BEFORE THE HEARING BOARD OF THE

SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT

In The Matter Of SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT, Petitioner, vs. CHIQUITA CANYON, LLC a Delaware Corporation, [Facility ID No. 119219] Respondent.	**Case No. 6177-4** **DECLARATION OF PABLO SANCHEZ SORIA, PH.D., CIH** Health and Safety Code § 41700, and District Rules 402, 431.1, 3002, 203, 1150 Hearing Date: April 24 – 25, 2024 Time: 9:30 am Place: Hearing Board South Coast Air Quality Management District 21865 Copley Drive Diamond Bar, CA 91765

I, Pablo Sanchez-Soria, Ph.D., CIH declare:

1. I am of sufficient age and am competent to testify in this proceeding. I provide this declaration based upon my personal knowledge and expertise in human and environmental toxicology and am competent to testify to the facts and opinions set forth herein.

Background and Credentials

2. As discussed in my prior declaration in this Case No. 6177-4, I serve on the Reaction Committee as a subject matter expert for public health relating to air quality and exposure to air contaminants. I am a Senior Toxicologist and Director of Health Sciences at the Center for Toxicology and Environmental Health ("CTEH") and have over 10 years of experience in the area of toxicology, specializing in human health risk assessments.

3. I was retained by Chiquita Canyon, LLC ("Chiquita") in August 2023, to provide expert consulting services related to evaluating potential long and short-term health and environmental impacts of the ongoing reaction at the Chiquita Canyon Landfill (the "Landfill").

4. This declaration is made for the April 24 and 25, 2024 status and modification hearing on the Modified Stipulated Order for Abatement ("Modified Stipulated Order") issued on March 21, 2024 in Case No. 6177-4.

Air Monitoring – Community Meetings

5. Every month the Landfill receives three or more Rule 402 NOVs from South Coast AQMD in a calendar year, Chiquita holds one–hour public community meetings as required by **Condition 40** of the Modified Stipulated Order. All meeting information is available on Chiquita's Odor Mitigation webpage. After each meeting, the meeting materials are also posted on Chiquita's Odor Mitigation webpage along with a brief description.

Air Monitoring and Health Analyses Update

6. In compliance with **Condition 12(g)(v)** of the Modified Stipulated Order, CTEH submitted a report to South Coast AQMD on the known health risks from acute and long-term exposure to DMS (the "DMS Report") on January 15, 2024. While DMS is highly odorous, CTEH concluded in the DMS Report that DMS is not a driver for health risks to the community. CTEH's primary recommendation in the DMS Report was that Chiquita continues to evaluate additional speciated sulfur compounds or other hazardous pollutants found to be emitted from the Landfill and detected in the community to help identify other chemicals of potential interest that could help address public health concerns.

7. The Los Angeles County Department of Public Health hired Roux Associates, Inc., a third-party toxicologist, to conduct an independent investigation of outdoor air quality and evaluation of potential health risks to the communities surrounding Chiquita. On February 7, 2024, Roux Associates, Inc. published a Community Air Sampling and Health Risk Screening Evaluation Report (the "Roux Report").[1] The Roux Report evaluated air sampling results around the Landfill. Among other recommendations, the Roux Report recommended that Chiquita evaluate whether improvements to existing community air monitoring and sampling strategies surrounding the Landfill are warranted.

[1] Available at https://planning.lacounty.gov/wp-content/uploads/2024/02/ccl_air-sampling-20240207.pdf (last accessed April 19, 2024).

8. In January 2024, Chiquita commissioned CTEH to develop a 28-Day Monitoring and Sampling Plan and associated Quality Assurance Project Plan ("QAPP"), the final versions of which are included as **Exhibit A** and **Exhibit B** respectively, to collect additional air quality monitoring data through conducting a 28-Day Air Quality Study (the "28-Day Study") in the communities surrounding the Landfill.

9. The primary objective of the 28-Day Study was to collect data to assist in preparing the report required by **Condition 12(g)(vi)** of the Modified Stipulated Order and to address CTEH's prior recommendation in the DMS Report to evaluate additional speciated sulfur compounds and other hazardous pollutants. **Condition 12(g)(vi)** requires that Chiquita provide a report on the health impacts from ongoing and long-term exposure to landfill emissions, including hydrogen sulfide (H_2S) and other speciated sulfur compounds, and hazardous air pollutants (HAPs) of concern potentially emitted from the Landfill (the "Health Impacts Report"). The data collected under the 28-Day Study provides daily ambient levels of chemicals of interest and odors in the communities surrounding the Landfill. Data from the 28-Day Study will also assist in evaluating, as recommended in the Roux Report, whether improvements to existing air monitoring and sampling strategies surrounding the Landfill are warranted. Collectively, these strategies generated data that will be used to prepare the Health Impacts Report required to be submitted to South Coast AQMD on August 1, 2024 by **Condition 12(g)(vi)**. Findings from the Health Impacts Report may be used to guide risk reduction measures as well as to identify future air quality evaluation needs, if any, beyond those in place or intended for implementation by Chiquita.

Implementation of the 28-Day Study

10. The 28-Day Monitoring and Sampling Plan and QAPP were provided to South Coast AQMD and the Department of Public Health for feedback. Feedback received was addressed and incorporated into the 28-Day Monitoring and Sampling Plan and QAPP by CTEH.

11. CTEH conducted the 28-Day Study from March 4, 2024 to March 31, 2024 by implementing four broadly defined air monitoring and sampling strategies to help characterize ambient air quality in the communities surrounding the Landfill. These four monitoring and sampling strategies included:

a. Around-the-clock data collection through use of roaming handheld monitoring equipment, shown in **Figure 1** below, by CTEH's team of environmental scientists.

Figure 1: Roaming Handheld Monitoring Equipment

b. Daily mobile monitoring using a PTR-MS monitoring van with laboratory grade equipment, shown in **Figure 2** below.

Figure 2: PTR-MS Monitoring Van

c. Short-term, 1-hour analytical air sampling shown in **Figure 3** below.

Figure 3: Short-Term, 1-Hour Analytical Air Sampling

d. Continuous 24-hour fixed analytical air sampling using consecutive 24-hour summa canisters as shown in **Figure 4** below.

Figure 4: 24-Hour Summa Canister (and field duplicate) for Continuous 24-hour Fixed Analytical Air Sampling

12. Locations of CTEH's Roaming Real-Time Air Monitoring for VOCs, benzene, and hydrogen sulfide are displayed in **Figures 5, 6, and 7** below.

[PHOTOS ON FOLLOWING PAGES]

Figure 5: Roaming Handheld Air Monitoring Area for VOCs

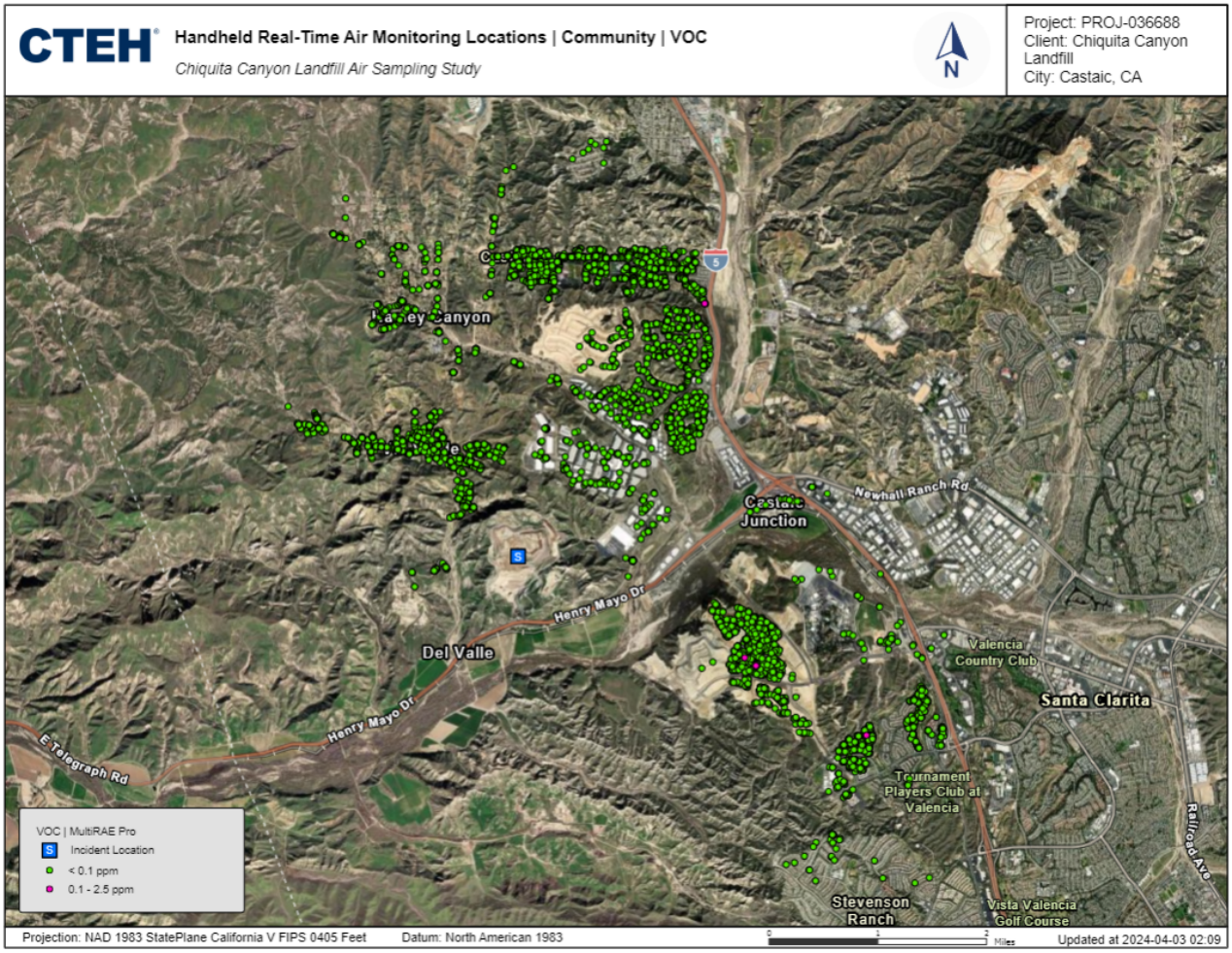


Figure 6: Roaming Handheld Air Monitoring Area for H_2S

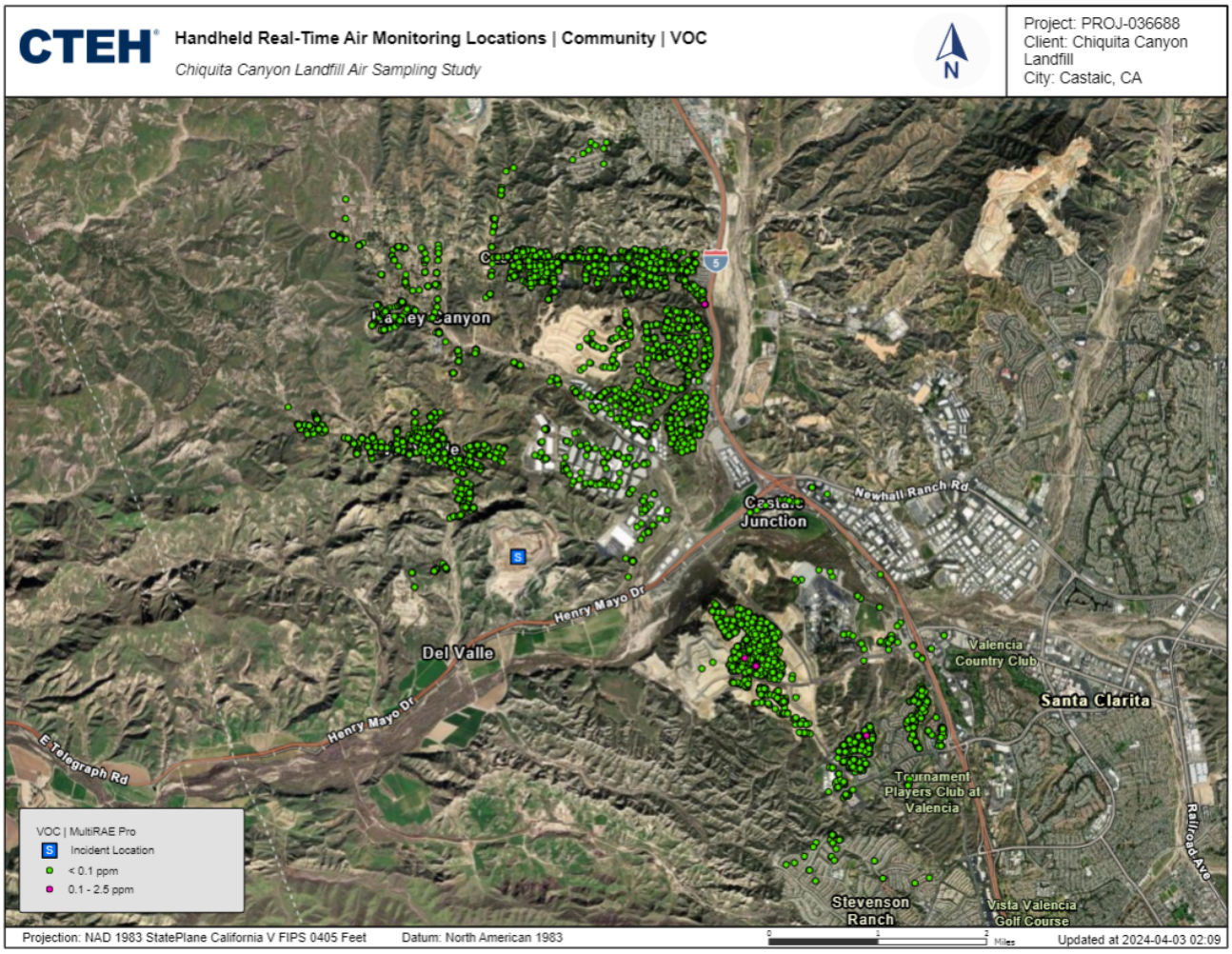
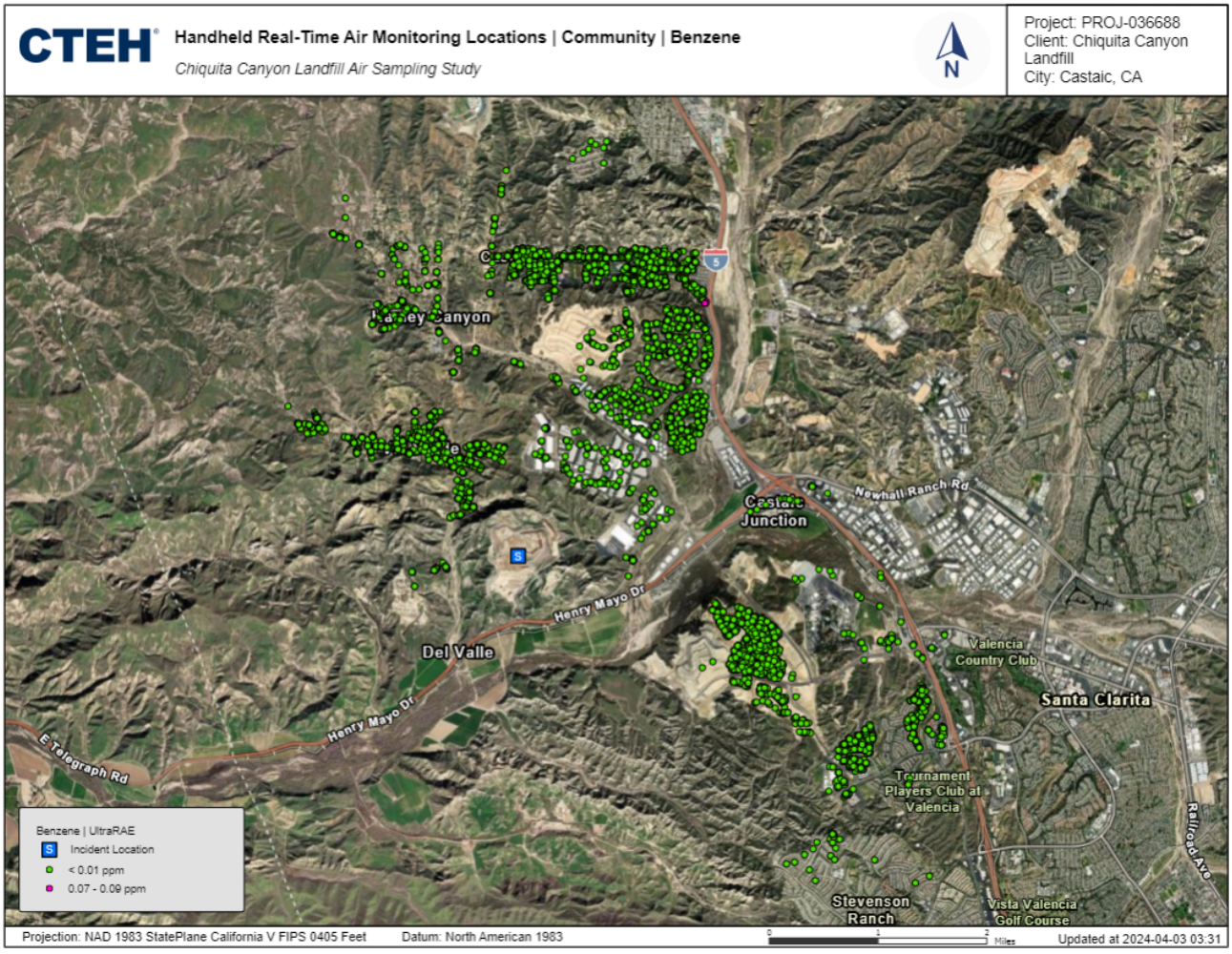
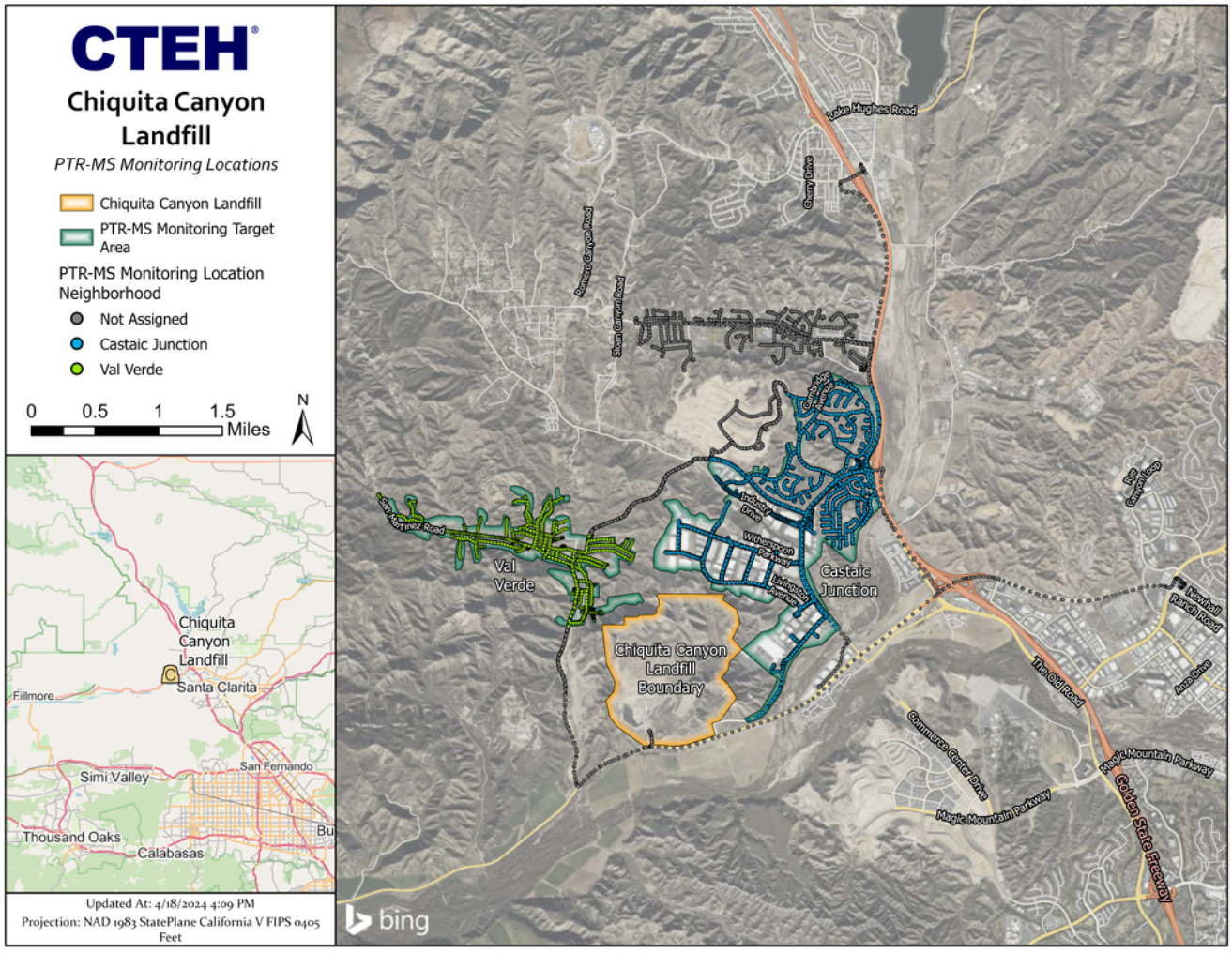


Figure 7: Roaming Handheld Air Monitoring Area for Benzene



13. CTEH's PTR-MS Van monitoring locations are displayed in **Figure 8** below.

Figure 8: PTR-MS Van Monitoring Locations



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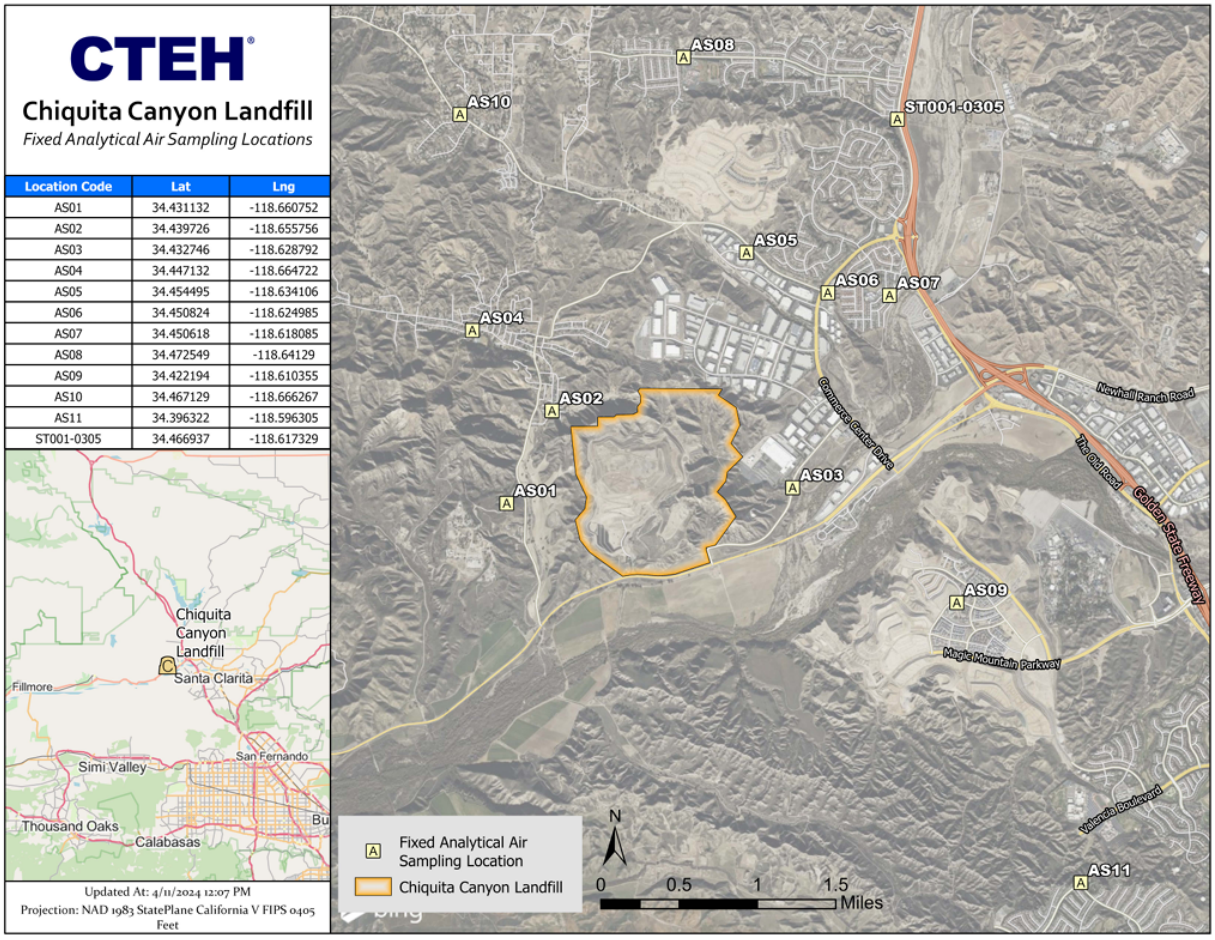
14. CTEH's analytical air sampling stations are displayed in **Figure 9** below.

Figure 9: Fixed Analytical Sampling Stations



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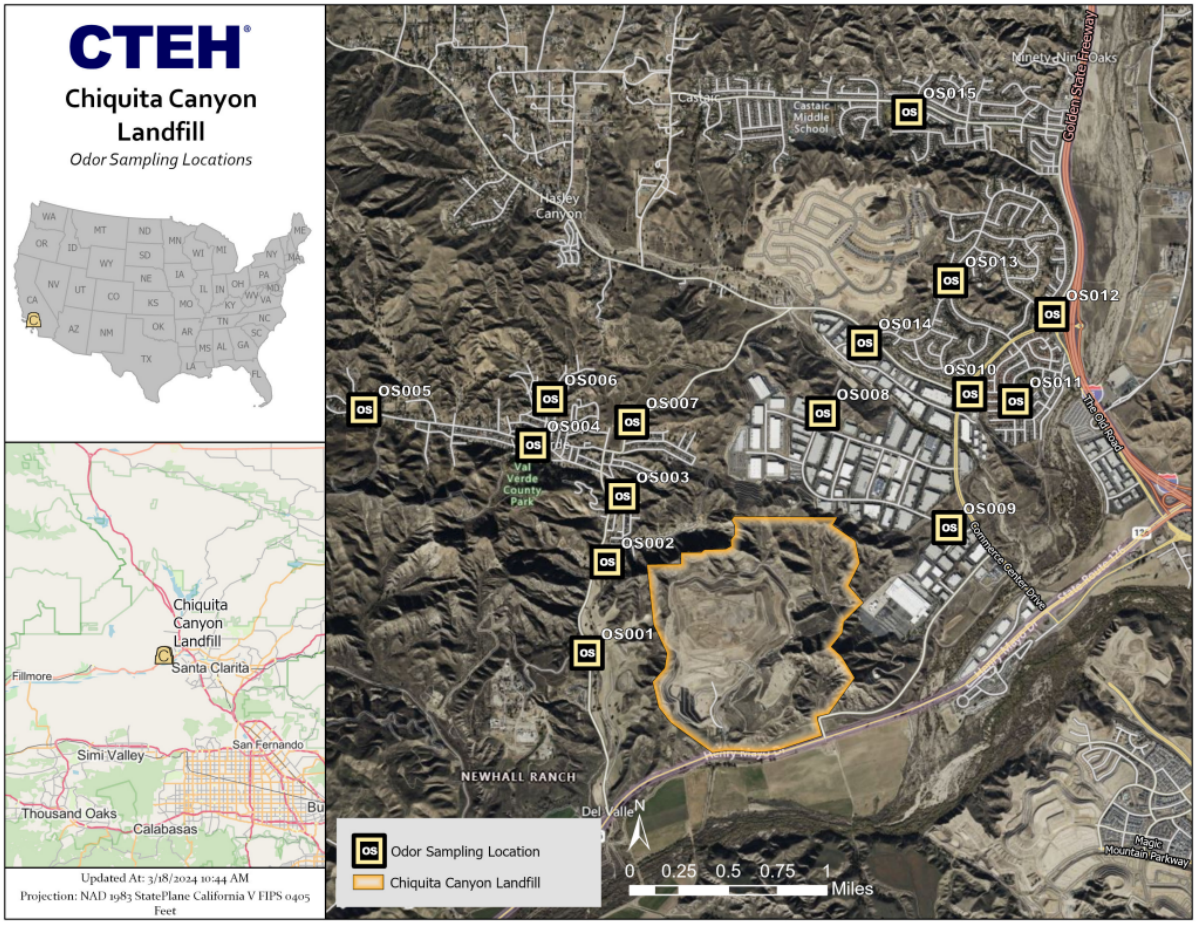
15. CTEH also conducted an odor survey evaluation as part of the 28-Day Study that began on March 11, 2024, around communities near the Landfill through the use of a Nasal Ranger device. The Nasal Ranger is an olfactometer that allows an odor panelist to quantify odor intensity by diluting ambient air with non-odorous carbon-filtered air, obtaining a dilution to threshold ratio. CTEH established 15 locations across the Val Verde and Castaic Junction Communities to conduct the odor survey, displayed in **Figure 10** below. The odor survey evaluation characterized the frequency, strength, hedonic tone, and character of odors in ambient air throughout communities surrounding the Landfill during the 28-Day Study.

Figure 10: Odor Survey Location Map



16. The 28-Day Study's odor survey evaluation took place in addition to the odor surveillance required under **Condition 1(a) – (e) and Condition 2** of the Modified Stipulated Order which has been continuously conducted in communities surrounding the Landfill by contractors hired

through CTEH since the Stipulated Order was first issued on September 7, 2023. All Odor Surveillance Logs from the odor surveillance and associated notifications and actions taking place under the Modified Stipulated Order are maintained and available to South Coast AQMD upon request.

Summary of 28-Day Monitoring and Sampling Data

17. Air monitoring and analytical air sampling information from the 28-Day Study is publicly available through Chiquita's air quality study webpage.[2]

18. CTEH collected 22,885 real-time handheld air monitoring data measurements throughout the 28-Day Study, including 7,638 measurements for benzene, 7,628 measurements for hydrogen sulfide, and 7,619 measurements for volatile organic compounds ("VOCs"). Of these measurements, there were 3 detections of benzene and 7 detections of VOCs. All detections of benzene by the handheld monitors were observed on March 6, 2024 around 8 AM, near Highway 5. At that time and as a result of the detections, as per the QAPP for the study, CTEH collected a short-term, 1-hour air sample in the same area to verify and further investigate the detection (the 1-hour air sampling devices are generally more sensitive than the handheld devices). The short-term air sample did not detect benzene levels above the detection limit of 0.2 ppb. These results will be further analyzed as part of the forthcoming Health Impacts Report.

19. The detection results of all real-time handheld air monitoring data measurements are summarized in **Table 1** below.

Table 1: Detection Results of All Real-Time Handheld Air Monitoring Data Measurements

Analyte	Count of readings	Count of detects	Concentration range
Benzene	7,638	3	70 – 90 ppb
Hydrogen sulfide	7,628	0	100 ppb
VOCs	7,619	7	100 – 2,500 ppb

20. The PTR-Mobile Van data from the 28-Day Study includes over 160,000 readings that were collected across the Val Verde and Castaic communities. Analytes evaluated included benzene, dimethyl disulfide, dimethyl sulfide, hydrogen sulfide, methyl ethyl ketone / tetrahydrofuran, propene,

[2] Available here: https://chiquitalandfillairqualitydata.sensible-edp.com/ (last accessed April 19, 2024).

styrene, tetrachloroethylene, and xylenes / ethylbenzene. The PTR-Mobile Van collected data at each community (i.e., Val Verde, Castaic Junction) for approximately four hours per day. To estimate short-term health impacts, 1-hour rolling averages will be calculated to compare to acute health-protective screening values (e.g., OEHHA Acute RELs). These calculations and resulting estimates will be included in the Health Impacts Report.

21. The 24-hour analytical data collected under the 28-Day Study included sampling across 11 locations in communities surrounding the Landfill for total reduced sulfur ("TRS") and VOCs on a daily basis. Average constituent concentrations at each sampling location will be compared to long term health based screening levels (e.g., OEHHA Chronic RELs, USEPA RfCs) consistent with risk assessment methodologies. Over 25,000 individual results were collected through analytical air sampling during the 28-Day Study. Concentrations of VOCs and TRS compounds were not detected above default health-protective noncancer screening values with the exception of hydrogen sulfide, found at an average of 11.98 ppb at AS09 – approximately 4 miles southeast from the Landfill, exceeding the OEHHA Chronic REL of 8 ppb. These results will be further analyzed as part of the forthcoming Health Impacts Report.

22. As discussed above, the 28-Day Study also included an odor evaluation component. Odors were evaluated 8 hours per day using Nasal Ranger devices. The timing of odor evaluation shifts was staggered between study days to evaluate odors in the early morning and the evening periods to correlate with the times when odors were most often reported. In total, 3,606 odor survey measurements were collected, with strong odors (7 D/T or greater) documented in 88 instances, representing 2.5% of all odors documented. Of the 88 strong odors documented, 98% were characterized as offensive in nature (i.e., garbage, rancid) according to the St. Croix Sensory, Inc. odor wheel. Additionally, moderate (4 D/T) and light (2 D/T) odors were documented 81 and 331 instances respectively, with 75% of the moderate odors being characterized as offensive and 49% of the light odors being characterized as offensive. Faint odors (< 2 D/T) were documented 1,340 times, with 21% of those being offensive in nature. A summary of these observations is provided in **Table 2**, below.

Table 2: Frequency Distribution of Odor Intensity and Proportion of Offensive Odors

Odor intensity (D/T)	Count of measurements	Proportion of measured odors categorized as offensive
Strong (≥7)	88	98%
Moderate (4)	81	75%
Light (2)	331	49%
Faint (<2)	1,700	22%
Non-detect	1,406	--
Total	**3,606**	**18.9%**

23. Of all the strong odors documented (88), 35 of them (40%) were detected at OS001, established next to the Los Angeles County Fire Department Del Valle Regional Training Center, west of the landfill, approximately 0.5 miles south of Val Verde, as shown in Figure 7, above.

Use of the 28-Day Study Data for the Health Impacts Report

24. All data collected through the 28-Day Study will be fully evaluated in the Health Impacts Report due to South Coast AQMD on August 1, 2024 under **Condition 12(g)(vi)**. The analysis of the data in the Health Impacts Report will include a cumulative health risk evaluation of all air sampling and monitoring results utilizing applicable health based screening values , where available. Cancer risk analyses of the data from the 28-Day Study will also be completed and discussed in the Health Impacts Report.

25. As part of the Health Impacts Report, odor data collected throughout the 28-Day Study, along with other odor and air quality information, will help inform the potential contribution of odors to physiological responses, as further described in the Declaration Dr. Richard Pleus.

Executed on this 19th day of April 2024, in Little Rock, Arkansas.

Pablo Sanchez-Soria, PhD, CIH
Senior Toxicologist
Director, Health Sciences
CTEH, LLC

EXHIBIT A

APPROVAL PAGE

	NAME/ORGANIZATION	SIGNATURE	DATE SIGNED
Prepared by:	Pablo Sanchez Soria, PhD, CIH		March 1, 2024
Reviewed by:	Lourdes Mahoney		March 7, 2024
Reviewed by:			
Reviewed by:			
Approved by:			
Approved by:			
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Approved by:			
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1.0 INTRODUCTION

Chiquita Canyon Landfill (CCL) is a municipal solid waste landfill located in Castaic, California, in the northwestern portion of Los Angeles County, owned and operated by Chiquita Canyon, LLC (Chiquita). CCL operates within the South Coast Air Quality Management District's (SCAQMD) jurisdiction under various operating permits issued by the SCAQMD. CCL also operates under a Conditional Use Permit (CUP) issued by the County of Los Angeles Department of Regional Planning.

In 2023, SCAQMD received nearly 6,800 odor complaints, with numerous complaints alleging CCL as the source of those odors. On September 6, 2023, the SCAQMD Hearing Board adopted a *Stipulated Order for Abatement*, which required that Chiquita implement various measures to mitigate an ongoing subsurface reaction at CCL, which has resulted in increased landfill gas and fugitive emissions. On January 17, 2024, the SCAQMD Hearing Board issued a modified version of the September 6, 2023, order. The *Modified Stipulated Order (Condition 12(g)(vi))* requires CCL produce a report evaluating the potential health impacts associated with exposure to such emissions, including hydrogen sulfide (H_2S) and other speciated sulfur compounds, and hazardous air pollutants (HAPs) potentially emitted from the Landfill (i.e., detected in landfill gas from flux chamber studies or stack emission testing, from liquids or leachate samples, air sampling results that were conducted to detect emissions from exposed liquids/leachate, and sampling results from samples collected in the community).

1.1 Site Description

CCL is in the unincorporated community of Castaic in Los Angeles County. The closest communities are Val Verde which is located northwest of the landfill. The closest communities are Val Verde which is located northwest of the landfill and Castaic Junction located northeast of the landfill. An industrial park is located approximately 1 mile to the northeast and the Castaic Junction community northeast of the industrial park. There are suburbs approximately 3.5 miles north of the reaction area of the landfill and approximately 4.5 miles southeast of the reaction area.

2.0 SCOPE AND OBJECTIVES

The main objective of this air sampling study is to generate data that can be used to conduct a health impact analysis related to exposure to hydrogen sulfide and other hazardous air pollutants (HAPs) identified as compounds of interest (COIs) to characterize air quality and health risks potentially associated with landfill emissions. Additionally, as part of the health impact analysis, an odor survey evaluation will be conducted to characterize the frequency, strength, hedonic tone, and character of odors in ambient air throughout communities surrounding the CCL.

2.1 Study Objectives

This section summarizes the overall objectives and scope of the study. Details regarding monitoring and sampling, COIs, methods, and locations are summarized in Section 3.0.

Objective 1. Data Collection and Evaluation: Design and conduct an air monitoring and sampling study to produce data of sufficient and known quality for use in a report of health impacts that includes a Human Health Risk Assessment (HHRA). The main objective of the air sampling study is to quantify temporal and spatial patterns in ambient air throughout nearby communities. An evaluation of concentrations of various compounds across the proposed locations, including background locations, will be conducted to assess whether the CCL has a measurable contribution to ambient air levels of COIs. Findings from this HHRA may be used to guide risk reduction measures as well as to identify future air quality evaluation needs, if any, beyond those in place or intended for implementation by the CCL.

Objective 2. Conduct an HHRA: The scope of this HHRA will include the characterization of health risks due to acute, long-term, and cumulative exposure to ambient air Volatile Organic Compounds (VOCs) with established[1] toxicity values, as well as a characterization of incremental risk from identified COIs potentially associated with emissions from CCL. Health risks from acute and chronic exposure durations will be evaluated, including:

1. Assessment of acute non-cancer health hazards.
2. Assessment of chronic non-cancer health hazards.
3. Estimates of lifetime individual excess cancer risks from exposure to ambient air, including a characterization of incremental risk potentially attributable to COIs emitted from CCL.

Further description of the HHRA methods is included in Section 9.0.

Objective 3. An Odor Survey Evaluation: An Odor Survey Evaluation will be conducted to characterize frequency, strength, hedonic tone, and character of odors in ambient air throughout communities surrounding the CCL. The odor survey will be conducted at defined locations to characterize odor experiences across the community. Details of this evaluation are in development and will be described in detail in Attachment A, which will be completed by March 8, 2024.

[1] *Including those set by the State of California, USEPA, ATSDR or other State health agencies.*

The study finding will be compiled in a report of Health Impacts by August 1, 2024 to fulfill condition 12(g)vi of the Modified Stipulated Order. Findings from this study will inform improvements to existing and future air monitoring strategies, if any are warranted.

3.0 AIR QUALITY STUDY DESIGN AND RATIONALE

The rational for this study was to provide a higher quality, more comprehensive, and more sensitive data set of air concentrations surrounding the CCL to better inform the report of health impacts in the Modified Stipulated Order section 12(g)iv. Secondly, this study is intended to evaluate if any improvements to existing air monitoring and sampling strategies surrounding the landfill are warranted.

3.1 Compounds of Interest Selection

While a HHRA will include a characterization of health risks and cumulative evaluation of exposure to ambient air constituents, a separate assessment of incremental risk potentially attributable to exposure to CCL emissions will be conducted by selecting COIs based on condition 12(g)(vi) of the Modified Stipulated Order for Abatement, dated February 1, 2024.

Per condition 12(g)(vi), CTEH considered the following COIs:

- Hydrogen sulfide;
- Speciated sulfur compounds;

  AND
- Other Hazardous Air Pollutants (HAPs) as defined in the federal Clean Air Act, 42 U.S.C § 7412, detected in:
    - Landfill gas over the past twelve months from flux chamber studies; **or**
    - Liquids and leachate samples collected and analyzed; **or**
    - Air samples performed to determine emissions from exposed liquids/leachate (i.e., headspace); **or**
    - Stack emissions testing;

  AND
    - Detected in community pursuant to the enhanced community air monitoring program (EAMP) in exceedance of recommended toxicity screening values published by the USEPA or other applicable screening values where USEPA toxicity screening values are unavailable.

To detail the process of COI selection, Tables 1 through 5 are presented below:

Table 1 Analytes Detected in Community 24-hour Air Samples – Collected by SCS Engineers

ANALYTE	CAS #
1-Propene	115-07-1
1,1-Dichloroethane	75-34-3
1,1,2-Trichloro-1,2,2-trifluoroethane	76-13-1
1,2-Dichloro-1,1,2,2-tetrafluoroethane	76-14-2
2-Bromothiophene	1003-09-4
Acetone	67-64-1
Benzene	71-43-2
Chloromethane	74-87-3
Cyclohexane	110-82-7
Dichlorodifluoromethane	75-71-8
Ethanol	64-17-5
Ethyl acetate	141-78-6
Ethylbenzene	100-41-4
Isopropanol	67-63-0
Methanol	67-56-1
Methyl bromide	74-83-9
Methyl disulfide	624-92-0
Methyl ethyl ketone	78-93-3
n-Hexane	110-54-3
ortho-Xylene	95-47-6
Tetrahydrofuran	109-99-9
Toluene	108-88-3
Total Reduced Sulfurs	N/A
Total Sulfur	N/A
Total Unidentified Sulfur	N/A
Trichlorofluoromethane	75-69-4
Unidentified sulfurs	N/A
Xylenes	1330-20-7

N/A = not applicable

Analytes detected in the community, presented in Table 1, were compared to analytes that had *at least one detection* as referenced in the Surface Air Emissions Report (flux chamber study) and reported by SCS Engineers in October 2023. Analytes detected in the community air samples and also detected in the flux chamber study are listed in Table 2.

Table 2 Compounds Detected in Flux Chamber Samples and Community Samples

Analyte	CAS #
1-Propene	115-07-1
Acetone	67-64-1
Benzene	71-43-2
Cyclohexane	110-82-7

Analyte	CAS #
Ethanol	64-17-5
Ethyl acetate	141-78-6
Ethylbenzene	100-41-4
Isopropanol	67-63-0
Methanol	67-56-1
Methyl ethyl ketone	78-93-3
n-Hexane	110-54-3
or-Xylene	95-47-6
Tetrahydrofuran	109-99-9
Toluene	108-88-3
Trichlorofluoromethane	75-69-4
Xylenes	1330-20-7

Similarly, analytes detected in the community, as presented in Table 1, were compared to analytes detected in stack emission testing, including Air Testing Services, Inc. report of landfill gas flare issued August 23, 2023, and in source test report for Flare No. 2, as reported by Montrose Air Quality Services, report dated February 2, 2024. Analytes detected in the community and detected in stack emissions reports are listed in Table 3.

Table 3 Compounds Detected in Stack Testing Samples and Community Samples

Analyte	CAS #
1-Propene	115-07-1
Acetone	67-64-1
Benzene	71-43-2
Chloromethane	74-87-3
Cyclohexane	110-82-7
Ethanol	64-17-5
Ethyl acetate	141-78-6
Ethylbenzene	100-41-4
Isopropanol	67-63-0
Methanol	67-56-1
Methyl ethyl ketone	78-93-3
n-Hexane	110-54-3
ortho-Xylene	95-47-6
Tetrahydrofuran	109-99-9
Toluene	108-88-3
Total Reduced Sulfurs	Total Reduced Sulfurs
Total Unidentified Sulfur	Total Unidentified Sulfur
Xylenes	1330-20-7

Analytes detected in the community, as presented in Table 1, were compared to analytes detected in air sampling performed to determine emissions from exposed liquids/leachate including samples collected by SCAQMD on October 20, 2023. Analytes detected in the community and detected in air samples above exposed liquids/leachate are listed in Table 4.

Table 4 Compounds Detected in Air Above Exposed Liquids / Leachate

ANALYTE	CAS #
1-Propene	115-07-1
Acetone	67-64-1
Benzene	71-43-2
Ethanol	64-17-5
Ethyl acetate	141-78-6
Isopropanol	67-63-0
Methanol	67-56-1
Methyl ethyl ketone	78-93-3
Tetrahydrofuran	109-99-9
Toluene	108-88-3
Trichlorofluoromethane	75-69-4

Analytes detected in the community, as presented in Table 1, were compared to analytes detected in leachate sample results provided by CCL, including leachate sampling records from January 25 – 26, 2023, and records from August 29 – 30, 2023 (Table 5).

Table 5 Compounds Detected in Leachate Samples and Community Samples

Analyte	CAS #
Acetone	67-64-1
Benzene	71-43-2
Ethylbenzene	100-41-4
Methyl ethyl ketone	78-93-3
ortho-Xylene	95-47-6
Toluene	108-88-3

All of the analytes detected in the community, as presented in Table 1, that were *also* identified in flux chamber studies, stack emissions, leachate headspace, or leachate sampling results are summarized in Table 6.

Table 6 Compounds Detected in Community Samples and Other Sampling Programs

Analyte Detected in Community Air Samples	CAS #	Detected in Flux Sample	Detected in Stack Testing Sample	Detected in Leachate Headspace	Detected in Leachate Sample
1-Propene	115-07-1	X	X	X	
Acetone	67-64-1	X	X	X	X
Benzene	71-43-2	X	X	X	X
Chloromethane	74-87-3		X		
Cyclohexane	110-82-7	X	X		
Ethanol	64-17-5	X	X	X	
Ethyl acetate	141-78-6	X	X	X	
Ethylbenzene	100-41-4	X	X		X
Isopropanol	67-63-0	X	X	X	
Methanol	67-56-1	X	X	X	
Methyl ethyl ketone	78-93-3	X	X	X	X
n-Hexane	110-54-3	X	X		
ortho-Xylene	95-47-6	X	X		X
Tetrahydrofuran	109-99-9	X	X	X	
Toluene	108-88-3	X	X	X	X
Trichlorofluoromethane	75-69-4			X	
Total Reduced Sulfurs	Total Reduced Sulfurs		X		
Total Unidentified Sulfur	Total Unidentified Sulfur		X		
Trichlorofluoromethane	75-69-4	X			
Xylenes	1330-20-7	X	X		

Of the compounds detected in the community potentially associated emission sources from the CCL, as summarized in Table 6, benzene was the only analyte that exceeded USEPA toxicity screening values (i.e., USEPA Regional Screening Levels – Residential Ambient Air) for cancer or noncancer endpoints. Where no USEPA toxicity values were available, other chronic values (i.e., Long-Term Air Monitoring Comparison Values (AMCVs) established by the Texas Commission on Environmental Quality (TCEQ)) were considered for screening purposes.

In this regard, whereas the language defined in Condition 12(g)(vi) only warrants that an evaluation of health impacts include those associated with exposures to hydrogen sulfide, reduced sulfur compounds, and benzene, the present study will evaluate multiple other target analytes, as detailed in Section 4.0, below. In addition, while dimethyl sulfide and dimethyl disulfide were not detected in any of the 24-hour samples collected across the community, and thus, they are not selected COIs following the criteria from Condition 12(g)(vi), CTEH has added them as target analytes for air sampling and PTR-Mobile Van monitoring strategies, as discussed in greater detail in Section 4.0. This is based, in part, on

recommendations, feedback and public interest regarding the characterization of these constituents potentially emitted from the landfill that could migrate to the communities nearby.

For the purpose of evaluating incremental risk potentially attributable to COIs emitted from CCL, analytes from Table 6 will be considered.

4.0 AIR MONITORING AND SAMPLING STRATEGY

CTEH will implement four broadly defined air monitoring and sampling strategies to help characterize ambient air quality as well as potential landfill gas migration into the community:

1. Roaming, handheld, real-time air monitoring;
2. PTR-MS mobile monitoring;
3. Short-term 1-hour analytical air sampling; and
4. Continuous 24-hour fixed analytical air sampling.

Each strategy is designed to collect data with defined objectives contributing to the overall health impact analysis report. The plans for collecting the data, as well as corresponding data objectives are further detailed in the QAPP.

4.1 Real-time Air Monitoring Objectives

The objective of real-time air monitoring is being employed to create a dataset that identifies in real-time air concentrations in the community and can be used to inform field personnel of potential air quality impacts associated with the CCL or other sources of VOCs (i.e., asphalt patching, idling vehicles, etc.). The handheld real-time air monitoring data will not be used in the HHRA but will be used to guide sampling for 1-hour analytical sample deployment. Along with real-time concentrations, additional information will be collected regarding environmental conditions at the time of the detection. These may include, but are not limited to, photographs or field notes regarding potential alternate sources of emissions, meteorological conditions, etc.

Real-time air monitoring data can be used to help identify whether concentrations of target analytes present the potential for acute health risks to occur. For example, eye irritation is considered one of the most sensitive health effects for hydrogen sulfide and has been documented at exposure levels as low as

5 ppm[2] [3]. Given that the hydrogen sulfide MultiRAE Pro Sensor detects as low as 0.1 ppm which is below the most sensitive irritation thresholds for hydrogen sulfide of 5 ppm, these data can be used to determine if hydrogen sulfide could have contributed to reported symptoms throughout nearby communities. Real-time air monitoring data is not intended to measure or characterize odors. Odors will be characterized by odor panelist teams according to the Odor Survey Evaluation Protocol described in detail in Attachment A.

Handheld Real-Time Air Monitoring

Roaming real-time air monitoring will be conducted in the communities surrounding CCL continuously for 28 days using handheld instruments including RAE Systems MultiRAE Pro and UltraRAE equipment. The roaming area expands past the Val Verde and Castaic Junction communities to provide a larger picture of the ambient air quality surrounding CCL. Roaming real-time air monitoring locations will be based on the specific neighborhoods surrounding CCL, proximity to the landfill, and the meteorological conditions present at the time of monitoring. Roaming, real-time readings will be reviewed in a centralized location by CTEH® personnel to allow for recognition, communication, and rapid response to changing conditions. Roaming real-time air monitoring will be conducted for VOCs, benzene, and hydrogen sulfide. When sustained (at or above 5 ppm for 5 minutes) VOC detections are observed, additional benzene monitoring will be conducted to check for the presence of benzene. Roaming real-time air monitoring will be conducted in populated residential areas within the identified communities surrounding CCL.

A summary of roaming real-time air monitoring parameters, action levels, and instrumentation is included in Table 7 and detailed descriptions of data quality objectives are included in Table 2 of the QAPP. A map of the real-time air monitoring area is provided in Figure 1**Error! Reference source not found.**.

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[2] *ACGIH (2010) 'Hydrogen Sulfide', in ACGIH (ed.) Documentation of Threshold Limit Values and Biological Exposure Indices. 7th ed. Cincinnati, Ohio: ACGIH*

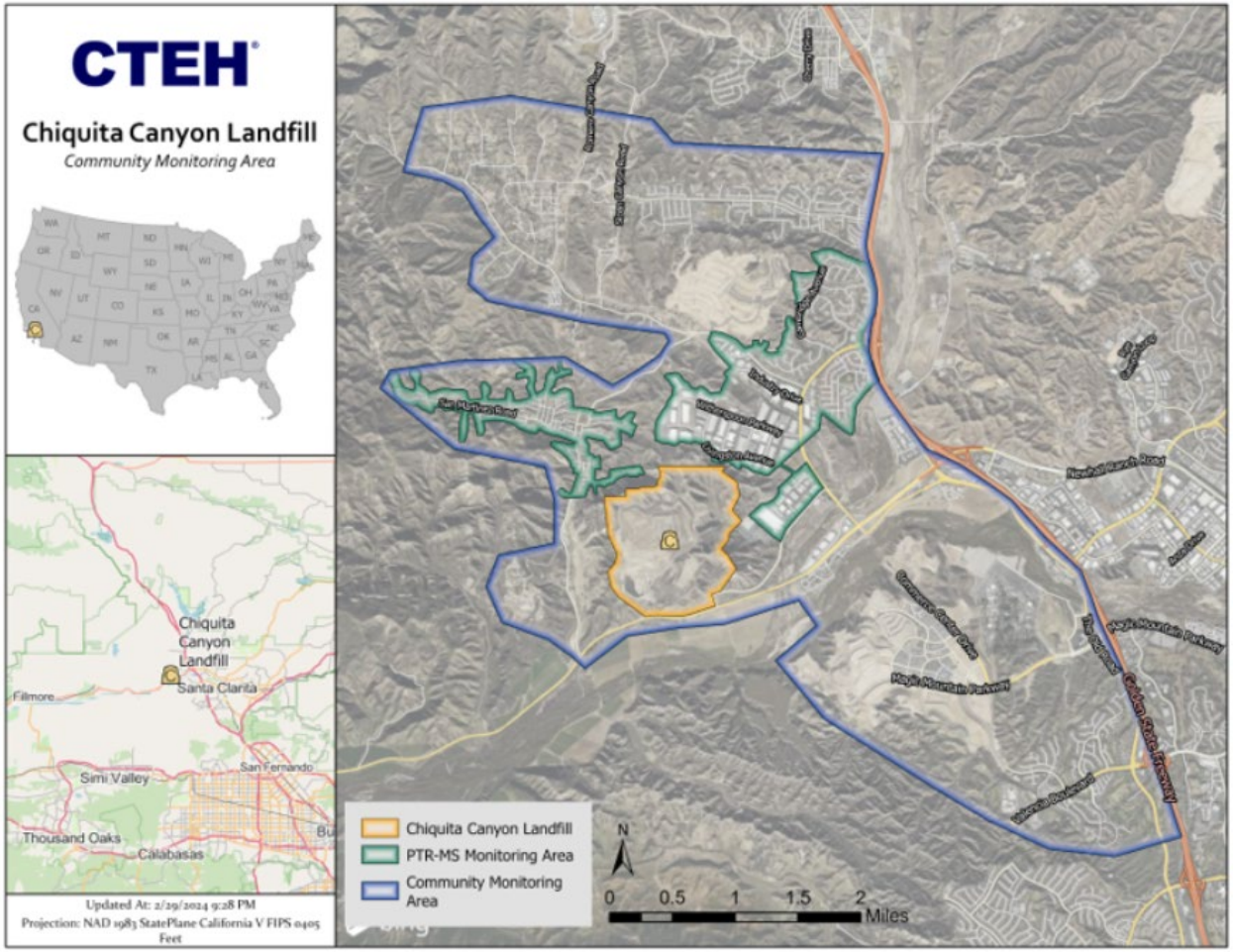
[3] *Beauchamp, R. O., Bus, J. S., Popp, J. A., Boreiko, C. J. and Andjelkovich, D. A. (1984) 'A critical review of the literature on hydrogen sulfide toxicity',* Critical Reviews in Toxicology, *13(1), pp. 25-97*

Table 7 Handheld Real-Time Community Air Monitoring Action Levels

Parameter	Action Level	Action to be Taken	Basis	Instrument	Detection Limit	Range*
VOCs	5 ppm Sustained for 5 min	Report reading to Field Manager; Assess for the presence of benzene	Surrogate action level for non-specific VOCs	MultiRAE 10.6 eV PID	0.01 ppm	0 – 5,000 ppm
Benzene	Detection (0.01 ppm) Sustained over 1-min	Report reading to Field Manager; Collect additional benzene measurements. If two detections are observed at the same location within 15 min, deploy a 1-hour analytical sample canister.	Instrument Detection Limit	UltraRAE 9.8 eV PID with Benzene SEP tubes	0.01 ppm	0 – 200 ppm
Hydrogen sulfide	0.1 ppm Sustained for 5 min	Report reading to Field Manager; Confirm reading; Collect additional readings to characterize spatial and temporal extent of potentially odorous event.	Instrument Detection Limit	MultiRAE Pro Sensor	0.1 ppm	0 – 100 ppm

*as published by the instrument manufacturer

Figure 1 Map of Roaming Real-Time Air Monitoring Area



PTR-MS Mobile Air Monitoring

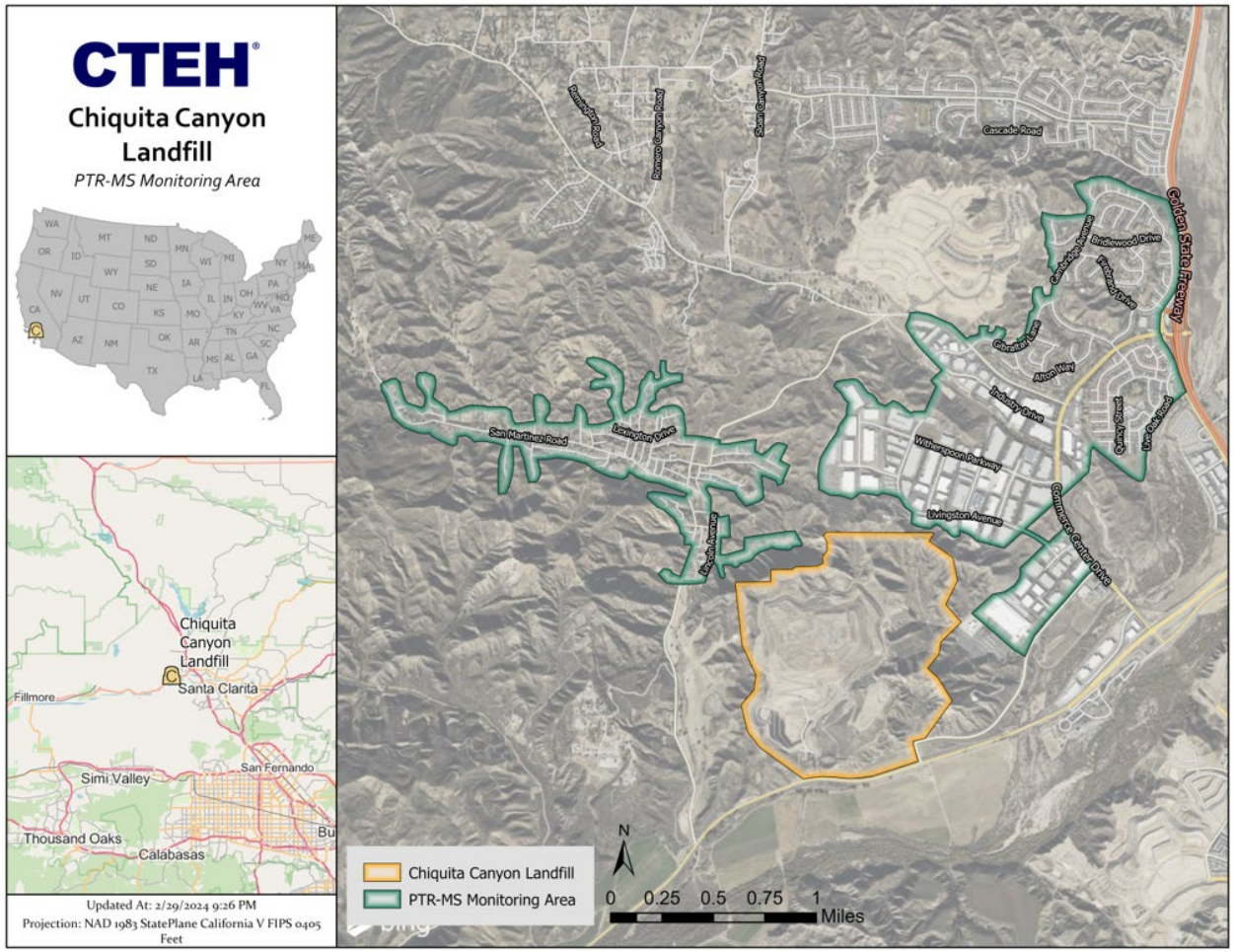
A PTR-MS Mobile Monitoring vehicle will be used to characterize a subset of compounds in two defined communities: Val Verde and Castaic Junction. The compounds that the mobile unit will evaluate were selected based on analytes detected in landfill emissions (i.e., flux-chamber studies) or leachate that have also been detected in air samples collected by SCS Engineers across the community. This subset of compounds was selected using the resources described above, with additional equipment-specific considerations. These considerations included the calibration capabilities of the equipment and the equipment operating mode that allows for continuous data collection. The van provides a large dataset of concentrations of compounds at lower detection limits than usually available with handheld real-time instruments. The PTR-MS Mobile Monitoring vehicle will operate approximately 8 hours per day[4] in the neighborhoods near CCL, as illustrated in Figure 2. Reporting limits are dependent on field-based calibrations and subject to change; however, anticipated reporting limits are provided in Table 7.

Table 8 PTR-MS Mobile Van Compound List

Analyte	CAS No.	Anticipated Reporting Limits (ppbv)
Benzene	71-43-2	0.2
Ethylbenzene	100-41-4	0.3
Dimethyl disulfide (DMDS)	624-92-0	5.0
Dimethyl sulfide	75-18-3	5.0
Hydrogen sulfide	7783-064	5.0
Methyl ethyl ketone	78-93-3	0.5
Propene	111-07-1	7.5
Styrene	100-42-5	0.3
Tetrachloroethylene	127-18-4	0.2
Tetrahydrofuran	109-99-9	0.5
Xylenes	1330-20-7	0.3

[4] Total duration monitored on any given day is dependent on equipment availability and functionality. Equipment maintenance cycles and calibration procedures may limit the duration of monitoring.

Figure 2 Map of PTR-MS Monitoring Area



4.2 Analytical Air Sampling Objectives

Analytical air samples will be collected during the Study using two different strategies, short-term air sampling and continuous, fixed-location air sampling. Short-term air samples will be collected for a 1-hour time duration and continuous, fixed-location air samples will be collected over 24-hour periods, with detection limits and sampling durations sufficiently low for comparison to applicable Health Based Screening Levels (HBSLs).

Analytical air samples will be shipped to and analyzed by TNI[5]-accredited laboratories. A summary of methods that will be used to analyze analytical air samples is included in Table 9. A list of the target analytes and their associated laboratory reporting limits are included in the QAPP for the Study.

Table 9 Analytical Air Sampling Methods and Media

COI	MEDIA/CAN	METHOD
VOCs	Evacuated Canister, 6L	USEPA TO-15, SIM[1]
Total Reduced Sulfur	Evacuated Canister, 6L	VOC Sulfurs by TO-15, Wet in Air
Dimethyl Disulfide	Evacuated Canister, 6L	USEPA TO-15, Wet in Air (EPA TO-15M)

[1] TO-15 Scan will be done for 1-hour samples and TO-15 SIM mode will be used for analysis of 24-hour samples.

FThree Kestrel 6000 meteorological stations will be deployed within the communities during the 28-Day Air Quality Study. Data collected will include wind direction and wind speed at a minimum. Additional parameters may be recorded to further assess ambient conditions. Deployment locations of the meteorological stations will be determined once CTEH personnel arrive on site.

Short-Term Air Sampling (1-hour samples)

Short-term air sampling will be conducted in coordination with real-time air monitoring. Short-term air samples will be deployed when an action level exceedance of benzene is observed by real-time air monitoring personnel. An action level exceedance is defined as two confirmed detections of benzene measurements using the UltraRAE with benzene-specific SEP tubes within a 15-minute time frame. Following an action level exceedance, a 1-hour evacuated canister sample will be collected in that location. Results from these samples will be compared against 1-hour health-based screening levels where available. A maximum of two 1-hour samples will be collected per community (i.e., Val Verde, Castaic Junction, etc.) per day.

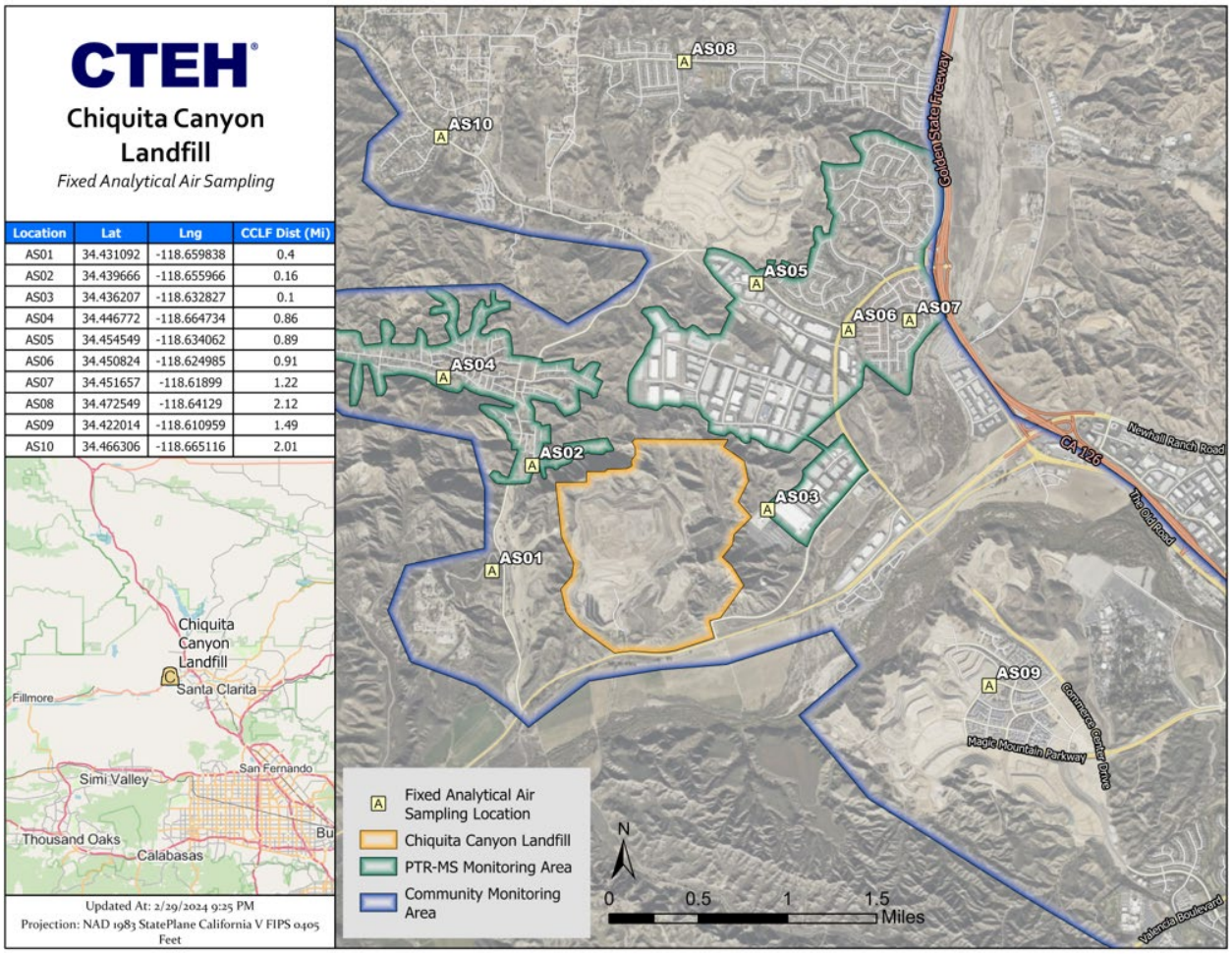
[5] *The NELAC Institute*

Continuous, Fixed-Location Air Sampling (24-hour samples)

Consecutive 24-hour air samples will be deployed at fixed locations in the communities surrounding the CCL. Air sampling will consist of 24-hour continuous sampling using 6-L evacuated canisters, and sampling will occur for 28 days. Eleven fixed locations will be utilized for consecutive samples and two will be designated as "background" locations (AS10 and AS11). A map of the fixed analytical sampling locations is provided in Figure 3.

The fixed locations used to establish "background" will be located to characterize community ambient air quality. One location (AS10) was chosen to represent a similar location as used by Roux in their Community Air Sampling and Health Risk Screening Evaluation Report. The second location (AS11) will be selected when teams arrive onsite and assess seasonal localized wind patterns to determine an optimal location to represent community ambient air quality.

Figure 3 Map of Fixed Analytical Sampling Stations



4.3 Proposed Personnel Requirements

Table 10 Personnel Requirements for Air Quality Study

Number of Persons	Role	Reporting location	Shift
4	Field Personnel for roaming community air monitoring	Onsite	DAY
2	Field Personnel for roaming community air monitoring	Onsite	NIGHT
2	Field Personnel for Air Sampling	Onsite	DAY
2	Mobile Monitoring Field Personnel	Onsite	DAY
1	Field Manager	Onsite	DAY
1	Data Manager	Offsite	DAY
1	Project Technical Director	Onsite and Offsite	DAY

5.0 COMMUNITY AIR MONITORING COMMUNICATION

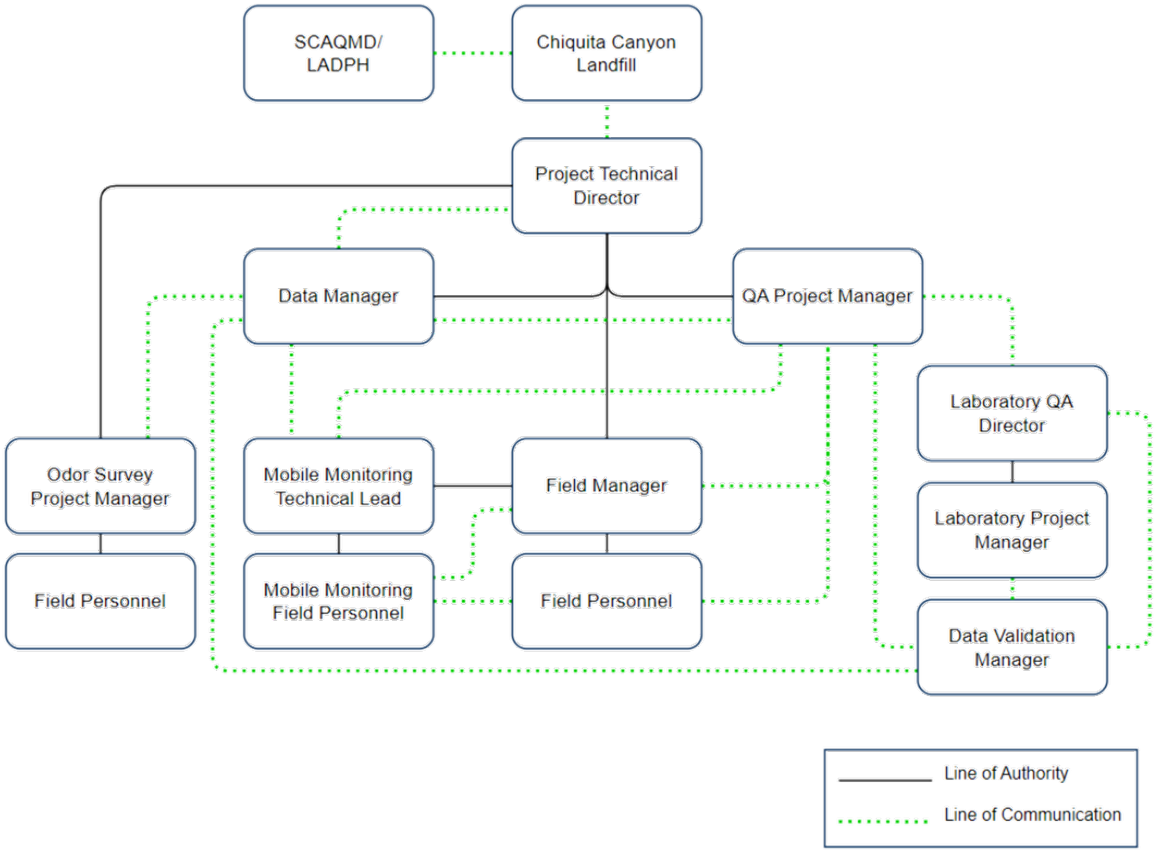
Exceedances of site-specific action levels will be reported from field personnel to the field manager and/or project technical director and will be communicated to CCL personnel via daily reporting.

CTEH personnel will communicate the results of air monitoring and air sampling to CCL on a regular basis (i.e., daily, weekly) as data become available and undergo quality control/quality assurance (QA/QC) processes. Results from air monitoring and sampling may be disseminated according to the communication flow and frequency agreed upon by CCL with other interested parties.

6.0 ROLES AND RESPONSIBILITIES

CTEH personnel will oversee and collect the air monitoring and sampling data for the Study. CTEH will be responsible for ensuring compliance with the air monitoring and sampling objectives outlined in this sampling plan and for ensuring data quality objectives as established in the Quality Assurance Project Plan (QAPP). Data quality objectives are also summarized in the CAMP. An organization chart of personnel and organizations involved in the Study is included in Figure 4 4. CTEH will be responsible for communicating Study-related information and data as directed by CCL.

Figure 4 4 Organizational Chart for Air Quality Study



7.0 DATA QUALITY OBJECTIVES AND DECISION STATEMENTS

Project and data quality objectives will address the selection of compounds, how compounds are measured, the quality criteria on which the data are screened, and decision-making associated with the air monitoring and sampling data. The objectives for the project and associated data are described below.

Air Monitoring will be conducted to determine if ambient concentrations are detectible in the community and below applicable community exposure guidelines. Exceedances of the community action levels will result in notification to the Field Manager and/or Project Technical Director who will notify the chain of command, as appropriate. Detailed Decision Statements are outlined in the QAPP.

8.0 DATA MANAGEMENT

8.1 Documentation

Data sources and data management processes are described in Table 11.

Table 11 Data Sources and Data Management

DATA SOURCE	DESCRIPTION	PROCESSING INSTRUCTIONS	PROCESSING FREQUENCY	PROCESSING RESPONSIBILITY	STORAGE LOCATION	FINAL OUTPUT
Site Documents	Site Files, Health and Safety Plan, SAP, QAPP	File hard copies and electronic copies in indicated storage location	Beginning of project and as needed	Field Manager	Digital: CTEH Projects Secure Server. Hard Copy: Project secure file	.pdf and other image formats
Field Forms	Sample No., Date, Time, Sampler, Location, Field conditions, COCs, Calibration logs, Leak Checks	File hard copies and electronic copies in indicated storage location	Per sampler, location, equipment, and date	Field Team Lead	Digital: CTEH Projects Secure Server Hard Copy: Project secure file	.pdf and other image formats
Real-time Air Monitoring Data	Instrument data with time, date, and GPS location	Upload into Mobile Data Systems (MDS) software	At least every 10 data logs	Data Manager	CTEH Secure Server	.pdf and other image formats
Laboratory Reports	Data Analysis, Preliminary Results, Final Lab Reports, Lab QC Report	Upload to secure server	As received (within 48 hours)	Data Manager	CTEH Secure Server	.pdf, .csv and other image formats

DATA SOURCE	DESCRIPTION	PROCESSING INSTRUCTIONS	PROCESSING FREQUENCY	PROCESSING RESPONSIBILITY	STORAGE LOCATION	FINAL OUTPUT
Data Validation Reports	Level II and Level IV DV Reports	Upload to secure server	As received (within 48 hours)	Data Manager	CTEH Secure Server	.pdf, .csv and other image formats
Meteorological Data	Wind Speed, Wind Direction, Temperature, RH, Barometric Pressure, Solar Radiation.	Upload to Electronic project folder	Weekly	Field Manager	CTEH Secure Server	.csv, .xlsx, or another tabular format
Geospatial Data Not Directly Associated with Sampling/ Monitoring	Points, lines, polygons associated with conceptual site model.	ArcGIS Pro, ArcGIS Enterprise, QGIS, or other geospatial platform.	As needed	Data Manager	CTEH Secure Server	File geodatabase, shapefile, geotiff, or another spatial format
Other data sources (as requested)						

8.2 Quality Controls

Pressure Checks and Leak Checks

Prior to sample deployment, canisters will undergo a pressure and leak check. For pressure checks, personnel will use a pressure gauge to check the pressure of the evacuated canisters to check that the canisters did not lose any vacuum during transit. Leak checks will also be conducted prior to deployment and entail capping the flow controller (to ensure no air is introduced into the canister) and then attaching the flow controller to the canister, then opening the canister (if not a quick connect). Any detected pressure drop during the leak check indicates potential leaks in the canister's integrity, prompting further investigation or maintenance. Canisters and flow controllers which fail the pressure or leak check will not be used for sample collection and will instead be sent back to the lab for cleaning and further inspection. Leak check durations will be anywhere between 15 minutes and 24 hours.

Sample Chain-of-Custody Forms and Custody Seals

During the sample collection process, samples will be stored in secure areas and CTEH personnel will maintain and document chain of custody (COC). Changes or corrections to the information documented by the COC record (including, but not limited to, field sample ID or requested analyses) must be changed by marking through the incorrect information with a single strikethrough line and dating and initialing the

change. If the request for a change or correction comes from the Field Sampling Personnel after the COC records have been relinquished to the laboratory, a copy of the COC record will be revised, initialed, and forwarded to the laboratory, where the revised version will supersede the original COC record, or the laboratory will be emailed with instructions to add information to the COC, for which the email will provide traceability. This record will be used to document sample custody transfer from the sampler to the laboratory and will become a permanent part of the project file.

Quality Control Samples

Quality control samples for air sampling include field duplicates, and co-located samples. Quality control samples and other measures are described in further detail in the QAPP.

8.2.1 Field Equipment Calibration

Real-time instruments may be calibrated in excess of the manufacturer's recommendations, whenever indicated by site conditions or instrument readings, or at least every 24 hours. Equipment maintenance, handling and calibration details are listed in corresponding reference documents, which are outlined in the QAPP.

Table 12 Quality Assurance/Quality Control Procedures

METHOD	PROCEDURE
Real-time Air Monitoring	• Real-time instruments may be calibrated in excess of the manufacturer's recommendations, whenever indicated by site conditions or instrument readings, or at the start of every 12-hour shift. • Serial numbers for all equipment used in field deployment will be recorded with every reading and logged with each calibration record.
PTR-MS Mobile Monitoring	• Initial multi-point calibration prior to the start of data collection • Daily Review of data and drift/stability checks • Two-Point span checks for BEX and hydrogen sulfide (acceptable if within 20%)
Air Sampling	• Chain of custody documents will be completed for each sample. • Serial numbers or other identifiers for all analytical equipment used in field deployment will be recorded in the sample record. • Co-located and/or duplicate sampling may be collected, to assess accuracy and precision in the field. • Level IV data validation may be performed on the first sample group analyzed. • Level II data validation may be performed on 100% of all samples. • Level IV data validation may be performed on 20% of all samples.

9.0 DATA ANALYSIS AND INTERPRETATION

HBSLs for data comparisons and risk assessment described in the following sections are included in Attachment B.

9.1 Handheld Real-Time Air Monitoring

Handheld real-time air monitoring data has two purposes. First to meet *Objective 1* and characterize VOCs, benzene, and hydrogen sulfide in a wide area surrounding the CCL. Second to inform 1-hour samples placement for characterize potential acute exposures to benzene and other constituents potentially emitted from nearby sources. Short-term 1-hour samples will be used to compare against acute non-cancer screening values, where available, to evaluate acute health hazards in the HHRA in *Objective 2*. Real-time air monitoring data collected during the Study may be reviewed for the frequency of detections observed by field personnel, the mean and maximum concentrations of VOCs, benzene and hydrogen sulfide observed by field personnel, general upwind/downwind trends in, and other analyses yet to be determined. Handheld real-time air monitoring data will also be utilized to make real-time decisions about resource management and relocation if immediate needs are identified at any time (i.e., request additional monitoring if/when multiple detections above action levels are observed).

9.2 PTR-MS Mobile Air Monitoring

The PTR-MS air monitoring data is intended to meet *Objective 1* and characterize multiple target analytes, as detailed in Table 7, above, across two defined neighborhoods (Val Verde and Castaic Junction) surrounding the CCL. Data collected by PTR-MS Mobile Monitoring will be assessed using one-hour rolling averages of measurements recorded while the monitoring van was driving routes through the neighborhoods listed above. These one-hour rolling average values will be compared to appropriate health-based screening values. Priority in selecting HBSLs for acute non-cancer health effects will be given to OEHHA acute RELs as outlined in condition 12(a)iv of the Modified Stipulated Order. If an acute REL is not available for a particular COI, peer-reviewed values from other states that match the 1-hour exposure duration will be utilized, such as the TCEQ AMCVs. PTR-MS Mobile Air Monitoring data will also be utilized to generate geospatial maps and other visual graphs of measured analytes to understand trends in wind direction to help identify potential sources of analytes detected across the communities monitored.

9.3 Short-Term Air Sampling

Data from short-term air samples collected in the communities near CCL will be analyzed as part of the acute non-cancer health hazards in *Objective 2*. Detected concentrations of compounds listed in Table 1 within each sample will be assessed for potential acute non-cancer health effects. In the event of a non-detection for a particular COI, half of the method detection limit (MDL) will be utilized for the analysis. Exposure concentrations within the exposure assessment section of the HHRA will be calculated using

default assumptions provided in the OEHHA Air Toxics Hot Spots Program Risk Assessment Guidelines[6]. For the toxicity assessment portion of the HHRA, HBSLs by which exposure concentrations will be evaluated will be selected using a tiered approach. Priority in selecting HBSLs for acute non-cancer health effects will be given to OEHHA acute RELs as outlined in condition 12(a)iv of the Modified Stipulated Order. If an acute REL is not available for a particular COI, peer-reviewed values from other states that match the 1-hour exposure duration will be utilized, such as the TCEQ AMCVs. If HBSLs for a particular COI are not available from these sources, HBSLs will be chosen from protective action criteria-1 (PAC-1) values from the PAC database, which include values from the USEPA Acute Exposure Guideline Levels (AEGLs), the American Industrial Hygiene Association (AIHA) Emergency Response Planning Guidelines (ERPGs), and the US Department of Energy (DOE) Temporary Emergency Exposure Limits (TEELs). Risk characterization analysis in the HHRA will be conducted using hazard quotient (HQ) and hazard index (HI) as described in OEHHA Air Toxics Hot Spots Risk Assessment Guidelines.

9.4 Continuous, Fixed-Location Air Sampling

Data from continuous, fixed-location air samples collected around CCL will be analyzed as part of the chronic non-cancer health hazards and estimate lifetime individual excess cancer risk in *Objective 2* for the 28-day data collection period. Average concentrations of detected COIs in 24-hour samples will be assessed for potential chronic non-cancer health effects and excess cancer risk estimates within the HHRA at each sampling location. In the event of a non-detection for a particular analyte, half of the MDL will be utilized to calculate averages in the analysis. For the purpose of evaluating incremental risk potentially attributable to the landfill COIs identified in Table 6 will be reviewed, along with sampling data collected at background locations to discern ambient air constituent contribution to cumulative health risk estimates.

Exposure concentrations within the exposure assessment section of the HHRA will be calculated using chronic exposure default assumptions provided in the OEHHA Air Toxics Hot Spots Program Risk Assessment Guidelines. Chronic non-cancer and excess cancer risk exposure concentrations will be calculated following USEPA Air Toxics Risk Assessment Risk Assessment (ATRA) Volume 2[7] and the USEPA Guidance for Superfund (RAGS) Part F[8]. For the toxicity assessment portion of the HHRA, HBSLs by which exposure concentrations will be evaluated will be selected using a tiered approach. Priority in selecting HBSLs for chronic non-cancer health effects will be given to OEHHA chronic RELs and the California

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[6] *Air Toxic Hot Spots Program. Risk Assessment Guidelines. Guidance Manual for Preparation of Health Risk Assessments. OEHHA 2015*

[7] *Air Toxics Risk Assessment Reference Library Volume 2: Facility-Specific Assessment. USEPA 2004*

[8] *Risk Assessment Guidance for Superfund. Volume I: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment) Final. USEPA 2009*

Ambient Air Quality Standards as outlined in condition 12(a)iv of the Modified Stipulated Order. If a chronic REL is not available for a particular COI, HBSLs will be chosen from federal, peer-reviewed values such as reference concentrations (RfCs) from USEPA IRIS, USEPA PPRTVs, or ATSDR MRLs. If HBSLs for a particular COI are not available from these sources, peer-reviewed values from other states may be utilized, such as the TCEQ AMCVs. To estimate excess cancer risks from continuous, fixed-location samples, inhalation unit risk (IUR) values will be obtained from OEHHA for the COIs that the agency assesses as carcinogens. Risk characterization analysis in the HHRA will be conducted using HQ and HI as described in OEHHA Air Toxics Hot Spots Risk Assessment Guidelines, USEPA ATRA Volume 2, and USEPA RAGS Part F. For excess cancer risk estimates, average COI exposure concentrations from each location will be multiplied by the COI IUR to generate lifetime excess cancer risk estimates as described in USEPA ATRA Volume 2 and USEPA RAGS Part F. Results from background sampling locations will be assessed with the same methodology to understand the existing health risks from baseline air quality in the area around CCL. Health risks from background sample locations will also be used to determine the contribution of emissions potentially associated with CCL identified within the samples collected around the landfill.

REVISION HISTORY

DATE	VERSION NUMBER	REASON FOR CHANGE	REVIEW PROCESS	NAME*	SIGNATURE
2/16/2024	1.0	Original Version	Author Reviewer	L.Mahoney P. Sanchez-Soria	
3/1/2024	1.1	A DRAFT version was submitted under v1.0. The version has been updated to DRAFT v1.1 due to incorporate comments from LADPH/ROUX, SCAQMD, numerous updates to content and formatting.	Reviewer Reviewer	L.Mahoney	
3/7/2024	1.2	Updated Pressure and Leak Check section the Plan.	Reviewer	L.Mahoney	

ATTACHMENT A

ODOR SURVEY EVALUATION PROTOCOL

CTEH®

Odor Survey Evaluation Protocol – Chiquita Canyon Landfill

1.0 Study Purpose

This odor survey evaluation protocol is designed to characterize the frequency, strength, hedonic tone, and character of odors in ambient air throughout the Val Verde and Castaic Junction communities surrounding the Chiquita Canyon Landfill (CCL). A secondary objective of this odor study is to assess whether odors, based on their character and location, could be attributable to known sources, by evaluating meteorological data collected concurrent with scentometry field data.

2.0 Background

Ambient odor evaluations present a challenge due to the low concentrations at which certain odors can be detected by the human nose, the complex composition of some odors, and the rapid fluctuation of conditions that can occur over time. Whereas laboratory instrumentation can provide information regarding the concentration of individual compounds (i.e., hydrogen sulfide, mercaptans, ammonia), analytical instrumentation does not provide information regarding the intensity or hedonic tone (offensiveness or pleasantness) of the odors. The human nose, on the other hand, can integrate the odors of hundreds of compounds from a single source to experience them as a unitary odor.

Furthermore, the human nose is the most reliable way to obtain data on odor intensity and tone; thus, human olfactory measurements (i.e., olfactometry) are currently the only reliable, well-established method for sensory quantification, and remain the ultimate determinant for nuisance odor episodes[1] . Olfactometry strategies can be classified into two categories – laboratory based olfactometry, and on-site field olfactometry (scentometry), both of which involve controlling the mixture of odorous air with non-odorous air to achieve known dilutions that can be evaluated by trained technicians (i.e., odor panelists).

Laboratory-based olfactometry offers the benefit of having multiple panelists characterize one sample of air that can be diluted and evaluated in parallel. The major benefit of field scentometry over laboratory-based olfactometry is the ability for trained odor panelists to objectively quantify odor intensity in real-time, offering the ability to characterize a multitude of conditions, scenarios and locations a few minutes apart.

[1] Brandt et al., 2011

Scentometry is established as an accepted methodology to quantify and characterize odors that may contribute to a nuisance. It is recognized in the scientific literature as a useful technique for the assessment of field odors and the evaluation of odor offensiveness downwind of known odorant sources such as animal feeding operations, wastewater treatment plants, industrial pulp and ethanol plants, and others[2][3][4][5][6][7][8]. In addition to its use in the field, scentometry is reported as a technique for comparison of ambient odors in controlled environments[9-10].

Scentometry is a method of measuring odor strength based on the ability to smell the odor after diluting the ambient air with a known concentration of carbon filtered (odorless) air. The amount of carbon filtered air dilutions required before an odor is no longer detectable by an odor panelist is termed the "dilution to threshold" or D/T. The D/T is a unitless ratio calculated as:

$$\frac{D}{T} = \frac{Volume\ of\ filered\ air}{Volume\ of\ odorous\ air}$$

The greater number of dilutions needed before reaching the odor threshold indicates the presence of a stronger odor. Conversely, detection at low dilution (low D/T) indicates a relatively weak odor. Perceived odor strength is often referred to as the odor intensity. Odor intensity will increase as a function of odorant concentration; however, when the concentration of an odorant is increased, the perceived odor intensity will always increase less sharply. This is largely because it takes larger and larger increases in odorant concentrations to maintain a constant increase in perceived odor intensity.

Scentometry was developed in the late 1950s through project grants from the U.S. Public Health Service (Huey et al., 1960).[11] This led to the development of the first Scentometer by the Barnebey-Cheney Company. During the development of scentometry, Huey et al. (1960) established the following odor concentration categories corresponding to dilution to threshold ratios[11]:

[2] Brandt et al., 2011
[3] Dalton et al., 2011
[4] Kosmider and Krajewska, 2007
[5] SRF, 2004
[6] Sheffield et al., 2004
[7] Witherspoon and Barnes, 2004
[8] Zhang et al., 2002
[9] Henry et al., 2011
[10] McGinley and McGinley, 2004
[11] Huey et al., 1960

Dilution to Threshold (D/T)	Odor Concentration Descriptor
2	Noticeable
7	Objectionable
15	Nuisance
31	Nauseating

3.0 Qualifications

Air quality panelists go through training from St. Croix, the manufacturers of the Nasal Ranger instrument. Panelists are trained on how to systematically identify and describe odor character using tools such as an odor wheel. Once training is complete, training certifications are provided for each panelist who has completed the training and has undergone an odor sensitivity test. Their odor sensitivity score is assessed prior to beginning an odor study and maintained on file.

Individuals have varying sensitivity to odors. Some individuals have a low sensitivity whereas others are hypersensitive. The odor sensitivity of the individual odor technicians is assessed with a test kit consisting of 14 odorous and 2 non-odorous pens that contain increasing concentrations of 1-butanol. The odor sensitivity test is conducted in a near odorless room with the test subject blindfolded. The tester presents three different pens to the odor panelist. One of the pens contains a concentration of 1-butanol and the other two pens are blank odorless pens. The tester asks the odor panelist to determine which pen contains the odor of 1-butanol. The presentation of the pens continues in increasing concentration until two positive detections of 1-butanol are identified in two consecutive tests. The odor sensitivity is determined by averaging the sums of each separate test. The concentration of 1-butanol in the pens is directly comparable to the odor panelist's odor sensitivity. A study performed by St. Croix Sensory, Inc. identified that an odor sensitivity score of 7.33 would represent the 50th percentile odor sensitivity in the general population[12].

4.0 Scope of Odor Survey Evaluation

Prior to beginning the odor survey evaluation on March 11, 2024, CTEH will establish a number of locations as pre-defined odor monitoring locations across the Val Verde and Castaic Junction Communities. In addition, odor readings may be collected at locations outside of those preplanned if CTEH odor panelists deem it necessary to characterize an odor event (i.e., strong odors perceived outside of pre-defined locations). These odor readings may be used to further characterize potential sources during the data evaluation phase. Meteorological conditions including temperature, humidity, and wind speed will be

[12] Lay and McGinley, 2004

collected from each location where odor evaluations are conducted. Topographical features of the area along with meteorological conditions will be used to determine locations for odor monitoring.

Odor panelists will follow the preestablished route and visit each of those sites regularly to characterize the frequency, strength, hedonic tone, and character of odors (or absence of odors) in ambient air throughout the day, daily from March 11 – 29, 2024.

5.0 Methods and Procedure

The device intended for the odor survey evaluation around communities near the CCL is the Nasal Ranger, manufactured by St. Croix Sensory, Inc. The Nasal Ranger is an olfactometer that allows an odor panelist to dilute ambient air with non-odorous carbon-filtered air and obtain a dilution to threshold ratio.

Odor measurements will be conducted per St. Croix Sensory protocols for the Nasal Ranger. Odor reading will be recorded at each of the monitoring locations. Odor monitoring readings will be taken as instructed during Nasal Ranger training. Two teams of two odor panelists will be equipped with Nasal Ranger instruments and hand-held weather monitoring equipment. These teams of two will work together and will take independent, simultaneous co-located readings. For each reading, odor monitors will record the following information:

- Date & time
- Location description and GPS
- Odor intensity (D/T dilution)
- Hedonic tone
- Odor group (character, descriptor)
- Meteorological information (temperature, humidity, and wind speed)
- Additional comments (observations, site conditions)

Each day shift will consist of one odor monitoring period of no more than four hours, followed by a two-hour break, and another four-hour period of odor monitoring. A supervisor may also be present as one of the panelists, and/or to oversee odor monitoring activities. Odor evaluations will begin at 7 AM. Monitoring personnel will follow the St. Croix Sensory protocol related to personal conduct, including not wearing scented personal products on the day of monitoring, not eating or drinking anything but water from one hour prior to the beginning of shift until the shift is complete (excluding a lunch break).

Prior to quantifying the odorous air, the panelist will breathe carbon-filtered air through their nose to clear their nasal palette of any odors (referred to as zeroing the nose). If an odor is detected in the ambient air after the nose is zeroed, the panelist will utilize the dilution settings (2, 4, 7, 15, 30, 60) that control the amount of odorous air entering the panelist's nose and six blank carbon filtered positions. The amount of carbon-filtered air required to dilute the odorous air is synonymous with the odor strength for that

measurement. The odor dilution settings on the instrument range from 2 (slightly noticeable odor) to 60 (very strong odor). Collection of an odor concentration measurement involves the following steps:

1. The odor panelist will arrive at a pre-determined location and begin breathing through carbon-filtered air utilizing the Nasal Ranger to clear the nasal palette of any odors and to "zero out" their nose.

2. The odor panelist will place their shoulder into the wind and maintain the Nasal Ranger on their nose, then turn the D/T dial clockwise to the 60-D/T position.

3. The odor panelist will inhale twice at the target inhalation rate of 16 to 20 liters per minute through the nasal mask, as indicated by the instrument. If an odor is detected, the odor concentration is recorded as greater than or equal to 60 D/T (≥60 D/T).

4. If no odor is detected at 60 dilutions, the odor panelist will then proceed to the next blank position and re-zeroes their nose by inhaling carbon-filtered air twice.

5. After re-zeroing their nose, the odor panelist will turn the dial to the 30 D/T position and inhale twice.

6. The odor panelist will continue this sequence of dilutions until an odor is detected. If no odor is detected through the instrument, yet an odor is perceived by the panelist upon removal of the Nasal Ranger® from the nose, the odor strength is recorded as less than 2 D/T (<2 D/T).

7. Upon completion of every odor monitoring event, the odor panelist will record the D/T observed at that location and time, along with GPS coordinates and meteorological information at the time. Comments and photography may be collected by the odor panelists to record additional details if warranted.

8. The panelist will conduct odor readings for a maximum continuous period of four hours, followed by rest at least two hours before resuming additional odor reading sessions.

9. All collected odor readings will undergo quality assurance and quality control checks to ensure accuracy and completeness.

The odor panelist will utilize standardized descriptor terms provided by the instrument manufacturer. This allows for consistency between odor panelists to report odor character. In addition to an odor description, the odor panelist will classify an odor based on its inherent pleasant or unpleasant characteristics. This classification is typically referred to as hedonic tone. This is accomplished by ranking the odor on a numeric scale from -10 (unpleasant odor) to +10 (pleasant odor) with zero being neutral, to classify an odor as pleasant or unpleasant based on the odor panelist's experience.

6.0 Documentation and Reporting

Data collected by the odor panelists will be recorded and stored electronically on secure servers.

ATTACHMENT B

HEALTH-BASED SCREENING LEVELS

Table B.1 – Acute Health-Based Screening Levels

Analyte	CAS	HBSL (ppb)	HBSL Name	Organization
1,1,1-Trichloroethane	71-55-6	12500	Acute REL	OEHHA
1,2,4-Trimethylbenzene	95-63-6	490	Acute REL	OEHHA
1,3,5-Trimethylbenzene	108-67-8	490	Acute REL	OEHHA
1,3-Butadiene	106-99-0	297	Acute REL	OEHHA
1,4-Dioxane	123-91-1	800	Acute REL	OEHHA
2-Butanone (MEK)	78-93-3	4500	Acute REL	OEHHA
Acrolein	107-02-8	1.1	Acute REL	OEHHA
Benzene	71-43-2	8	Acute REL	OEHHA
Benzyl Chloride	100-44-7	46	Acute REL	OEHHA
Bromomethane	74-83-9	1000	Acute REL	OEHHA
Carbon Disulfide	75-15-0	2000	Acute REL	OEHHA
Carbon Tetrachloride	56-23-5	300	Acute REL	OEHHA
Chloroform	67-66-3	30	Acute REL	OEHHA
Isopropyl alcohol	67-63-0	1300	Acute REL	OEHHA
Methylene chloride	75-09-2	4000	Acute REL	OEHHA
Styrene	100-42-5	5100	Acute REL	OEHHA
Tetrachloroethylene (PCE)	127-18-4	2900	Acute REL	OEHHA
Toluene	108-88-3	1300	Acute REL	OEHHA
Vinyl chloride	75-01-4	72000	Acute REL	OEHHA
Xylenes, Total	1330-20-7	5000	Acute REL	OEHHA
Carbon Disulfide	75-15-0	2000	Acute REL	OEHHA
Hydrogen Sulfide	7783-06-4	30	Acute REL	OEHHA
Carbonyl sulfide	463-58-1	270	Acute REL	OEHHA
1,1,2,2-Tetrachloroethane	79-34-5	10	Short-Term AMCV	TCEQ
1,1,2-Trichloroethane	79-00-5	100	Short-Term AMCV	TCEQ
1,1-Dichloroethane	75-34-3	1000	Short-Term AMCV	TCEQ
1,1-Dichloroethylene	75-35-4	180	Short-Term AMCV	TCEQ
1,2-Dibromoethane (EDB)	106-93-4	66	Short-Term AMCV	TCEQ
1,2-Dichloroethane	107-06-2	540	Short-Term AMCV	TCEQ
1,2-Dichloropropane	78-87-5	100	Short-Term AMCV	TCEQ
1-Ethyl-4-methyl benzene	622-96-8	250	Short-Term AMCV	TCEQ
2-Hexanone (MBK)	591-78-6	10	Short-Term AMCV	TCEQ
4-Methyl-2-pentanone (MIBK)	108-10-1	200	Short-Term AMCV	TCEQ
Acetone	67-64-1	11000	Short-Term AMCV	TCEQ
Chlorobenzene	108-90-7	100	Short-Term AMCV	TCEQ
Chloromethane	74-87-3	500	Short-Term AMCV	TCEQ
cis-1,3-Dichloropropene	10061-01-5	9.9	Short-Term AMCV	TCEQ
Cyclohexane	110-82-7	1000	Short-Term AMCV	TCEQ
Dichlorodifluoromethane	75-71-8	10000	Short-Term AMCV	TCEQ
Ethyl acetate	141-78-6	4000	Short-Term AMCV	TCEQ
Ethylbenzene	100-41-4	20000	Short-Term AMCV	TCEQ
Heptane	142-82-5	8300	Short-Term AMCV	TCEQ
Hexane	110-54-3	5400	Short-Term AMCV	TCEQ
Isooctane	540-84-1	4100	Short-Term AMCV	TCEQ
Isopropylbenzene	98-82-8	510	Short-Term AMCV	TCEQ

m+p-Xylenes	179601-23-1	1700	Short-Term AMCV	TCEQ
Methyl-t-butyl ether (MTBE)	1634-04-4	500	Short-Term AMCV	TCEQ
Naphthalene	91-20-3	95	Short-Term AMCV	TCEQ
n-Butane (C4)	106-97-8	92000	Short-Term AMCV	TCEQ
n-Nonane (C9)	111-84-2	3000	Short-Term AMCV	TCEQ
n-Propylbenzene	103-65-1	510	Short-Term AMCV	TCEQ
o-Xylene	95-47-6	1700	Short-Term AMCV	TCEQ
n-Pentane (C5)	109-66-0	68000	Short-Term AMCV	TCEQ
Propylene	115-07-1	Simple Asphyxiant	Short-Term AMCV	TCEQ
TBA	75-65-0	4900	Short-Term AMCV	TCEQ
trans-1,3-Dichloropropene	10061-02-6	9.9	Short-Term AMCV	TCEQ
Trichloroethylene	79-01-6	100	Short-Term AMCV	TCEQ
Trichlorofluoromethane	75-69-4	10000	Short-Term AMCV	TCEQ
1,4-Dichlorobenzene	106-46-7	30000	PAC-1	No Technical Basis
Chloroethane	75-00-3	300000	PAC-1	No Technical Basis
trans-1,2-Dichloroethylene	156-60-5	280000	AEGL-1	USEPA
Vinyl acetate	108-05-4	6700	AEGL-1	USEPA
1,1-Difluoroethane	75-37-6	10000000	ERPG-1	AIHA
1,1,1,2-Tetrachloroethane	630-20-6	1500	TEEL-1	DOE
1,1,2-Trichloro-1,2,2-trifluoroethane	76-13-1	1250000	TEEL-1	DOE
1,2,4-Trichlorobenzene	120-82-1	450	PAC-1	No Technical Basis
1,2-Dichlorobenzene	95-50-1	50000	PAC-1	No Technical Basis
1,2-Dichlorotetrafluoroethane	76-14-2	3000000	PAC-1	No Technical Basis
1,3-Dichlorobenzene	541-73-1	6000	PAC-1	No Technical Basis
2-Chlorotoluene	95-49-8	75000	PAC-1	No Technical Basis
Allyl chloride	107-05-1	2800	AEGL-1	USEPA
Bromodichloromethane	75-27-4	190	TEEL-1	DOE
Bromoform	75-25-2	1500	PAC-1	No Technical Basis
cis-1,2-Dichloroethylene	156-59-2	140000	AEGL-1	USEPA
Dibromochloromethane	124-48-1	130	PAC-1	No Technical Basis
Ethanol	64-17-5	1800000	ERPG-1	AIHA
Hexachlorobutadiene	87-68-3	1000	ERPG-1	AIHA
Methyl methacrylate	80-62-6	17000	AEGL-1	USEPA
Tetrahydrofuran	109-99-9	100000	ERPG-1	AIHA
Vinyl bromide	593-60-2	39000	TEEL-1	DOE
1-Propanethiol	107-03-9	45	PAC-1	No Technical Basis
Dimethyl sulfide	75-18-3	500	ERPG-1	AIHA
Ethyl mercaptan	75-08-1	1000	AEGL-1	USEPA
Methyl mercaptan	74-93-1	5	ERPG-1	AIHA
Dimethyl disulfide	624-92-0	10	ERPG-1	AIHA
2-Propanethiol	75-33-2	NE	NE	NE

Table B.2 – Chronic Health-Based Screening Levels

Analyte	CAS	HBSL (ppb)	HBSL Name	Organization
1,1,1-Trichloroethane	71-55-6	200	Chronic REL	OEHHA
1,1-Dichloroethylene	75-35-4	20	Chronic REL	OEHHA
1,2,4-Trimethylbenzene	95-63-6	1	Chronic REL	OEHHA
1,2-Dibromoethane (EDB)	106-93-4	0.1	Chronic REL	OEHHA
1,2-Dichloroethane	107-06-2	100	Chronic REL	OEHHA
1,3,5-Trimethylbenzene	108-67-8	1	Chronic REL	OEHHA
1,3-Butadiene	106-99-0	1	Chronic REL	OEHHA
1,4-Dichlorobenzene	106-46-7	100	Chronic REL	OEHHA
1,4-Dioxane	123-91-1	800	Chronic REL	OEHHA
Acrolein	107-02-8	0.15	Chronic REL	OEHHA
Benzene	71-43-2	1	Chronic REL	OEHHA
Bromomethane	74-83-9	1	Chronic REL	OEHHA
Carbon Disulfide	75-15-0	300	Chronic REL	OEHHA
Carbon Tetrachloride	56-23-5	6	Chronic REL	OEHHA
Chlorobenzene	108-90-7	300	Chronic REL	OEHHA
Chloroethane	75-00-3	10000	Chronic REL	OEHHA
Chloroform	67-66-3	50	Chronic REL	OEHHA
Ethylbenzene	100-41-4	400	Chronic REL	OEHHA
Hexane	110-54-3	2000	Chronic REL	OEHHA
Isopropyl alcohol	67-63-0	3000	Chronic REL	OEHHA
Methylene chloride	75-09-2	100	Chronic REL	OEHHA
Methyl-t-butyl ether (MTBE)	1634-04-4	2000	Chronic REL	OEHHA
Naphthalene	91-20-3	2	Chronic REL	OEHHA
Propylene	115-07-1	2000	Chronic REL	OEHHA
Styrene	100-42-5	200	Chronic REL	OEHHA
Tetrachloroethylene (PCE)	127-18-4	5	Chronic REL	OEHHA
Toluene	108-88-3	110	Chronic REL	OEHHA
Trichloroethylene	79-01-6	100	Chronic REL	OEHHA
Vinyl acetate	108-05-4	50	Chronic REL	OEHHA
Xylenes, Total	1330-20-7	200	Chronic REL	OEHHA
Carbon Disulfide	75-15-0	300	Chronic REL	OEHHA
Hydrogen Sulfide	7783-06-4	8	Chronic REL	OEHHA
Carbonyl sulfide	463-58-1	4	Chronic REL	OEHHA
1,1-Difluoroethane	75-37-6	14810.00	IRIS RfC	USEPA
1,2-Dichloropropane	78-87-5	0.87	IRIS RfC	USEPA
2-Butanone (MEK)	78-93-3	1695.33	IRIS RfC	USEPA
2-Hexanone (MBK)	591-78-6	7.32	IRIS RfC	USEPA
4-Methyl-2-pentanone (MIBK)	108-10-1	732.33	IRIS RfC	USEPA
Allyl chloride	107-05-1	0.32	IRIS RfC	USEPA
Chloromethane	74-87-3	43.58	IRIS RfC	USEPA
Cyclohexane	110-82-7	1743.11	IRIS RfC	USEPA
Isopropylbenzene	98-82-8	81.37	IRIS RfC	USEPA
Methyl methacrylate	80-62-6	170.94	IRIS RfC	USEPA
TBA	75-65-0	1649.35	IRIS RfC	USEPA
Tetrahydrofuran	109-99-9	678.13	IRIS RfC	USEPA
Vinyl bromide	593-60-2	0.69	IRIS RfC	USEPA

Vinyl chloride	75-01-4	39.12	IRIS RfC	USEPA
1,1,2-Trichloro-1,2,2-trifluoroethane	76-13-1	652.45	PPRTV RfC	USEPA
1,2,4-Trichlorobenzene	120-82-1	0.27	PPRTV RfC	USEPA
Benzyl Chloride	100-44-7	0.19	PPRTV RfC	USEPA
cis-1,2-Dichloroethylene	156-59-2	10.09	PPRTV RfC	USEPA
Ethyl acetate	141-78-6	19.42	PPRTV RfC	USEPA
Heptane	142-82-5	97.60	PPRTV RfC	USEPA
n-Nonane (C9)	111-84-2	3.81	PPRTV RfC	USEPA
n-Pentane (C5)	109-66-0	338.88	PPRTV RfC	USEPA
trans-1,2-Dichloroethylene	156-60-5	10.09	PPRTV RfC	USEPA
o-Xylene	95-47-6	50	Chronic MRL	ATSDR
1,1,2,2-Tetrachloroethane	79-34-5	1	Long-Term AMCV	TCEQ
1,1,2-Trichloroethane	79-00-5	10	Long-Term AMCV	TCEQ
1,1-Dichloroethane	75-34-3	100	Long-Term AMCV	TCEQ
1-Ethyl-4-methyl benzene	622-96-8	25	Long-Term AMCV	TCEQ
Acetone	67-64-1	6700	Long-Term AMCV	TCEQ
cis-1,3-Dichloropropene	10061-01-5	0.99	Long-Term AMCV	TCEQ
Dichlorodifluoromethane	75-71-8	1000	Long-Term AMCV	TCEQ
Isooctane	540-84-1	380	Long-Term AMCV	TCEQ
m+p-Xylenes	179601-23-1	140	Long-Term AMCV	TCEQ
n-Butane (C4)	106-97-8	10000	Long-Term AMCV	TCEQ
n-Propylbenzene	103-65-1	51	Long-Term AMCV	TCEQ
trans-1,3-Dichloropropene	10061-02-6	0.99	Long-Term AMCV	TCEQ
Trichlorofluoromethane	75-69-4	1000	Long-Term AMCV	TCEQ
1,1,1,2-Tetrachloroethane	630-20-6	NE	NE	NE
1,2-Dichlorobenzene	95-50-1	NE	NE	NE
1,2-Dichlorotetrafluoroethane	76-14-2	NE	NE	NE
1,3-Dichlorobenzene	541-73-1	NE	NE	NE
2-Chlorotoluene	95-49-8	NE	NE	NE
Bromodichloromethane	75-27-4	NE	NE	NE
Bromoform	75-25-2	NE	NE	NE
Dibromochloromethane	124-48-1	NE	NE	NE
Ethanol	64-17-5	NE	NE	NE
Hexachlorobutadiene	87-68-3	NE	NE	NE
1-Propanethiol	107-03-9	NE	NE	NE
2-Propanethiol	75-33-2	NE	NE	NE
Dimethyl sulfide	75-18-3	NE	NE	NE
Ethyl mercaptan	75-08-1	NE	NE	NE
Methyl mercaptan	74-93-1	NE	NE	NE
Dimethyl disulfide	624-92-0	NE	NE	NE

Table B.3 – Inhalation Unit Risk Values for Excess Cancer Risk Evaluation

Analyte	CAS	OEHHA IUR
1,1,2,2-Tetrachloroethane	79-34-5	5.8 E-5
1,1-Dichloroethane	75-34-3	1.6 E-6
1,2-Dibromoethane (EDB)	106-93-4	7.1 E-5
1,2-Dichloroethane	107-06-2	2.1 E-5
1,2-Dichloropropane	78-87-5	1.0 E-5
1,3-Butadiene	106-99-0	1.7 E-4
1,4-Dichlorobenzene	106-46-7	1.1 E-5
1,4-Dioxane	123-91-1	7.7 E-6
Allyl chloride	107-05-1	6.0 E-6
Benzene	71-43-2	2.9 E-5
Benzyl Chloride	100-44-7	4.9 E-5
Bromodichloromethane	75-27-4	3.7 E-5
Carbon Tetrachloride	56-23-5	4.2 E-5
Chloroform	67-66-3	5.3 E-6
Ethylbenzene	100-41-4	2.5 E-6
Methylene chloride	75-09-2	1.0 E-6
Methyl-t-butyl ether (MTBE)	1634-04-4	2.6 E-7
Naphthalene	91-20-3	3.4 E-5
Tetrachloroethylene (PCE)	127-18-4	6.1 E-6
Trichloroethylene	79-01-6	2.0 E-6
Vinyl chloride	75-01-4	7.8 E-5

EXHIBIT B

CHIQUITA CANYON LANDFILL

28-DAY AIR QUALITY STUDY

QUALITY ASSURANCE PROJECT PLAN

DRAFT Version 1.2

Prepared on Behalf of:
Chiquita Canyon, LLC

Prepared By:
CTEH, LLC
5120 Northshore Drive
Little Rock, AR 72118
501-801-8500

March 2024

QAPP WORKSHEET #1 AND #2: TITLE AND APPROVAL PAGE

Site Name:	Chiquita Canyon Landfill
Project Name:	28-Day Air Quality Study
CTEH Project Number:	PROJ-036688
Site Location:	Castaic, California

This Quality Assurance Project Plan (QAPP) refers to the Air Monitoring and Sampling Plan for the 28-Day Air Quality Study that is being conducted by CTEH to help address the Modified Stipulated Order (Condition 12(g)(vi)), which requires Chiquita Canyon Landfill[1] (CCL or Landfill) to produce a report evaluating the potential health impacts associated with exposure to increased landfill gas and fugitive emissions, including hydrogen sulfide (H_2S) and other speciated sulfur compounds, and hazardous air pollutants (HAPs) potentially emitted from the Landfill (i.e., detected in landfill gas from flux chamber studies or stack emission testing, in liquids or leachate samples, in air sampling performed to detect emissions from exposed liquids/leachate, and in the community).

The main objective of this air sampling study is to generate data that would be used to conduct an exposure assessment of potential chemical stressors for characterizing incremental impact human health risks during the ongoing subsurface reactions causing offsite impacts at CCL.

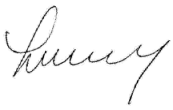
This QAPP was prepared in accordance with the "Guidance for Quality Assurance Project Plans (US EPA QA/G-5)" (EPA/240/R-02/009; December 2002), "EPA Requirements for Quality Assurance Project Plans (EPA QA/R-5)" (EPA 240/B-01/003; March 2001, reissued May 2006), and "Uniform Federal Policy for Quality Assurance Project Plans" (Parts 1-3 EPA-505-B-04-900A-900C; March 2005).

Organizational Stakeholders and Connections

ORGANIZATIONAL STAKEHOLDERS
Chiquita Canyon, LLC
South Coast Air Quality Management District (SCAQMD)
Los Angeles Department of Public Health (LADPH)

[1] Chiquita Canyon Landfill is operated by Chiquita Canyon, LLC.

APPROVAL PAGE

	Name/Organization	Signature	Date Signed
Prepared by:	Lourdes Mahoney/QA Project Manager/CTEH		3/7/2024
Approved by:			
Approved by:			
Approved by:			
Approved by:			

CHANGE MANAGEMENT

The purpose of this section is to document revisions, additions, and/or addendums made to the approved QAPP. Descriptions of the changes with section and page numbers are detailed below along with the reasons for the revision where appropriate. Amendments to the QAPP may be made in the following circumstances: when new information is presented; specific chemicals or parameters of interest are added or eliminated; site conditions change; activities change, are initiated, or ceased; or when the project moves into a new phase. After revisions are adopted, the QAPP's revision number and revision date are updated. The title page of subsequent versions of the QAPP will include the revision number, revision date, and original approval date. The template for incorporating revisions is provided below.

Change 001		
Description of Change: DRAFT version submitted for comments under v1.0. Incorporated comments from LPDPH/Roux Associates. Updating version to DRAFT v2.0 WORKING DOCUMENT due to numerous updates.		
	Name/Position	Date Signed
Prepared By:	Lourdes Mahoney/QA Project Manager	3/1/2024
Approved By:		
Change 002		
Description of Change: Updated file name from 1.1 to match the cover page of 1.2 and saved a version. Updated this versions title page and file name to 1.2. Updated headers to V1.2 from V1.1. On page 40 updated header to "V1.2" from "Preliminary Draft v1.1". On page 10, removed "above instrument detection limits" from row 2 under the Investigative question and ACTION columns third item in the cell and replace it with "of 5ppm".		
	Name/Position	Date Signed
Prepared By:	Lourdes Mahoney/QA Project Manager	3/5/2024
Approved By:		
Change 003		
Description of Change:		
	Name/Position	Date Signed
Prepared By:		
Approved By:		

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF ACRONYMS AND ABBREVIATIONS

ATSDR	Agency for Toxic Substances and Disease Registry
CA	Corrective Action
CCV	Continuing Calibration Verification
COC	Chain of Custody
COI	Compound of Interest
CSM	Conceptual Site Model
CTEH	Center for Toxicology and Environmental Health, LLC
DMDS	Dimethyl disulfide
DQI	Data Quality Indicator
DQO	Data Quality Objective
EDD	Electronic Data Deliverable
FB	Field Blank
GC	Gas Chromatograph
GIS	Geographic Information System
GPS	Global Positioning System
ICAL	Initial Calibration
ICV	Initial Calibration Verification
LCS	Laboratory Control Sample
LIMS	Laboratory Information Management Systems
LOD	Limit of Detection
LOQ	Limit of Quantitation
MB	Method Blank
MDL	Method Detection Limit
MPC	Measurement Performance Criteria
MS/MSD	Matrix Spike/Matrix Spike Duplicate
PDF	Portable Document Format
PID	Photoionization Detector
PM	Project Manager
PT	Proficiency Testing (previously known as performance evaluation (PE) sample)
PTR-MS	Proton Transfer Reaction-Mass Spectrometry
QA	Quality Assurance
QAPP	Quality Assurance Project Plan
QC	Quality Control

LIST OF ACRONYMS AND ABBREVIATIONS

QL	Quantitation Limit
QS	Quality System
QSM	Quality Systems Manual
RPD	Relative Percent Difference
RSD	Relative Standard Deviation
RT	Retention Time
SAP	Sampling and Analysis Plan
SCAQMD	South Coast Air Quality Management District
SD	Standard Deviation
SDG	Sample Delivery Group
SOP	Standard Operating Procedure
SQLs	Sample Quantitation Limits
SRM	Standard Reference Material
TBD	To Be Determined
TIC	Tentatively Identified Compound
TNI	The NELAC Institute
TOF	Time-of-flight
TRS	Total Reduced Sulfur
UFP	Uniform Federal Policy
USEPA	United States Environmental Protection Agency
VOC	Volatile Organic Compounds

INTRODUCTION

CTEH®, LLC was engaged to address sections 12(g)(vi) for the *Findings and Decision for a Modified Stipulated Order for Abatement* and provide a public health expert to sit on the Reaction Committee and deliver a health impacts report to assess potential off-site impacts from the ongoing subsurface reaction at CCL. This plan describes the study design, air sampling plan, and analysis plan for collected data to complete this report. Field work, data collection, and data analysis will be conducted in accordance with this Plan and the associated Quality Assurance Project Plan (QAPP).

This section summarizes the overall objectives and scope of the study. Details regarding monitoring and sampling, compounds of interest (COIs), methods, and locations are summarized in the Air Monitoring and Sampling Plan and in this QAPP.

Objective 1. Data Collection and Evaluation: Design and conduct an air monitoring and sampling study to produce data of sufficient and known quality for use in a report of health impacts that includes a Human Health Risk Assessment (HHRA). The main objective of the air sampling study is to quantify temporal and spatial patterns in ambient air throughout nearby communities of COIs that may be released from the CCL .An evaluation of concentrations of COIs across the proposed locations, including background locations, will be conducted to assess whether the CCL has a measurable contribution to ambient air levels of COIs. Findings from this HHRA may be used to guide risk reduction measures as well as to identify future air quality evaluation needs, if any, beyond those in place or intended for implementation by the CCL.

Objective 2. Conduct an HHRA: The scope of this HHRA will include the characterization of health risks due to acute, long-term and cumulative exposure to ambient air Volatile Organic Compounds (VOCs) with established[2] toxicity values, as well as a characterization of incremental risk from identified COIs potentially associated with emissions from CCL. Health risks from acute and chronic exposure durations will be evaluated, including:

1. Assessment of acute non-cancer health hazards.
2. Assessment of chronic non-cancer health hazards.
3. Estimates of lifetime individual excess cancer risks from exposure to ambient air, including a characterization of incremental risk potentially attributable to COIs emitted from CCL.

Further description of the HHRA methods is included in the Air Monitoring and Sampling Plan.

Objective 3. An Odor Survey Evaluation: An Odor Survey Evaluation will be conducted to characterize frequency, strength, hedonic tone, and character of odors in ambient air throughout communities surrounding the CCL. The odor survey will be conducted at defined locations to characterize odor experience across the community. Details of this evaluation are in development

[2] Including those set by the State of California, USEPA, ATSDR or other State health agencies.

and will be described in detail in an Appendix to the Air Monitoring and Sampling Plan, which will be completed within a week of starting.

The study finding will be compiled in a report of Health Impacts by August 1, 2024, to fulfill condition 12(g)vi of the Modified Stipulated Order. Findings from this study will inform improvements to existing and future air monitoring strategies, if any are warranted.

CTEH will implement four broadly defined air monitoring and sampling strategies:

1. Roaming, handheld, real-time air monitoring;
2. Proton Transfer Reaction-Mass Spectrometry (PTR-MS) mobile monitoring;
3. Short-term 1-hour analytical air sampling; and
4. Continuous 24-hour fixed analytical air sampling.

Monitoring and sampling will be performed over a 28-day period for this study. Each strategy is designed to collect a specific data set to answer specific components in the Health Impact Assessment.

QAPP WORKSHEET #3 & 5: PROJECT ORGANIZATION AND QAPP DISTRIBUTION

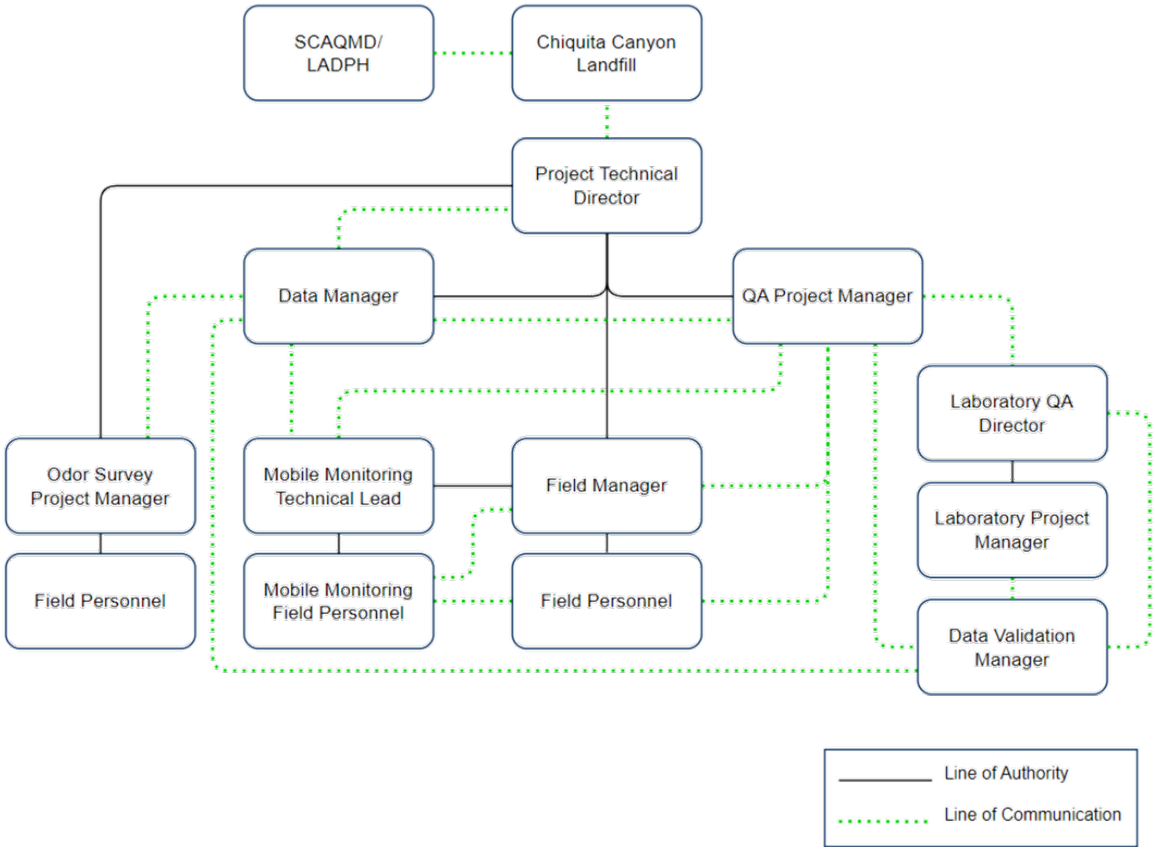
This QAPP and future revisions will be distributed to key personnel at each organization listed below.

RECIPIENTS	TITLE	ORGANIZATION	PROJECT ROLE
Pablo Sanchez-Soria, PhD, CIH	Senior Toxicologist	CTEH	Project Technical Director
Lourdes Mahoney, CHMM	Senior Quality Program Manager	CTEH	QA Project Manager
Cassandra Smythe	Consultant	CTEH	Field Manager
Eric Callahan	IT Project Manager	CTEH	Data Manager
Ginny Thrasher	Laboratory Project Manager-Richmond	Enthalpy – Richmond	Laboratory Project Manager
Mandy Mishra	Laboratory Director	Enthalpy – Richmond	Laboratory Director
Paul Mariani	QA Director	Enthalpy – Richmond	QA Director
John Goyette	Laboratory Project Manager-Orange	Enthalpy – Orange	Laboratory Project Manager
Patricia Caines	Laboratory Director	Enthalpy – Orange	Laboratory Director
Linda Scharpenberg	QA Director	Enthalpy – Orange	QA Director
Dana Hebert	Data Validation Project Manager	eQAQC	Data Validation Manager
Steven Yuchs, PhD	Mobile Monitoring Specialist	Montrose Environmental Group	Mobile Monitoring Technical Lead
Steve Cassulo	District Manager	Chiquita Canyon, LLC	Primary Contact for Chiquita Canyon, LLC

QAPP WORKSHEETS #5 & 6: PROJECT ORGANIZATIONAL CHART AND COMMUNICATIONS PATHWAYS

Project organization relative to the QAPP implementation is presented in Figure 1. Figure 1 further identifies lines of authority and lines of communication within the QA Program structure.

Figure 1 Organizational Chart and Communication Pathways for Air Quality Study



QAPP WORKSHEET #4 & 8: KEY PROJECT PERSONNEL QUALIFICATIONS

All CTEH personnel, including key personnel and field personnel, have received training to be qualified for their specific project tasks and functions. Training records including field personnel safety training records, certifications, licenses, and some task-specific training completions are stored on CTEH secure servers. Personnel are trained using instrument-specific and task-specific standard operating procedures (SOPs) referenced in Worksheet #21. No further specialized training has been identified for this Study.

QAPP WORKSHEET #7: PROJECT ROLES AND RESPONSIBILITIES

A description of project roles and responsibilities for air quality study personnel is provided below.

PROJECT ROLE	RESPONSIBILITIES
Project Technical Director (PTD)	The PTD is the primary point of contact for the project team. The PTD is responsible for developing and coordinating the study design. The PTD implements and communicates monitoring plans, identifies, and recommends action levels and communicates data to appropriate parties. Reviews and provides data summaries and reports.
Field Manager	The Field Manager plans, schedules, coordinates, and oversees field sampling activities. The Field Manager reviews field documentation to verify compliance with the QAPP and SAP. The Field Manager is the primary contact in the field and is responsible for communicating issues identified during field activities. The Field Manager is also responsible for coordinating performance audits of field activities during data collection to assess the procedures and performance of the Field Personnel relative to the project requirements.
Field Personnel	Field Personnel are responsible for the performance of field activities as required by the QAPP and 28-Day Air Monitoring and Sampling Plan. Field Personnel document compliance with project requirements by recording field activities and observations in a field logbook at the time of the activity or observation. In addition, Field Personnel are responsible for collecting samples, submitting them to laboratories, and maintaining COC Records.
Laboratory Project Manager (Laboratory PM)	The Laboratory PMs are the primary point of contact for the project team at the analytical laboratory. The Laboratory PMs are responsible for reviewing project plans and communicating requirements to laboratory personnel; receiving analytical requests; identifying laboratory facilities with appropriate capacity and capability (including certification, where required) to analyze samples collected under this QAPP and 28-Day Air Monitoring and Sampling Plan. Laboratory PMs are responsible for scheduling bottleware orders; communicating issues observed upon sample receipt; tracking and communicating data reporting status; and reviewing and submitting deliverables.
Laboratory QA Director	The Laboratory QA Director ensures analytical work is conducted in accordance with this QAPP, referenced analytical methods, and the laboratory quality system. The Laboratory QA Director is responsible for reviewing analytical data; investigating and responding to data inquiries; conducting corrective action investigations for nonconformances; preparing status reports and reports documenting completion of corrective actions; and overall administration of the laboratory QA program. The Laboratory QA Director is responsible for reviewing the QAPP and associated project plans to confirm QC requirements are met.
QA Project Manager	The QA PM is responsible for developing, implementing, administering, and monitoring compliance with the project QA program as defined in this QAPP. The QA PM holds overall authority for the project QA and maintains that authority independently from the operational/production aspects of the project. The QA PM prepares and updates the QAPP; initiates and directs internal observations of quality-related activities; directs the performance of QA functions described in this QAPP; requests corrective action for nonconformances; and ensures corrective actions are effective. The QA PM also acts as an advisor in coordinating laboratory analytical work and may act as a liaison between Field Manager and analytical laboratories. The QA PM is responsible for communicating issues related to environmental data quality to the project team.
Data Validation Manager	The Data Validation Manager is responsible for ensuring analytical data are evaluated for completeness, correctness, compliance, and usability relative to the requirements in this QAPP, the 28-Day Air Monitoring and Sampling Plan, and the published analytical methods. The Data Validation

PROJECT ROLE	RESPONSIBILITIES
	Manager is responsible for scheduling, tracking, and providing data status updates to project data users. The Data Validation Manager is responsible for reviewing and submitting data validation reports and for communicating data usability issues to data users. The Data Validation Manager is responsible for notifying the QA PM of potential analytical issues observed during data validation for investigation and corrective action where warranted.
Data Manager	Data Managers are responsible for managing the project databases, which include field- and laboratory-generated analytical data and associated metadata. Data Managers are the main point of contact for data-related issues and data reporting needs. Data Managers are responsible for ensuring compliance with the QAPP. Data Managers oversee receipt and loading of electronic data deliverables from the field personnel and project laboratories; coordinates production data validation efforts with the Data Validation Manager; defines valid values and similar controls for the database; and coordinates delivery of data to regulatory agencies and data users. Data Managers are responsible for communicating data status and potential data management issues.
Mobile Monitoring Technical Lead and Mobile Monitoring Field Personnel	The Mobile Monitoring Technical Lead plans, schedules, coordinates, and oversees field activities. The Mobile Monitoring Technical Lead reviews field documentation to verify compliance with the QAPP and SAP. The Mobile Monitoring Technical Lead is the primary contact in the field for the PTR-MS unit and is responsible for communicating issues identified during field activities. The Mobile Monitoring Technical Lead is also responsible for coordinating performance audits of field activities during data collection to assess the procedures and performance of the Field Personnel relative to the project requirements.
Odor Team	TBD

QAPP WORKSHEET #9: PROJECT PLANNING SESSION SUMMARY

Project Name:	PROJ-036688 – Chiquita Canyon Landfill – CTEH Air Quality Study		
Projected Date(s) of Sampling:	February 2024	Site Location:	Castaic, CA

Meeting Title	Date	Participants	Key Decisions/Action Items
Kickoff and DQO Planning	1/31/2024	PTD, QA PM, Field Manager	Review of Objectives, Study Design and Task Delegation.
Progress Check-in	2/7/2024	PTD, QA PM, Field Manager	Review of progress and action plan
Progress Check-In	2/12/2024	PTD, QA PM, Field Manager	Review of 28-Day Air Monitoring and Sampling Plan and QAPP progress
Review of QAPP and SAP	2/29/2024	PTD, QA PM, Field Manager	Incorporating comments from LADPH
Review of QAPP and SAP	3/5/2024	PTD, QA PM, Field Manager	Review updates to QAPP

QAPP WORKSHEET #10: PROBLEM DEFINITION

Chiquita Canyon Landfill is a municipal solid waste landfill located in Castaic, California, in the northwestern portion of Los Angeles County, owned and operated by Chiquita Canyon, LLC (Chiquita). The CCL operates within the South Coast Air Quality Management District's (SCAQMD) jurisdiction under various operating permits issued by the SCAQMD. CCL also operates under a Conditional Use Permit (CUP) issued by the County of Los Angeles Department of Regional Planning.

From January 2023 to January 2024, SCAQMD received over 2,500 odor complaints identifying CCL as a potential source of those odors. On September 6, 2023, the SCAQMD Hearing Board adopted a Stipulated Order for Abatement, which required that Chiquita to implement various measures to mitigate an ongoing subsurface reaction at CCL, which has resulted in increased landfill gas and fugitive emissions. On January 17, 2024, the SCAQMD Hearing Board issued a modified version of the September 6, 2023 order (Modified Order). The Modified Order (Condition 12(g)(vi)) requires CCL produce a report evaluating the potential health impacts associated with exposure to such emissions, including hydrogen sulfide (H2S) and other speciated sulfur compounds, and hazardous air pollutants (HAPs) potentially emitted from the Landfill (i.e., detected in landfill gas from flux chamber studies or stack emission testing, in liquids or leachate samples, in air sampling performed to detect emissions from exposed liquids/leachate, and in the community).

The main objective of this air sampling study is to generate data that can be used to conduct a health impact analysis related to exposure to hydrogen sulfide and other hazardous air pollutants (HAPs) identified as compounds of interest (COIs) to characterize the potential for acute and chronic human health risks.

QAPP WORKSHEET #11-A: PROJECT DATA QUALITY OBJECTIVES

CTEH will collect air quality data in communities surrounding CCL through four broadly defined strategies. First, CTEH air monitoring personnel will conduct roaming, real-time air monitoring using handheld air monitoring instruments. Second, a mobile monitoring van equipped with proton transfer reaction-mass spectrometry (PTR-MS) equipment will drive pre-defined routes through communities surrounding CCL collecting high-resolution PTR-MS data. Third, short-term air sampling using evacuated canisters will be collected if CTEH air monitoring personnel observe sustained detections above site-specific action levels on handheld air monitoring equipment. Fourth, continuous 24-hour air sampling using evacuated canisters will be conducted in fixed locations surrounding CCL. Air monitoring and sampling will be conducted for COIs that may be associated with emissions from the Landfill.

Air samples will be compared to the applicable screening values in Worksheet #15. Data collected under the 28-Day Air Monitoring and Sampling Plan may be utilized as secondary/existing data once risk levels/action levels are determined, provided data are sufficiently sensitive to meet the objectives of the 28-Day Air Monitoring and Sampling Plan and QAPP. For the purpose of the Study, data will be focused on achieving sufficient sensitivity to meet applicable screening values and other data usability objectives outlined in this QAPP. The following section outlines the project-specific Data Quality Objectives (DQOs) and investigative questions that will focus CTEH air sampling and monitoring efforts to produce comparable data and provide guidance for stakeholders and onsite decision making. DQOs are broken out into four broadly defined strategies:

1. Roaming, handheld, real-time air monitoring;
2. PTR-MS mobile monitoring;
3. Short-Term Air Sampling; and
4. Continuous Fixed Air Sampling

COMMUNITY HANDHELD REAL-TIME AIR MONITORING DATA QUALITY OBJECTIVES

Handheld real-time air monitoring for VOCs, benzene, and hydrogen sulfide used as screening tools to detect the presence or absence of these parameters to record data. These readings are not used for broader decision-making for public health, as instantaneous real-time readings are not directly comparable to health-based screening levels (i.e., OEHHA REL, ATSDR MRL, or TCEQ AMCV) and are not used to make definitive risk-based decisions regarding public safety and/or exposure. If VOCs readings are detected above 5 parts per million (ppm) using real-time instrumentation and sustained for five (5) minutes or more, then an additional assessment at that location will be performed. Efforts will be made to characterize VOCs spatially and temporally and continue to monitor the area. Benzene-specific monitoring will also be performed. Refer to Table 1 for DQOs and actions taken for community real-time monitoring using hand-held instrumentation while roaming in the neighboring communities.

Table 1 Community Real-Time Air Monitoring using Hand-Held Instruments Data Quality Objectives

PARAMETER	DECISION STATEMENT #	INVESTIGATIVE QUESTION	ACTION
VOCs via 10.6 eV Photoionization Detector (PID)	1	Is roaming real-time air monitoring for **VOCs** in the community non-detect (i.e., below the instrument's limit of detection)?	If real-time air monitoring results indicate that VOCs are not detected at one location (i.e., below the instrument's limit of detection (LOD)), monitoring will continue, and the person will resume roaming air monitoring for VOCs.
	2	Is there a detection of **VOCs** above 5 ppm via roaming real-time air monitoring in the community?	If real-time air monitoring results indicate that VOCs are detected, then environmental conditions will be documented and assessed (i.e., visible dust, high traffic, smoke from fire or cigarettes). Personnel will stay in the area and continue monitoring to further characterize the area for at least another 5 minutes to determine if detections of VOCs are transient and intermittent or sustained. If VOC detections of 5ppm are sustained for 5 minutes or longer, air monitoring personnel will monitor for benzene specifically to determine the absence or presence of benzene above the instrument LOD (0.01 ppm or 10 ppb). See Decision Statement #3. Field personnel will relay their findings to the Field Manager and/or PTD, immediately.

PARAMETER	DECISION STATEMENT #	INVESTIGATIVE QUESTION	ACTION
Benzene via 9.8eV PID	3	After verifying a sustained (> 5 minutes) detection of VOCs with a PID, is the roaming real-time air monitoring for **benzene** in the community non-detect (i.e., below the instrument's LOD)?	If air monitoring results for benzene are non-detect (< 10ppb) in response to detections of VOCs, then it will be determined that benzene is not present above the instrument's limit of detection. Air monitoring for benzene will then continue for at least 15 minutes if VOC detections continue.
	4	Is there a detection of **benzene** via roaming real-time air monitoring in the community above the instrument's LOD?	If air monitoring results for benzene in response to VOC detections (above the instrument's LOD), the air monitoring personnel will continue monitoring and will record a second benzene measurement (at minimum) at the same location within fifteen (15) minutes of the initial benzene detection to evaluate whether the detection is transient or sustained. If the second benzene measurement recorded within fifteen (15) minutes of a benzene detection at the same location results in another benzene detection, a one (1)-hour air sample will be collected via evacuated canister for analysis. One (1)-hour canister sampling will be conducted no more than twice per day in each community. SEE SHORT-TERM AIR SAMPLING, Decision Statement #10. If air monitoring personnel determine that the detection of benzene is due to ambient sources unrelated to Landfill operations, the personnel will document accordingly and continue with their community air monitoring roaming route. Field personnel will relay their findings to the Field Manager and PTD.
Hydrogen sulfide (H_2S) via MultiRAE sensor	5	Is roaming real-time air monitoring for **H_2S** in the community non-detect (i.e., below the instrument's LOD)?	If air monitoring results for H_2S are non-detect, monitoring will continue and personnel will resume roaming air monitoring.
	6	Is there a detection of **H_2S** via roaming real-time air monitoring in the community above the instrument's LOD?	If air monitoring results for H_2S are detected above the instrument's LOD, the air monitoring personnel will continue monitoring to evaluate whether the detection is transient or sustained (at least 5 minutes).
	7	Is there a detection of **H_2S** via roaming real-time air monitoring in the community above the instrument's LOD and continues to be sustained?	If air monitoring results for H_2S are detected above the instrument's LOD, the air monitoring personnel will continue monitoring and will record a second H_2S measurement at the same location within fifteen (15) minutes of the first H_2S detection to evaluate whether the detection is transient or sustained. If real-time air monitoring results indicate that H_2S is detected, then environmental conditions will be documented and assessed (i.e., visible dust, high traffic, smoke from fire or cigarettes).

PARAMETER	DECISION STATEMENT #	INVESTIGATIVE QUESTION	ACTION
			Once documentation is complete, the personnel will continue with their air monitoring route. Field personnel will relay their findings to the Field Manager and/or PTD, immediately.

MOBILE MONITORING UNIT DATA QUALITY OBJECTIVES

A PTR-MS Mobile Monitoring vehicle will be used to evaluate a subset of the COIs selected using existing data sources along with additional equipment-specific considerations. These considerations include the calibration capabilities of the equipment and the equipment operating mode that allows for continuous data collection. The PTR-MS Mobile Monitoring vehicle will operate approximately 8-hours per day in the communities near the Landfill. An updated map of the PTR-MS monitoring route.

Table 2 Mobile Monitoring Unit Data Quality Objectives

DECISION STATEMENT #	INVESTIGATIVE QUESTION	ACTION
8	Are all analytes being reported by the mobile monitoring units in the community non-detect (i.e., below the instrument's limit of detection)?	If mobile air monitoring results indicate that analytes are not detected (i.e., below the instrument's LOD) for all analytes, mobile air monitoring will continue.
9	Are there detections of analytes by the mobile monitoring units in the community?	If there are detections of analytes in the community by the mobile monitoring unit, Mobile Monitoring Field Personnel will inform the Field Manager of findings.

SHORT-TERM AIR SAMPLING DATA QUALITY OBJECTIVES

Short-term air sampling will be conducted in coordination with handheld real-time air monitoring. Short-term air samples will be deployed when a benzene action level exceedance is observed by real-time air monitoring personnel. Following an action level exceedance, a 1-hour evacuated canister sample will be collected at that location. Results from these samples will be compared against 1-hour health-based screening levels where available. A maximum of two 1-hour samples will be collected per community (e.g., Val Verde), per day.

Table 3 Short-Term Air Sampling Data Quality Objectives

ANALYTE	DECISION STATEMENT #	INVESTIGATIVE QUESTION	ACTION
VOCs, Sulfurs and DMDS via USEPA TO-15	10	Are the laboratory results for the evacuated canisters non-detect (i.e., below the LOD) for COIs?	Community air sampling will continue for the duration of the 28-day study.
	11	Are the laboratory results for the evacuated canisters at or above acute screening levels for COIs?	A retrospective assessment of the sampling location, weather conditions, and landfill activities will be performed to assess potential causes of the exceedance. Results will be compared against acute health-protective screening values such as the OEHHA Acute RELs.

COMMUNITY AIR SAMPLING DATA QUALITY OBJECTIVES

Consecutive 24-hour air samples will be deployed at eleven fixed-locations in the communities surrounding the Landfill. Air sampling will consist of 24-hour continuous sampling using 6-L evacuated canisters over the course of 28 days. Of the eleven fixed locations, two will be considered background sample locations (AS10 and AS11). Daily meteorological conditions will be recorded.

Table 4 Community Sampling Data Quality Objectives

ANALYTE	DECISION STATEMENT #	INVESTIGATIVE QUESTION	ACTION
VOCs via USEPA TO-15 SIM, Sulfurs and DMDS via USEPA TO-15	12	Are the laboratory results for the evacuated canisters non-detect (i.e., below the LOD) for COIs?	Continuous 24-hour air sampling will continue the duration of the 28-day study.
	13	Are the laboratory results for the evacuated canisters at or above screening levels for any COIs?	A retrospective assessment of the sampling location, weather conditions, and landfill activities will be performed to assess potential causes of the exceedance. Results will be compared against intermediate and/or chronic health-protective screening values such as the OEHHA Chronic RELs, USEPA IRIS, PPRTVs, or ATSDR MRLs, where available.

ODOR SURVEY EVALUATION DATA QUALITY OBJECTIVES

PLACEHOLDER FOR ODOR SURVEY EVALUATION DETAILS TO BE DETERMINED

Table 5 Odor Survey Evaluation Data Quality Objectives

ANALYTE	DECISION STATEMENT #	INVESTIGATIVE QUESTION	ACTION

QAPP WORKSHEET #30- ANALYSES AND LABORATORY CONTACTS

Samples will be submitted to the analytical laboratories identified in Table 6 for analysis in accordance with the SAP.

Table 6 Analyses and Laboratory Contacts

SAMPLING TYPE	MATRIX	ANALYSIS METHOD	LABORATORY	CONTACT
1-hour, Short -Term Air Samples	6L, Evacuated canisters	VOCs via USEPA TO-15 Sulfurs and DMDS via USEPA TO-15	Enthalpy Analytical- Richmond 1941 Reymet Rd Richmond, VA 23237	Ginny Thrasher
24-hour Air Samples	6L, Evacuated canisters	VOCs via USEPA TO-15 Selective Ion Monitoring (SIM) method	Enthalpy Analytical- Orange 931 W. Barkley Avenue Orange, CA 92868	John Goyette
		Sulfurs and DMDS via USEPA TO-15	Enthalpy Analytical- Richmond 1941 Reymet Rd Richmond, VA 23237	Ginny Thrasher

QAPP WORKSHEET #12-A: MEASUREMENT PERFORMANCE CRITERIA

Table 7 Measurement Performance Criteria– Field QC Samples for Air

QC SAMPLE	ANALYTICAL GROUP	FREQUENCY	DATA QUALITY INDICATORS (DQIS)	DESCRIPTION AND DETAIL	MEASUREMENT PERFORMANCE CRITERIA*
Field Duplicate	Air (evacuated canisters)	One per 10 field samples, or 10% of samples	Precision	Precision is determined from the analyzed concentrations of samples collected simultaneously from the same air mass using two discrete canisters collected through the same sampling inlet	If both the original and duplicate results are ≥ 5× LOQ, the RPD should be ≤ 30% for air samples; preferrable ≤ 25%
Field Co-located	Air (evacuated canisters)	One per 10 field samples, when duplicate is not possible	Precision	Precision is determined from the analyzed concentrations of samples collected simultaneously from the same air mass using two discrete canisters collected through two separate sampling inlets; this determines the precision of the sampling and analysis processes.	If both the original and co-located results are ≥ 5× LOQ, the RPD should be ≤ 30% for air samples; preferrable ≤ 25% or RPD listed in Worksheet #28.3-A.
Field Spikes	Air (evacuated canisters)	Not Performed	N/A	N/A	N/A
Field Blanks	Air (evacuated canisters)	Not Performed	N/A	N/A	N/A

Table 8 Measurement Performance Criteria for Evacuated Canisters for VOCs in Air (EPA Method TO-15)

DQIs	MEASUREMENT PERFORMANCE CRITERIA	QC SAMPLE AND/OR ACTIVITY USED TO ASSESS MEASUREMENT PERFORMANCE	FREQUENCY	ERROR ASSESSED BY QC SAMPLE*
Completeness	≥ 95%	% Complete = $\frac{usable\ results}{results\ reported} \times 100\%$	-	S&A
Sensitivity	LOD for non-detect results are less than Project-Required Quantitation Limits (PRQL)	Evaluate laboratory LOD and LOQ	-	A
Accuracy, bias, contamination	No analytes detected > ½ LOQ or > 1/10th the amount measured in any sample or 1/10th the regulatory limit, whichever is greater	Method Blank	Initially, every 24 hours	A
Accuracy, bias	≤ 30 %	Continuing Calibration Verification (CCV)	Initially, every 24 hours	A
Instrument performance	Tune criteria consistent with analytical method	Mass spectrometer tuning	Initially, every 24 hours	A
Sensitivity, accuracy, bias	Recoveries within 60% to 140% of ICAL midpoint standard area or the CCV on days when ICAL is not performed	Internal standards	Every field sample and QC sample, added prior to analysis	A
Precision	Relative percent difference (RPD) must be ≤ 25% or as specified in Worksheet #28.3-A.	Laboratory duplicate	One per batch of 20 samples	A

Notes: Evacuated canisters analyzed for VOCs via EPA Method TO-15
Sampling (S), Analytical (A), or Both (S&A)
LOQ = Limit of quantitation
RL = reporting limit
MB = method blank
CCV= continuing calibration verification

Table 9 Measurement Performance Criteria for Mobile Monitoring Unit†

DATA QUALITY INDICATOR(S)	MEASUREMENT PERFORMANCE CRITERIA	QC SAMPLE AND/OR ACTIVITY USED TO ASSESS MEASUREMENT PERFORMANCE	FREQUENCY	ERROR ASSESSED BY QC SAMPLE*
Completeness	≥ 95%	% Complete = $\frac{usable\ results}{results\ reported} \times 100\%$	-	S&A
Sensitivity	Reporting Limits (RL) for non-detect results are less than quantitation limits (QLs)	Evaluate LOQ	-	A
Accuracy, bias, and sensitivity	Within ±20%	Continuing Calibration Verification (CCV)	Check performed daily, before daily sampling	A

† This includes the PTR-MS mobile monitoring vehicle
* S = Sampling; A = Analysis; S&A = Both Sampling and Analysis

QAPP WORKSHEET #13: SECONDARY DATA USES AND LIMITATIONS

Only definitive data of known quality will be utilized in assessing risk. Examples of secondary data that may be used to inform project decisions are provided in the table below.

SECONDARY DATA	DATA SOURCE	DATA GENERATOR(S)	HOW DATA WILL BE USED	LIMITATIONS ON DATA USE
Stack Testing Data, Laboratory Reports, other community air sampling	CCL and CCL subcontractors	CCL and SCS Engineers	To continuously evaluate selected COIs and monitoring and sampling strategy for air quality study	Used to determine COIs, but not used directly in risk assessment/ evaluation of health impacts
Weather Conditions	Meteorological Stations (third party)	Third Party Generators (NOAA, etc.)	Review weather conditions and forecasts; Anticipate wind direction	General weather prediction limitations
Weather Conditions	CCL weather station	CCL	Review weather conditions and forecasts; Anticipate wind direction	General weather prediction limitations

QAPP WORKSHEET #14-A AND #16-A: PROJECT TASKS & SCHEDULE

Sampling and analysis schedules for the air quality study are provided in the SAP.

Table 10 Project Tasks & Schedule

CONTRACTOR	ACTIVITY	DATES/DURATION	DELIVERABLE/FREQUENCY
CTEH	Community Air monitoring (Handheld Real-time and Mobile Monitoring) and Sampling (Short-term and continuous sampling)	28 days (March 2024)	Final Report (by August 1, 2024)
CTEH	PTR-MS Mobile Monitoring	28 days (March 2024)	PTR-MS Summary Report;
Enthalpy	Sample Analysis	As received. (approx. 3 day TAT)	Laboratory Reports/ Data packages as received
eQAQC	Data Validation	As received, following receipt of final laboratory deliverables	Data Validation Reports
CTEH	Data Analysis and Risk Assessment		by August 1, 2024

QAPP WORKSHEET #15-A AND 28.3-A: LABORATORY-SPECIFIC REPORTING LIMITS, QUANTITATION LIMITS AND QUALITY CONTROL LIMITS

Laboratory-specific reporting and quantitation limits will be maintained and accessible to regulatory agencies on the Secure CTEH Servers or upon request.

Analytical accuracy and precision goals are also presented below. Laboratory-generated statistically derived control limits are used to assess accuracy and precision for some methods; these limits are periodically updated by the laboratory.

Table 11 LODs for VOCs by EPA Method TO-15 for 1-Hour Canisters

Analyte	LOD (ppbv)
1-Ethyl-4-methyl benzene	0.50
1,1-Dichloroethane	0.50
1,1-Dichloroethylene	0.50
1,1,1-Trichloroethane	0.50
1,1,1,2-Tetrachloroethane	0.50
1,1,2-Trichloro-1,2,2-trifluoroethane	0.50
1,1,2-Trichloroethane	0.50
1,1,2,2-Tetrachloroethane	0.50
1,2-Dibromoethane (EDB)	0.50
1,2-Dichlorobenzene	0.50
1,2-Dichloroethane	0.50
1,2-Dichloropropane	0.50
1,2-Dichlorotetrafluoroethane	0.50
1,2,4-Trichlorobenzene	0.50
1,2,4-Trimethylbenzene	0.50
1,3-Butadiene	0.50
1,3-Dichlorobenzene	0.50
1,3,5-Trimethylbenzene	0.50
1,4-Dichlorobenzene	0.50
1,4-Dioxane	0.50
2-Butanone (MEK)	0.50
2-Chlorotoluene	0.50
2-Hexanone (MBK)	0.50
4-Methyl-2-pentanone (MIBK)	0.50
Acetone	0.50
Acrolein	0.50
Allyl chloride	0.50
Benzene	0.50
Benzyl Chloride	0.50
Bromodichloromethane	0.50
Bromoform	0.50
Bromomethane	0.50
Carbon Disulfide	0.50
Carbon Tetrachloride	0.50
Chlorobenzene	0.50
Chloroethane	0.50
Chloroform	0.50
Chloromethane	0.50
cis-1,2-Dichloroethylene	0.50
cis-1,3-Dichloropropene	0.50
Cyclohexane	0.50

Dibromochloromethane	0.50
Dichlorodifluoromethane	0.50
Ethanol	0.50
Ethyl acetate	0.50
Ethylbenzene	0.50
Heptane	0.50
Hexachlorobutadiene	0.50
Hexane	0.50
Isooctane	0.50
Isopropanol (IPA)	0.50
m,p-Xylenes	1.00
Methyl methacrylate	0.50
Methyl-t-butyl ether (MTBE)	0.50
Methylene chloride	1.00
n-Butane (C4)	0.50
n-Nonane (C9)	0.50
n-Pentane (C5)	0.50
n-Propylbenzene	0.50
Naphthalene	0.50
o-Xylene	0.50
Propylene	1.00
Styrene	0.50
TBA	0.50
Tetrachloroethylene (PCE)	0.50
Tetrahydrofuran	0.50
Toluene	0.50
trans-1,2-Dichloroethylene	0.50
trans-1,3-Dichloropropene	0.50
Trichloroethylene	0.50
Trichlorofluoromethane	0.50
Vinyl acetate	0.50
Vinyl bromide	0.50
Vinyl chloride	0.50
Xylene (total)	1.50

Table 12 LODs for VOCs by EPA Method TO-15 SIM for 24-Hour Canisters

Analyte	LOD (ppbv)
1,1-Dichloroethane	0.01
1,1-Dichloroethylene	0.01
1,1-Difluoroethane	1.00
1,1,1-Trichloroethane	0.01
1,1,1,2-Tetrachloroethane	0.01
1,1,2-Trichloroethane	0.01
1,1,2,2-Tetrachloroethane	0.01
1,2-Dibromoethane (EDB)	0.01
1,2-Dichlorobenzene	0.01
1,2-Dichloroethane	0.01
1,2-Dichloropropane	0.01
1,2,4-Trichlorobenzene	0.01
1,2,4-Trimethylbenzene	0.01
1,3-Dichlorobenzene	0.01
1,3,5-Trimethylbenzene	0.01

1,4-Dichlorobenzene	0.01
2-Butanone (MEK)	1.00
2-Chlorotoluene	0.01
2-Hexanone (MBK)	0.50
4-Ethyltoluene	0.20
4-Methyl-2-pentanone (MIBK)	0.20
Acetone	1.00
Benzene	0.01
Benzyl Chloride	0.01
Bromodichloromethane	0.01
Bromoform	0.01
Bromomethane	0.01
Carbon Disulfide	0.20
Carbon Tetrachloride	0.01
Chlorobenzene	0.01
Chloroethane	0.01
Chloroform	0.01
Chloromethane	0.10
cis-1,2-Dichloroethylene	0.01
cis-1,3-Dichloropropene	0.01
Dibromochloromethane	0.01
Ethylbenzene	0.01
Freon 113	0.01
Freon 114	0.01
Freon 12	0.01
Hexachlorobutadiene	0.01
Isopropanol (IPA)	1.00
m,p-Xylenes	0.01
Methyl-t-butyl ether (MTBE)	0.20
Methylene chloride	0.02
n-Hexane	0.20
o-Xylene	0.01
Styrene	0.01
Tetrachloroethylene (PCE)	0.01
Toluene	0.01
trans-1,2-Dichloroethylene	0.01
trans-1,3-Dichloropropene	0.01
Trichloroethylene	0.01
Trichlorofluoromethane	0.01
Vinyl acetate	1.00
Vinyl bromide	0.01
Vinyl chloride	0.01
Xylene (total)	0.20

Table 13 Reporting Limits, LODs and Quality Control Limits for Sulfurs by EPA Method TO-15, Wet in Air

Analyte	CAS No.	LOD (ppb)	Reporting Limit	Surrogate %Rec	Duplicate RPD	LCS %Rec	LCS RPD
Carbon Disulfide	75-15-0	10.0	10.0 ppbv		25	70-130	25
Hydrogen Sulfide	7783-06-4	10.0	10.0 ppbv		25	70-130	25
1-Propanethiol	107-03-9	10.0	10.0 ppbv		25	70-130	25
2-Propanethiol	75-33-2	10.0	10.0 ppbv		25	70-130	25
Carbonyl sulfide	463-58-1	10.0	10.0 ppbv		25	70-130	25
Dimethyl sulfide	75-18-3	10.0	10.0 ppbv		25	70-130	25
Ethyl mercaptan	75-08-1	10.0	10.0 ppbv		25	70-130	25
Methyl mercaptan	74-93-1	10.0	10.0 ppbv		25	70-130	25
Total Reduced Sulfurs	NA						
Surr: 1,4-Difluorobenzene (Surr)	540-36-3			80-120	25		25
I.S.: Bromochloromethane (IS)	74-97-5				25		25

Table 14 Reporting Limits, LODs and Quality Control Limits for Dimethyl disulfide by EPA Method TO-15

Analyte	CAS No.	LOD (ppb)	Reporting Limit	Surrogate %Rec	Duplicate RPD	LCS %Rec	LCS RPD
Dimethyl disulfide	624-92-0	10.0	10.0 ppbv		25	70-130	25
Surr: 1,4-Difluorobenzene (Surr)	540-36-3			80-120	25		25
I.S.: Bromochloromethane (IS)	74-97-5				25		25

QAPP WORKSHEETS #17-A: SAMPLING DESIGN AND RATIONALE

The complete sampling design and rationale for the 28-Day Air Monitoring and Sampling Plan is included in the 28-Day Air Monitoring and Sampling Plan for the Air Quality Study. The 28-Day Air Monitoring and Sampling Plan focuses on characterizing air with respect to COIs, determining whether COIs are present in the air surrounding community and, if present, determining if the concentrations of COIs present in the air pose a risk to human health. This characterization will be accomplished through a multilayered air monitoring and air sampling approach in community areas surrounding the Landfill. The specific objectives are: (1) to evaluate the presence of COIs in air; (2) if detected in air, to evaluate the concentrations of COIs in air; (3) to compare the concentrations of COIs in air to California Office of Environmental Health Hazard Assessment (OEHHA) Recommended Exposure Limits (RELs), Agency for Toxic Substances and Disease Registry (ATSDR) Minimal Risk Levels (MRLs), USEPA Regional Screening Levels (RSLs), and/or Texas Commission on Environmental Quality (TCEQ) Air Monitoring Comparison Values (AMCVs), as appropriate; (4) to record observations of activities and potential alternative sources of COIs unrelated to Landfill activities to determine “background” levels; and (5) to report on health impacts from potential ongoing and long-term exposure. All results will be provided to CCL for sharing with appropriate parties to make data-driven decisions.

For the sample design, data collected will be focused on achieving sufficient sensitivity required to assess any exceedances of project-specific action levels and screening values protective of human health. Sampling locations were chosen to be biased towards sensitive receptors and nearest residences of CCL for air sampling. Eleven fixed locations will be utilized for consecutive samples, two of which will be classified as background (AS10 and AS11). These locations are subject to change as needed to meet the objectives of the study.

QAPP WORKSHEETS #18-A: SAMPLING LOCATIONS AND METHODS

In addition to handheld real-time air monitoring, 24-hour analytical air sampling will be conducted by collecting air samples in evacuated canisters, which will subsequently be sent off-site for laboratory analysis. Air samples will be collected at eleven near target communities and/or near sensitive receptors, including neighborhoods and public facilities (e.g., schools, parks). Additional fixed air sampling locations may be established in areas that contain sensitive receptors.

Short-term (1-hour) air samples will also be collected as needed in conjunction with handheld real-time air monitoring for benzene. These short-term air samples will be collected in locations where benzene is detected as outlined in the 28-Day Air Monitoring and Sampling Plan and data quality objectives (DQO)s. Results of air samples are provided in lab reports and in electronic data deliverables (EDDs) by which results will be uploaded to the project database.

QAPP WORKSHEET #19-A AND #30-A: SAMPLE CONTAINERS, PRESERVATION, AND HOLD TIMES

Table 15 Sample Containers, Preservation, And Hold Times

MATRIX	ANALYTICAL GROUP	ANALYTICAL METHOD	CONTAINERS OR MEDIA	PRESERVATION REQUIREMENTS	MAXIMUM HOLDING TIME[1]
Air (Evacuated canisters)	Selected VOCs	EPA Method TO-15 and SIM	Evacuated canister (individually certified)	None	Collection to Preparation: 30 days;
	TRS			None	17 days
	DMDS			None	17 days

Notes:

[1] Maximum holding time is calculated from the time the sample is collected to the time the sample is prepared/extracted.

QAPP WORKSHEET #20-A: FIELD QUALITY CONTROL SUMMARY

Table 16 Field Quality Control Summary

MATRIX	ANALYTICAL GROUP	NO. OF DUPLICATE OR CO-LOCATED SAMPLES	NO. OF MS/MSDS	NO. OF FIELD BLANKS	NO. OF TRIP BLANKS
Air (Evacuated canisters)	VOCs, TRS, DMDS	Duplicate or co-located at 1/10 samples	N/A	N/A	N/A

QAPP WORKSHEETS #21-A: FIELD SAMPLING SOP REFERENCES

Table 17 CTEH Sops, Technical Notes and Manufacturer References

TITLE	DESCRIPTION	LOCATION
Evacuated Canister Air Sampling and Management SOP (includes evacuated canisters of all sizes)	Outlines process for equipment checks, deployment, troubleshooting, documentation, sample pick up and shipping for analysis.	CTEH SharePoint

QAPP WORKSHEETS #22-A: FIELD EQUIPMENT CALIBRATION, MAINTENANCE, TESTING, AND INSPECTION

The project-specific equipment details are outlined in the 28-Day Air Monitoring and Sampling Plan and a list of CTEH SOPs and manufacturer references is provided below. CTEH personnel will use equipment listed below or an equivalent with similar detection limits and sensitivity.

Table 18 Standard Operating Procedures and Equipment References

TITLE	DESCRIPTION	LOCATION
MultiRAE w/10.6 eV PID	CTEH SOP that outlines equipment use, maintenance, calibration, data collection and storage.	CTEH SharePoint
UltraRAE 3000 SOP v2.0	CTEH SOP that outlines equipment use, maintenance, calibration, data collection and storage.	CTEH SharePoint
Evacuated Canister Sampling and Sample Management	Describes all of sample management, inspection, leak checks, deployment and pick-up, record management	CTEH SharePoint
KestrelMet® 6000 Cellular Weather Station Instruction Manual	CTEH SOP that outlines equipment use, maintenance, calibration, data collection and storage.	CTEH SharePoint
PTR-MS Mobile Laboratory	Outlines equipment use, maintenance, calibration, data collection and storage.	CTEH SharePoint
PTR-MS Data Processing	Outlines data collection, storage and processing procedures.	CTEH SharePoint

QAPP WORKSHEET #23-A: ANALYTICAL SOPS

A listing of analytical laboratory SOPs associated with anticipated analytical work is provided below. Laboratory SOPs are available for regulatory review upon request. Additional SOPs may be required as project needs evolve and/or additional laboratories are utilized.

ORGANIZATION PERFORMING ANALYSIS	LAB SOP NUMBER	TITLE REVISION	DEFINITIVE	DESCRIPTION	INSTRUMENT
Enthalpy Analytical-Richmond	D3540	TO-15 by GCMS	Definitive	Air (Evacuated Canisters) for VOCs	GCMS
Enthalpy Analytical-Orange	B-0015, Revision 5	TO-15 SIM	Definitive	Air (Evacuated Canisters) for VOCs	GCMS
Enthalpy Analytical-Richmond	D3560	Sulfur Compounds by GCMS	Definitive	Air (Evacuated Canisters) for Sulfur Compounds	GCMS

QAPP WORKSHEET #24-A: ANALYTICAL INSTRUMENT CALIBRATION

INSTRUMENT	CALIBRATION PROCEDURE	FREQUENCY OF CALIBRATION	ACCEPTANCE CRITERIA	CORRECTIVE ACTION	PERSON RESPONSIBLE FOR CA*	SOP REFERENCE
GC/MS	ICAL Multipoint calibration	At instrument setup; prior to sample analysis	Each analyte must meet on of the three options listed: percent relative standard deviation (%RSD) for each analyte ≤ 30%; linear regression for each analyte: $r^2 \geq 0.99$; non-linear regression (quadratic): $r^2 \geq 0.99$.	Correct problem, then repeat ICAL.	Analyst/ Supervisor	D3540, B-0015, Revision 5, and D3560
GC/MS	ICV	Daily before samples are analyzed	± 30 % of True Value	Correct problem, Rerun ICV. If reanalysis fails, repeat ICAL.	Analyst/ Supervisor	D3540, B-0015, Revision 5, and D3560
GC/MS	CCV	Before sample analysis, after every 10 samples and at the end of the analytical sequence	Initial CCV ± 30% of True Value	Perform instrument maintenance; recalibrate if necessary	Analyst/ Supervisor	D3540, B-0015, Revision 5, and D3560
GC/MS	Calibration Blanks (ICB/CCB)	Immediately after every CCV	The absolute values of all analytes must be < ½ the LOQ or < $1/10^{th}$ the amount measured in any sample.	Rinse and reanalyze once. All samples following the last acceptable Calibration Blank must be reanalyzed.	Analyst/ Supervisor	D3540, B-0015, Revision 5, and D3560
GC/MS	Tune	Prior to ICAL or field sample analysis	Specific ion abundance criteria of BFB from method.	Retune instrument and verify.	Analyst/ Supervisor	D3540, B-0015, Revision 5, and D3560

Notes: The analyst initiates the corrective action, and the Laboratory QA Director and analyst are responsible for the corrective action.
*CA = Corrective Action

QAPP WORKSHEET #25-A: ANALYTICAL INSTRUMENT AND EQUIPMENT MAINTENANCE, TESTING, AND INSPECTION

INSTRUMENT/ EQUIPMENT	MAINTENANCE ACTIVITY	TESTING/INSPECTION ACTIVITY	FREQUENCY	ACCEPTANCE CRITERIA	CORRECTIVE ACTION	RESPONSIBLE PERSON	SOP REFERENCE
GC/MS	Change Septum, clip column, clean/replace detector, clean injection port liners, etc.	QC samples performed before, during and with each analytical batch	As needed to meet method criteria	See SOP	Perform maintenance; recalibrate instrument	Laboratory QA Director / Analyst [1]	D3540, B-0015, Revision 5, and D3560

Notes:
[1] The analyst initiates the corrective action, and the Laboratory QA Director and analyst are responsible for the corrective action.

QAPP WORKSHEET #26 AND #27: SAMPLE HANDLING, CUSTODY, AND DISPOSAL

The purpose of sample custody procedures is to document the history of samples from the time of sample collection through shipment and sample receipt, analysis, and disposal. A sample is considered to be in one's custody if one of the following conditions applies:

- The sample is in an individual's actual possession;
- The sample is in view after being in an individual's physical possession;
- The sample is in possession of a sampling manager or coordinator within CTEH;
- The sample was in the physical possession of an investigator and then they secured it to prevent tampering; and/or
- The sample is placed in a designated secure area.

Each individual field sampler is responsible for the care and custody of the samples they collect until the samples are properly transferred to temporary storage or are shipped to the laboratory.

Changes or corrections to the information documented by the chain-of-custody (COC) record (including, but not limited to, field sample ID or requested analyses) must be changed by marking through the incorrect information with a single strike through line and dating and initialing the change. If the request for a change or correction comes from the Field Personnel after the COC Records have been relinquished to the laboratory, a copy of the COC Record will be revised, initialed, and forwarded to the laboratory, where the revised version will supersede the original COC Record, or the laboratory will be emailed with instructions to add information to the COC, and the email will provide traceability. This record will be used to document sample custody transfer from the sampler to the laboratory and will become a permanent part of the Project File. To ensure sample and data integrity, a proper sample handling system will be followed from the start of sample collection through sample disposal. Information on sample containers, preservation, and holding times is provided in QAPP Worksheet #19-A and #30-A.

Sample labeling and nomenclature will follow guidance based on the CTEH Environmental Sample Nomenclature. In general, sample IDs will contain 12 characters, with characters 10, 14, 15, and 16 optional. Sample IDs will contain no spaces; all zeros will contain lines and a strikethrough on the letter.

Table 19 Sample Nomenclature Description

CHARACTER	DESCRIPTION	EXAMPLE
1, 2, 3, 4	Four Character Site Prefix (City, State or Client Specific Prefix)	NELA or NOLA for New Orleans, Louisiana KETX for Kemah, Texas AWWU for Acme Widget West Unit
5, 6, 7, 8	Two Digit Month and Two Digit Day	0615 for June 15 20230615 or 06152023 if it is a long-term project with the possibility of spanning multiple years
9, 10	Matrix Code and Sample Types	Examples below
11, 12, 13	Two- or three-digit serial ID*	01-99 or could possibly be a three-digit code as in 001-999
14+	QC Sample Code	QC Sample Code, sequential replicate code (A-Z) or sample depth

* Field teams may use a two- or three-digit serial ID. If using a two-digit serial ID, then 13+ will be used for QC sample codes. If using a three-digit sample code, then 14+ will be used for QC sample codes.

Matrix Codes and Sample Types*

Examples:

CL – Co-located
D – Duplicate

Duplicates will not be submitted as blind samples to the laboratory unless stated on the chain-of-custody (COC) record. This is done so the laboratory can provide %D or %RPD values and report the duplicate as a QC sample. Samples suspected to contain high concentrations of contaminants will be indicated on the COC to prevent damage to laboratory equipment. Changes or corrections to the information documented by the COC record (including, but not limited to, field sample ID or requested analyses) must be changed by marking through the incorrect information with a single strikethrough line and dating and initialing the change. If the request for a change or correction comes from the Field Personnel after the COC records have been relinquished to the laboratory, a copy of the COC record will be revised, initialed, and forwarded to the laboratory, where the revised version will supersede the original COC record, or the laboratory will be emailed with instructions to add information to the COC, for which the email will provide traceability. This record will be used to document sample custody transfer from the sampler to the laboratory and will become a permanent part of the project files.

Air monitoring and sampling field logs, notebooks, photographs, and data will be accounted for in accordance with the data sources, data management, and sampling documentation guidance listed in Table 20.

Table 20 Sample Handling, Storage, Custody, and Disposal*

SAMPLE COLLECTION, PACKAGING, AND SHIPMENT (PERSONNEL/ORGANIZATION) *	
Sample Collection	CTEH; Field Personnel
Sample Packaging	CTEH; Field Personnel
Coordination of Shipment	CTEH; Field Personnel
Type of Shipment/Carrier	Laboratory Courier or FedEx or similar express carrier
SAMPLE RECEIPT AND ANALYSIS (PERSONNEL/ORGANIZATION)	
Sample Receipt	Enthalpy; Lab Analyst
Sample Custody and Storage	Enthalpy; Lab Personnel
Sample Preparation	Enthalpy; Lab Analyst
Sample Determinative Analysis	Enthalpy; Lab Analyst
SAMPLE ARCHIVING (NUMBER OF DAYS FROM SAMPLE COLLECTION OR EXTRACTION / DIGEST)	
Field Sample Storage	If the sample analysis meets criteria, sample canisters will be cleaned after analysis. If a sample requires additional attention (i.e. dilution or an additional injection/extraction), the laboratory will contact the QA Project Manager and/or PTD, prior to running additional analysis and prior to disposal. After this review, sample canisters will be cleaned and prepped for redeployment
SAMPLE DISPOSAL	
Personnel/Organization	Enthalpy; Various Personnel
Number of Days from Analysis	Sample results will be reviewed to check the data meet criteria. After this review, sample canisters will be cleaned and prepped for redeployment.

*List organization and personnel, as appropriate

Table 21 Data Sources and Data Management

DATA SOURCE	REQUIRED INFORMATION	PROCESSING INSTRUCTIONS	PROCESSING FREQUENCY	PROCESSING RESPONSIBILITY	STORAGE LOCATION	FINAL OUTPUT
Site Documents	Site Files, Plans, Addendums	File Hard Copies and Electronic Copies In Indicated Storage Location	Beginning Of Project and As Needed	Field Manager	Digital: CTEH Projects Secure Server; Hard Copy: Project Secure File	.pdf And Other Image Formats
Field Forms	Sample No., Date, Time, Sampler, Location, Field Conditions	File Hard Copies and Electronic Copies in Indicated Storage Location	Per Sampler, Location, Equipment, And Date	Field Manager	Digital: CTEH Projects Secure Server; Hard Copy: Project Secure File	.pdf And Other Image Formats
Real-Time Monitoring Data	Instrument Data with Time, Date, And GPS Location	Upload Into Mobile Data Studio (MDS) Software	At Least Every 10 Data Logs	Data Manager	CTEH Secure Server	.pdf And Other Image Formats

QAPP WORKSHEET #28: ANALYTICAL QUALITY CONTROL AND CORRECTIVE ACTION

Worksheet #28.1-A: Analytical Quality Control and Corrective Action – VOCs in Air (Evacuated Canisters)

Table 22 Analytical QA/QC for Enthalpy Labs for VOCs by US EPA METHOD TO-15

QC SAMPLE	FREQUENCY & NUMBER	METHOD OR SOP QC ACCEPTANCE LIMITS	CORRECTIVE ACTION	PERSON(S) RESPONSIBLE FOR CA	DQI	MEASUREMENT PERFORMANCE CRITERIA
Tune	Prior to ICAL and prior to each 24-hour period of analysis	Refer to Method SOP for specific ion abundance of BFB	Retune instrument; no samples shall be analyzed without a valid tune.	Analyst/ Supervisor		Method SOP
Surrogates	All field and QC samples	80-120%	Evaluate matrix, then analytical data, then reprepare and reanalyze all affected samples. If the surrogate(s) fail high and the sample is non detect (ND) for all target analytes, the sample can be reported. Qualify and narrate outliers. If obvious chromatographic interference with surrogate is present, contact the client as to additional measures to be taken.	Analyst/ Supervisor	Accuracy / bias / sensitivity	80-120%
Method Blank	One per preparatory batch	No analytes detected > 1/2 LOQ or > 1/10 the amount measured in any sample. Common contaminants must be less than LOQ	Verify instrument clean (evaluate calibration blank and samples prior to method blank), then reanalyze. Evaluate to determine if systematic issue within laboratory, correct, then reprepare and reanalyze the method blank and all samples processed with the contaminated blank	Analyst/ Supervisor	Accuracy / bias / contamination	No analytes detected > 1/2 RL or > 1/10 the amount measured in any sample or > 1/10 the regulatory limit, whichever is greater. Common laboratory contaminants, no target analytes ≥ RL
LCS	One per preparatory batch	Laboratory-generated statistically derived control limits	Reanalyze the LCS once. If acceptable, report. Analytes in the LCS that fail high and are ND in the samples can be reported. Qualify and narrate outliers. All others are reprepared/reanalyzed.	Analyst/ Supervisor	Accuracy / bias	Laboratory-generated statistically derived control limits

QAPP WORKSHEET #28.3-A: LABORATORY-SPECIFIC QUANTITATION LIMITS AND QUALITY CONTROL LIMITS

Analytical accuracy and precision goals are also presented below. Laboratory-generated statistically derived control limits are used to assess accuracy and precision for some methods; these limits are periodically updated by the laboratory.

Table 23 Quality Control Limits for VOCs by EPA Method TO-15

Analyte	CAS No.	Surrogate %Rec	Duplicate RPD	LCS %Rec	LCS RPD
1,1,1-Trichloroethane	71-55-6		25	70-130	25
1,1,1,2-Tetrachloroethane	630-20-6		25	70-130	25
1,1,2,2-Tetrachloroethane	79-34-5		25	70-130	25
1,1,2-Trichloro-1,2,2-trifluoroethane	76-13-1		25	70-130	25
1,1,2-Trichloroethane	79-00-5		25	70-130	25
1,1-Dichloroethane	75-34-3		25	70-130	25
1,1-Dichloroethylene	75-35-4		25	70-130	25
1,2,4-Trichlorobenzene	120-82-1		25	60-140	25
1,2,4-Trimethylbenzene	95-63-6		25	70-130	25
1,2-Dibromoethane (EDB)	106-93-4		25	70-130	25
1,2-Dichlorobenzene	95-50-1		25	70-130	25
1,2-Dichloroethane	107-06-2		25	70-130	25
1,2-Dichloropropane	78-87-5		25	70-130	25
1,2-Dichlorotetrafluoroethane	76-14-2		25	70-130	25
1,3,5-Trimethylbenzene	108-67-8		25	70-130	25
1,3-Butadiene	106-99-0		25	70-130	25
1,3-Dichlorobenzene	541-73-1		25	70-130	25
1,4-Dichlorobenzene	106-46-7		25	70-130	25
1,4-Dioxane	123-91-1		25	70-130	25
1-Ethyl-4-methyl benzene	622-96-8		25	70-130	25
2-Butanone (MEK)	78-93-3		25	70-130	25
2-Chlorotoluene	95-49-8		25	70-130	25
2-Hexanone (MBK)	591-78-6		25	70-130	25
4-Methyl-2-pentanone (MIBK)	108-10-1		25	70-130	25
Acetone	67-64-1		25	70-130	25
Acrolein	107-02-8		25	70-130	25
Allyl chloride	107-05-1		25	70-130	25
Benzene	71-43-2		25	70-130	25
Benzyl Chloride	100-44-7		25	70-130	25
Bromodichloromethane	75-27-4		25	70-130	25
Bromoform	75-25-2		25	70-130	25
Bromomethane	74-83-9		25	70-130	25
Carbon Disulfide	75-15-0		25	70-130	25
Carbon Tetrachloride	56-23-5		25	70-130	25

Chlorobenzene	108-90-7		25	70-130	25
Chloroethane	75-00-3		25	70-130	25
Chloroform	67-66-3		25	70-130	25
Chloromethane	74-87-3		25	70-130	25
cis-1,2-Dichloroethylene	156-59-2		25	70-130	25
cis-1,3-Dichloropropene	10061-01-5		25	70-130	25
Cyclohexane	110-82-7		25	70-130	25
Dibromochloromethane	124-48-1		25	70-130	25
Dichlorodifluoromethane	75-71-8		25	70-130	25
Ethanol	64-17-5		25	70-130	25
Ethyl acetate	141-78-6		25	70-130	25
Ethylbenzene	100-41-4		25	70-130	25
Heptane	142-82-5		25	70-130	25
Hexachlorobutadiene	87-68-3		25	60-140	25
Hexane	110-54-3		25	70-130	25
Isooctane	540-84-1		25	70-130	25
Isopropyl alcohol	67-63-0		25	70-130	25
Isopropylbenzene	98-82-8		25	70-130	25
m+p-Xylenes	179601-23-1		25	70-130	25
Methyl methacrylate	80-62-6		25	70-130	25
Methylene chloride	75-09-2		25	70-130	25
Methyl-t-butyl ether (MTBE)	1634-04-4		25	70-130	25
Naphthalene	91-20-3		25	60-140	25
n-Butane (C4)	106-97-8		25	70-130	25
n-Nonane (C9)	111-84-2		25	70-130	25
n-Propylbenzene	103-65-1		25	70-130	25
o-Xylene	95-47-6		25	70-130	25
n-Pentane (C5)	109-66-0		25	70-130	25
Propylene	115-07-1		25	70-130	25
Styrene	100-42-5		25	70-130	25
TBA	75-65-0		25	70-130	25
Tetrachloroethylene (PCE)	127-18-4		25	70-130	25
Tetrahydrofuran	109-99-9		25	70-130	25
Toluene	108-88-3		25	70-130	25
trans-1,2-Dichloroethylene	156-60-5		25	70-130	25
trans-1,3-Dichloropropene	10061-02-6		25	70-130	25
Trichloroethylene	79-01-6		25	70-130	25
Trichlorofluoromethane	75-69-4		25	70-130	25
Vinyl acetate	108-05-4		25	70-130	25
Vinyl bromide	593-60-2		25	70-130	25
Vinyl chloride	75-01-4		25	70-130	25
Xylenes, Total	1330-20-7		25		25
Surr: 4-Bromofluorobenzene (Surr)	460-00-4	80-120	25		25
I.S.: Bromochloromethane (IS)	74-97-5		25		25

I.S.: 1,4-Difluorobenzene (IS)	540-36-3	25	25
I.S.: Chlorobenzene-d5 (IS)	3114-55-4	25	25

Table 24 Quality Control Limits for Sulfurs by EPA Method TO-15, Wet in Air

Analyte	CAS No.	Surrogate %Rec	Duplicate RPD	LCS %Rec	LCS RPD
Carbon Disulfide	75-15-0		25	70-130	25
Hydrogen Sulfide	7783-06-4		25	70-130	25
1-Propanethiol	107-03-9		25	70-130	25
2-Propanethiol	75-33-2		25	70-130	25
Carbonyl sulfide	463-58-1		25	70-130	25
Dimethyl sulfide	75-18-3		25	70-130	25
Ethyl mercaptan	75-08-1		25	70-130	25
Methyl mercaptan	74-93-1		25	70-130	25
Total Reduced Sulfurs	NA				
Surr: 1,4-Difluorobenzene (Surr)	540-36-3	80-120	25		25
I.S.: Bromochloromethane (IS)	74-97-5		25		25

Table 25 Quality Control Limits for Dimethyl disulfide by EPA Method TO-15

Analyte	CAS No.	Surrogate %Rec	Duplicate RPD	LCS %Rec	LCS RPD
Dimethyl disulfide	624-92-0		25	70-130	25
Surr: 1,4-Difluorobenzene (Surr)	540-36-3	80-120	25		25
I.S.: Bromochloromethane (IS)	74-97-5		25		25

QAPP WORKSHEET #29: PROJECT DOCUMENTS AND RECORDS

Electronic files, including but not limited to final documents, and laboratory analytical reports are maintained on secure CTEH servers.

Applicable electronic field and laboratory data collected during sampling will be archived electronically. Online cloud backups of databases and programs or software utilities will be maintained in a secure location. CTEH mainly uses electronic records, but in the event hardcopy data are generated, including but not limited to field logbooks, laboratory logbooks, instrument calibration records, these will be maintained by the originator for inclusion in the project file.

Table 26 Sample Collection and Field Records

RECORD	GENERATION	VERIFICATION	STORAGE LOCATION ARCHIVAL
Field Notebook: daily observations and notes, personnel on site, tailgate meetings, communications with US EPA or state agency representatives, unusual incidents, recording of sample collection dates and times including parameters, preservation, and sketch of sampling locations and/or GPS coordinates, etc.	Field Personnel	Field Manager	Secure CTEH Servers
Site Maps	Field Personnel	Field Manager	Secure CTEH Servers
Field instrument maintenance records	Field Personnel	Field Manager	Secure CTEH Servers
Monitoring Instrument Readings including calibration records (PID, etc.)	Field Personnel	Field Manager	Secure CTEH Servers
Data analyses	Laboratory analyst	Laboratory QA Director	Laboratory data package
Laboratory instrument maintenance records	Laboratory analyst	Laboratory QA Director	Laboratory
Data analyses	Field analyst	Field Manager	Secure CTEH Servers
PTR-MS instrument maintenance records	Field Analyst	Field Manager	Secure CTEH Servers
Mobile unit (PTR-MS) data results	Field Analyst	Field Manager	Secure CTEH Servers
COC Records	Field Personnel	Field Manager	Laboratory data package & copy on Secure CTEH Servers

Table 27 Project Assessment Records

RECORD	GENERATION	VERIFICATION	STORAGE LOCATION ARCHIVAL
Field Audit Checklists (for field operations, logbooks, etc.)	QA Project Manager	Field Manager	Secure CTEH Servers
Data validation reports	Data Validation Manager	QA Project Manager	Secure CTEH Servers

PTR-MS Mobile Monitoring Trip reports	Mobile Monitoring Field Personnel	Field Manager	Secure CTEH Servers
Progress Reports (Project Logbook)	Field Manager	PTD	Secure CTEH Servers

Table 28 Laboratory Documentation Records

RECORD*	GENERATION	VERIFICATION	STORAGE LOCATION ARCHIVAL
Laboratory data packages (Level II and Level IV)	Laboratory personnel	Laboratory PM	Secure CTEH Servers
Laboratory electronic data deliverable (EDD)	Laboratory personnel	Laboratory PM	Secure CTEH Servers
Laboratory records*	Laboratory personnel	Laboratory PM	Laboratory project file

* Laboratory records include the following:
Internal COC documentation
Standards preparation records and traceability records (including certificates)
Laboratory Quality Manual
Instrument Maintenance records
Non-Conformance Records
Communication records (i.e., Project specific email communication with CTEH)
Laboratory personnel training records
LOD/RL studies
Laboratory Accreditations/Certifications
Analytical SOPs
Control Charts
Accreditation audit reports
PT study results

QAPP WORKSHEET #31, #32, AND #33: ASSESSMENTS AND CORRECTIVE ACTION

One of the goals of the project QA program is to quickly identify, correct, and resolve errors and to prevent recurrence. A description of assessments conducted as part of the project QA program and parties responsible for the corrective action response are presented below.

CTEH's QA PM or designee will receive nonconformances by CTEH personnel through cteh.com/quality, other electronic means (i.e., email, project portal, daily briefing logs, field logs, etc.). Nonconformances are issues fail to meet the requirements[3] or simply, something that went wrong. These nonconformances are tracked in a log[4] and when issues arise (based on severity of the issue against the task or process) that require root cause analysis (RCA), the corrective actions process will take place. The investigation will include a root cause analysis tool (e.g., Ishikawa or 5-whys) and be documented on a corrective actions report (CAR). Nonconformances that impact data integrity or usability (i.e., major finding) will be documented in a CAR and provided to the QA Coordinator for distribution. Both the log and report will note corrective action(s) and preventative action(s) as well as a timeline and responsible individual. Furthermore, the nonconformance will not be closed out until the execution of the improvement(s) are monitored and effective at preventing reoccurrence. For minor items, the goal is to close out the nonconformance within five (5) days. For major findings, the goal is to complete the CAR within 48 hours. The CTEH QA PM will adjust these timelines based on the number of actions, difficulty to implement (e.g., programming, new equipment needed, etc.) and note the deadline on the nonconformance log. All these records will be retained.

[3] Requirements include but not limited to processes, data, practices, or performance that are provided in SOP(s), best management practices, standards, manufacturers manual.
[4] The nonconformance log lists the issue, issue type, date of occurrence, severity (i.e., provided as opportunity for improvement, minor, or major), who is assigned the tasks for corrective actions (which can be multiple people), due date(s), status, completion date, actions implemented, and monitoring of effectiveness. A copy of the non-conformance log can be provided upon request with severity scale.

Table 29 Laboratory Assessments and Responsibilities

ASSESSMENT TYPE	FREQUENCY	INTERNAL OR EXTERNAL	ORGANIZATION PERFORMING ASSESSMENT	PERSON(S) RESPONSIBLE FOR PERFORMING ASSESSMENT	PERSON(S) RESPONSIBLE FOR RESPONDING TO ASSESSMENT FINDINGS	PERSON(S) RESPONSIBLE FOR IDENTIFYING AND IMPLEMENTING CA	PERSON(S) RESPONSIBLE FOR MONITORING EFFECTIVENESS OF CA
Onsite Lab. Systems Audit	During certification period, at discretion of the Accreditation Officer	External	TNI	TNI Auditor	Lab QA Director	Lab QA Director	LabQA Director
QC of Daily Field readings, summaries, field forms, review against SAP requirements	Each sample event	Internal	CTEH	Field Manager	QA PM	Sampling Contractor PM	Sampling Contractor PM
Lab Report Deliverables – verification of data package completeness, analytical compliance, and data correctness (also see Worksheet #35)	Each SDG	Internal	Laboratory	Lab PM	Lab QA Director	Lab QA Director	Lab QA Director
Data Validation (also see Worksheet #36 & 37)	Each SDG	Internal	eQAQC	Data Validation PM	Lab PM or Lab QA Director	QA PM and Lab QA Director	QA PM
Lab. CA Investigation	As needed	Internal	Enthalpy Analytical	QA PM	Lab QA Director	Lab QA Director	QA PM
Performance Evaluation Samples	May be performed to further assess data quality	External		QA PM	Lab QA Director	Lab QA Director	QA PM

QAPP WORKSHEETS #34: DATA VERIFICATION AND VALIDATION INPUTS

This worksheet lists the inputs that will be used during data verification and validation. Inputs include planning documents, field records, and laboratory records. To confirm that scientifically sound data of known and documented quality are used in making project decisions, the following three-step data review will be performed:

- Verification will confirm that all specified activities involved in collecting and analyzing samples have been completed and documented and that the necessary records (objective evidence) are available to proceed to data validation.
- Validation will assess whether the sampling and analytical processes comply with the project-specific and QAPP-specific requirements.
- Usability assessment will determine whether the resulting data are suitable as a basis for the decision being made.

Worksheet #35 (Data Verification Procedures), **Worksheet #36** (Data Validation Procedures), and **Worksheet #37** (Data Usability Assessment) describe the processes to be followed for the above three steps, respectively. This worksheet establishes the procedures that will be followed to verify and validate project data, including, but not limited to, sampling documents and analytical data packages.

Table 30 Data Verification and Validation Inputs

DESCRIPTION	VERIFICATION (COMPLETENESS)	VALIDATION (CONFORMANCE TO SPECIFICATIONS)
Planning Documents/Records		
Approved QAPP	X	
Approved SAP	X	
Field SOPs	X	
Laboratory SOPs	X	
Sampling Methods	X	X
Analytical Methods	X	X
List of project-specific analytes	X	X
Field Documents		
Field Logbooks	X	X
Equipment Calibration Records	X	X
COC Records	X	X
Identification of QC samples	X	X
Sampling diagrams/surveys	X	X
Monitoring Reports / Documents	X	X
Relevant Correspondence	X	X
Change Orders/Deviations	X	X
Field Audit Reports	X	X
Field Corrective Action Reports	X	X
Analytical Data Package		
Cover sheet (Laboratory identifying information)	X	X
Case Narrative	X	X

DESCRIPTION	VERIFICATION (COMPLETENESS)	VALIDATION (CONFORMANCE TO SPECIFICATIONS)
Internal Laboratory COC Record	X	X
Sample Receipt Records	X	X
Sample Chronology (*e.g.*, dates and times of receipt, preparation,	X	X
Communication records	X	X
LOD/LOQ establishment and verification	X	X
Standards Traceability	X	X
Instrument Calibration Records	X	X
Definition of Laboratory Qualifiers	X	X
Results Reporting forms	X	X
QC Sample Results	X	X
Corrective Action Reports	X	X
Raw data	X	X
Electronic Data Deliverables	X	X
External Reports		
External Audit Report	X	X
Laboratory Assessment	X	X
Laboratory QA Plan	X	X
LOD study information	X	X
Laboratory Accreditation	X	X

QAPP WORKSHEETS #35: DATA VERIFICATION PROCEDURES

Data will be verified in accordance with **Worksheet #35**.

Table 31 Analytical Air Sampling Data Verification Procedures Including Inputs

DATA REVIEW INPUT	DESCRIPTION	RESPONSIBLE FOR VERIFICATION	STEP I / IIA / IIB*
Verification Chain-of-Custody Records	Chain-of-Custody Records will be reviewed upon completion and verified against the packed samples. The Chain-of-Custody Records will be relinquished by the sampler prior to shipment. A copy of the COC Record will be retained in the project file, while the original and all necessary copies will be shipped with the samples (in a waterproof bag, as appropriate)	Field Manager	I
Verification Chain-of-Custody Records Sample Receipt Records	Review the sample shipment for completeness and integrity; sign to accept the shipment. All sample labels will be checked against the Chain-of-Custody Record; any discrepancies will be identified, investigated, and corrected. The samples will be logged in at every storage area and workstation required by the designated analyses. Individual analysts will verify the completeness and accuracy of the data recorded on the forms. Verification of sample login/receipt and Chain-of-Custody Records will be documented on the Laboratory Sample Receipt Record.	Laboratory PM	I
Verification Chain-of-Custody Records	Check that the Chain-of-Custody Records was signed/dated by the sampler relinquishing the samples and by the laboratory sample custodian receiving the samples for analyses. Verification of Chain-of-Custody Records will be documented in the validation workbook.	Data Validators	I
Verification Field SOPs	Verify that all applicable sampling SOPs were followed.	QA PM	I
Verification QAPP sample tables	Verify that all proposed samples listed in the QAPP tables have been collected. Sample completeness will be documented in the validation workbook and validation report.	QA PM	I
Verification Field Documentation	Verify that information recorded in Field Logbooks, Equipment Calibration Records, etc., the log sheets and field notes are accurate and complete. Field data verification will be documented by dated signature on the last page or page immediately following the review material.	Field Manager	I
Verification Field QC samples	Check that field QC samples, described in Worksheet #12, and listed in Worksheet #20, were collected as required. QC sample completeness will be documented in the validation workbook and validation report.	QA PM	I
Verification Laboratory SOPs	Verify that all applicable analytical SOPs were followed.	Data Validators	I
Verification Analytical data package	Verify that all analytical data packages are complete. Each laboratory data package must contain a Case Narrative. The Case Narrative must identify and document any problems or anomalies observed during the receipt, handling, preparation, and/or analysis of a sample. The Case Narrative must briefly and concisely identify/describe all deviations from analytical methods, the QAPP, and relevant laboratory SOPs. Reportable data will include the following information at minimum: field chains-of-custodies, sample ID cross-references, test reports (dilution factors, preparation methods, etc.), surrogate recoveries, test reports/summary forms for blank samples, laboratory control sample/laboratory control sample duplicates (LCS/LCSDs), project MS/MSDs, duplicates, and associated method quantitation limits. The laboratory PM (or designee) will sign each data package.	Laboratory PM	I
Verification Analytical data package	Verify the data package for completeness. The Case Narrative should contain enough information to allow the data validators to independently assess the magnitude of any potential inaccuracy or imprecision, the direction of potential bias, and other potential effects on	Data Validation PM	I

DATA REVIEW INPUT	DESCRIPTION	RESPONSIBLE FOR VERIFICATION	STEP I / IIA / IIB*
	the quality of the reported data. Data package completeness will be documented in the validation reports.		

* II_A = compliance with methods, procedures, and contracts [see Table 10, page 117, QAPP manual, V.1, March 2005]; II_B = comparison with measurement performance criteria in the QAPP [see Table 11, page 118, QAPP manual, V.1, March 2005]

Table 32 Real-Time Air Monitoring Data Verification Procedures

REAL-TIME DATA TYPE	VERIFICATION PROCESS
Handheld Real-Time Air Monitoring Data	Each measurement record is reviewed by CTEH personnel experienced in real-time data collection for errors and accuracy (e.g., appropriate location category, instrument, detection limit, etc.) in accordance with the Real-Time QAQC SOP (CTEH SharePoint). The CTEH reviewer will correct the record as appropriate or mark it with a "NU" (not usable) qualifier. If it is marked "NU," it is excluded from the dataset.
PTR-MS Air Monitoring Data	• Each measurement record is reviewed by the Mobile Monitoring Field Personnel experienced in real-time data collection for errors and accuracy • Initial Multi point calibration prior to the start of data collection. • Daily Review of data and drift/stability checks • Two-Point span checks (ex. BEX and/or hydrogen sulfide); acceptable if within 20%

QAPP WORKSHEET #36: DATA VALIDATION PROCEDURES

Data will be validated in accordance with **Worksheet #36**.

Table 33 Data Validation Procedures Including Inputs

DATA REVIEW INPUT	DESCRIPTION	STEP I / II_A / II_B*
Validation Chain-of-custody	Examine the traceability of the data from the time of sample collection until reporting of data. Ensure that the custody and integrity of the samples were maintained from collection to analysis and that the custody records are complete with any deviations recorded. Chain-of-Custody verification will be documented in the validation workbook.	IIA
Validation Holding times	Review that the samples were shipped and stored at the required temperature and sample pH for chemically preserved samples to meet the requirements listed in Worksheet #19 & #30. Ensure that the analyses were performed within the holding times. If holding times were not met, confirm that deviations were documented. Holding time examination will be documented in the validation workbook and validation report.	IIA
Validation Sample results for representativeness	Check that the laboratory recorded the temperature at sample receipt and the pH of the chemically preserved samples to ensure sample integrity from collection to analysis. Sample receipt and preservation will be documented in the validation workbook and validation report.	IIA/IIB
Validation Field Documentation	Review field documentation to ensure the sampling processes comply with the project requirements.	IIA
Validation Laboratory data results for accuracy	Ensure that the laboratory QC samples were analyzed and that the measurement performance criteria (MPC) listed in Worksheets #24 and #28 were met for all field samples and QC analyses. Check that specified field QC samples were collected and analyzed, as listed in Worksheet #12, and that the analytical QC criteria were met. Accuracy will be documented in the validation report.	IIA/IIB
Validation Field and laboratory duplicate analyses for precision	Check the field sampling precision by calculating the RPD for field duplicate samples. Check the laboratory's precision by reviewing the RPD or percent-difference values from laboratory duplicate analyses, MS/MSDs, and LCS/ LCSD. Ensure compliance with the precision goals listed in Worksheets #12 and #28. Precision will be documented in the validation workbook and validation report.	IIA/IIB
Validation Project quantitation limits for sensitivity	Assess and document the impact on matrix interferences or sample dilutions performed because of the high concentration of one or more contaminants; assess and document the impact on the other target compounds reported as undetected.	IIA/IIB
Validation Data quality assessment report	Summarize deviations from methods, procedures, or contracts. Qualify data results based on method or QC deviation and explain all data qualifications. Present tabular qualified data and data qualifier codes and summarize data qualification outliers. Determine whether the data met the MPC. Determine the impact of any deviations on the data's technical usability. Result qualification will be documented in the validation report.	IIA/IIB
Validation QC sample documentation	Ensure that all QC samples specified in the QAPP were collected and analyzed and that the associated results were within acceptance limits. QC sample completeness and assessment will be documented in the validation report.	IIA/IIB
Validation Analytical data deviations	Determine the impact of any deviation from sampling or analytical methods and the effect of laboratory SOP requirements and matrix interferences on the analytical results. Data deviations will be documented in the validation workbook and validation report.	IIB

DATA REVIEW INPUT	DESCRIPTION	STEP I / II_A / II_B*
Validation Matrices – Air	Assess data against MPC identified in Worksheets #12, #19 & #30, #24, and #28. 100% of the data will undergo verification and Level II data validation and 20% will undergo verification and EPA Stage IV data validation. All data validation findings will be documented in a validation report.	IIA/IIB
Validation Qualifiers	U This result should be considered "non-detect" because it was not detected > the detection limit, or it was detected in a field blank or laboratory blank at a similar level.	
	R Unreliable positive or non-detect result; analyte may or may not be present in sample.	
	J Quantitation is approximate due to limitations identified during data validation.	IIA/IIB
	UJ This analyte was not detected, but the reporting limit may or may not be higher due to a bias identified during data validation.	
	NJ The analysis indicates the presence of a compound that has been "tentatively identified" and the associated numerical value represents its approximate concentration.	

* II_A = compliance with methods, procedures, and contracts [see Table 10, page 117, QAPP manual, V.1, March 2005]; II_B = comparison with measurement performance criteria in the QAPP [see Table 11, page 118, QAPP manual, V.1, March 2005]

QAPP WORKSHEET #37: USABILITY ASSESSMENT

Analytical data generated will be subjected to data usability assessment as described below. The purpose of analytical data verification and validation is to ensure data completeness, correctness, and method compliance/conformance, and to identify data quality issues, including unusable data that would not be sufficient to support environmental decisions. In addition to the laboratory QA review, the data presented in Level IV data packages will be verified and validated by the Data Validators, eQAQC. eQAQC has been hired as the data validation firm for CTEH to ensure the:

- Compliance with requested testing requirements.
- Compliance with this QAPP.
- Analytical data completeness.
- Reporting accuracy (including hardcopy to EDD).
- Review of data against laboratory reporting limits and acceptance criteria.
- Confirmation of receipt of requested items, and
- Traceability, sensibility, and usability of the data.

Data review will be performed with guidance from the National Functional Guidelines for Organic Data Review (US EPA). These validation guidance documents specifically address analyses performed in accordance with the Contract Laboratory Program (CLP) analytical methods and are not completely applicable to the type of analyses and analytical protocols performed for the USEPA methods utilized by the laboratory for these samples. Therefore, data validators will use professional judgment to determine the usability of the analytical results and compliance relative to USEPA methods used by the laboratory. Furthermore, data will be provided by the analytical laboratory to validate and verify that they can identify the compound, provide LODs and reporting limits, studied and/or reported quality control limits, and provide performance criteria. Validators will review these data against this QAPP, method requirements, and laboratory control limits. Validators will also validate whether the laboratory has provided sufficient data to prove and verify that the correctness and/or accuracy of compounds are identified and reported, LODs, control limits, result values, duplicates RPD, spikes %R, and exports of the data.

Data Review

Data usability directly affects whether project objectives can be achieved. The results of these evaluations will be included in the project report. Data characteristics will be evaluated for multiple concentration levels if the evaluator determines that it is necessary to do so. To the extent required by the type of data being reviewed, the assessors will consult with other technically competent individuals to render sound assessments of the data characteristics outlined in Table 34. Furthermore, project DQOs are outlined in Worksheets #10 and #11 to drive decision statements. Validators performing data review will ensure that data reported (after their review) can be used to answer decision statements.

Table 34 Data Usability Indicator Description

DATA USABILITY INDICATOR	DESCRIPTION
Precision	The degree of agreement between the numerical values of a set of duplicate samples performed in an identical fashion constitutes the precision of the measurement. During the collection of data using field methods and/or instruments, precision is checked by reporting measurements at one location and comparing results. $\%RPD = abs\left[\frac{A-B}{\left(\frac{A+B}{2}\right)}\right] \times 100$ Where: A = Value of original sample B = Value of duplicate sample
Accuracy	Accuracy is the degree to which a given result agrees with the true value. The accuracy of an entire measurement system is an indication of any bias that exists. Spiked sample results provide information needed to assess the accuracy of analyses. Surrogate spike, MS/MSD, and LCS %Rs are used to assess accuracy. Every organic sample is spiked with known quantities of non-target surrogate compounds. The formula used to calculate accuracy for all accuracy indicators, except MS, is: $\% R = \left(\frac{A_T}{A_F}\right) \times 100$ Where: A_T = Total concentration of the analyte measured or recovered A_F = Concentration of the analyte spiked The formula used to calculate accuracy for the MS is: $\% R = \left(\frac{A_T - A_O}{A_F}\right) \times 100$ Where: A_T = Concentration of the analyte measured or recovered A_0 = Unspiked concentration of the analyte A_F = Concentration of the analyte spiked
Representativeness	Representativeness expresses the degree to which sample data are accurate and precisely represent a characteristic of a population, parameter variations at a sampling point, or an environmental condition. Representativeness is a qualitative parameter associated with the proper design of the sampling program.
Completeness	Completeness is a measure of the degree to which the amount of sample data collected meets the needs of the sampling program and is quantified as the relative number of analytical data points that meet the acceptance criteria (including accuracy, precision, and any other criteria required by the specific analytical method used). Completeness is defined as a comparison between actual numbers of usable data points expressed as a percentage of expected number of points. The minimum goal for completeness is 95%; the ability to exceed this goal is dependent on the applicability of the analytical methods to the sample matrix analyzed. If data cannot be reported without qualifications, project completion goals may still be met if the qualified data (data of known quality, even if not perfect) are suitable for specified project goals. $\%C = \frac{total\ number\ of\ usable\ results}{total\ number\ of\ results} \times 100$

DATA USABILITY INDICATOR	DESCRIPTION
Comparability	Comparability is a qualitative parameter used to express the confidence with which one data set can be compared with another. The comparability of the data, a relative measure, is influenced by sampling and analytical procedures. By providing specific protocols for obtaining and analyzing samples, data sets will be comparable regardless of who collects the sample or who performs the sample analysis.
Sensitivity	Analytical sensitivity is a measure of an analytical technique's capability to reliably detect a positive signal compared to background noise. Sensitivity is measured in terms of laboratory-specific LODs. The Detection and reporting limits will be compared to project ALs and DQOs to ensure sufficient sensitivity to meet project objectives. If sensitivity goals are not achieved, the limitations on the data will be described.

Accuracy and precision will be quantitatively assessed by comparing recoveries and relative percent difference to the goals identified in **Worksheets #12** and **#28**. Data associated with accuracy or precision indicators that do not meet these goals will be assigned data usability qualifiers as identified in **Worksheet #36**. These data usability qualifiers, along with data qualification reason codes, will be stored as attributes to the analytical results in the project database.

Data qualification reason codes are defined in the following table.

Table 35 Data Qualification Reason Codes

Reason Code[1]	Description
+	The associated quality control item indicates a potential high bias in the sample result
-	The associated quality control item indicates a potential low bias in the sample result
AST	Compound not quantitated against an authentic standard; potential bias indeterminate
BF	Contamination present in a field blank (e.g., Field Blank, etc.); evaluation criteria exceeded
BL	Contamination present in a laboratory blank (e.g., Method Blank, Instrument Blank, etc.); evaluation criteria exceeded
BN	Elevated detection limit or estimated result due to negative instrument drift (e.g., negative instrument blank result with an absolute value > 2× the MDL or LOD)
C	Initial and/or Continuing calibration issue
CC	Possible contamination due to carryover from a previous sample
CR	Calculated result in which one or more of the components has been qualified
CRQ	Calculated result flagged due to reporting protocol
E	Result exceeds calibration range
EP	Estimated Maximum Possible Concentration (EMPC)
FD	Field duplicate imprecision; potential bias indeterminate
FG	Total versus dissolved imprecision
FP	Target compound identification criteria not met; potential false positive
H	Holding time exceeded
I	Internal standard evaluation criteria not met
L	Laboratory control sample/laboratory control sample duplicate recovery criteria not met

Reason Code[1]	Description
LP	Laboratory control sample/laboratory control sample duplicate precision criteria not met; potential bias indeterminate
LD	Laboratory duplicate precision criteria not met; potential bias indeterminate
LM	The lock mass selected ion current profiles indicate that ion suppression is evident
LR	Linear range exceeded; potential bias indeterminate
M	Matrix spike/matrix spike duplicate recovery criteria not met
MDP	Laboratory deviated from the method for a method-defined parameter, based on regulatory requirements
MP	Matrix spike/matrix spike duplicate precision criteria not met; potential bias indeterminate
NQC	Absence of supporting quality control samples
P	Post-digestion spike recovery criteria not met
PM	Performance evaluation mixture criteria not met
PT	Chromatographic pattern in sample does not match pattern of calibration standard
Q	Chemical preservation issue
QCI	Quantitation/confirmation ion ratios in sample are inconsistent with reference spectra; potential bias indeterminate
QCP	Quantitation/qualification ion transition ratio did not meet criteria; potential bias indeterminate
RA	Replicate/multiple analyses criteria not met; potential bias indeterminate
RL	The analysis meets all qualitative identification criteria, but the measured concentration is between the MDL and the quantitation or reporting limit; potential bias indeterminate
RM	Reference material recovery criteria not met
R	Reporting limit standard(s) outside of acceptance limits
S	Surrogate recovery criteria not met
SA	Method of standard additions criteria not met; potential bias indeterminate
SC	Relative percent difference between two columns exceeds criteria; potential bias indeterminate
SCC	Second column confirmation was not performed as required by the analysis method
SD	Serial dilution results did not meet evaluation criteria
SS	Second source calibration verification/initial calibration verification criteria not met
ST	Sample container type incorrect
SW	Sample switch suspected
T	Temperature preservation issue
TIC	Tentatively identified compound, quantified using an assumed calibration factor; potential bias indeterminate
TN	Instrument tune criteria not met
Y	Potential bias due to the y-intercept in the calibration curve significantly affecting the analyte response
ZZ	Other

[1] For any Reason Code that does not indicate that the potential bias is indeterminate, the "+" or "-" reason code may be appended to the qualification reason code in order to indicate a direction of bias (e.g., MS+ would be used to indicate potential high bias due to a high matrix spike recovery)

The Data Validation PM will review data generated by the laboratories for analyses of project samples. Any issues observed during data validation will be brought to the attention of the QA PM; the Laboratory PM will be contacted to determine and implement an appropriate corrective action if warranted.

Data validation reports will be prepared and reviewed by the Data Validation PM. The data validation reports will summarize the data reviewed, the level of review, any issues observed, and any data qualification. Data validation reports will be submitted to the Secure CTEH servers.