



STATE OF TENNESSEE

BRADLEY CO. LANDFILL

AIR QUALITY STUDY

8/14/2020

Contents

Introduction	3
Scope	3
Project Design & Methodology.....	4
Background	4
Target Chemicals.....	4
Sampling Schedule & Duration.....	6
Study Location.....	7
Bradley County Landfill	8
Meteorology	8
Colorimetric Analysis	10
Results and Discussion.....	12
Summary	12
Sampling Locations.....	12
Sampling Frequency	12
Results.....	13
Conclusion.....	15
Appendix A.....	16
Inorganic Colorimetric Reaction Principals.....	16
Organic Chemical Reaction Principals.....	16
Appendix B.....	17
Sampling Forms	17

Introduction

The purpose of this study was to assist community members living near and downwind of the Bradley County Landfill (BCLF) in identifying potential chemicals that may be associated with reported odors in the community. Over the last several years, there have been a variety of odor descriptions and reported health impacts by community members. These descriptions included “chemical,” “acidic,” and something smelling like “gas and oil.” Community members identified the Bradley County Landfill (BCLF) as the alleged source of the odors and their reported health impacts, although the Landfill has been and is currently in compliance with regulatory air and solid waste permits. There is no single known chemical emission that could be tested for due to the complexity of landfill gases and the difficulty in identifying odors.

The Tennessee Department of Environment & Conservation’s Division of Air Pollution Control (TDEC DAPC) used a screening method to test for the presence of numerous chemicals in the ambient air in the neighborhood downwind of the BCLF. Air sampling tubes with color-changing chemical indicators (colorimetric analysis) were utilized as a way to screen for a variety of hazardous chemicals. The presence of any detectable chemical would have initiated more refined and targeted colorimetric sampling in order to determine the approximate ambient level of the chemical discovered.

Scope

TDEC DAPC does not regulate odors nor does it specifically permit the amount or type of waste accepted at landfills. Daily disposition and coverage of waste falls under the jurisdiction of the Division of Solid Waste Management (DSWM). TDEC DAPC regulates air emissions associated with the BCLF through a regulatory permit. The Title V permit requires the landfill to report to DAPC the amount of nonmethane organic compounds (NMOC) to evaluate the need for controlling gas emissions. Currently, the level of NMOCs is below the threshold needed to require emission controls; however, BCLF does operate a control flare for odor mitigation. TDEC DAPC works to ensure air quality in Tennessee is protective of public health and welfare.

This report details the methods and results of a qualitative ambient chemical screening analysis that was requested by residents living near the BCLF. The purpose of the study was to determine the presence of any detectable chemicals that may be contributing to reported quality of life and acute health impacts within the community.

Project Design & Methodology

Background

In the beginning of 2019, TDEC DAPC was made aware of odors stemming from a neighborhood near the BCLF. Residents of the neighborhood reported a change in the typical landfill odors sometime in 2017. These described new odors did not fit the description of typical landfill odors and were often described by community members as having a chemical smell with associated breathing difficulty and headaches.

Concerned residents in the neighborhood requested that a special air sampling study be conducted to assess the air quality in the neighborhood given their reported health effects and their concern with the BCLF operations. TDEC DAPC determined that, although the BCLF was in compliance with both solid waste and air regulatory permits, a limited special monitoring study (i.e., a screening) would be conducted to assess ambient air quality in the neighborhood. Staff working in TDEC DAPC's ambient air monitoring program began designing an ambient air sampling study. Ambient air sampling measures the potential contamination in the outside air where people breathe. In contrast, soil gas and near surface monitoring at landfills happens at the facility and provides useful information for workers who may be exposed to air contaminants but is not useful for evaluating air contamination where people live.

TDEC DAPC staff analyzed reports from the community regarding the odors and the health impacts as well as detailed logs of the waste being brought into the landfill. This research was conducted in order to help identify possible chemicals that could be associated with the odor reports.

Landfill odors are primarily caused by hydrogen sulfide and ammonia. These odors have a distinct smell, with hydrogen sulfide smelling of rotten eggs and ammonia having a strong pungency that is familiar to most people. The reported odors in this study did not fit the description of typical landfill odors and could not be attributed to any single chemical suspect. Ambient sampling methods vary depending on the type and amount of chemical being targeted for measurement. For an unknown chemical, a sampling method that screens for several chemicals at once is useful.

Target Chemicals

For this study, TDEC DAPC opted to use a qualitative screening method in an attempt to narrow down a specific chemical or class of chemicals before doing a more refined chemical-specific sampling study.

Colorimetric sampling was chosen as the sampling method because it offered portability and a wide range of chemical detection at levels corresponding to short-term health impacts, such as difficulty breathing. The EPA has compiled various acute health guideline levels for many of the chemicals sampled for; this information can be accessed at the following web address:

<https://www.epa.gov/fera/dose-response-assessment-assessing-health-risks-associated-exposure-hazardous-air-pollutants>

Table 1 lists the chemicals that were screened for using the colorimetric analysis and the approximate level of detection for this method. The detection levels provided can be considered an estimate within a range of possible concentrations, with a level of uncertainty associated with each chemical.

The table also provides the lower end of the odor detection ranges. Chemical odors in outside ambient air are likely to be detected at or around threshold levels. The odor threshold levels are established using a variety of studies that have been compiled by the American Industrial Hygiene Association.¹

Chemical Sampled	Approximate Detection Limit (ppm)	Odor Threshold (ppm)
Acetaldehyde	100	0.002
Aniline	40	0.012
Arsine	20	<1.0
Benzene	10	0.47
1,3-Butadiene	100	0.099
Carbon disulfide	100	0.016
Chlorine	5	0.021
Cresols (mixed)	20	0.00005
Diethanolamine	5	0.279
Ethyl benzene	60	<0.002
Ethylene oxide	100	0.82
Formaldehyde	10	0.027
n-Hexane	10	1.5
Hydrazine	5	3
Hydrogen sulfide	10	0.00004
Methanol	100	3.05

Chemical Sampled	Approximate Detection Limit (ppm)	Odor Threshold (ppm)
Trichloroethylene	10	0.5
Triethylamine	5	0.005
Vinyl chloride	10	203
Xylenes (mixed)	60	0.012
1-Butanol	100	0.003
Acetic Acid	15	0.0004
Acetone	600	0.4
Acetylene	10	226
Butane	10	0.421
Butyl Acetate	100	0.0001
Carbon Monoxide	100	
Ethyl Acetate	600	0.09
Ethyl Cellosolve	100	0.3
Gasoline	.1 mg/l	
Heptane	10	0.41
Hydrogen Chloride	20	0.06

¹ American Industrial Hygiene Association. *Odor Threshold for Chemicals with Established Occupational Health Standards (Second Edition)*. AIHA, 2013.

Chemical Sampled	Approximate Detection Limit (ppm)	Odor Threshold (ppm)
Methyl chloroform	1000	0.97
Methylhydrazine		1
Methyl isobutyl ketone	100	0.03
Nitrosodimethylamine	5	0.008
Phenol	10	0.005
2-Naphthylamine	5	0.24
Styrene	100	0.003
Tetrachloroethene	100	0.767
Toluene	30	0.021
2,4-Toluene diamine	5	

Chemical Sampled	Approximate Detection Limit (ppm)	Odor Threshold (ppm)
Isopropyl Alcohol	600	1
Kerosene	.1 mg/l	
Methyl Ethyl Ketone	100	0.07
Methyl Mercaptan	20	<0.00001
Nitrogen Dioxide	5	0.058
Phosphine	2	0.01
Propane	100	1497
Sulfur Dioxide	10	0.33
Tetrahydrofuran	100	0.092
Ammonia	5	0.043
Ethyl Amine	20	0.027

Table 1: Chemicals Targeted in the Sampling Study

Sampling Schedule & Duration

Odor reports submitted to TDEC DAPC and DSWM were combined and analyzed in an effort to determine a pattern that could inform the study's sampling schedule. A weekday pattern could not be determined as the reports prior to the study occurred throughout the week:

Table 2: Odor Reports Prior to the Study

Weekday	Total Reports
Sun	2
Mon	3
Tue	2
Wed	8
Thu	4
Fri	9
Sat	6

Sampling was planned to occur at least weekly until the sample study period concluded. The sampling study was scheduled to run from May 1, 2020 until July 1, 2020, with around 20 sampling events anticipated.

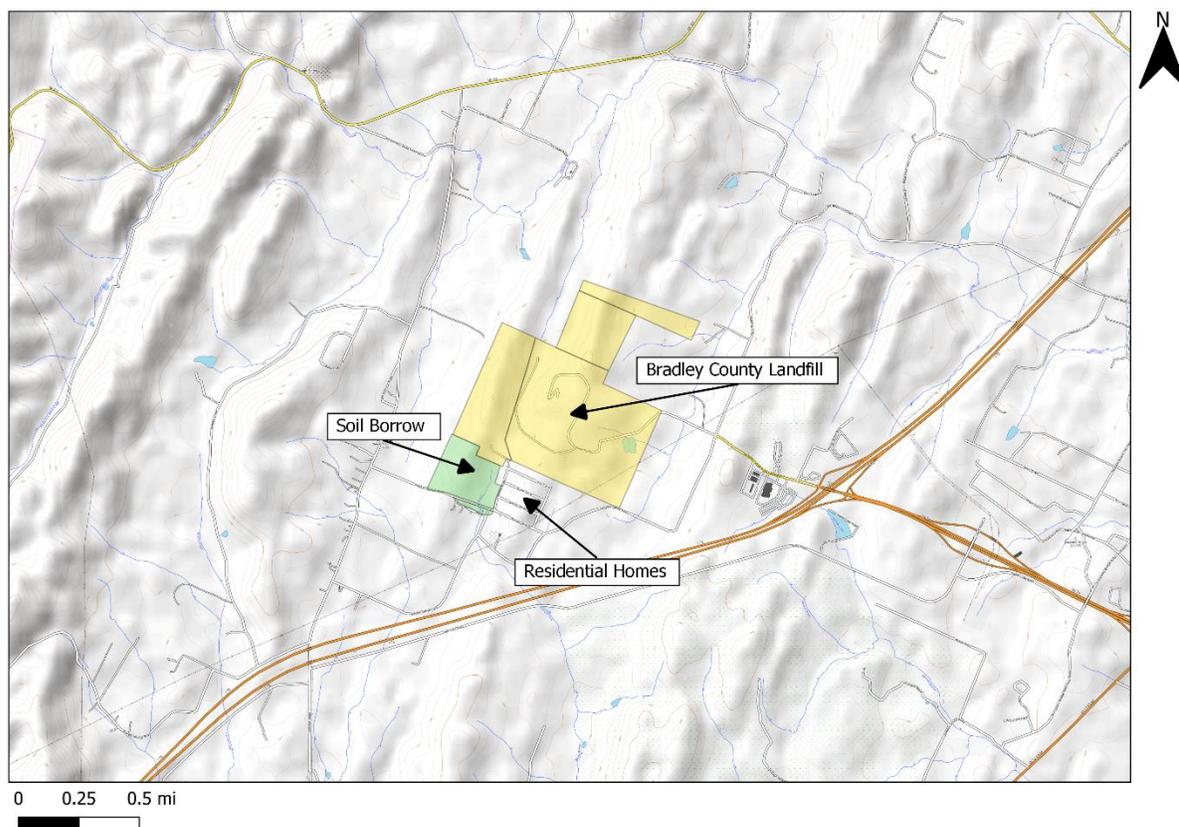
An odor report phone line was setup for residents to call in when an odor was reported. These voicemail reports would be disseminated to staff members in an effort to trigger a sampling event in the presence of an odor. In the absence of an odor report, staff

scheduled sampling times to ensure sampling was conducted on a weekly basis at a minimum.

Study Location

The location of the residential community is presented in Figure A. The neighborhood is approximately 5 miles west of Cleveland, TN in McDonald. Bradley County is situated geographically in the Chattanooga-Cleveland-Dalton, TN-GA-AL Combined Statistical Area, positioned in the southeastern portion of the TN Valley.

Figure A: Study location in McDonald, TN



The neighborhood sits on the western edge of a small ridge that runs from SSW-NNE with a parallel ridge to the west. The western edge of the neighborhood is in a low-lying area, with the landfill's soil borrow hill to the west, the existing landfill to the north, and a ridge to the east. The neighborhood is outlined in red in the satellite image below (Figure B). These local terrain features likely have an impact on odor accumulation within the low-lying area of the neighborhood under certain meteorological conditions.

Figure B: Satellite Image of the Neighborhood and Landfill



Bradley County Landfill

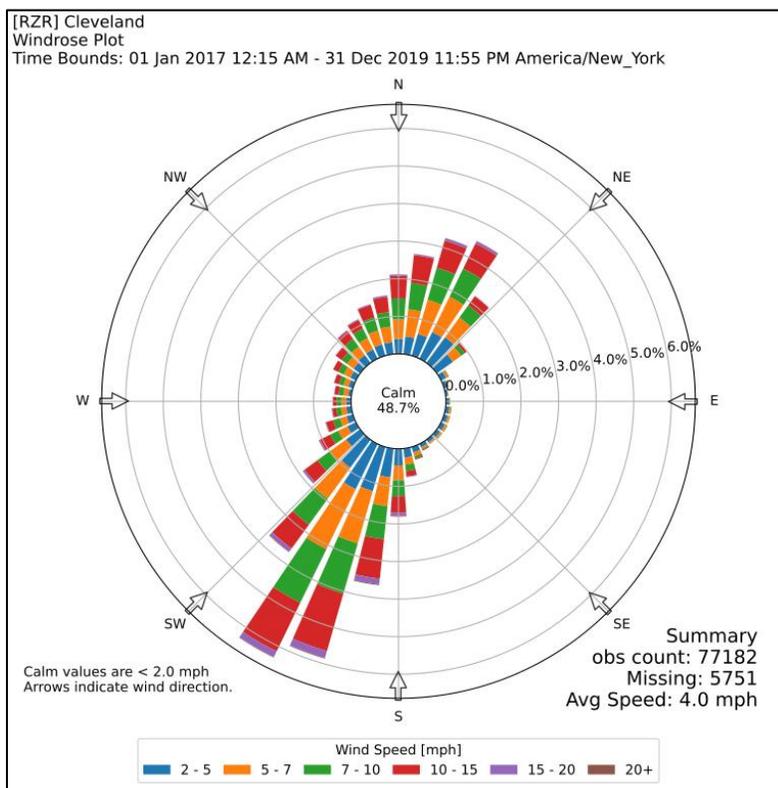
The landfill in Bradley County has been in operation since the 1970s. In 1987, operation of the landfill was contracted to Santek, who has been operating the landfill ever since. Santek is currently permitted to accept municipal solid waste and also some special waste at its class I landfill in Bradley County. All waste is deposited on a total of 80 acres. Waste is to be covered with soil each day to reduce odors. Hazardous waste acceptance is not permitted at this facility.

In 2019 Santek voluntarily installed a gas collection system in order to capture methane odors that were being reported by the local community. In addition to this gas collection system, Santek installed a vaporizing deodorant system. Deodorant systems are used at landfills to mask unpleasant smells that can travel beyond the landfill's buffer zones and into nearby residential areas and businesses. The deodorant system was turned off in March 2020, prior to the study due to complaints about the system and remained off while the study was conducted.

Meteorology

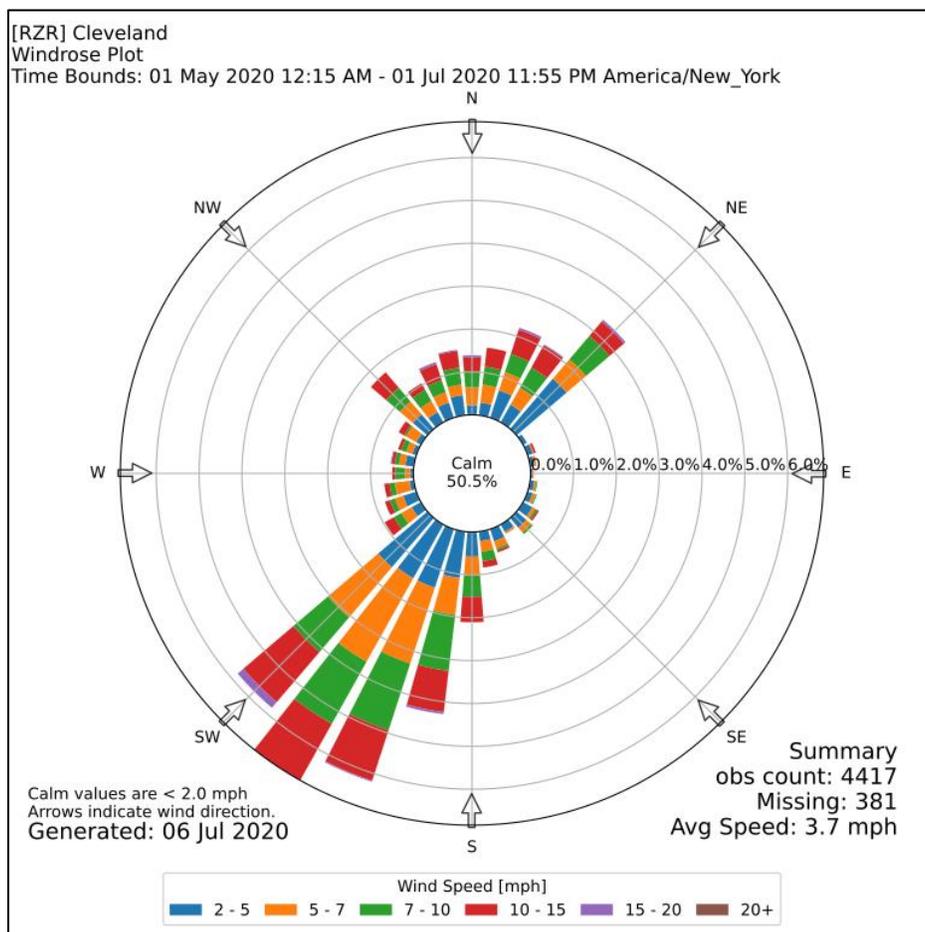
The odors that disperse from a landfill are guided by local weather conditions. Where they end up is primarily determined by winds. Wind patterns at the Bradley County Landfill follow the regional terrain and generally flow along an axis parallel to the TN ridge and valley, south-southwest to north-northeast and vice versa. A 3-yr wind rose plot depicts the frequency of wind speeds and directions taken from the nearby Cleveland Regional Jetport (Figure C).

Figure C: 3-Yr Wind Frequencies in Cleveland, TN



The neighborhood to the south-southwest of the landfill would be considered to be downwind of the landfill around 20% of the time the wind is blowing. During the sampling period from May 1 to July 1, wind patterns generally followed the same orientation (Figure D).

Figure D: Wind Frequency During the Sampling Study



While winds can have a large impact on odor trajectory, the lack of wind under calm conditions can also cause odors to build up around the landfill and are likely to be most concentrated in low-lying areas near the landfill. Winds in this area are calm 50% of the time. For this reason, many samples were collected in the lowest elevations of the neighborhood.

Colorimetric Analysis

Colorimetric tubes are glass tubes that contain color-changing reagents that produce specific color changes in the presence of specific gases. These tubes often go by their brand names (Gastec tubes or Draeger tubes) and typically contain a graduated indicator that produces a final resulting concentration of a known gas.

The tips of the glass tubes are unsealed (snapped off) when it's time for sampling and inserted into a hand pump that draws a specific volume of air through the tube. As the air travels up the tube, it reacts with the reagent inside and produces a color change.

Screening tubes are used to detect the presence of multiple chemicals in one sample. If a chemical is identified, follow-up sampling is conducted, using the chemical-specific graduated colorimetric tube in order to determine the concentration amount.

This project used Sensidyne® screening tubes (inorganic and organic chemicals) as well as the compatible Sensidyne® hand pump (AP-20S). The colorimetric chemical reaction principals are detailed in

Appendix A.

Results and Discussion

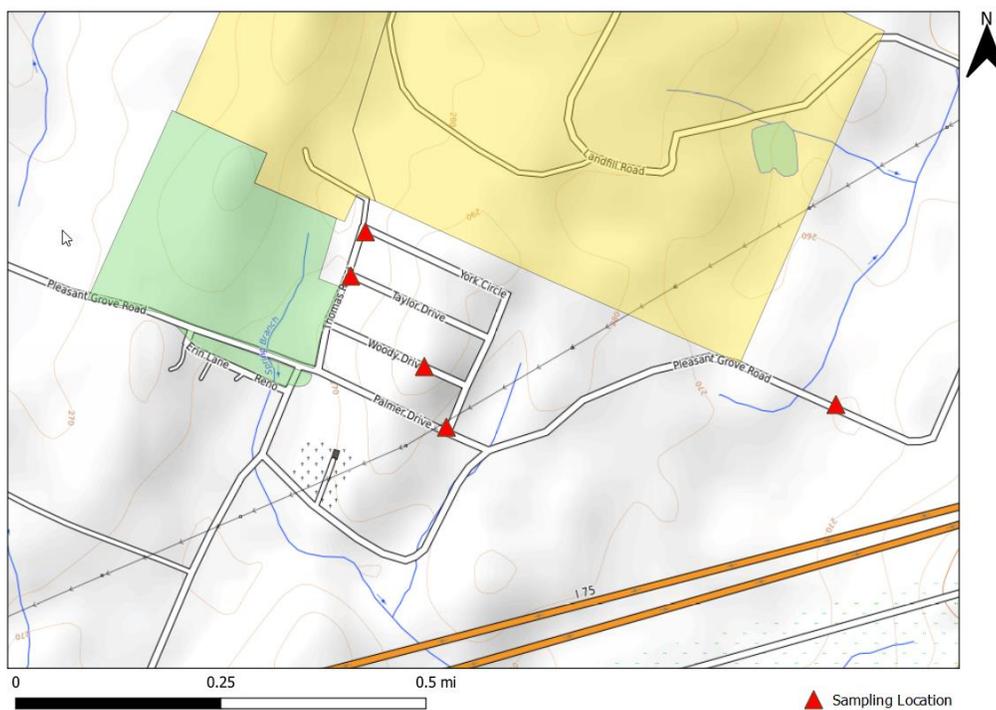
Summary

During the sampling period from May 1st to July 1st, 2020, TDEC DAPC received 77 odor reports and conducted 22 sampling events. Just over half of the samples taken were in response to a reported odor. None of the samples collected produced a color change, indicating that the 53 chemicals sampled for were unlikely to be found in the ambient air near the concentration levels provided in Table 1 at the sample locations.

Sampling Locations

Samples were taken near locations of odor reports, where there were no other sources of odors (smoke, fresh paint, idling engines, etc). Most samples were pulled from within the neighborhood (Figure E).

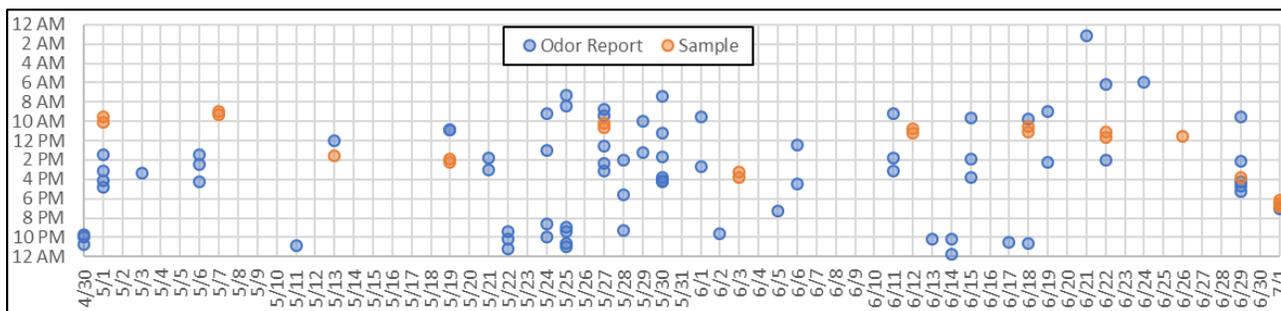
Figure E: Sampling Locations



Sampling Frequency

Samples were collected on average at a rate of 2 per week, with more than half of samples collected in response to a reported odor. Figure F depicts the hour of the day an odor was reported to TDEC DAPC (blue) and the hour that an ambient sample was taken (orange).

Figure F: Odor Reports and Sample Times



Results

Table 3 details the results of each individual sampling event. Included is the date and time of the sampling event, the location of the sample, whether the sampling event was scheduled by TDEC DAPC staff or if the sampling was in response to a community report of an odor, and the results of the sampling analysis, including if TDEC DAPC staff detected an odor during sampling. In some instances, an odor report was received during a scheduled sampling event.

Table 3: Air Sampling Event Details

Sampling Date	Location	TDEC Scheduled	Community Reported	Color Change	Odor Present
5/01/20 10:07 AM	Corner of Parmer and York	Yes	Yes	No	No
5/01/20 9:32 AM	Corner of Thomas and York	Yes	Yes	No	No
5/07/20 9:20 AM	125 Woody Drive SE	Yes	No	No	No
5/07/20 8:58 AM	Corner of Thomas and York	Yes	No	No	No
5/13/20 1:33 PM	York and Parmer	No	Yes	No	No
5/19/20 1:52 PM	Corner of Thomas and York	No	Yes	No	Yes
5/19/20 2:12 PM	York and Parmer	No	Yes	No	Yes
5/27/20 10:12 AM	Corner of Thomas and York	No	Yes	No	No
5/27/20 10:36 AM	Corner of Thomas and Taylor	No	Yes	No	No
6/03/20 3:47 PM	125 Woody Drive SE	Yes	No	No	No
6/03/20 3:13 PM	Corner of Thomas and York	Yes	No	No	No
6/12/20 11:13 AM	Corner of Thomas and Taylor	Yes	No	No	Yes
6/12/20 10:44 AM	125 Woody Drive SE	Yes	No	No	Yes
6/18/20 10:31 AM	Corner of Thomas and Taylor	No	Yes	No	No
6/18/20 11:06 AM	Corner of Thomas and York	No	Yes	No	No
6/22/20 11:07 AM	York and Parmer	Yes	Yes	No	No
6/22/20 11:41 AM	125 Woody Drive SE	Yes	Yes	No	No
6/26/20 11:36 AM	Corner of Thomas and York	Yes	No	No	No
6/29/20 3:46 PM	Pleasant Grove Rd at KOA Campground	No	Yes	No	No

Bradley County Landfill Air Quality Study

Sampling Date	Location	TDEC Scheduled	Community Reported	Color Change	Odor Present
7/01/20 6:07 PM	Corner of Thomas and York	Yes	No	No	Yes
7/01/20 6:28 PM	125 Woody Drive SE	Yes	No	No	No
7/01/20 6:49 PM	Pleasant Grove Rd at KOA Campground	Yes	No	No	Yes

Photographs of the color-changing reagent layers were taken immediately after sampling alongside an unbroken tube for comparison. The results were verified using these photographs by technical staff working on the study. The field reports are attached to the end of this report.

Conclusion

The colorimetric screening method used offered the most beneficial results, with over 50 chemical species available for detection in 5 different locations around the landfill. With 77 odor reports from the community and several from our own sampling staff, TDEC DAPC is confident that this study sampled air that was suspected to be contaminated.

A chemical source could not be attributed to the odor reports from the community living near the Bradley County Landfill. While odors near the landfill are unpleasant for those who live and operate businesses nearby, there is no evidence from this study to suggest the presence of the specific chemicals sampled for at detectable levels. Without this evidence, TDEC DAPC cannot move forward with an additional targeted assessment.

TDEC DAPC is dedicated to protecting the air in all communities in Tennessee where we live, work, and play and will continue to work with stakeholders to ensure air quality is protective of public health, general welfare and physical property within the state.

Appendix A

Inorganic Colorimetric Reaction Principals

Section	Chemistry
A	By reacting with Phosphoric acid, PH indicator is discolored. $2\text{NH}_3 + \text{H}_3\text{PO}_4 \rightarrow (\text{NH}_4)_2\text{HPO}_4$
B	By reacting with Alkaline, PH indicator is discolored. $\text{SO}_2 + 2\text{NaOH} \rightarrow \text{Na}_2\text{SO}_3 + \text{H}_2\text{O}$
C	By reacting with o-Toluidine, Nitro-o-Toluidine (Dyestuff) is liberated.
D	By reacting with Lead Acetate (II), Lead sulphide is produced. $\text{H}_2\text{S} + \text{Pd}(\text{CH}_3\text{COO})_2 \rightarrow \text{PdS} + 2\text{CH}_3\text{COOH}$
E	Potassium disulphide palladate (II) is reduced and Palladium is liberated. $\text{CO} + \text{K}_2\text{Pd}(\text{SO}_3)_2 \rightarrow \text{K}_2(\text{SO}_3)_2\text{PdCO}$ $\text{K}_2(\text{SO}_3)_2\text{PdCO} \rightarrow \text{CO}_2 + \text{SO}_2 + \text{K}_2\text{SO}_3$

Organic Chemical Reaction Principals

Section	Chemistry
A	Chromium oxide is reduced. $\text{CH}_3(\text{CH}_2)_4\text{CH}_3 + \text{Cr}^6 + \text{H}_2\text{SO}_4 \rightarrow \text{Cr}^{3+}$
B	Molybdate is reduced and Molybdeum blue is produced. $\text{H}_2\text{C} = \text{CH}_2 + \text{PdSO}_4 + (\text{NH}_4)_2\text{MoM}_4 \rightarrow \text{Mo}_3\text{O}_8$
C	Iodine pent-oxide is reduced. $\text{C}_2\text{H}_5\text{CH}_3 + \text{I}_2\text{O}_5 + \text{H}_2\text{SO}_4 \rightarrow \text{I}_2$
D	Phenol is oxidized and the polymer is produced. $\text{C}_6\text{H}_5\text{OH} + \text{Ce}_4^+ \rightarrow (\text{C}_6\text{H}_5\text{O})_n$

Appendix B

Sampling Forms

Sensidyne® Field Colorimetric Screen Sampling Form

Date:	5/1/20
Personnel:	AP, JK
Weather:	clear 739.6 mm Hg 21.6 °C
Location:	corner of Palmer and York Cir.

Select the Sampling Reason(s)

Scheduled Sample

Complaint Received

Date/time of complaint: 4/30/20 9:59, 10:44, 10:49 PM ET

Observations/comments: _____

Leak Check

Pass Fail

Corrective actions for failed check: _____

Results

Time of Sample: 10:07 AM / PM

Place an "X" or an arrow over any corresponding reagent color changes and/or describe the result on the line beside it. Include the level of discoloration (I: the whole layer is discolored, II: half of the layer is discolored, III: approx. 0.5-2.0 mm is discolored)

Tube #131 (1)
20 Sec. Sample

E	[Yellow]	[Black]	[White]	[Yellow]	[White]	[White]
D	[White]	[White]	[White]	[White]	[White]	[White]
C	[White]	[White]	[White]	[White]	[White]	[White]
B	[Pink]	[Yellow]	[Pink]	[Pink]	[Pink]	[Pink]
A	[Yellow]	[Purple]	[Purple]	[Purple]	[Purple]	[Purple]

Tubes #186B (2)
30 Sec. Sample

Pump ← "D" Side Sampling "A" Side Sampling → Pump

D	[Yellow]	[White]	[White]	[White]	[White]	[White]
C	[Yellow]	[White]	[White]	[White]	[White]	[White]
B	[White]	[White]	[White]	[White]	[White]	[White]
A	[Brown]	[Orange]	[Orange]	[Orange]	[Orange]	[Orange]

Sensidyne® Field Colorimetric Screen Sampling Form

Date:	5/1/20
Personnel:	AP, JK
Weather:	clear 739 mm Hg 16°C
Location:	corner of Thomas and York Cir.

Select the Sampling Reason(s)

Scheduled Sample

Complaint Received

Date/time of complaint: 4/30/20 9:59 10:44 10:49 PM ET

Observations/comments: _____

Leak Check

Pass Fail

Corrective actions for failed check: _____

Results

Time of Sample: 9:32 AM / PM

Place an "X" or an arrow over any corresponding reagent color changes and/or describe the result on the line beside it. Include the level of discoloration (I: the whole layer is discolored, II: half of the layer is discolored, III: approx. 0.5-2.0 mm is discolored)

Tube #131 (1)
20 Sec. Sample

E				
D				
C				
B				
A				

Tubes #186B (2)
30 Sec. Sample

D				
C				
B				
A				

Sensidyne® Field Colorimetric Screen Sampling Form

Date:	S/7/20
Personnel:	AP, JK
Weather:	clear, 739.5 mmHg, 11.1 °C
Location:	125 Woody Drive SE

Select the Sampling Reason(s)

Scheduled Sample

Complaint Received

Date/time of complaint: _____

Observations/comments: _____

Leak Check

Pass Fail

Corrective actions for failed check: _____

Results

Time of Sample: 9:20 AM / PM

Place an "X" or an arrow over any corresponding reagent color changes and/or describe the result on the line beside it. Include the level of discoloration (I: the whole layer is discolored, II: half of the layer is discolored, III: approx.. 0.5-2.0 mm is discolored)

Tube #131 (1)
20 Sec. Sample

E						
D						
C						
B						
A						

Tubes #186B (2)
30 Sec. Sample

D						
C						
B						
A						

Sensidyne® Field Colorimetric Screen Sampling Form

Date:	5/7/20
Personnel:	AP, JK
Weather:	clear, 74.5 mmHg 10.0°C
Location:	corner of Thomas and York

Select the Sampling Reason(s)

Scheduled Sample

Complaint Received

Date/time of complaint: _____

Observations/comments: _____

Leak Check

Pass Fail

Corrective actions for failed check: _____

Results

Time of Sample: 8:58 AM / PM

Place an "X" or an arrow over any corresponding reagent color changes and/or describe the result on the line beside it. Include the level of discoloration (I: the whole layer is discolored, II: half of the layer is discolored, III: approx. 0.5-2.0 mm is discolored)

Tube #131 (1)
20 Sec. Sample

Tube #186B (2)
30 Sec. Sample

Diagram details: The diagram shows a vertical tube on the left with arrows indicating flow direction. To its right are three horizontal rows of colorimetric results. The top row is for Tube #131 (1) with sections A, B, C, D, and E. The middle row is for Tube #186B (2) with 'D' Side Sampling and 'A' Side Sampling. The bottom row is for another 'A' Side Sampling. Each section contains colored bars representing reagent changes, with some sections having small boxes for recording levels of discoloration (I, II, III).

Sensidyne® Field Colorimetric Screen Sampling Form

Date:	5/13/20
Personnel:	JK
Weather:	overcast 743.1 mmHg 21.1°C
Location:	York and Parmer

Select the Sampling Reason(s)

Scheduled Sample

Complaint Received

Date/time of complaint: 5/13/20 11:59am

Observations/comments: _____

Leak Check

Pass Fail

Corrective actions for failed check: _____

Results

Time of Sample: 1:33 AM / PM

Place an "X" or an arrow over any corresponding reagent color changes and/or describe the result on the line beside it. Include the level of discoloration (I: the whole layer is discolored, II: half of the layer is discolored, III: approx. 0.5-2.0 mm is discolored)

Tube #131 (1)
20 Sec. Sample

Tube #186B (2)
30 Sec. Sample

"B" Side Sampling

E	III	
D	III	
C	III	
B	III	
A	III	

"A" Side

A	III	
---	-----	--

Sensidyne® Field Colorimetric Screen Sampling Form

Date:	5/19/20
Personnel:	JDK
Weather:	partly cloudy 73.2.6mmHg 21.4°C
Location:	corner of Thomas and York

Select the Sampling Reason(s)

- Scheduled Sample
 Complaint Received

Date/time of complaint: 5/19/20 10:56 am

Observations/comments: slight odor detected during sampling

Leak Check

- Pass Fail

Corrective actions for failed check: _____

Results

Time of Sample: 1:52 AM / PM

Place an "X" or an arrow over any corresponding reagent color changes and/or describe the result on the line beside it. Include the level of discoloration (I: the whole layer is discolored, II: half of the layer is discolored, III: approx. 0.5-2.0 mm is discolored)

Tube #131 (1)
20 Sec. Sample

Tubes #186B (2)
30 Sec. Sample

"D" Side Sampling

"A" Side Sampling

E	[Yellow]	[Black]	[Yellow]	[Yellow]	
D	[White]	[White]	[White]	[White]	
C	[White]	[White]	[White]	[White]	
B	[Red]	[Yellow]	[Pink]	[Red]	
A	[Yellow]	[Purple]	[Purple]	[Purple]	

D	[Yellow]	[Orange]	[Blue]	[Blue]	
C	[Yellow]	[White]	[White]	[White]	
B	[White]	[Orange]	[White]	[White]	
A	[Orange]	[Orange]	[Orange]	[Orange]	

A	[Red]	[Brown]	[Green]	[Green]	[Orange]	
---	-------	---------	---------	---------	----------	--

Sensidyne® Field Colorimetric Screen Sampling Form

Date:	5/19/20
Personnel:	JDK
Weather:	partly cloudy 73.2. le numby 26.4°C
Location:	corner of Farmer and York

Select the Sampling Reason(s)

- Scheduled Sample
- Complaint Received

Date/time of complaint: 5/19/20 10:56am

Observations/comments: slight odor detected during sampling

Leak Check

- Pass
- Fail

Corrective actions for failed check: _____

Results

Time of Sample: 2:12 AM / PM

Place an "X" or an arrow over any corresponding reagent color changes and/or describe the result on the line beside it. Include the level of discoloration (I. the whole layer is discolored, II. half of the layer is discolored, III. approx. 0.5x2.0 mm is discolored)

Tube #131 (1)
20 Sec. Sample

E					
D					
C					
B					
A					

Tubes #186B (2)
30 Sec. Sample

D					
C					
B					
A					

Sensidyne® Field Colorimetric Screen Sampling Form

Date:	5/27/20
Personnel:	JDK
Weather:	partly sunny 737.4nm Hg 25.8°C
Location:	corner of Thomas and Taylor

Select the Sampling Reason(s)

- Scheduled Sample
- Complaint Received

Date/time of complaint: 5/27/20 8:46am
9:25am

Observations/comments: no odor upon arrival nor during sampling

Leak Check

- Pass
- Fail

Corrective actions for failed check: _____

Results

Time of Sample: 10:36 AM / PM

Place an "X" or an arrow over any corresponding reagent color changes and/or describe the result on the line beside it. Include the level of discoloration (I: the whole layer is discolored, II: half of the layer is discolored, III: approx. 0.5-2.0 mm is discolored)

Tube #131 (1)
20 Sec. Sample

Diagram description: Tube #131 (1) 20 Sec. Sample. Reagent layers A-E. Results: A (yellow), B (red), C (white), D (white), E (yellow). Discoloration levels: A (I), B (I), C (I), D (I), E (I).

Tubes #186B (2)
30 Sec. Sample

← "D" Side Sampling "A" Side Sampling →

Diagram description: Tubes #186B (2) 30 Sec. Sample. Reagent layers A-D. Results: A (orange), B (white), C (yellow), D (yellow). Discoloration levels: A (I), B (I), C (I), D (I).

Sensidyne® Field Colorimetric Screen Sampling Form

Date:	5/27/20
Personnel:	JDK
Weather:	partly sunny 73.7.4mm by 25.8°c
Location:	corner of Thomas and York

Select the Sampling Reason(s)

Scheduled Sample

Complaint Received

Date/time of complaint: 5/27/20 8:46 am
9:25 am

Observations/comments: no odor upon arrival nor during sampling

Leak Check

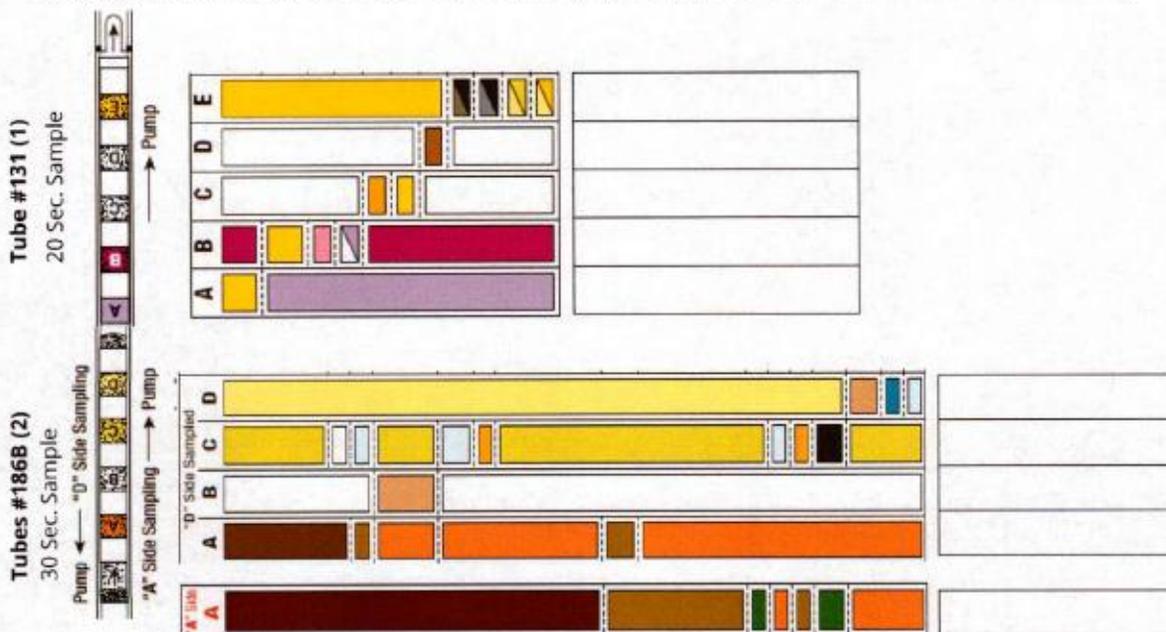
Pass Fail

Corrective actions for failed check: _____

Results

Time of Sample: 10:12 AM / PM

Place an "X" or an arrow over any corresponding reagent color changes and/or describe the result on the line beside it. Include the level of discoloration (I: the whole layer is discolored, II: half of the layer is discolored, III: approx. 0.5-2.0 mm is discolored)



Sensidyne® Field Colorimetric Screen Sampling Form

Date:	5/27/20
Personnel:	JDK
Weather:	partly sunny 737.4mm Hg 25.8°C
Location:	corner of Thomas and Taylor

Select the Sampling Reason(s)

- Scheduled Sample
- Complaint Received

Date/time of complaint: 5/27/20 8:46am
9:25am

Observations/comments: no odor upon arrival nor during sampling

Leak Check

- Pass
- Fail

Corrective actions for failed check: _____

Results

Time of Sample: 10:36 AM AM / PM

Place an "X" or an arrow over any corresponding reagent color changes and/or describe the result on the line beside it. Include the level of discoloration (I: the whole layer is discolored, II: half of the layer is discolored, III: approx.. 0.5-2.0 mm is discolored)

Tube #131 (1)
20 Sec. Sample

Diagram description: Tube #131 has 5 reagent layers (A-E). Layer A is yellow with a purple band. Layer B is yellow with a pink band. Layer C is yellow with a yellow band. Layer D is yellow with a brown band. Layer E is yellow with a black band. To the right are five empty boxes for notes.

Tubes #186B (2)
30 Sec. Sample

Pump ← "D" Side Sampling → Pump

"A" Side Sampling → Pump

Diagram description: Tubes #186B have 4 reagent layers (A-D). Layer A is dark brown with an orange band. Layer B is yellow with an orange band. Layer C is yellow with a blue band. Layer D is yellow with a blue band. To the right are four empty boxes for notes.

Sensidyne® Field Colorimetric Screen Sampling Form

Date:	6/3/20
Personnel:	JOK
Weather:	partly sunny, 736.8 mmHg, 33.2°C
Location:	125 Woody Drive SE

Select the Sampling Reason(s)

Scheduled Sample

Complaint Received

Date/time of complaint: _____

Observations/comments: no odors detected

Leak Check

Pass Fail

Corrective actions for failed check: _____

Results

Time of Sample: 3:47 AM / PM

Place an "X" or an arrow over any corresponding reagent color changes and/or describe the result on the line beside it. Include the level of discoloration (I: the whole layer is discolored, II: half of the layer is discolored, III: approx. 0.5-2.0 mm is discolored)

The diagram shows three sampling tubes with their respective results. Each tube is divided into sections labeled A, B, C, D, and E. The results are as follows:

- Tube #131 (1):** 20 Sec. Sample. Results: A (yellow), B (red), C (yellow), D (white), E (yellow).
- Tubes #186B (2):** 30 Sec. Sample. Results: A (orange), B (white), C (yellow), D (yellow).
- Tube #186B (3):** 30 Sec. Sample. Results: A (dark red), B (orange), C (orange), D (orange).

Sensidyne® Field Colorimetric Screen Sampling Form

Date:	6/3/20
Personnel:	JOK
Weather:	partly sunny, 736.8 mmHg, 33.1°C
Location:	Thomas and York

Select the Sampling Reason(s)

- Scheduled Sample
- Complaint Received

Date/time of complaint: _____

Observations/comments: no odors detected

Leak Check

- Pass Fail

Corrective actions for failed check: _____

Results

Time of Sample: 3:13 AM / PM

Place an "X" or an arrow over any corresponding reagent color changes and/or describe the result on the line beside it. Include the level of discoloration (I: the whole layer is discolored, II: half of the layer is discolored, III: approx.. 0.5-2.0 mm is discolored)

Tube #131 (1)
20 Sec. Sample

Tubes #186B (2)
30 Sec. Sample

Labels: "D" Side Sampled, "A" Side Sampling, Pump

Results for Tube #131 (1):

- Layer E: Yellow bar with black diagonal lines (III)
- Layer D: Yellow bar with black diagonal lines (III)
- Layer C: Yellow bar with black diagonal lines (III)
- Layer B: Yellow bar with black diagonal lines (III)
- Layer A: Yellow bar with black diagonal lines (III)

Results for Tubes #186B (2):

- Layer D: Yellow bar with black diagonal lines (III)
- Layer C: Yellow bar with black diagonal lines (III)
- Layer B: Yellow bar with black diagonal lines (III)
- Layer A: Yellow bar with black diagonal lines (III)
- "A" Side: Yellow bar with black diagonal lines (III)

Sensidyne® Field Colorimetric Screen Sampling Form

Date:	6/12/20
Personnel:	JDK
Weather:	Sunny, breezy 27.8°C 743.0 mm Hg
Location:	Taylor and Thomas

Select the Sampling Reason(s)

Scheduled Sample

Complaint Received

Date/time of complaint: _____

Observations/comments: slight odor noted upon arrival

Leak Check

Pass Fail

Corrective actions for failed check: _____

Results

Time of Sample: 11:13 AM / PM

Place an "X" or an arrow over any corresponding reagent color changes and/or describe the result on the line beside it. Include the level of discoloration (I: the whole layer is discolored, II: half of the layer is discolored, III: approx.. 0.5-2.0 mm is discolored)

Tube #131 (1)
20 Sec. Sample

E	Yellow	Discolored (I)	
D	White	Discolored (I)	
C	White	Discolored (I)	
B	Red	Discolored (I)	
A	Yellow	Discolored (I)	

Tubes #186B (2)
30 Sec. Sample

D	Yellow	Discolored (I)	
C	Yellow	Discolored (I)	
B	White	Discolored (I)	
A	Orange	Discolored (I)	
A	Orange	Discolored (I)	

Sensidyne® Field Colorimetric Screen Sampling Form

Date:	6/12/20
Personnel:	JDK
Weather:	740.9 mm Hg 24.9°C sunny, breezy
Location:	125 Woody Dr. SE

Select the Sampling Reason(s)

- Scheduled Sample
- Complaint Received

Date/time of complaint: _____

Observations/comments: Slight odor noted upon arrival

Leak Check

- Pass
- Fail

Corrective actions for failed check: _____

Results

Time of Sample: 10:44 AM / PM

Place an "X" or an arrow over any corresponding reagent color changes and/or describe the result on the line beside it. Include the level of discoloration (I: the whole layer is discolored, II: half of the layer is discolored, III: approx. 0.5-2.0 mm is discolored)

Tube #131 (1)
20 Sec. Sample

Tube #186B (2)
30 Sec. Sample

Side Sampling: "D" Side Sampling, "A" Side Sampling

Colorimetric results for Tube #131 (1):

E	Yellow	
D	Yellow	
C	Yellow	
B	Yellow to Red	
A	Yellow to Purple	

Colorimetric results for Tube #186B (2):

D	Yellow	
C	Yellow	
B	Yellow to Orange	
A	Orange to Dark Brown	
A (Side)	Dark Brown to Green	

Sensidyne® Field Colorimetric Screen Sampling Form

Date:	6/18/20
Personnel:	JDK
Weather:	overcast, 23.2°C 739.8 mmHg
Location:	Thomas at Taylor

Select the Sampling Reason(s)

Scheduled Sample

Complaint Received

Date/time of complaint: 6/18/20 9:44am

Observations/comments: no odors detected

Leak Check

Pass Fail

Corrective actions for failed check: _____

Results

Time of Sample: 10:31 AM / PM

Place an "X" or an arrow over any corresponding reagent color changes and/or describe the result on the line beside it. Include the level of discoloration (I: the whole layer is discolored, II: half of the layer is discolored, III: approx.. 0.5-2.0 mm is discolored)

Tube #131 (1)
20 Sec. Sample

E						
D						
C						
B						
A						

Tubes #186B (2)
30 Sec. Sample

Pump ← "D" Side Sampling → Pump "A" Side Sampling → Pump

D						
C						
B						
A						

A Side						
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Sensidyne® Field Colorimetric Screen Sampling Form

Date:	6/18/20
Personnel:	JDK
Weather:	overcast 24.9°C 739.5 mmHg
Location:	Thomas at York

Select the Sampling Reason(s)

Scheduled Sample

Complaint Received

Date/time of complaint: 6/18/20 9:44am

Observations/comments: no odors detected

Leak Check

Pass Fail

Corrective actions for failed check: _____

Results

Time of Sample: 11:06 AM / PM

Place an "X" or an arrow over any corresponding reagent color changes and/or describe the result on the line beside it. Include the level of discoloration (I: the whole layer is discolored, II: half of the layer is discolored, III: approx.. 0.5-2.0 mm is discolored)

Tube #131 (1)
20 Sec. Sample

Tubes #186B (2)
30 Sec. Sample

Colorimetric results for Tube #131 (1):

E	Yellow	Discoloration: I
D	White	Discoloration: I
C	White	Discoloration: I
B	Yellow, Pink, Purple	Discoloration: I
A	Yellow, Purple	Discoloration: I

Colorimetric results for Tubes #186B (2):

"D" Side Sampled	D	Yellow	Discoloration: I
"D" Side Sampled	C	Yellow	Discoloration: I
"D" Side Sampled	B	White	Discoloration: I
"D" Side Sampled	A	Orange	Discoloration: I
"A" Side Sampled	A	Dark Red	Discoloration: I

Sensidyne® Field Colorimetric Screen Sampling Form

Date:	6/22/20
Personnel:	JDK
Weather:	partly cloudy, calm, 30.3°C, 738.8 mmHg
Location:	Parmer and York

Select the Sampling Reason(s)

- Scheduled Sample
- Complaint Received

Date/time of complaint: _____

Observations/comments: no odors detected during sampling

Leak Check

- Pass
- Fail

Corrective actions for failed check: _____

Results

Time of Sample: 11:07 AM / PM

Place an "X" or an arrow over any corresponding reagent color changes and/or describe the result on the line beside it. Include the level of discoloration (I: the whole layer is discolored, II: half of the layer is discolored, III: approx.. 0.5-2.0 mm is discolored)

Tube #131 (1)
20 Sec. Sample

Diagram description: Tube #131 (1) 20 Sec. Sample. Layers A-E. Layer A: yellow, layer B: red, layer C: yellow, layer D: white, layer E: yellow. Results: Layer A: purple, Layer B: red, Layer C: yellow, Layer D: white, Layer E: yellow.

Tubes #186B (2)
30 Sec. Sample

Diagram description: Tubes #186B (2) 30 Sec. Sample. Layers A-D. Layer A: brown, layer B: white, layer C: yellow, layer D: yellow. Results: Layer A: orange, Layer B: white, Layer C: yellow, Layer D: yellow.

Sensidyne® Field Colorimetric Screen Sampling Form

Date:	6/22/20
Personnel:	JDK
Weather:	partly cloudy, calm, 736.6 mmHg, 28.2°C
Location:	125 Woody Dr. S.E.

Select the Sampling Reason(s)

Scheduled Sample

Complaint Received

Date/time of complaint: _____

Observations/comments: no odors detected during sampling

Leak Check

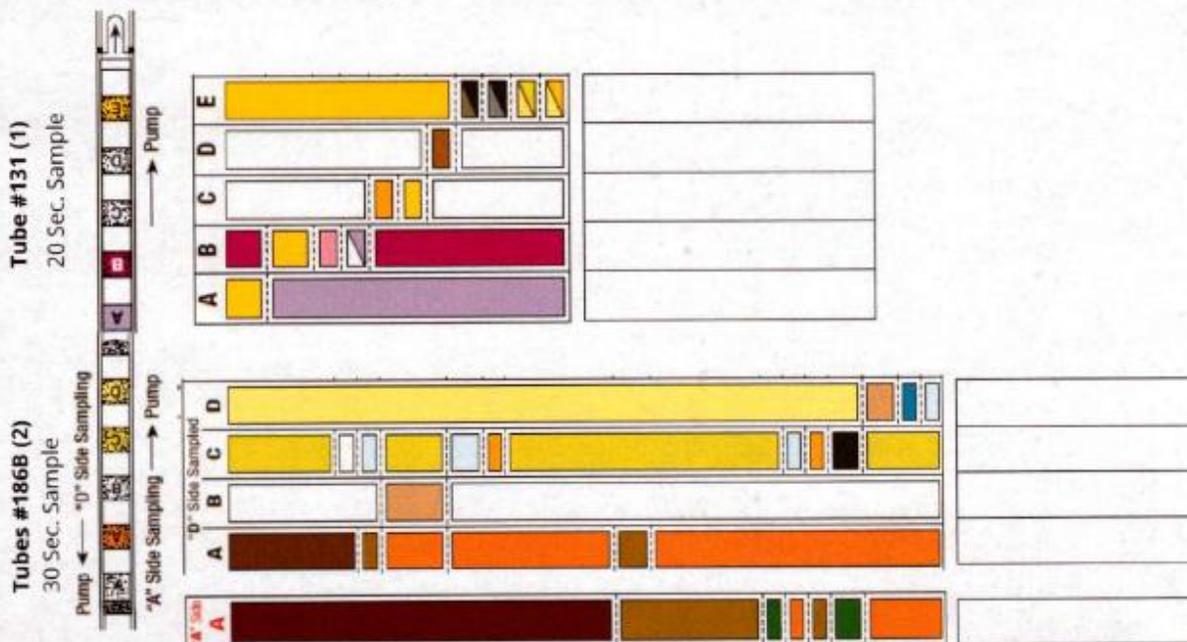
Pass Fail

Corrective actions for failed check: _____

Results

Time of Sample: 11:41 AM / PM

Place an "X" or an arrow over any corresponding reagent color changes and/or describe the result on the line beside it. Include the level of discoloration (I: the whole layer is discolored, II: half of the layer is discolored, III: approx. 0.5-2.0 mm is discolored)



Sensidyne® Field Colorimetric Screen Sampling Form

Date:	6/26/20
Personnel:	JDK
Weather:	overcast, 23.2°C, 742.5 mmHg
Location:	Thomas and York

Select the Sampling Reason(s)

Scheduled Sample

Complaint Received

Date/time of complaint: _____

Observations/comments: no odors during sampling

Leak Check

Pass Fail

Corrective actions for failed check: _____

Results

Time of Sample: 11:36 AM / PM

Place an "X" or an arrow over any corresponding reagent color changes and/or describe the result on the line beside it. Include the level of discoloration (I: the whole layer is discolored, II: half of the layer is discolored, III: approx. 0.5-2.0 mm is discolored)

Tube #131 (1)
20 Sec. Sample

Diagram of tube #131 showing reagent layers A-E. Results: Layer A is purple; Layer B is red; Layer C is white; Layer D is white; Layer E is yellow with some discoloration.

Tubes #186B (2)
30 Sec. Sample

Diagram of tubes #186B showing reagent layers A-D. Results: Layer A is orange; Layer B is white; Layer C is yellow; Layer D is yellow.

Sensidyne® Field Colorimetric Screen Sampling Form

Date:	6/29/20
Personnel:	JDX
Weather:	calm, overcast, 737.7mmHg, 33.4°C
Location:	Pleasant Grove Rd. at KOA Campground

Select the Sampling Reason(s)

Scheduled Sample

Complaint Received

Date/time of complaint: 6/29/20 2:11pm

Observations/comments: no odors detected upon arrival nor during sampling

Leak Check

Pass Fail

Corrective actions for failed check: _____

Results

Time of Sample: 3:46 AM / PM

Place an "X" or an arrow over any corresponding reagent color changes and/or describe the result on the line beside it. Include the level of discoloration (I: the whole layer is discolored, II: half of the layer is discolored, III: approx. 0.5-2.0 mm is discolored)

Tube #131 (1)
20 Sec. Sample

E	Yellow	Orange	Red	Dark Red	Black	White	
D	Yellow	Orange	Red	Dark Red	Black	White	
C	Yellow	Orange	Red	Dark Red	Black	White	
B	Yellow	Orange	Red	Dark Red	Black	White	
A	Yellow	Orange	Red	Dark Red	Black	White	

Tubes #186B (2)
30 Sec. Sample

D	Yellow	Orange	Red	Dark Red	Black	White	
C	Yellow	Orange	Red	Dark Red	Black	White	
B	Yellow	Orange	Red	Dark Red	Black	White	
A	Yellow	Orange	Red	Dark Red	Black	White	
A	Yellow	Orange	Red	Dark Red	Black	White	

Sensidyne® Field Colorimetric Screen Sampling Form

Date:	7/1/20
Personnel:	JDK
Weather:	partly cloudy, calm, 27.3°C 732.8mm
Location:	125 Woody Dr. S.E.

Select the Sampling Reason(s)

Scheduled Sample

Complaint Received

Date/time of complaint: _____

Observations/comments: no odor observed

Leak Check

Pass Fail

Corrective actions for failed check: _____

Results

Time of Sample: 6:28 AM / PM

Place an "X" or an arrow over any corresponding reagent color changes and/or describe the result on the line beside it. Include the level of discoloration (I: the whole layer is discolored, II: half of the layer is discolored, III: approx. 0.5-2.0 mm is discolored)

Tube #131 (1)
20 Sec. Sample

Tubes #186B (2)
30 Sec. Sample

The diagram shows two sampling tubes with reagent layers labeled A, B, C, D, and E. To the right of each tube are boxes for recording results. Tube #131 shows a yellow layer (E) with some discoloration, and a purple layer (A) with a dark purple color change. Tubes #186B show a yellow layer (D) with some discoloration, and a dark orange layer (A) with a dark orange color change.

Sensidyne® Field Colorimetric Screen Sampling Form

Date:	7/1/20
Personnel:	JDK
Weather:	partly cloudy, calm, 31.7°C 736.3mm
Location:	Pleasant Grove Rd. at KOA Campground

Select the Sampling Reason(s)

Scheduled Sample

Complaint Received

Date/time of complaint: _____

Observations/comments: very slight odor observed during testing

Leak Check

Pass Fail

Corrective actions for failed check: _____

Results

Time of Sample: 6:49 AM / PM

Place an "X" or an arrow over any corresponding reagent color changes and/or describe the result on the line beside it. Include the level of discoloration (I: the whole layer is discolored, II: half of the layer is discolored, III: approx.. 0.5-2.0 mm is discolored)

Tube #131 (1)
20 Sec. Sample

Tubes #186B (2)
30 Sec. Sample

Diagram showing colorimetric results for three tubes. Each tube has sections labeled A through E. The results are as follows:

- Tube #131 (1):**
 - Section E: Yellow background with vertical black lines.
 - Section D: Yellow background with vertical black lines.
 - Section C: Yellow background with vertical black lines.
 - Section B: Yellow background with vertical black lines.
 - Section A: Yellow background with vertical black lines.
- Tubes #186B (2):**
 - Section D: Yellow background with vertical black lines.
 - Section C: Yellow background with vertical black lines.
 - Section B: Yellow background with vertical black lines.
 - Section A: Yellow background with vertical black lines.