A detailed discussion of the bulk and wipe samples analyzed by McCampbell Analytical, Inc. is presented in Section 1.2 Background, in which the bulk and wipe samples are summarized in **Table 1** and the lab reports presented as **Appendices A and B**. Comparison of the bulk and wipe samples to May 2023 soil samples is presented in Section 3.2 Data Composition and Comparison to Spent Catalyst Dust and Bulk Samples, with composition comparison pie charts presented as **Appendix F** of the Draft SLHHERA. No text change required.

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		4d. Sample D-6 of the McCampbell work order was collected on 11/28/2022, three days after the release. Eighteen test names are listed. (page 80) Sample D-6 is the background sample. (page 9/16 and page 75.) BAAQMD wrote a request for lab analysis of the samples of November, including a sample taken from COBS main hopper, which also has field comments about a sample of spent catalyst from the main hopper at COBS. (page 14/16, and page 63) BAAQMD also requested an analysis of samples 1-6 with sites D-1 to D-5 being compared to D-6. D-6's location is listed as 3487 Pacheco Blvd, the address of Martinez Refining Company. Contra Costa News of 11/29/2022 printed a statement from the Martinez Refining Company: "The tests confirm the samples are 'spent catalyst' that originated from the refinery's Fluidized Catalytic Cracking Unit and the catalyst had been incinerated at high temperatures to remove impurities for reuse in the refinery process and was accidentally released during overnight hours on Thanksgiving night." The above omissions of the actual and timely sample of the actual catalyst, and the residential samples in Martinez make conclusions based on far-flung sampling of other county soils questionable. Plus, TRC's discussion of even more far-flung soils in Napa County and Union City, Alameda County is a distraction and a comparison of Contra Costa soils to them is also questionable for the purpose at hand.	General Comment	MR-1; Purpose of Dust sample analyses ; Fingerprinting	See MR-1: As noted in the SAP, bulk samples of dust and wipe samples collected by the County were analyzed to determine the nature of the released material and to therefore subsequently compare with soil samples collected based on the dispersion modeling and community reports of dust deposition. Wipe sample, D-6, is indeed a background sample. The only address on the wipe sample laboratory report (presented as **Appendix B** in the Draft SLHHERA) is the address of the Contra Costa County Hazardous Materials Program, 4585 Pacheco Blvd, Martinez, CA. A comparison between bulk samples and expected background range was not conducted, as that was not the focus of the Draft SLHHERA (wipe and bulk samples helped to identify the chemical composition of the catalyst dust, which was used to determine which chemicals to analyze for during the May 2023 soil investigation). The background literature studies selected were meant to derive a regional background range, which may include samples collected from the San Francisco Bay area, and which presents unique geological formations, as shown in **Response Figure 2**. Based on the screening level assessment of the soil data, which includes a comparison to an expected background range, TRC concluded the following: • None of the metals analyzed exceed the expected regional background range, • Two metals (arsenic and lead) exceed residential direct contact screening levels, however these exceedances are not likely associated with the spent catalyst material, as the proportions of the metals found did not match that of the spent catalyst composition in the bulk material or dust (wipe samples).
Charles Davidson	21-22	**5a.** **Inadequate Sampling Locations**: The TRC study indicated only two out of the 14 sample locations were from areas that experienced visible deposition from the MRC event. This is concerning, especially when TRC's Gale Hoffnagle acknowledges the likely heavy deposition nearby the refinery. Sampling Methodology: TRC's Jonathan Scheiner noted that their sampling locations were determined by the BAAQMD's plume model. However, if the goal was to evaluate the "worst case" scenarios, then basing the study on only two visibly affected locations (nearby and downwind of) the refinery seems counterintuitive out of a total of 14 locations (with the majority of sample locations from between 5 and 15 miles to the west). Depth of Soil Samples: The depth at which the samples were taken is questionable, especially considering the samples were taken almost three quarters of a year post-event and after multiple atmospheric river winter storms. A mere 6-inch depth at only two affected sites makes the scientific relevance of such samples highly suspect.	General Comment	MR-1 SAP	As stated in MR-1, soil sampling locations were determined based on the BAAQMD dispersion modeling and associated plume map as well as input from the community (e.g., reports of observed dust deposition). As referenced in **Table 5** of the Draft SLHHERA Report, the screening level risk assessment presented health risks associated with potential exposure to affected soils on a "per sample location" basis, summing the risks from each exposure pathway at that location. Each quantified risk presented in this summary table is based on a comparison with published screening levels, and therefore presents a "worst-case" risk (i.e., due to the conservative exposure and toxicity assumptions inherent in the derivation of the published screening levels.
		5b. Air District's Role: My discussions with the Air District revealed that they neither provided specific advice to TRC nor CC Health on utilizing the provided map for sampling. It appears the map was more of a starting point rather than an exact guide, raising further questions about the selected sample locations. Clarification on Air District's Role: Per my communications with BAAQMD: "The Air District did not provide specific advice to TRC or CC Health on how to use the map" And The Air District, in both remote meetings and written documents, clarified that this map provided modeled deposition values as a starting point for purposes of informing the soil sampling program; this modeling map was not developed to identify where residents are impacted by catalyst materials."	General Comment	MR-1 SAP	As noted in MR-1, and as confirmation, the BAAQMD did not provide any instructions or guidance on "how to use the map". TRC's certified meteorologist conducted a technical peer review of the Air District's modeling, and per findings that the modeling was properly conducted, the plume map was used to inform the determination of soil sample locations. Dust deposition is most likely to be located in locations within the plume provided by the BAAQMD.
		5c. Recommended Sampling Approach: For a more robust and credible study, TRC should have begun their sampling from the center of the visible deposition area near the MRC refinery and then expanded outward.	General Comment	MR-1 SAP	A basic premise of the SAP is that meteorological conditions (e.g., wind patterns) would most accurately govern the deposition of released dust. There is no scientific reason to believe that the dust would be distributed in a pattern independent of meteorological conditions at the time of the release (e.g., a circular distribution pattern).
		5d. Role of the County: The county's delay in conducting a comprehensive sampling post the incident, especially ahead of the winter storms, raises concerns. Immediate sampling would have been more informative and credible, even if a consultant like TRC was to be engaged later.	General Comment	Timing of Investigation	County Response re delay in timing of investigation CCH acknowledges that the timeline from the incident to obtaining soil sampling results was quite long. MRC's initial failure to notify the county delayed the determination of this incident as a Major Chemical Accident or Release (MCAR) by about 3 weeks. This designation was crucial to the development of an Oversight Committee. The process of forming the oversight committee, selecting a contractor, and initiating the work contributed to the delay. The process itself is set very intentionally to have a very strong focus on environmental justice by having a transparent and public process. CCH is working to be more nimble when incidents of this severity occur. CCH has heard the concerns from the community and will be instituting changes to our procedure for the future.
		5e. Historical Context: The very notion that there was no rise in soil heavy metals around a century-old heavy crude refinery seems improbable. Historical data suggests such refineries have been sources of airborne contamination.	General Comment	MR-1 SAP	As noted in MR-1 and detailed in the SAP, the objective of the Draft SLHHERA was to determine - on a worst-case preliminary basis - the health and ecological risks posed by this release of catalyst dust; it is noted that the subject area is not a natural, "pristine" area.
		5f. Concerns about Ongoing Emissions: Beyond this event, there is a broader concern about the continued emission of PM2.5 particulate matter, which has known severe health implications due to its ability to deeply penetrate lungs and carry toxic heavy metals.	General Comment	Ongoing Emissions	County Response CCH does not have jurisdiction over ongoing emissions, however CCH continues to work closely with BAAQMD on this matter.
		5g. Recommendation: It's imperative that comprehensive heavy metal sampling be conducted not just in the soil but also inside nearby residential areas, particularly inside homes. In light of the above concerns, **I strongly urge a re-evaluation of the current findings and an in depth**, scientifically sound study to ensure the health and safety of our community.	General Comment	MR-1 SAP	The Draft SLHHERA was conducted to evaluate potential risks posed by exposure to catalyst dust from this particular release - on a "worst-case" basis - and incorporated residential areas. Uncovered soils in the plume area represent the worst case for identifying dust samples in the local environment; re-deposition of dust into homes would represent a lesser exposure than "outdoor" samples and certainly not a "worst-case" exposure.

Commenter Name	PDF Page #	Comment	Section of Report	Response Category	TRC Response
Katie Keenan	23-25	**6.0** Both my husband and I coughed for 2 weeks following the incident. **Regardless of the findings I disagree.** I have 6 fruit trees which yearly produced fruit except after 11/2022! The leaves were wilted and white. It is 9/13/23 and not one piece of fruit! I've since dug up Topsoil surrounding the trees and placed new compost. Yet this damage after the spent catalyst which from rains penetrated the soil. Do not tell me they were "safe levels" You write ONLY arsenic and lead exceeded screening levels! BOTH ARE TOXIC to humans and animals! **What is the District Attorney doing?**	General Comment	General MR-1 SAP	Unfortunately, the atmospheric conditions immediately after the release were not captured and could not be evaluated as part of this Draft SLHHERA. Although anthropogenic sources of metals can not be clearly distinguished from naturally-occurring background levels, elevated arsenic concentrations at MRC-2, MRC-4, and MRC-8 compared to all other samples (see Response Figure 1) can be attributed to a geologic classification called the Great Valley Formation (see Response Figure 2), where arsenic "concentrations measured in the Great Valley Formation are about double those of other units" (LBNL, 2009). As stated in Draft SLHHERA Section 4.2.1 (Arsenic Update by Plants), "The Agency for Toxic Substances and Disease Registry (ATSDR) published a pamphlet in 2015 called *Safe Gardening, Safe Play, and a Safe Home* , which looks at exposure and risk when arsenic in soil is greater than 20 mg/kg, similar to May 2023 soil samples, MRC-2 and MRC-4. The ATSDR study concluded that "*even for those areas showing elevated levels of arsenic, the uptake into home grown vegetables or fruits, is not likely to be sufficient to cause any health effects to persons gardening in the soil or eating vegetables grown in the garden* ." It should be noted that the source bulk sample (B-6) reported only 5.8 mg/kg of arsenic and 12 mg/kg of lead. The lead concentration at B-6 is below the SFRWQCB Environmental Screening Level (ESL) protective of residential exposure (80 mg/kg), which is the California-specific health standard. The Draft SLHHERA was conducted to evaluate - on a "worst-case" basis, and incorporated residential areas. Uncovered soils in the plume area represent the worst case for identifying dust samples in the local environment.
Kathleen Claney	27	**7.0** Jenny Phillips comment specific focus was on soil samples collected from the surface to 6" down only because this type catalyst does not leach into water and is not diluted by heavy rain. When it rains often the top layer is carried away by the rain/water into sewer drains. Is not water affected.	General Comment	Sample Deposition	It is noted that some surficial soils may have been physically transported from an initial deposition location by heavy rains in the '22-'23 wet season. The SAP was developed to provide a representative snapshot of soils in the dispersion area.
Maureen Brennan	32	**8a.** These TRC studies are skewing background numbers. They have cherry-picked other sources to ratchet up current background levels. This TRC study introduces numbers that are outliers, and should not be considered as background. Zinc The mean for Berkeley Lawrence Labs (BLL) is 64. Yet, TRC looked at 8 sites in other countries, and most were below 100, as was Berkeley Labs. The outlier in Union city (474mg/kg) which became the high normal for background levels is geographically too far away for comparison. That number is an outlier and should be ignored. Chromium At BLL, the background of Chromium is 100 mg/kg. Our new high normal is 1690 mg/kg. The Napa fire 2017 data is another outlier because of the extensive incineration that occurred. It skews numbers considered background, and real contamination hides behind those numbers. DTSC calls this an Error II mistake, or a false negative. We cannot set background levels so very high for our communities. DTSC also recommends studies for legacy pollution to include a "coring" of soil, as they do in the ocean. Recommend hat this is performed As a reminder, this is a risk assessment document. I've only seen numbers from soil sampling. However, a true risk assessment would include the repercussions of contamination of heavy metals for health conditions. Including background contamination. Demographics of who is affected, old and young typically. Cancer? or non-cancer repercussions. Heavy metals tested, and what are symptoms? We are still at risk, especially since these numbers are set at an unusually high level.	General Comment	Background	The background literature studies selected were meant to derive a regional background range. The upperbound background concentration for zinc was collected within the San Francisco Bay region as part of a City of Oakland Survey of Studies of Naturally-occurring Metals Concentrations conducted in 2016. If the City of Oakland and its source study acknowledges the upperbound zinc background value, there is no reason to remove it from the background dataset. Similarly, if the 2017 Napa County background study acknowledges the upperbound chromium background value, there is no reason to remove it from the background dataset. The purpose of this report is to focus on health and environmental impacts related to airborne deposition of spent catalyst using a screening level risk assessment process which is adopted and utilized by both USEPA and DTSC. The focus of this report was on soil conditions due only to the airborne deposition of spent catalyst, not on baseline soil concentrations prior to the release, which may be due to anthropogenic or naturally-occurring background conditions. Based on the screening level assessment of the soil data, which includes a comparison to an expected background range, TRC concluded the following: • None of the metals analyzed exceed the expected regional background range, • Two metals (arsenic and lead) exceed residential direct contact screening levels, however these exceedances are not likely associated with the spent catalyst material, as the proportions of the metals found did not match that of the spent catalyst composition in the bulk material or dust (wipe samples). Based on these findings, TRC does not recommend additional sampling or further evaluation. No text change required.
		8b. The May 2023 analysis is too late for a November 2022 event (after 6 atmospheric rivers). Of 14 samplings, only 3 were close to the site of release, This is not good science. [County to respond re timing of investigation]	General Comment	Timing of Investigation	County Input re Timing of Investigation CCH acknowledges that the timeline from the incident to obtaining soil sampling results was quite long. MRC's initial failure to notify the county delayed the determination of this incident as a Major Chemical Accident or Release (MCAR) by about 3 weeks. This designation was crucial to the development of an Oversight Committee. The process of forming the oversight committee, selecting a contractor, and initiating the work contributed to the delay. The process itself is set very intentionally to have a very strong focus on environmental justice by having a transparent and public process. CCH is working to be more nimble when incidents of this severity occur. CCH has heard the concerns from the community and will be instituting changes to our procedure for the future.

Notes:

ATSDR = Agency for Toxic Substances and Disease Registry
BAAQMD = Bay Area Air Quality Management District
DTSC = California Department of Toxic Substances Control
ESL = Environmental Screening Level
HERO = Human and Ecological Risk Office
HHRA = Human Health Risk Assessment
MR-1 = Master Response 1 to Public Comments Regarding Soil Sampling Logistics
MRC = Martinez Refining Company
SAP = Sampling and Analysis Plan
SLHHERA = Screening Level Human Health and Ecological Risk Assessment
SFRWQCB = San Francisco Bay Regional Water Quality Control Board
USEPA = United States Environmental Protection Agency

Reference:

Lawrence Berkeley National Laboratory Analysis of Background Distributions of Metals in the Soil at Lawrence Berkeley National Laboratory, D. Diamond, D. Baskin, D. Brown, L. Lund, J. Najita, and I Javandel, June 2002 Revised April 2009

I – DETERMINATION OF SOIL SAMPLE LOCATIONS

The spatial location of soil samples collected to characterize the nature and extent of spent catalyst dust released was based on the following two key criteria:

1. Observed physical evidence of dust present in surrounding areas following the release (e.g., as observed by members of the community and County officials)
2. Plume dispersion modeling conducted by the Bay Area Air Quality Management District (BAAQMD or District) per County request to determine, using available data and predictive modeling, where the released dust would be expected to be deposited given prevailing meteorological conditions (e.g., release criteria, prevailing wind speeds and other existing conditions).

These two key criteria are summarized below:

Physical Evidence: In general, the spent catalyst is a granular, gray material comprised predominately of aluminum silicate and trace amounts of heavy metals. Physical evidence of the release was observed and reported by community members as a white powder covering surfaces in local areas, including dust particulates observed on vehicles, trash cans, and residential garden areas within the community. Samples of the dust were collected by County officials from various surfaces in the aftermath of the release; these samples consisted of both bulk dust samples and wipe samples (e.g., collected from windshields and other surfaces). Dust and wipe samples were submitted under standard chain-of-custody protocols to a state-certified environmental laboratory and analyzed for a suite of constituents typically found in spent catalyst. This information was used to inform the analytical plan for collection of soil samples from the affected area surrounding the refinery release point.

Based on preliminary analyses of dust particulates collected by County Health Department staff in the immediate aftermath of the release, detectable levels of the following metals were detected (as listed with laboratory results from bulk and wipe samples in Table 1 of the SLHHERA Report):

1. Aluminum
2. Arsenic
3. Barium
4. Beryllium
5. Chromium (Total)[1]
6. Cobalt
7. Copper
8. Lead
9. Molybdenum
10. Nickel
11. Selenium
12. Vanadium
13. Zinc

[1] Hexavalent Chromium was added to the laboratory analytical suite of parameters to be tested to further speciate the detected total chromium (e.g., given the increased toxicity of the hexavalent form of chromium that might be included in the total chromium laboratory results).

Dispersion (Plume) Modeling: The dispersion modeling incorporated information regarding the physical and chemical nature of the dust, release parameters (e.g., particle sizes, height of the stacks from which the dust was released, hourly release data per recorded opacity readings from the stacks), actual meteorological data from two local, onsite weather stations and simulated meteorological data per a standard weather forecasting model ("Weather Research and Forecasting [WRF] Model" – Skamarock et al., 2008).

The plume dispersion modeling conducted by the BAAQMD was peer reviewed by TRC's certified consulting meteorologist (Mr. Gale Hoffnagle) who has specific expertise in the analysis of catalyst dust releases from oil refineries in the U.S. Mr. Hoffnagle determined the District's dispersion modeling to be satisfactorily conducted and appropriate for use in developing a soil sampling plan specific to this release and applicable as data inputs to the SLHHERA analysis.

The District's plume modeling generated a plan view map showing two principal areas with simulated deposition and depicted with two corresponding differences in shading. As anticipated, the plume modeling showed deposition extending predominately westward from the release point within the refinery (i.e., consistent with prevailing wind directions recorded by both onsite weather stations and simulated data from the WRF forecasting model).

Coupled with input from the community reporting direct observations of catalyst dust following the release, the plume map generated by the BAAQMD's dispersion modeling represented the most reliable and compelling rationale for selection of soil sampling locations. Given prevailing wind directions, the pattern of wind-driven deposition from the refinery stacks presented a fact-based foundation for determining locations for further investigation. Twelve (12) locations were selected based the plume map and community input; two (2) additional sampling locations were added to capture sensitive receptor areas which were within the downwind and/or cross-wind area of the release source. Actual field locations were in some cases adjusted slightly to address access considerations and property ownership issues.

II – ANALYTICAL PROGRAM

As detailed above, samples of dust collected by the County in the aftermath of the release included both bulk dust samples and wipe samples collected from various surfaces where dust was observed immediately following the release (e.g., windshields of cars). The samples were analyzed and the metallic constituents characteristic of catalyst dust were identified in applicable laboratory reports; these formed the basis of the analytical program for soil samples collected as part of the SLHHERA. A total of 14 soil samples were analyzed by Eurofins Environment Testing, a State-certified chemical laboratory, under an expedited 5-day turnaround time, for the following constituents:

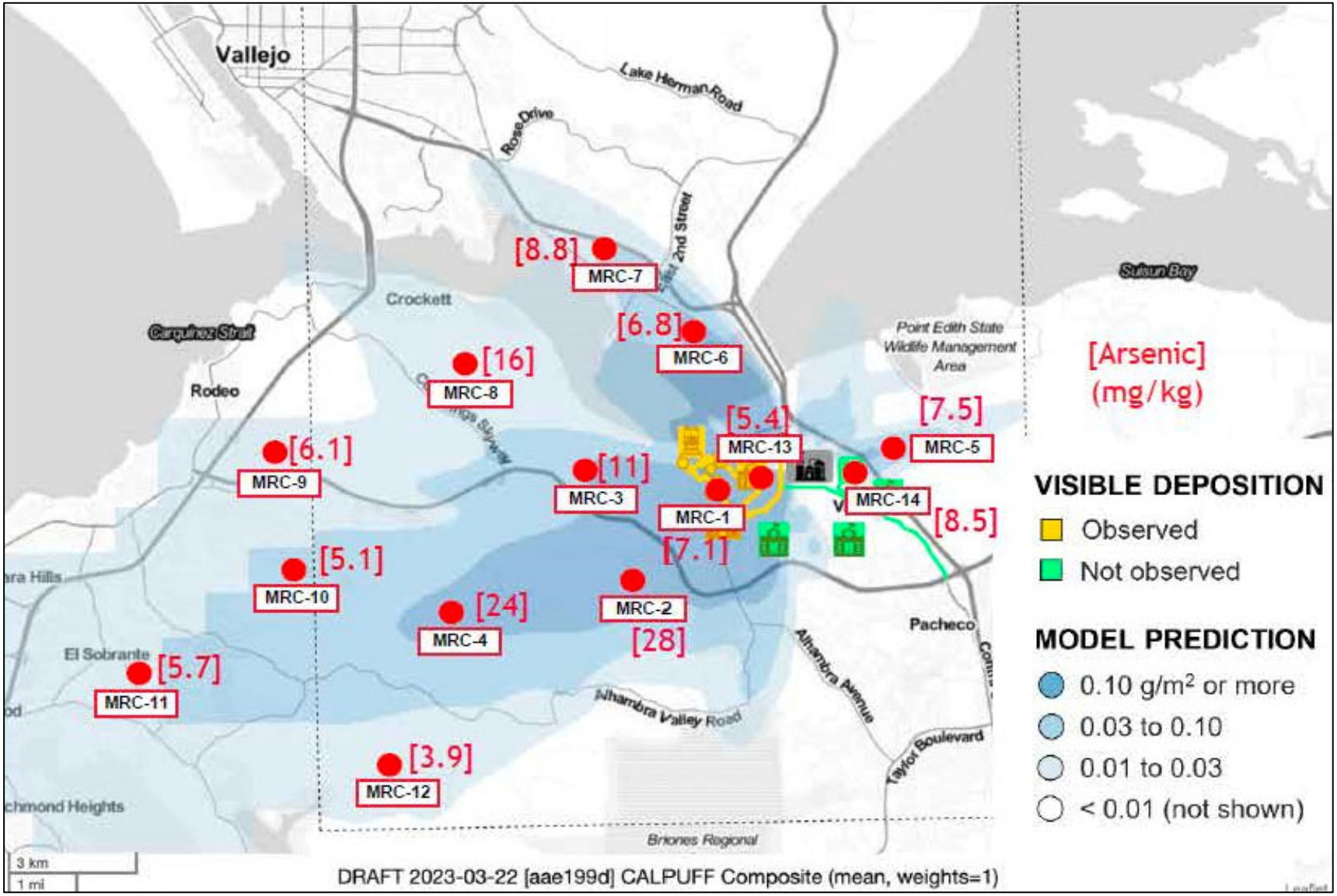
- Title 22 metals + aluminum using USEPA Methods 6010B and 7471A
- Hexavalent chromium using USEPA Method 7199

As noted above, this consisted of 13 metals analyzed plus an additional analysis for the hexavalent form of Chromium. Other tests conducted included percent moisture (ASTM Method D 2216) and pH by EPA Method 9045C.

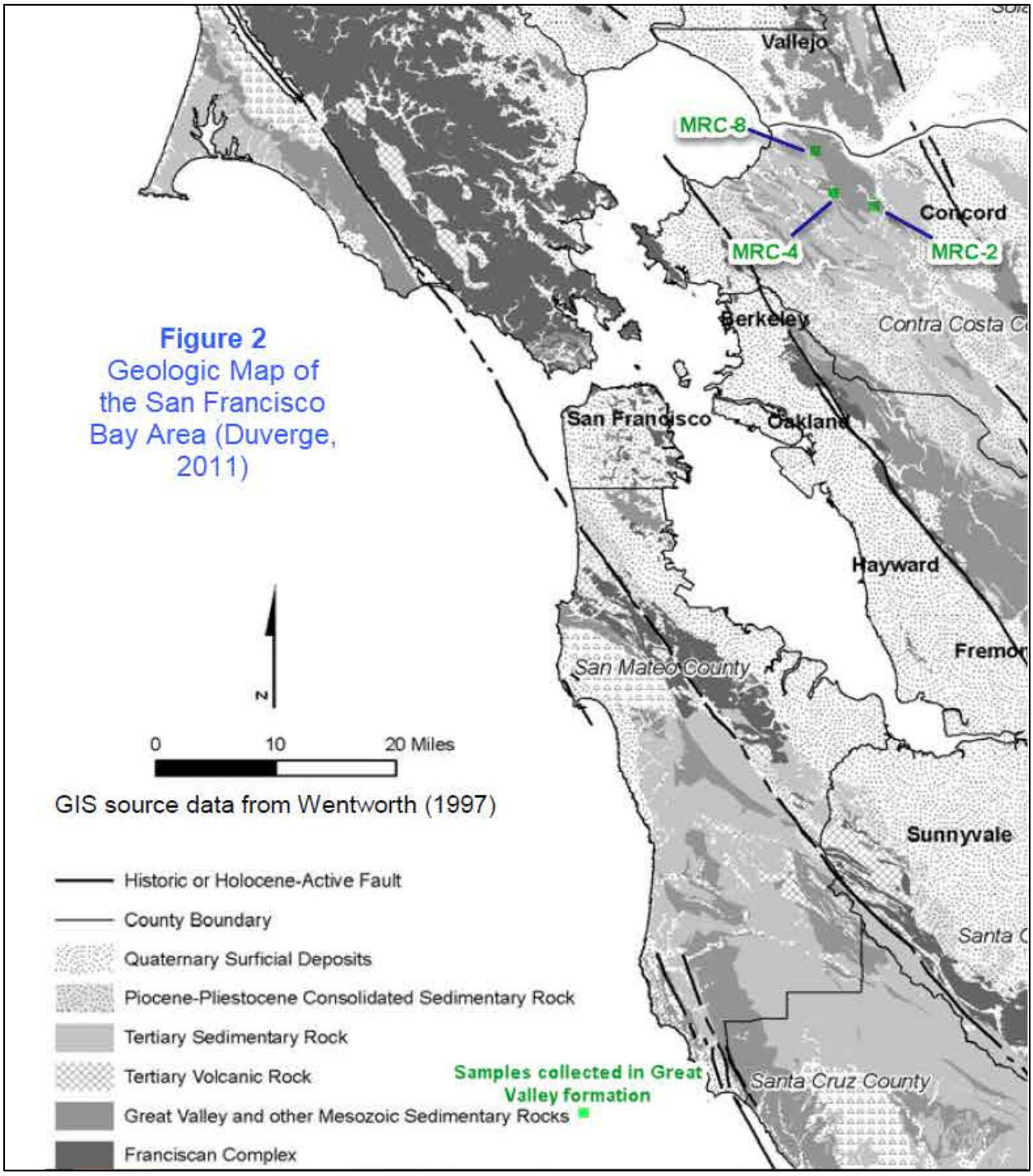
III – FIELD SOIL SAMPLING PROGRAM

Using hand tool methods, TRC collected soil samples at 14 locations to complement the dust sample data collected by the County for catalyst dust depositions. These samples were collected from areas specified by the County where significant accumulation of catalyst dust was initially observed and where the County was able to provide access for sampling.

Near-surface soil samples (depth of 0-6 inches) were collected at all 14 locations. Preference was given to soil in the shallower portion of the sampling interval (upper 3 inches) to capture dust deposited during the release and given its relative environmental and chemical stability. Where possible, and if any visible dust was observed, actual dust particles were included in the sample. Given the relative physical and chemical stability of the dust and its metallic particulate constituents, the most conservative ("worst-case") working assumption was that the dust would be relatively immobile in the soil locations where deposition occurred. While it is possible that dust particles could have been transported laterally or vertically during significant rain events occurring in the months following the release, the subject screening level investigation focused on surficial soils in the identified deposition zone as a "worst-case" scenario. Depending on the results of the "screening level" risk assessment, additional field sampling and investigation – either laterally per drainage patterns or vertically in discrete areas where such conduits were evident represented a potential next step if warranted (e.g., as a contingent next step per health or ecological risks calculated during this analysis). Redeposition of dust material per mechanical transport via rain events would have represented an additional uncertainty in determining a representative sampling grid for this screening level assessment.



Response Figure 1



Response Figure 2

		Contra Costa Health (CCH) Response to Public Comments	
Commenter Name	PDF Page #	Comment	CCH Response
Arlene Grimes	Page 1:	The results of your recent study assuring we citizens of "safe soil" in Martinez is meaningless without telling us exactly (locality) where they sampling was done. This seems like a "cover-up" that benefits MRC. Please publish these locations in print and digitally. Thank you!	Thank you for your comments: The soil sampling locations are posted at: https://www.cchealth.org/health-and-safety-information/hazardous-materials/martinez-refining-company-2022-hazmat-release-incident under the header of Soil Sampling Locations We have also included a table of location numbers and Latitude and Longitude for your reference.
Mark Sheeley	Page 2:	Greetings, In response to your request for comment regarding the Martinez Refinery Releases, I would like to recommend more citizen participation regarding the entire refinery safety plan. It is obvious the safety of Martinez citizens is at the bottom of the refinery list of priorities and that will remain until the citizen themselves are allowed to participate in the drafting of any safety measures affecting them. There are a host of other subjects needing to be addressed. One subject close to my needs is beautification. Why can they not install more landscaping to help with the unpleasant appearance of the plant? It would result in much better public relations for all. If these subjects alone cannot or will not be discussed or achieved, the refinery in my opinion should be shut down permanently. I worked inside all the local refineries over the past 40 years for a local contractor and each refinery seems to have a differing level of respect for the local community. It is quite obvious to anyone working inside the fence. I would be happy to serve or assist with the endeavor to correct this problem. Thank you for the opportunity to provide comment.	Thank you for your comments: Regarding the Refinery Safety plans, CCH Hazmat is required to host a 45 day public comment period upon receipt and review of a new safety plan which occurs every 3 years. This public comment period allows for public participation and comment on the Refinery's Safety Plans. CCH Hazmat is also required to host a 45 day public comment period for all triennial audit reports. Additionally CCH is required to have a presence at a public event during this comment period to respond to questions from the public regarding the safety plan or triennial audit. To be informed of any future public notice periods please send an email to hazmat.arpteam@cchealth.org
Wendy Ke	Page 11:	I just wanted to thank CC Health and Hazmat Staff for the mailer you sent residents of Martinez related to MRC incidents and the Risk Assessment. We appreciat	Thank you for your comments. CCH is committed to increasing transparency and communication to residents regarding the independent evaluations for MRC. We have a dedicated MRC webpage www.cchealth.org/hazmat/mrc which hosts all published reports and other information for MRC. Interested Parties may also sign up to receive updates from CCH on this site.
Kevin Burke	Page 13:	Were concerned that the County's 2040 General Plan and 6th Cycle Housing Element are planning to place a disproportionate amount of the County's new housing in polluted areas close to refineries and other sources of pollution. While the County and the Air Quality Management District try hard to mitigate sources of pollution, this incident demonstrates that they are not perfect at doing so, and/or not given adequate notification by facility managers, which leave residents at risk. It would be preferable to plan a disproportionate amount of the County's new housing stock to go in places that are located far from existing heavy industry sites. I encourage the Health Hazardous Materials Program staff to work with DCD on the County's long range planning efforts.	Thank you for your comments. CCH Hazmat does not have jurisdiction over these matters, however CCH Hazmat does work closely with the county's Department of Conservation and Development regarding facilities which handle hazardous materials and Land Use Permits.
Gayle Goldblatt	Pages 17-18:	I appreciate this opportunity to provide feedback. As a resident of downtown Martinez, with many years experience with refinery issues, I wish to provide my observations and concerns about the Martinez Refining Company (MRC). It is essential that businesses operating in Contra Costa County are respectful and considerate of the health and safety of the residents. And while I can appreciate that the main focus of the investigation is the November 2022 ("Thanksgiving") incident, I am concerned that the MRC may have an operational strategy of disregard of the community and an approach to their operations characterized by a "what can we get away with?" business approach. The key question for your investigation then is, was this incident a single error in judgement, or potentially an illumination of a policy of plant maintenance and care that cavalierly disregards the health and safety of the community? In addition, what was the reason for the excessive amount of time to provide soil testing results? Was this by design or default? I have little confidence in the motivation of MRC because in May, when there were literally reporters circling for quotes about the possible soil contamination, they initiated a loud, multimonth maintenance project with a significant impact on the community, with no notice to neighbors. Very loud noise (65-85 db) began the week of 5/22. My neighbors who work construction identified it as the sound of sand blasting. I called the refinery and was told "we aren't doing any sand blasting" and abruptly the work stopped. When the work resumed the following week, I contacted the State Air Board (on 6/6) and spoke with Anais. She came out to investigate in person. She told me she could clearly hear how loud it was from outside the plant perimeter. She said that she could not locate the specific work site and that when she called them to discuss, they stated they were not sandblasting, they were "using slurry", refused to allow her on site to observe, and stated that notice had been sent out. Interestingly, a letter was drafted dated 6/6 informing the neighbors of this project, calling it a maintenance project and that it would conclude in October. I suspect this Air Board inquiry motivated the communications which should have occurred prior to starting the project. After this Air Board visit, it was silent for the rest of the week. The following week, the work resumed, clearly at an accelerated pace. For example on 6/14 my Apple Watch decibel meter showed the sound on my front porch to be consistently 65-75 decibels and occasionally as loud as 86 decibels. The usual ambient sound level in my neighborhood is 45-55. This work went on until early July. If indeed this loud sound was caused by slurry, and not sand blasting, why would the MRC refuse a regulator admission to their site? In addition to the noise, sand blasting causes large amounts of potentially dangerous particulate matter in the surrounding area. I suspect that they were using a contractor to sandblast tanks without a permit and attempted to get as much work done using the more effective sandblasting method as they could until they were caught.	Thank you for your comments. CCH Hazmat is separately conducting an Independent Incident Investigation and Root Cause Analysis which will address exactly what happened during the November 24 incident, identify the management system root causes, and make recommendations to prevent a future reoccurrence. CCH acknowledges that the timeline from the incident to obtaining soil sampling results was quite long. MRC's initial failure to notify the county delayed the determination of this incident as a Major Chemical Accident or Release (MCAR) by about 3 weeks. This designation was crucial to the development of an Oversight Committee. The process of forming the oversight committee, selecting a contractor, and initiating the work contributed to the delay. The process itself is set very intentionally to have a very strong focus on environmental justice by having a transparent and public process. CCH is working to be more nimble when incidents of this severity occur. CCH has heard the concerns from the community and will be instituting changes to our procedure for the future. CCH acknowledges your comments regarding noise and inquiries regarding regulators from the Air District. CCH defers to the Air District on this matter.

Gayle Goldblatt	Pages 17-18:	[Continued Comment from above] Perhaps it was legally true that "we are not sandblasting" (per my phone call) if they were using contractors to perform the work. If, as demonstrated by this recent experience, the MRC has a 'what can we get away with" approach to their plant operations, then we need to consider -- what would be an effective prevention strategy to ensure the health and safety of our community in the future? Fines don't help people breathe. I would propose -- 1. ENSURE REGULATOR ACCESS Ensure that all city, county, state, and federal regulators have authority to immediate access the MRC plant to investigate any complaints at any time. 2. SINGLE POINT OF CONTACT An online single point MRC complaint log must be created and maintained that is easily accessible to the public. At minimum, there should be the date of the complaint, how it was made (community members perhaps can be identified by their street address), name of agency (ies) involved, name and email address of agency representative involved, the status of the complaint, and the results of the investigation. There should also be the ability of the public to input possible complaints, in a "pending" category. 3. ACCOUNTABILITY AT THE HIGHEST LEVEL OF LEADERSHIP MRC leadership must be held accountable for the policies they require their employees and contractors to follow. There must be clear understanding of expectations of compliance with applicable laws and regulator requests. There must be an understanding that any continued behavior in violation of these laws can result in potential criminal charges for MRC leadership. 4. ACCESS FOR COMMUNITY Any fines collected should be used to create a single point contact for the community in addition to the idea of the log above. Thank you again for your work on this project, and for your efforts to attempt to ensure a safe environment for the people of Contra Costa County and the City of Martinez.	[Continued response from above] CCH thanks you for your suggestions. In a recent letter issued to MRC on December 28, 2023 (found here: https://www.cchealth.org/home/showpublisheddocument/29255/638393577197900000) CCH required that MRC (PBF) allow CCH regulators onsite at all times and permit access to any part of the facility. CCH through the oversight committee is currently evaluating the Safety Culture of the facility including management commitment to safety. CCH will take your other comments under advisement.
William Cooper	Page 26:	What sort of efforts will be made in the future should something similar happen in the future? If something similar happens in the future are there evacuations plans if they are needed?	Thank you for your comments. Should a Major Chemical Accident or Release (MCAR) happen in the future, CCH Hazmat through the Industrial Safety Ordinance (ISO) has the authority to conduct an independent investigation. Additionally CCH, upon notification of incidents of MCAR severity, is able to utilize the Community Warning system to direct residents to take proper protective actions such as Shelter in Place or if necessary evacuation.
Cynthia Peterson	Page 28:	Why wasn't CCH notified earlier to give the public info? What ramifications will MRC have? Who is paying for the oversight committee + sampling and contractor	Thank you for your comments. The matter of MRC's failure to notify has been referred to the District Attorney (DA). The DA would best be able to speak to the status of this. In regards to payment, CCH is authorized by the Industrial Safety Ordinance (ISO) to pass the cost associated with the Oversight Committee work to MRC directly.
Quanah Brightman Katherine Marsden	Pages 29 &30	Page 29: United Native Americans demands that the FBI, EPA, and the Department of Justice shut down the Martinez Refining Company. Page 30: The refinery is a health hazards and unsustainable. The only safe resolution is to shut the refinery down and restore it to open space.	CCH thanks you for your comments.
Tom Lewis	Page 31:	Why wasn't Ca Dept. of fish and wildlife not included in the initial forums, as the watershed drains directly to the Carquinez strait. Has MRC provided raw sample analysis from routine 3rd party testing?	Thank you for your comments. Contra Costa Health collaborated early in the investigation with the San Francisco Bay Regional Water Quality Control Board (RWQCB) and the California Department of Fish and Wildlife. Both these agencies have the responsibility of protecting the watershed. The latest information about the collaboration was released as a joint statement from agencies on November 16th, 2023. Routine sample data and monitoring would be covered under the facility National Pollution Discharge Elimination System (NPDES) Permit and falls under the authority of the RWQCB.

Sample ID	Latitude	Longitude
MRC-1	38.014444	-122.133056
MRC-2	37.989167	-122.144444
MRC-3	38.016111	-122.177222
MRC-4	37.996389	-122.1975
MRC-5	38.024722	-122.097222
MRC-6	38.046667	-122.144167
MRC-7	38.059722	-122.168056
MRC-8	38.036667	-122.211389
MRC-9	38.018611	-122.257222
MRC-10	37.971111	-122.243889
MRC-11	37.966944	-122.309722
MRC-12	37.922778	-122.164444
MRC-13	38.018333	-122.128889
MRC-14	38.011111	-122.094722

2365 Harbor View
Martinez, CA 94553
Sept. 2, 2023

Dear CCHHMP,

The results of your recent study assuring we citizens of "safe soil" in Martinez is meaningless without telling us exactly (locality) where the sampling was done.

This seems like a "cover-up" that benefits the MRC.

Please publish those locations, in print and digitally.

Thank you!

Sincerely yours,

Arlene Grimes

Michael Dossey

From: Mark Sheeley <msheeley@att.net>
Sent: Thursday, August 31, 2023 11:24 AM
To: Hazmat Arpteam
Subject: [EXTERNAL] Refinery accident comments- Martinez Refinery

Follow Up Flag: Flag for follow up
Flag Status: Flagged

Greetings,

In response to your request for comment regarding the Martinez Refinery releases, I would like to recommend more citizen participation regarding the entire refinery safety plan. It is obvious the safety of Martinez citizens is at the bottom of the refinery list of priorities and that will remain until the citizens themselves are allowed to participate in the drafting of any safety measures affecting them.

There are a host of other subjects needing to be addressed. One subject also close to my needs is beautification. Why can they not install more landscaping to help with the unpleasant appearance of the plant? It would result in much better public relations for all. If these subjects alone cannot or will not be discussed or achieved, the refinery in my opinion should be shut down permanently.

I worked inside all the local refineries over the past 40 years for a local contractor and each refinery seems to have a differing level of respect for the local community. It is quite obvious to anyone working inside the fence. I would be happy to serve or assist with the endeavor to correct this problem. Thank you for the opportunity to provide comment.

Sincerely,

Mark Sheeley
Martinez, CA resident

Michael Dossey

From: Eames, Tameji@Cannabis <Tameji.Eames@cannabis.ca.gov>
Sent: Tuesday, September 5, 2023 2:50 PM
To: Hazmat Arpteam
Subject: [EXTERNAL] Human Health and Ecological Risk assessment draft comments

Hi,

I live in Martinez and I would like to provide some comments on the draft risk assessment. As an environmental scientist I have a unique perspective on the sampling and the conclusions drawn from the data.

Page 4 - The scientific explanation for why the 14 sites were picked was not clearly articulated. Sure, the sample sites were informed by the BAAQMD model. However, that model, as presented at the city meeting, was based on assumptions that have significant effects on the model's output. Mainly, plume and weather maps rely on a large data set to make informed conclusions – they had a limited dataset (2 days of weather) to inform the model which means the model's predications could be vastly different from reality. My suggestion is that 14 spots all detecting no notable increases, is not a sufficient sample size to properly conclude there is no health risk. 14 samples lack the statistical power to properly report a lack of risk. Finding zero everywhere is not a good answer. We would want to find data that support that model is correct in predicting plume and fallout. Then we can assess for risk.

Page 4 "No visible dust was observed at any of the sample locations." – Duh! No surprise here. Samples were taken May 4-5 when the release was in November 2022 after the heaviest rainfall in CA in a decade. Maybe soil samples aren't going to sufficient to access the risk.

Page 7 – "the soil samples do not appear to have the same composition as the spent catalyst dust or bulk samples." I would not expect the soil samples to have the same composition. The soil samples should have other things plus elevated levels of the release dust. Different ratios of the chemicals of interest would be expected. We do not have a sample of the soil prior to the release so there is not a good understanding of baseline.

Page 11 – "However, aerated garden soils in neighborhoods surrounding MRC would generally contain the less soluble, less mobile, and less phytoavailable pentavalent arsenic. – There needs to be a citation for this – how are you sure this is true? Provide a reference for this statement.

Page 14 – "None of the metals analyzed exceed the expected regional background range," – What is the background range for an area not proximate to a refinery? Say Danville… Saying that the soil samples do not exceed background levels is not the same as saying there is a healthy concentration of trace elements (listed on page 5) in the soil where sampled.

Page 14 – "Two metals (arsenic and lead) exceed residential direct contact screening levels, however these exceedances are not likely associated with the spent catalyst material, as the proportions of the metals found did not match the spent catalyst composition in the bulk material or dust (wipe samples)." – This statement does not make sense. The lead in the ground could have come from the catalyst. Why would you expect the proportions of metals in the soil to match the proportions of the catalyst exactly? MRC has released chemicals for years so the soil is already contaminated. There would not be equal ratios if there were already high lead concentration contaminated soil. We do not have a baseline

lead measurement for this soil *prior* to the catalyst release so how can you say this is a non-issue when the levels exceed the residential direct screening levels? And the term “not likely.” This should come with a confidence interval. How “non-likely?” This is not a quantifiable measure and the whole point of testing is to *quantify!*

I am disappointed with the superficial effort put forth with this sampling paradigm and report. I would like to see a significantly larger breadth and depth of testing to 1) support the BAAQMD plume model (nothing in the risk assessment report confirms or denies the model was well-informed), and 2) to ensure that the food I eat out of my garden is safe because this report does neither.

T.J. Eames
2471 Leslie Ave
Martinez

Tameji (T.J.) Eames
Environmental Scientist
Compliance Division

Direct: 916.214.0817
info@cannabis.ca.gov
www.cannabis.ca.gov [cannabis.ca.gov]

Department of Cannabis Control
CALIFORNIA

From: City of Martinez <communications@cityofmartinez.org>
Sent: Tuesday, September 5, 2023 9:31 AM
To: Eames, Tameji@Cannabis <Tameji.Eames@cannabis.ca.gov>
Subject: City News and Events - Martinez Pride, Martini Shake-Off & More City News!

[EXTERNAL]: bounce-mc.us10_174832305.13534724-ca5c394f13@mail227.sea101.rsgsv.net

CAUTION: THIS EMAIL ORIGINATED OUTSIDE THE DEPARTMENT OF CANNABIS CONTROL!
DO NOT: click links or open attachments unless you know the content is safe.
NEVER: provide credentials on websites via a clicked link in an Email.

City News

Thinking of building an Accessory Dwelling Unit?

An Accessory Dwelling Unit, also known as an “ADU”, is a residential unit that provides independent living facilities including a kitchen, sleeping, and bathroom facilities. A Junior Accessory Dwelling Unit, also known as a “JADU”, is a residential unit that is no more than 500 square feet in size, contained entirely within the walls of an existing residence and has a separate entrance, an efficiency kitchen and may include a separate bathroom or may share a bathroom within an existing residence.

Now it's even easier to create the space of your dreams right in your own backyard. Whether you're looking to create flexible living spaces for friends and family or explore rental opportunities, the City’s updated regulations, which went into effect on August 18, 2023, pave the way. ADUs and JADUs can often be built at a fraction of the price of a single-family home, while widening the range of available housing options. For more information, please visit the City’s new ADU webpage, where you’ll find information on the process, costs, and other helpful resources. Together, we're building a brighter future, one ADU at a time!

Study Session: Waterfront Marina Trust Lands Use Plan

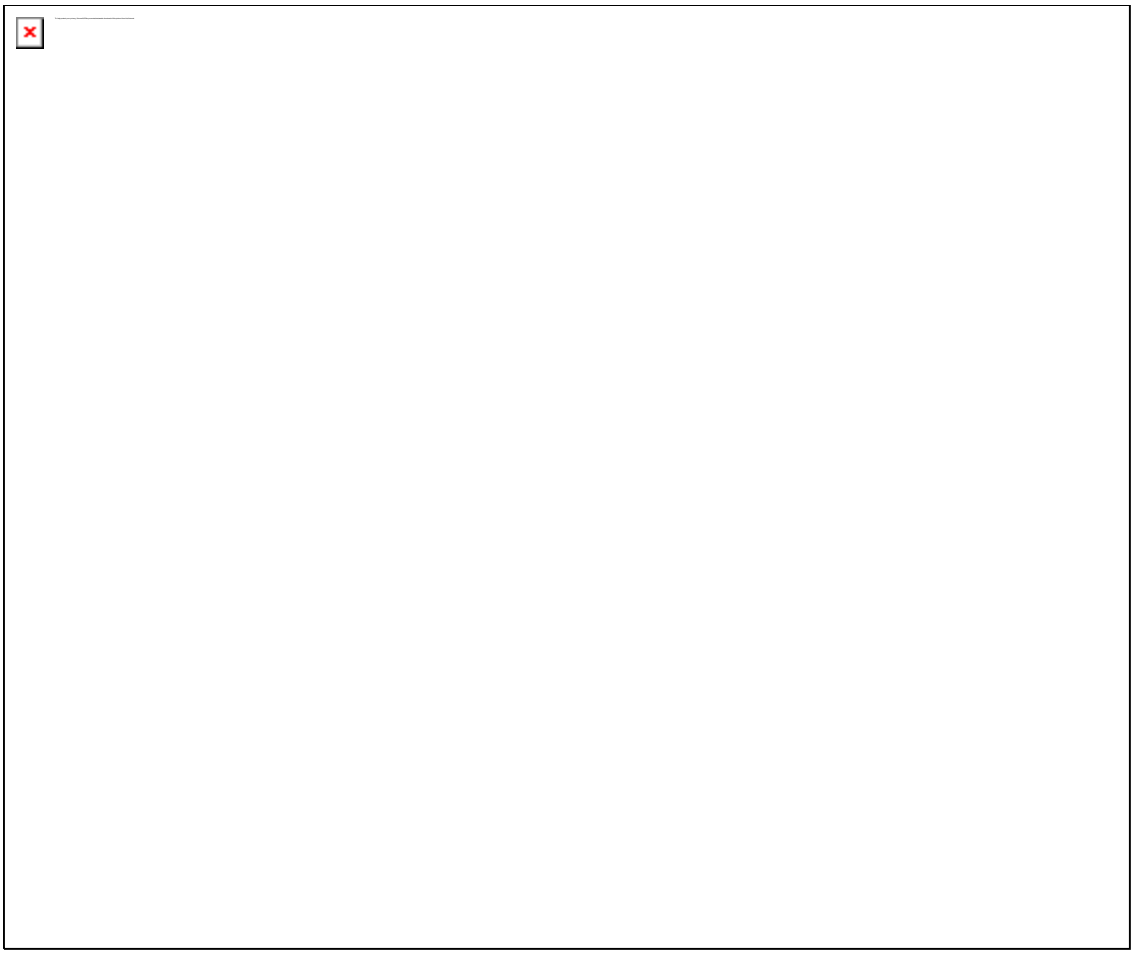
Interested to learn about future plans at the Waterfront? Please attend this week's City Council Study Session on Wednesday, September 6 at 5:30 p.m. in the Council Chambers to learn about the draft Waterfront Marina Trust Lands Use Plan. The Martinez Marina encompasses approximately 70 acres in three parcels within the Martinez shoreline area, including the marina, a portion of North Court Street, Yacht Club and Eagle Marine. The marina includes 332 boat slips, a park, open space and marine-related businesses. An additional 65 acres consists of Trust lands held by the East Bay Regional Park District (EBRPD) which are leased to the City, and include baseball fields, Martinez Bocce Federation courts area, trails and a horse arena. The entire waterfront area subject to this planning effort covers approximately 135 acres. The Plan is designed to guide local decision making on how to maximize the recreational and economic benefits of the Martinez waterfront, marina, and adjacent lands.

Learn how to join a meeting or review the agenda here: https://bit.ly/3toofeW

Pavement Rehabilitation Project Update

You may have seen ADA curb ramps being constructed on Howe Road, Old Orchard Road, and Arnold Drive. This is a part of the City's Pavement Rehabilitation Project, funded by Measure D! Paving work on these streets is scheduled to begin on Tuesday September 5th. Construction will continue through the end of October and will vastly improve the ride quality.

Please observe all signage, including detours. For residents in the vicinity of the project, please be on the lookout for door hangers from the construction contractor with more information. Project information is also available on the City's website at www.cityofmartinez.org.



Martinez Refining Company Updates

MRC Oversight Committee Update

Scott Berger & Associates was hired by the County to conduct the independent root cause analysis investigation and has been working with MRC on a non-disclosure agreement (NDA). Since the last staff report to the City Council meeting on July 19, 2023, a non-disclosure agreement was fully executed allowing for the investigation to move forward. Next steps will require MRC to provide numerous documents in response to the investigation, along with a site visit by the investigations team.

On July 27, 2023, the Industrial Safety Ordinance (ISO) / Community Warning System (CWS) Ad Hoc Committee (County Supervisors Glover and Gioia) met. At that meeting, the Committee directed a Safety Culture Assessment, pursuant to the ISO, be conducted to understand the underlying safety culture issues that need to be remedied.

These two assessments - the Root Cause Analysis and the Safety Culture Assessment - follow the Community Risk Assessment that was completed in the Spring, which evaluated the impact of the November 24/25 incident on public health. A draft report of the Community Risk Assessment has since been produced and the public can now provide public comment on the report until the public comment period closes on October 12, 2023. A public meeting will also be held at the Contra Costa Administration Building on September 25, 2023, from 6:00 p.m. to 8:00 p.m. to receive feedback on the draft report. Comments can be emailed to hazmat.arpteam@cchealth.org.

- Read the City's full MRC update clicking **HERE**.
- Read the draft Community Risk Assessment **HERE**.

Upcoming Meetings & Events

City Meetings

- City Council Meeting - Wednesday, September 6 at 7:00 p.m.
- Veterans Commission - Thursday, September 7 at 6:30 p.m.
- Parks, Recreation, Marina and Cultural Commission Meeting - Tuesday, July 19 at 7:00 p.m.

View City Council meetings and agendas at Meetings and Agendas | Martinez, CA (cityofmartinez.org).

Upcoming Events

- Farmers' Market - Every Sunday from 9:00 a.m. to 1:00 p.m.
- Open Air Market - Sunday, September 10 from 9:00 a.m. to 1:00 p.m.
- Annual Martini Shake-Off - September 16 from 6:30 - 10:00 p.m.
  - Buy tickets here - Intro (martinezmartini.com)
- Martinez Pride - Saturday, September 23 from 11:00 a.m. to 2:00 p.m. at Waterfront Park
  - More information here - Martinez Pride Tickets, Sat, Sep 23, 2023 at 11:00 AM | Eventbrite

Help the City be Prepared for an Emergency

Disasters can strike at any time, so it's important to be prepared! The City of Martinez Community Emergency Response Team (CERT) invites you to attend a free, Basic Training Course on emergency response. The course consists of 25 hours of instruction and covers Personal and Family Preparedness, Earthquake Preparation, Team Organization, Medical Operations and Triage, Damage Assessment, Fire Suppression, Utility Control and Light Search and Rescue. Below is the schedule:

- Every Wednesday in September from the 6th-27th
- Every Wednesday in October from the 4th-25th

All classes will be held at the Martinez Senior Center (818 Green St.) from 6-9:30 p.m.. For more information and to register, visit: https://bit.ly/3ZIlXqk

Para Traducir/For Translation

1. Para traducir un correo electrónico una vez que esté en su bandeja de entrada, haga clic en "Ver este correo electrónico en su navegador"
2. Clic el botón "Traducir" en la esquina superior derecha de la página
3. Seleccione su idioma preferido en el menú desplegable Traductor de Google
4. Ver la campaña traducida

Our mailing address is:
525 Henrietta Ave
Martinez, Ca 94553

Michael Dossey

From: Wendy Ke <wke_aloha@yahoo.com>
Sent: Wednesday, September 6, 2023 1:44 PM
To: Hazmat Arpteam
Cc: Kim McCarl
Subject: [EXTERNAL] Thank you!

All,

I just wanted to thank CC Health and Hazmat staff for the mailer you sent to residents of Martinez related to MRC incidents and the Risk Assessment. We appreciate your efforts to keep our community informed about these ongoing issues.

Best regards,
Wendy Ke
Downtown Resident & Healthy Martinez Member

Sent from Yahoo Mail on Android [mail.onelink.me]

Michael Dossey

From: Tom Kellogg <ggollekmot@hotmail.com>
Sent: Thursday, September 7, 2023 9:13 AM
To: Hazmat Arpteam
Cc: Tom Kellogg
Subject: [EXTERNAL] Comments on the report RE MRC accident

I would like to know how you arrived at the conclusion that the release did not exceed regional background levels when they are expressed in concentrations, e.g., ug/L, and your analyses are expressed in ug/wipe.
V/R,
Thomas Kellogg

Sent from Mail [go.microsoft.com] for Windows

Michael Dossey

From: Kevin Burke <kevin@burke.dev>
Sent: Thursday, September 7, 2023 4:30 PM
To: Hazmat Arpteam
Subject: [EXTERNAL] Comment on hazardous material evaluation

We're concerned that the County's 2040 General Plan and 6th Cycle Housing Element are planning to place a disproportionate amount of the County's new housing in polluted areas close to refineries and other sources of pollution.

While the County and the Air Quality Management District try hard to mitigate sources of pollution, this incident demonstrates they are not perfect at doing so, and/or not given adequate notification by facility managers, which leave residents at risk.

It would be preferable to plan a disproportionate amount of the County's new housing stock to go in places that are located far from existing heavy industry sites. I encourage the Health Hazardous Materials Program staff to work with DCD on the County's long range planning efforts.

Best,
Kevin

[EXTERNAL] comments: risk assessment evaluation of the November 24-25 spent catalyst release from the Martinez Refining Company

Jan Warren <jtxwarren@gmail.com>
Wed 10/11/2023 10:04 PM
To:Hazmat Arpteam <Hazmat.Arpteam@cchealth.org>

Attn: Michael Dorsey,

I'm going to begin my comments with the observation that CA Soils baseline was from Bradford-Kearney Foundation Report dated 1996. The background concentrations of trace and major elements in CA Soils.

The other baseline used was Western (West of 96th meridian0 Shacklette and Boerngen 1984 elements. The concentrations in Soils and other Surficial Materials of the Conterminous U S Geological Survey Professional Paper 1270.

On the one hand old data is being used and it is an overall average of a large area of different environments. Secondly, there is no reference to verify what areas were even used as various locations around the State of CA the Western U.S.

I searched more recent data from the Berkeley Lawrence National Laboratory, NIOSH, OSHHA, OSHA, and the US Environmental Protection Agency for specific levels of health risk of different components of elements in the samples of the 14 locations in the MRC area.

ARSENIC

The recommended exposure limit set by the National Institute for Occupational Safety and Health (NIOSH) is 2 microgram per cubic meter of air for no more than a 15 minute period, based on classification of arsenic as a potential human carcinogen.

The Occupational Safety and Health Administration (OSHA) has set a permissible exposure limit (PEL) of 10 micrograms of arsenic per cubic meter of workplace air (10 $\mu g/m^3$) for 8 hour shifts and 40 hour work weeks.

The EPA has stated that levels of arsenic in soil from 5 ppm up to 20 ppm are generally viewed as safe, even if contact with arsenic at these levels continues for many years.

The report states that arsenic exceeded ecological soil of 25 mg/kg at MRC sample site 7 at 28mg/kg.

LEAD

Action level means employee exposure, without regard to the use of respirators, to an airborne concentration of lead of 30 micrograms per cubic meter of air (30 μg/m^3) calculated as an 8-hour time-weighted average (TWA).

- OSHA set a Permissible Exposure Limit (PEL) for lead in workplace air of 50 μg/m^3 (8-hour time weighted average).
- OSHA mandates periodic determination of BLL for those exposed to air concentrations at or above the action level of 30 μg/m^3 for more than 30 days per year.
- The worker must be notified in writing within 15 days after the receipt of the results or any monitoring performed, and provided with a medical examination if a BLL is found to be greater than 40 μg/dL.
- The employer is obligated to remove the employee from excessive exposure, with maintenance of seniority and pay, until the employee's BLL falls below 40 μg/dL if a worker's one-time BLL reaches 60 μg/dL (or averages 50 μg/dL or more on three or more tests) in general industries or shipyards, or 50 μg/dL in construction.
  - The National Institute of Occupational Safety and Health (NIOSH) at CDC has set a Recommended Exposure Limit (REL) of 50 μg/m^3 for a Time Weighted Average (TWA) of 8 hours to be maintained so that worker blood lead remains <60 μg/dL of whole blood.

  - The report states 32/mg/kg level of safety, yet 2 locations MRC-1 at 82/mg/kg and MRG-2 at 130 mg/kg greatly exceed the healthy safe target.

There are 4 community sample wipes that vary considerably in different types of metals.

The report states that the soil samples were taken anywhere from 0-6". I would like to see the same element compared from the same depth at the different locations. It isn't stated and there is no identification at what level the samples were taken. That doesn't seem scientific to me.

In general I object to comparisons of actual samples taken near MRC being compared against average old data instead of taking actual samples from real areas that can be identified.

Thank you for the opportunity to comment.

Jan Warren

3202 Primrose Lane

Walnut Creek, CA 94598

[EXTERNAL] Public Comment response to Contra Costa District Attorney investigation about Martinez Refining Company failure to notify authorities as is legally required—what was original cause and what is an effective prevention strategy for the future?

Gayle Goldblatt <gayle94553@yahoo.com>

Thu 10/12/2023 2:09 PM

To:Hazmat Arpteam <Hazmat.Arpteam@cchealth.org>

Public Comment response to Contra Costa District Attorney investigation about Martinez Refining Company failure to notify authorities as is legally required—what was original cause and what is an effective prevention strategy for the future?

I appreciate this opportunity to provide feedback. As a resident of downtown Martinez, with many years experience with refinery issues, I wish to provide my observations and concerns about the Martinez Refining Company (MRC).

It is essential that businesses operating in Contra Costa County are respectful and considerate of the health and safety of the residents. And while I can appreciate that the main focus of the investigation is the November 2022 ("Thanksgiving") incident, I am concerned that the MRC may have an operational strategy of disregard of the community and an approach to their operations characterized by a "what can we get away with?" business approach. **The key question for your investigation then is, was this incident a single error in judgement, or potentially an illumination of a policy of plant maintenance and care that cavalierly disregards the health and safety of the community? In addition, what was the reason for the excessive amount of time to provide soil testing results? Was this by design or default?**

I have little confidence in the motivation of MRC because in May, when there were literally reporters circling for quotes about the possible soil contamination, they initiated a loud, multimonth maintenance project with a significant impact on the community, with no notice to neighbors.

Very loud noise (65-85 db) began the week of 5/22. My neighbors who work construction identified it as the sound of sand blasting. I called the refinery and was told "we aren't doing any sand blasting" and abruptly the work stopped. When the work resumed the following week, I contacted the State Air Board (on 6/6) and spoke with Anais. She came out to investigate in person. She told me she could clearly hear how loud it was from outside the plant perimeter. She said that she could not locate the specific work site and that when she called them to discuss, they stated they were not sandblasting, they were "using slurry", refused to allow her on site to observe, and stated that notice had been sent out. Interestingly, a letter was drafted dated 6/6 informing the neighbors of this project, calling it a maintenance project and that it would conclude in October. I suspect this Air Board inquiry motivated the communications which should have occurred prior to starting the project.

After this Air Board visit, it was silent for the rest of the week. The following week, the work resumed, clearly at an accelerated pace. For example on 6/14 my Apple Watch decibel meter showed the sound on my front porch to be consistently 65-75 decibels and occasionally as loud

as 86 decibels. The usual ambient sound level in my neighborhood is 45-55. This work went on until early July.

- If indeed this loud sound was caused by slurry, and not sand blasting, why would the MRC refuse a regulator admission to their site?
- In addition to the noise, sand blasting causes large amounts of potentially dangerous particulate matter in the surrounding area.
- I suspect that they were using a contractor to sandblast tanks without a permit and attempted to get as much work done using the more effective sandblasting method as they could until they were caught. Perhaps it was legally true that "we are not sandblasting" (per my phone call) if they were using *contractors* to perform the work.

If, as demonstrated by this recent experience, the MRC has a 'what can we get away with" approach to their plant operations, then we need to consider -- what would be an effective prevention strategy to ensure the health and safety of our community in the future? Fines don't help people breathe.

I would propose --

1. ENSURE REGULATOR ACCESS
   Ensure that all city, county, state, and federal regulators have authority to immediate access the MRC plant to investigate any complaints at any time.
2. SINGLE POINT OF CONTACT
   An online single point MRC complaint log must be created and maintained that is easily accessible to the public. At minimum, there should be the date of the complaint, how it was made (community members perhaps can be identified by their street address), name of agency (ies) involved, name and email address of agency representative involved, the status of the complaint, and the results of the investigation. There should also be the ability of the public to input possible complaints, in a "pending" category.
3. ACCOUNTABILITY AT THE HIGHEST LEVEL OF LEADERSHIP
   MRC leadership must be held accountable for the policies they require their employees and contractors to follow. There must be clear understanding of expectations of compliance with applicable laws and regulator requests. There must be an understanding that any continued behavior in violation of these laws can result in potential criminal charges for MRC leadership.
4. ACCESS FOR COMMUNITY
   Any fines collected should be used to create a single point contact for the community in addition to the idea of the log above.

Thank you again for your work on this project, and for your efforts to attempt to ensure a safe environment for the people of Contra Costa County and the City of Martinez.

Gayle Goldblatt
1446 Beech Street
Martinez. CA 94553

[EXTERNAL] Comments to TRC Report of 8/2023

Kathy Petricca <kpfast@aol.com>

Thu 10/12/2023 4:15 PM

To:Hazmat Arpteam <Hazmat.Arpteam@cchealth.org>

The Executive Summary of the TRC Report titled Screen Level Human Health and Ecological Risk Assessment of August 2023 lists 4 main bullet points. (See page v and page 5 of the whole TRC report.)

First is a determination of the nature and extent of the release. The nature is a broad term, but the proposed extent of the release is the Plume Model produced by the Bay Area Air Quality Management District (BAAQMD), released the following Spring. (See timeline of Chart 1, page vii, page 8 of the whole report.)

Second is the chemical composition of the dust. The McCampbell sampling and analysis was requested by the Contra Costa County Health Department (CCH) and BAAQMD on 11/26/2023 on a RUSH basis. The TRC Report refers to the evidence of the dust as including dust particles from "vehicles, trash cans, and residential garden areas within the community". (See page v.) The rest of the TRC soil sampling uses different sites in central and eastern areas of the county. The 5 locations of the McCampbell are all in the City of Martinez. (See Appendix A, page 13/16, or page 62 of the whole report.)
The TRC sampling map is based on the BAAQMD Plume Distribution model and includes central and eastern areas of the county. It lists 2 City of Martinez sampling sites (Susana Park and Highland Avenue Park), and a close-by site (Camino Del Sol. (See Figure 1, page 34 of the whole report. See also Attachment E and page 127 of the whole report.) By May, when TRC sampling was done, that no dust was found that seemed like catalyst is not surprising.

Third is the extent of dust in the soils within the release area. It is based on the larger area of the Plume Model and doesn't refer to the catalyst analysis of McCampbell analysis. Instead TRC's commentary is on what would be expected and what would not be expected, and which level is not likely to be associated with catalyst dust. (See Executive Summary, page vi and page 7 of the whole report.) TRC states "Soil samples did not appear to have typical make-up of spent catalyst dust.' (See page vi.). The samples of the catalyst analyses by McCampbell is not mentioned.

Sample D-6 of the McCampbell work order was collected on 11/28/2022, three days after the release. Eighteen test names are listed. (See page 80 of the whole report.) Sample D-6 is the background sample. (See page 9/16 and page 75 of the whole report.)
BAAQMD wrote a request for lab analysis of the samples of November, including a sample taken from COBS main hopper, which also has field comments about a sample of spent catalyst from the main hopper at COBS. (See page 14/16, and page 63 of the whole report.) BAAQMD also requested an analysis of samples 1-6 with sites D-1 to D-5 being compared to D-6. D-6's location is listed as 3487 Pacheco Blvd, the address of Martinez Refining Company.

Contra Costa News of 11/29/2022 printed a statement from the Martinez Refining Company: "The tests confirm the samples are 'spent catalyst' that originated from the refinery's Fluidized

Catalytic Cracking Unit and the catalyst had been incinerated at high temperatures to remove impurities for reuse in the refinery process and was accidentally released during overnight hours on Thanksgiving night."

Fourth is the potential risks to human and ecological receptors posed by exposure to dust in a residential setting.
I won't list any comments on the fourth bullet point. I believe the above omissions of the actual and timely sample of the actual catalyst, and the residential samples in Martinez make conclusions based on far-flung sampling of other county soils questionable. Plus, TRC's discussion of even more far-flung soils in Napa County and Union City, Alameda County is a distraction and a comparison of Contra Costa soils to them is also questionable for the purpose at hand.

[EXTERNAL] Concerns over TRC Soil Sampling Post MRC Refinery Incident on Thanksgiving Evening 2022

charlesdavidson@me.com <charlesdavidson@me.com>

Thu 10/12/2023 5:09 PM

To:Hazmat Arpteam <Hazmat.Arpteam@cchealth.org>

To: Contra Costa County Hazardous Materials Division, Dept. of Health Email: Hazmat.Arpteam@cchealth.org

Subject: Concerns over TRC Soil Sampling Post MRC Refinery Incident on Thanksgiving Evening 2022

From: CHARLES DAVIDSON, Hercules, CA

Dear Contra Costa County Hazmat Division,

I wish to address the apparent discrepancies and concerns in the soil contamination study conducted by TRC following the MRC Refinery event on Thanksgiving evening 2022.

Inadequate Sampling Locations: The TRC study indicated only two out of the 14 sample locations were from areas that experienced visible deposition from the MRC event. This is concerning, especially when TRC's Gale Hoffnagle acknowledges the likely heavy deposition *nearby* the refinery.

Sampling Methodology: TRC's Jonathan Scheiner noted that their sampling locations were determined by the BAAQMD's plume model. However, if the goal was to evaluate the "worst-case" scenarios, then basing the study on only two visibly affected locations (nearby and downwind of) the refinery seems counterintuitive out of a total of 14 locations (with the majority of sample locations from between 5 and 15 miles to the west).

Depth of Soil Samples: The depth at which the samples were taken is questionable, especially considering the samples were taken almost three quarters of a year post-event and after multiple atmospheric river winter storms. A mere 6-inch depth at only two affected sites makes the scientific relevance of such samples highly suspect.

Air District's Role: My discussions with the Air District revealed that they neither provided specific advice to TRC nor CC Health on utilizing the provided map for sampling. It appears the map was more of a starting point rather than an exact guide, raising further questions about the selected sample locations.

Clarification on Air District's Role: Per my communications with BAAQMD: "The Air District did not provide specific advice to TRC or CC Health on how to use the map" And The Air

District, in both remote meetings and written documents, clarified that this map provided modeled deposition values as a starting point for purposes of informing the soil sampling program; this modeling map was not developed to identify where residents are impacted by catalyst materials."

Recommended Sampling Approach: For a more robust and credible study, TRC should have begun their sampling from the center of the visible deposition area near the MRC refinery and then expanded outward. This method would be akin to how Mohs surgery identifies and removes cancer margins.

Role of the County: The county's delay in conducting a comprehensive sampling post the incident, especially ahead of the winter storms, raises concerns. Immediate sampling would have been more informative and credible, even if a consultant like TRC was to be engaged later.

Historical Context: The very notion that there was no rise in soil heavy metals around a century-old heavy crude refinery seems improbable. Historical data suggests such refineries have been sources of airborne contamination.

Concerns about Ongoing Emissions: Beyond this event, there is a broader concern about the continued emission of PM2.5 particulate matter, which has known severe health implications due to its ability to deeply penetrate lungs and carry toxic heavy metals.

Recommendation: It's imperative that comprehensive heavy metal sampling be conducted not just in the soil but also inside nearby residential areas, particularly inside homes.

In light of the above concerns, I strongly urge a re-evaluation of the current findings and an in-depth, scientifically sound study to ensure the health and safety of our community.

Sincerely,

CHARLES DAVIDSON

[EXTERNAL] 9/13/23 ⚠ 45 day comment Hazmat

Katie Keenan <glazankakk@gmail.com>

Wed 9/13/2023 4:18 PM

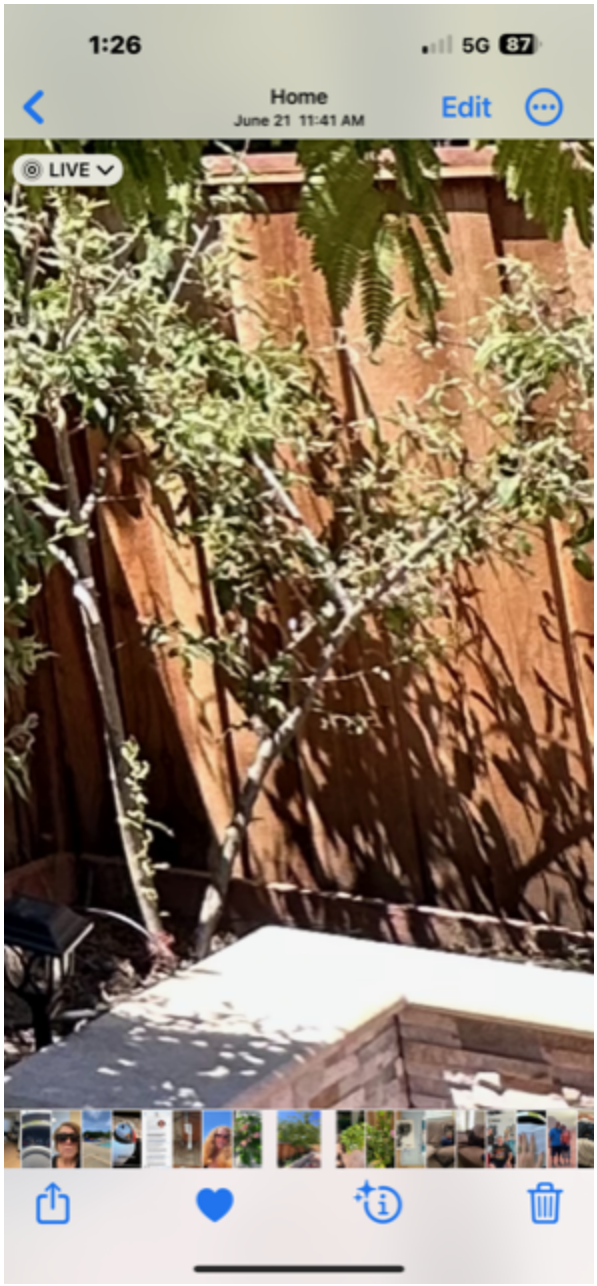
To:Hazmat Arpteam <Hazmat.Arpteam@cchealth.org>
Cc:glazanka <glazanka@gmail.com>

Contra Costa Health Hazardous
Materials Program
4585 Pacheco Blvd. Ste 100
Martinez, Ca 94553

Hello
Here is my email concerning event November 2022 MRC accident; spending “Spent Catalyst” into the surrounding community.
Both my husband and I coughed for
2 weeks following the incident.
Regardless of the findings I disagree.
My neighborhood was not contacted.
I have 6 fruit trees which yearly produced fruit except after 11/2022! The leaves were wilted and white [not frost burned brown.] It is 9/13/23 and not one piece of fruit!
I’ve since dug up Topsoil surrounding the trees and placed new compost. Yet
This damage ⚠ after the spent catalyst which from rains penetrated the soil. I am
Hopeful next year fruit returns.
Do not tell me they were “safe levels”
ONLY - you write ONLY arsenic and lead exceeded screening levels!
BOTH ARE TOXIC to humans and animals!
What is the District Attorney doing?
Please respond that this was received.

Two pictures: one from 6/5/22 of my
Nectarine tree Full of fruit!! Next 2023

This picture of same nectarine tree 6/21/23 shriveled white leaves NO FRUIT!



Sent from my iPhone

CONTRA COSTA HEALTH

cchealth.org

Public Comment

Public Comment Instructions

1. **It is important to complete this card legibly as it is a public record. Please print clearly.**

Name: William Cooper Phone #: 925-839-0107

Address: 486 Morello Ave #214 Martinez CA 94553

Email (Optional): [redacted]

Thank you

☑ I wish to be added to the Interested Party Database

Comments:

What sort of efforts will be made in the future should something similar happen in the future? If something similar happens in the future are there evacuation plans if one are needed?

CONTRA COSTA HEALTH

cchealth.org

Public Comment

Public Comment Instructions

1. **It is important to complete this card legibly as it is a public record. Please print clearly.**

Name: Kathleen Clancy Phone #:

Address: Martinez, CA

Email (Optional):

☐ I wish to be added to the Interested Party Database

Comments:

Re.. Jenny Phillips comment specific focus was on Soil Samples collected from the surface to 6" down only because this type catalyst does not leech into water/or is not dissolved by heavy rain. When it rains often the top layer is carried away dirt & by the rain/water into sewer drains. Is not water effected

CONTRA COSTA HEALTH

cchealth.org

Public Comment

Public Comment Instructions

1. **It is important to complete this card legibly as it is a public record. Please print clearly.**

Name: Cynthia Peterson Phone #: 4158024000

Address: 1304 Alhambra Ave, MTZ

Email (Optional): _____

☐ I wish to be added to the Interested Party Database

Comments:

Why wasn't CCH notified earlier to give the public info?
What ramifications will MRC have?

Who is paying for the oversight committee & sampling? and contractors?

CONTRA COSTA HEALTH

cchealth.org

Public Comment

Public Comment Instructions

1. **It is important to complete this card legibly as it is a public record. Please print clearly.**

Name: Quanah Brightman Phone #: (510) 672-7187

Address: 165 22nd Street, Richmond, CA 94801

Email (Optional): _____

☒ I wish to be added to the Interested Party Database

Comments: United Native Americans Demands that The FBI, EPA, and The Department of Justice Shut Down the Martinez Refining Company!

CONTRA COSTA HEALTH

cchealth.org

Public Comment

Public Comment Instructions

1. **It is important to complete this card legibly as it is a public record. Please print clearly.**

Name: Katherine Marsden Phone #: 510-693-7130

Address: 4550 Hays Rd ; Martinez

Email (Optional): kmarsden1001@gmail.com

☑ I wish to be added to the Interested Party Database

Comments: The refinery is a health hazard and unsustainable. The only safe resolution is to shut the refinery down and restore it to open space

CONTRA COSTA HEALTH

cchealth.org

Public Comment

Public Comment Instructions

1. **It is important to complete this card legibly as it is a public record. Please print clearly.**

Name: Tom Lewis Phone #: 925 348 4470

Address: 9 Corte Estrella, Martinez

Email (Optional): tallenlewis@gmail.com

☑ I wish to be added to the Interested Party Database

Comments: Why wasn't Ca Dept of Fish + Wildlife not included in the initial forums, as the watershed drains directly to the Carquinez Strait.

Has MRC provided RAW sample Analasys from Routine 3rd Party testing?

These TRC studies are skewing background numbers. They have cherry-picked other sources to ratchet up current background levels. Historically background numbers have come from Berkeley Lawrence Lab, reasonable since they are in the shadow of Chevron refinery. However, this TRC study introduces numbers that are outliers, and should not be considered as background.

For example, zinc. The mean for Berkeley Lawrence Labs is 64. Yet, TRC looked at 8 sites in other counties, and most were below 100, as with Berkeley Labs. However, there was one outliner, in Union City, at 474 mg/kg. which became our high normal for background levels in this county, according to TRC. Geographically too far away for comparison. Not good science, as that number is an outlier and should be ignored. The daily, safe level of zinc ingestion for humans is 2mg/kg.

Also, Chromium. Also, toxic. At Berkeley Lawrence Labs the background of Chromium is 100 mg/kg. Yet, our new hi normal is 1690 mg/kg. TRC added data from the Napa fire 2017, and at only one, of six sites was 1690. Another outlier. That event incinerated everything, commercial and residential. Humans and pets. All contain Chromium. That is an erroneous normal for contamination. Yet it skews numbers considered background, and real contamination hides behind those numbers. The daily safe Chromium intake for humans is 2.0 mg/kg.

DTSC calls this an Error II mistake, or a false negative. And as TRC knows, they never look back. Once set by the county, they will remain unchanged. We cannot set background levels so very high for our communities.

DTSC also recommends studies for legacy pollution to include a "coring" of soil, as they do in the ocean. This gives a vertical picture through time of the pollutants. They test the core top to bottom, to that interface where no pollution occurs. An important timeline. And not performed.

As a reminder, this a risk assessment document. I've only seen numbers from soil sampling. However, a true risk assessment would include the repercussions of contamination of heavy metals for health conditions. Including back-ground contamination. Demographics of who is affected, old and young typically. Cancer? or non-cancer repercussions.. Heavy metals tested, and what are symptoms. We are still at risk, especially since these numbers are set at an unusually high level.
Identify the risks. That's the point.

Two last things to consider. This May 2023 analysis is too late for a November 2022 event. After 6 atmospheric rivers, this data is too old. Also, of 14 samplings, only 3 were actually close to the site of release. Again, this is not good science.

Maureen Brennan

Maureen Brennan
Rodeo CA