



Infrastructure · Water · Environment · Buildings

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Subject:
Impoundment Basin Odor Characterization Results Report
Hercules Inc. Hattiesburg Facility
Hattiesburg, Forrest County, Mississippi
Agency Interest No. 2022

ENVIRONMENT

Dear Mr. Wells:

ARCADIS U.S., Inc., is pleased to submit this *Impoundment Basin Odor Characterization Results Report* on behalf of our client, Hercules Incorporated (Hercules), for the above referenced site. This report contains the results of the odor characterization effort conducted in response to the Mississippi Department of Environmental Quality's January 23, 2012, *Revisions to Impounding Basin Decommissioning Workplan* letter.

Date:
2 March 2012

If there are any questions concerning this submittal, please contact Hercules Project Coordinator Mr. Timothy Hassett at (302) 995-3456 or one of the undersigned at (225) 292-1004.

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John Ellis, P.G.


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208

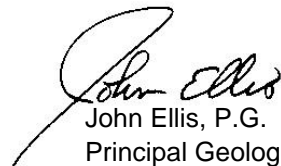
Sincerely,

ARCADIS U.S., Inc.

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Our ref:
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2999.7/C/1/kp


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Mr. Gary Rikard, Butler Snow

Attachment

Imagine the result

HERCULES

Impoundment Basin Odor Characterization Results Report

Hattiesburg, Mississippi

March 2, 2012



John Ellis
Principal Geologist/Project Manager

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**Impoundment Basin Odor
Characterization Results
Report**

Hattiesburg, Mississippi

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Hercules Incorporated

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LA002999.0007

Date:
March 2, 2012

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1. Introduction

This Impoundment Basin (IB) Odor Characterization Results Report is being submitted by ARCADIS U.S., Inc. (ARCADIS), on behalf of Hercules Incorporated, (Hercules), as required by the Mississippi Department of Environmental Quality's (MDEQ's) letter dated August 2, 2011 for the IB located at the Hercules Hattiesburg Facility (Figure 1). The activities leading up to the Odor Characterization effort are as follows:

- ARCADIS completed field activities to characterize and evaluate appropriate treatment methods for the sludge contained within the IB in April of 2010.
- ARCADIS on behalf of Hercules submitted a *Sludge Characterization and Bench Scale Treatability Report* on August 20, 2010. The report included an *IB Decommissioning Work Plan*.
- MDEQ provided comments on the *Sludge Characterization and Bench Scale Treatability Report* on November 10, 2010.
- ARCADIS on behalf of Hercules submitted a response to the November 2010 comments on January 7, 2011. This response included a *revised IB Decommissioning Work Plan* (Work Plan) and the associated technical specifications.
- MDEQ provided comments on the Work Plan in a letter dated August 2, 2011. Comment 1 of this letter required that a pilot test(s) for odor mitigation be performed.
- Hercules provided a response to these comments in a letter dated December 22, 2011. The response included an *Odor Characterization Work Plan*.
- MDEQ approved the *Odor Characterization Work Plan* in a letter dated January 23, 2012.

The *Odor Characterization Work Plan* was implemented on February 13, 2012 so that appropriate monitoring and preventative measures, if required, can be evaluated before sludge removal begins. The intent of the characterization effort was to simulate the conditions that are expected during the removal and placement of sludge into a holding container or dewatering equipment.

Based on the results presented herein, Section 2.4 of the Work Plan will be revised to include methods for odor monitoring and mitigation. This section will also present contingencies should the target odor thresholds be exceeded on site or at the property boundary.

This report presents the sampling protocol used during the implementation of the odor characterization effort, a presentation of the odor and potential constituents of concern (COC) results, and conclusions based on the data.

2. Sampling Protocol

A senior ARCADIS odor expert/emission control engineer implemented the odor characterization with the assistance of staff from our Baton Rouge, Louisiana office. The characterization effort consisted of the collection of three samples of sludge from the IB representing different areas of material to be removed (within the western influent area, west end of the main settling area and east end of the main settling area). Figure 2 presents the approximate locations where the samples were collected. At each location, samples were collected using a 4-liter aluminum bucket fastened to a 12-foot long, 2-inch by 2-inch piece of lumber. The samples were collected approximately one to two feet below the sludge surface. At each location, approximately 8 to 12 liters of sample were collected.

The samples were composited by placing them in a clean container (composite container) with the cover in place. The cover had two 1/8-inch (inside diameter) ports, one for extracting air samples and one to allow air to enter the chamber when an air sample was being removed. The contents of the composite container were mixed for approximately ten seconds to ensure a well composited sample.

Following the mixing, one port in the lid was connected with clean tubing to an evacuation lung device. A Tedlar® bag was placed in the evacuation lung device and was connected to the sample tubing via a fitting in the wall of the lung device. The external side of the fitting was connected to an SKC Inc. (SKC) pump with tubing and the pump was used to evacuate the lung device. The resulting vacuum in the evacuated lung caused air from the composite container to fill the sample bag. The sample bag was filled once, purged and refilled. The purging process conditions the inside surface of the bag to the sample and precludes reactions between the bag and sample air which may interfere with the sample's quality. The sample (No. 1) was analyzed for a series of compounds by Dräger-Tubes. The purpose of this effort was to

identify potential specific odorous compounds within the IB to assist in developing both odor and human health monitoring and mitigation efforts in the Work Plan.

The process of collecting and compositing a sludge sample was repeated two more times from the same location (No. 1). The second time, a sample was collected in a Tedlar® bag for analysis in an odor laboratory to quantify odor concentration, intensity, and characteristics. The third time, the cover was removed from the composite container and odors were perceived using a handheld olfactometer called a Nasal Ranger® manufactured by St. Croix Sensory, Inc. A copy of the product brochure for the Nasal Ranger® is presented in Appendix A.

The sludge sample collection and compositing, laboratory odor sample collection, and field Nasal Ranger® and Dräger-Tube analysis was repeated at two additional locations in the IB (sample No. 2 and No. 3). The composite container was rinsed with IB surface water at the subsequent location before collecting new sludge samples for analysis.

At the second location (No. 2), additional air sampling was completed to evaluate the results of the Dräger-Tubes. This additional sampling included:

- Collection of an air sample in a 1 liter SUMMA® canister for analysis of benzene, toluene, acetone, and carbon tetrachloride using United States Environmental Protection Agency Method TO-15 by TestAmerica, Inc. in South Burlington, Vermont;
- Pumping of the air sample using a laboratory calibrated pump through a hydrobromic acid treated sorbent tube for analysis of ethylene oxide using method National Institute for Occupational Safety and Health (NIOSH) 1614M/Occupational Safety and Health Administration (OSHA) 1010 by Analytics Corporation of Ashland, Virginia;
- Pumping of the air sample using a laboratory calibrated pump through a treated alumina sorbent tube for analysis of Organic Basic Nitrogen Compounds (Amines) using a method developed by Columbia Analytical Services, Inc. of Simi Valley, California and analyzes for 13 amine compounds. The sorbent tube is desorbed and analyzed by gas chromatography using a nitrogen phosphorus detector;

- Collection of an air sample in a Zefon EconoGrab™ bag for analysis reduced sulfur compounds using American Society for Testing of Materials (ASTM) 5504-08 by Columbia Analytical Services, Inc. of Simi Valley, California;
- Pumping of the air sample using a laboratory calibrated pump through a sulfuric acid treated SKC Anasorb® 747 sorbent tube for analysis of ammonia using method OSHA ID-188 by TestAmerica in Phoenix, Arizona;
- Pumping of the air sample using a laboratory calibrated pump through a coconut shell charcoal tube for analysis of epichlorohydrin using modified method NIOSH 1010 by TestAmerica, Inc. of Phoenix, Arizona, and;
- Pumping of the air sample using a laboratory calibrated pump through a SKC XAD®-7 sorbent tube for analysis of phenol using modified method OSHA 2546 by TestAmerica, Inc. of Phoenix, Arizona.

Prior to sampling the IB, odor readings were recorded using the olfactometer at a minimum of four locations around the IB including to the east which is adjacent to Providence Street (public road).

3. Odor Intensity and Characterization Results

This section explains the analysis and presents the result for both the field measured data and laboratory analyzed data pertaining to odor.

3.1 Field Measured Data (Nasal Ranger®)

Odor concentrations were measured in the field using a handheld olfactometer specifically a Nasal Ranger®. The device enables ambient air to be delivered to the tester's nose at a range of dilutions. A dilution referred to as dilution-to-threshold (D/T) and is defined as the ratio of the volume of carbon filtered air divided by the volume of odorous air. By adjusting the dial on the unit, air can be delivered to the tester's nose at D/T values of 60, 30, 15, 7, 4, and 2.

The testing is begun at the highest D/T value, 60, i.e., the setting that produces the highest dilution. If the ambient air is perceived to be odorous at the highest D/T value, the testing is concluded at that location. The results would be reported as >60 D/T, because this is the upper D/T of the device and the air being tested could have a higher D/T value if tested in a laboratory with an olfactometer having a higher dilution

capacity. If no odors are perceived, the testing continues to lower D/T settings until an odor is perceived. If no odors are perceived the results are reported as D/T <2. The higher the D/T value at which the ambient air is perceived to be odorous, the more odorous is the air.

The D/T results using the Nasal Ranger® for the three sludge odor samples and the IB perimeter odor samples are presented in Table 1. The results indicate that IB sample No. 1 had a D/T value of 15 to 30 while samples No. 2 and No. 3 had D/T values >60. Odor measurements were taken around the perimeter of the IB measured D/T values less than 2 except in the south direction, however this odor was thought to be indicative of vehicle fumes rather than the IB.

3.2 Laboratory Analytical Data

Samples were sent for laboratory analysis of reduced sulfur compounds to identify potential compound contributing to the odor and to an odor laboratory to identify additional information pertaining to the characteristics and intensity of the odor. The following sections explain the data and presents the results. The laboratory analytical report is included in Appendix B.

3.2.1 Odor Parameters.

Odors parameters were measured in a laboratory using industry standards by an odor panel consisting of at least four members, and generally containing six to eight members. Table 2 summarizes the odor laboratory results.

3.2.1.1 Dilution Threshold (D/T) and Recognition Threshold (R/T)

D/T and R/T are expressions of odor concentration. Both are expressed as a dimensionless number that is defined by the ratio of the initial volume of an air sample and the final volume of the odorous sample diluted to approximately the detection level. D/T represents the dilution value at which an average person can detect the presence of an odor. R/T represents the dilution value at which an average person can recognize the odor and its character. The odor analyses were conducted per ASTM E679-91, and EN 13725:2003 using a dynamic dilution, forced-choice, triangular olfactometer with a presentation air flow rate of 20-liters/min.

The D/T ranged from 8,000 to 12,000 while the R/T ranged from 4,100 to 10,000 for the three samples collected.

3.2.1.2 *Intensity*

Intensity is reported as values ranging from 1 to 8, which correspond to increasing concentrations of a standard odorant, n-butanol, from 12 to 1,550ppm_v, in a geometric progression, according to procedures outlined in ASTM E544-99. Due to the elevated recognition threshold, odor intensity was not measured from sample No. 1. Odor intensity ranged between 4 and 5 for samples No. 2 and No. 3 indicating a light to moderate/moderate intensity.

3.2.1.3 *Hedonic Tone*

Hedonic tone expresses the degree of unpleasantness and pleasantness of an odor on scales of -10 to 0 and from 0 to +10, respectively. For instance a highly unpleasant odor would be given a rating of -10 and a highly pleasant odor a +10. The hedonic tone of the three samples ranged from -3.8 to -5.0 indicating an unpleasant but not highly unpleasant characteristic.

3.2.1.4 *Odor Characterization*

Odors are characterized using referencing vocabulary for sensation and odor descriptors. Examples of sensation descriptor categories include warm, tingling, itching, metallic, cool, sharp, pungent and burning. Examples of odor descriptor categories include vegetable, fruity, floral, medicinal, chemical, fishy, offensive, and earthy. In some instances the descriptor is ranked in relative intensity on a 0 to 5 scale (faint to strong). When a common set of descriptors are used, the odor testing data can then be plotted using the respective intensity values.

Each of the three samples had a common odor characterization. They were described as chemical, offensive, earthy, vegetable, and fruity, however chemical and offensive were the dominant characteristics.

3.2.2 *Reduced Sulfur Compounds*

Reduced sulfur compounds (which includes hydrogen sulfide) are found in anaerobic conditions. These compounds have relatively low odor detection concentrations similar to hydrogen sulfide. For instance, the detection concentration for methyl mercaptan is 0.5 parts per billion by volume (ppb_v). These compounds were analyzed by gas chromatography that measures for twenty reduced sulfur compounds (ASTM Method D5504). The list of compounds included in the reduced sulfur scan is presented in Table 3. The results of the analysis on sample No. 2 indicate that hydrogen sulfide,

isopropyl mercaptan, and methyl mercaptan were detected at 110, 0.084, and 0.025 ppm_v, respectively. No compounds were detected in the blank. The presence of hydrogen sulfide was not detected in the Dräger-Tube possibly indicating that there were variations in sample collection.

4. Potential Constituents of Concern Results

The following presents the results of field and laboratory data for constituents thought to be potentially present in the vapors from the IB. Dräger-Tubes were used for collecting real time data similar to methods to be used during field oversight. Laboratory analysis was completed in an attempt to validate the Dräger-Tube results assuming the samples are similar. The laboratory analytical report is included in Appendix B.

4.1 Field Measured Data (Dräger-Tubes)

A total of ten Dräger-Tubes were used to provide field measured concentrations of ten constituents potentially present in the odors of the IB. Each analysis required a different tube requiring differing numbers of pumps with the Dräger hand pump. The constituents analyzed, measuring range, number of pumps, and results of the testing are presented on Table 4. All concentrations were not detectable except 0.2 ppm_v of hydrogen sulfide in sample No. 1 and 0.5 ppm_v of benzene in sample No. 2.

4.2 Laboratory Analytical Data

The results of the laboratory analysis of sample No. 2 are presented in Table 3 with the reduced sulfur scan data. A spike was identified during the analysis of the sample No. 2 using TO-15. This spike was identified as toluene at a concentration of 6.8 ppm_v. No constituents other than the previously presented reduced sulfur scan constituents were detected. Field and laboratory analyzed results appear to be consistent since neither detected any similar compounds.

5. Conclusions

Based on the results of the odor characterization effort the following conclusions have been derived.

- A hydrogen sulfide concentration of 110 ppm_v and a D/T concentration ranging from 8,000 to 12,000 during the sampling event indicates that there is a high off-site odor potential with respect to concentration.
- The concentration of hydrogen sulfide (100 ppm_v) analyzed in the laboratory during this characterization effort indicates that the emission of hydrogen sulfide could be a health concern with workers and the community. However, since the majority of the odor is from hydrogen sulfide, if the odor is addressed sufficiently, then the health risk will be addressed as well.
- An intensity value ranged from 4 to 5 during the sampling event indicates that there is a medium off-site odor potential with respect to intensity.
- No IB odors were perceived at the start of the day with the IB in an undisturbed state.
- It is expected that removal and dewatering of sludge from the IB could lead to off-site odor issues given the odor concentrations reported herein therefore mitigation efforts will be implemented at the IB during sludge removal and dewatering operations such as the use of foaming agents and vapor recovery and treatment.

Based on the above conclusions, the IB sludge removal contractor will be required to select a mitigation approach and prove its effectiveness on site prior to full scale implementation of sludge removal and dewatering. Section 2.4 of the Work Plan will outline mitigation technologies with a high potential for success based on the data presented in this *Odor Characterization Results Report* for the contractor to implement. The Work Plan will also outline standards for the contractor to achieve as a measure of success. The contractor will also be required to have a contingency plan prior to mobilization to the site in the event that the selected technology does not perform to the standards.

Table 1. Olfactometer Field Results, Odor Characterization, Impoundment Basin, Hercules, Hattiesburg, MS.

Sample Location	D/T	Nasal Ranger Setting					
		60	30	15	7	4	2
No. 1	15 to 30	N	N	Y	Y	Y	Y
No. 2	>60	Y	Y	Y	Y	Y	Y
No. 3	>60	Y	Y	Y	Y	Y	Y
IB - S	2 to 4	N	N	N	N	N	Y ⁽¹⁾
IB - W	<2	N	N	N	N	N	N
IB - N	<2	N	N	N	N	N	N
IB - E	<2	N	N	N	N	N	N

D/T - Dilution threshold (dilution ratio at which it is no longer detected) based on the Nasal Ranger readings

N - Indicates that the odor has not been detected using the Nasal Ranger® when sample was diluted by the ratio equal to the Nasal Ranger setting.

Y - Indicates that the odor was detected using the Nasal Ranger® when sample was diluted by the ratio equal to the Nasal Ranger setting.

⁽¹⁾ Odor had a burnt, vehicle exhaust quality.

Table 2. Odor Laboratory Results, Odor Characterization, Impoundment Basin, Hercules, Hattiesburg, MS.

Sample Number	ASTM E679 & EN13725		ASTM E544	CHARACTERIZATION		Sensation Description (based on scale of 0 to 5, 1=fair, 5=strong)								Odor Description (based on scale of 0 to 5, 1=fair, 5=strong)							
	Detection Threshold	Recognition Threshold	Intensity	Hedonic Tone	Principal Odor Descriptors	warm	tingling	itching	metallic	cool	sharp	pungent	burning	floral	fruity	vegetable	earthy	offensive	fishy	chemical	medicinal
1	12,000	10,000	NO	-5.0	Chemical, Offensive, Earthy, Vegetable, Fruity	0.6	0.0	0.0	0.0	0.0	0.4	1.6	0.0	0.0	0.2	0.6	0.6	2.6	0.0	2.6	0.0
2	14,000	8,600	n = 4 to 5 (140 ppm)	-3.8	Offensive, Chemical, Earthy, Vegetable, Floral	0.6	0.0	0.0	0.0	0.0	0.0	0.8	0.6	0.2	0.0	0.6	0.8	2.8	0.0	2.2	0.0
3	8,000	4,100	n = 4 to 5 (130 ppm)	-4.4	Chemical, Offensive, Earthy, Vegetable, Fruity	0.6	0.0	0.0	0.0	0.0	0.4	0.6	0.6	0.0	0.2	0.6	1.0	2.6	0.0	2.8	0.0

NO - Not observed

ASTM - American Society of Testing of Materials

Detection threshold = maximum dilution ratio at which the odor from the sample could still be detected.

Recognition threshold = maximum dilution ratio at which the odor from the sample could still be recognized.

Hedonic Tone = scale to quantify the offensive nature of the odor. (0 being least offensive and -10 being the most offensive).

Intensity = reported as a concentration relative to n-butanol (standard odorant), converted to a scale (n-scale) of 1 to 8 which can be described as follows.

- n=1 very faint Odorant present in the air which is barely perceptible and may not be detected if not specifically inhaling to detect an odor.
- n=2 very light Odorant present in the air which activates the sense of smell but the characteristics may not be distinguishable.
- n=3 light Odorant present in the air which activates the sense of smell and is distinguishable and definite but not necessarily objectionable in short duration (Recognition Threshold).
- n=4 light to moderate Odorant present in the air which activates the sense of smell, is distinguishable and definite, and at times objectionable.
- n=5 moderate Odorant present in the air which easily activates the sense of smell, is very distinct and clearly distinguishable and may tend to be objectionable and/or irritating.
- n=6 moderate to strong Odorant present in the air which easily activates the sense of smell, is very distinct and tends to be objectionable, and at times perceived pungent enough to cause a person to avoid it completely.
- n=7 strong Odorant present in the air which would be objectionable and cause a person to attempt to avoid it completely.
- n=8 very strong Odorant present in the air which is so strong it is overpowering and intolerable for any length of time.

Table 3 . Laboratory Analytical Results, Odor Characterization, February 13, 2012, Impoundment Basin, Hercules, Hattiesburg, MS.

Sample ID Units	No. 2 ppm (mg/m ³)	Blank ppm (mg/m ³)
RSS: Sulfides ⁽¹⁾		
Hydrogen Sulfide	110 (150)	<0.005 (<0.007)
Carbonyl Sulfide	<0.050 (<0.120)	<0.005 (<0.012)
Dimethyl Sulfide	<0.050 (<0.130)	<0.005 (<0.013)
Carbon Disulfide	<0.025 (<0.078)	<0.005 (<0.0078)
Ethyl Methyl Sulfide	<0.050 (<0.160)	<0.005 (<0.016)
Diethyl Sulfide	<0.050 (<0.180)	<0.005 (<0.018)
Dimethyl Disulfide	<0.025 (<0.096)	<0.0025 (<0.0096)
Diethyl Disulfide	<0.025 (<0.120)	<0.0025 (<0.012)
RSS: Mercaptans ⁽¹⁾		
Methyl Mercaptan	0.25 (0.5)	<0.005 (<0.0098)
Ethyl Mercaptan	<0.050 (<0.130)	<0.005 (<0.013)
Isopropyl Mercaptan	0.084 (0.26)	<0.005 (<0.016)
tert-Butyl Mercaptan	<0.050 (<0.180)	<0.005 (<0.018)
n-Propyl Mercaptan	<0.050 (<0.180)	<0.005 (<0.016)
Isobutyl Mercaptan	<0.050 (<0.180)	<0.005 (<0.018)
n-Butyl Mercaptan	<0.050 (<0.160)	<0.005 (<0.018)
RSS: Phene's ⁽¹⁾		
Thiophene	<0.050 (<0.170)	<0.005 (<0.017)
3-Methylthiophene	<0.050 (<0.200)	<0.005 (<0.020)
Tetrahydrothiophene	<0.050 (<0.180)	<0.005 (<0.018)
2,5-Dimethylthiophene	<0.050 (<0.230)	<0.005 (<0.0023)
2-Ethylthiophene	<0.050 (<0.230)	<0.005 (<0.023)
Organic Basic Nitrogen Compounds ⁽¹⁾		
Dimethylamine	<0.00053*	<0.00053*
Ethylamine	<0.00055*	<0.00055*
Trimethylamine	<0.00054*	<0.00054*
Isopropylamine	<0.00051*	<0.00051*
tert-Butylamine	<0.001*	<0.001*
n-Propylamine	<0.00052*	<0.00052*
Diethylamine	<0.00051*	<0.00051*
sec-Butylamine	<0.00051*	<0.00051*
Isobutylamine	<0.00051*	<0.00051*
n-Butylamine	<0.00052*	<0.00052*
Diisopropylamine	<0.00051*	<0.00051*
Triethylamine	<0.00052*	<0.00052*
Dipropylamine	<0.00050*	<0.00050*
Organic Carbon Compounds ⁽²⁾		
Benzene	<0.042 (<0.130)	<0.0002 (<0.00064)
Toluene	6.8 (26)	<0.0002 (<0.00075)
Carbon Tetrachloride	<0.042 (<0.270)	<0.0002 (<0.0013)
Acetone	<1.1 (<2.5)	<0.005 (<0.012)
Epichlorohydrin ⁽⁴⁾	<0.304 (<1.15)	<0.0047*
Ethylene Oxide ⁽³⁾	<0.002*	<0.002*
Ammonia ⁽⁴⁾	<3.87 (<2.7)	<0.029*
Phenol ⁽⁴⁾	<0.535 (<2.06)	<0.00402*

(1) Analyzed by Columbia Analytical Service, Inc. of Simi Valley, CA.
(2) Analyzed by TestAmerica Laboratories, Inc. of South Burlington, VT.
(3) Analyzed by Analytics Corporation of Ashland, VA.
(4) Analyzed by TestAmerica Laboratories, Inc. of Phoenix, AZ.
ppm - parts per million by volume.
ug/m³ - milligrams per meter cubed.
RSS - reduced sulfur scan.
* Measured as milligrams on sample tube.
Detected constituents presented in **BOLD**.

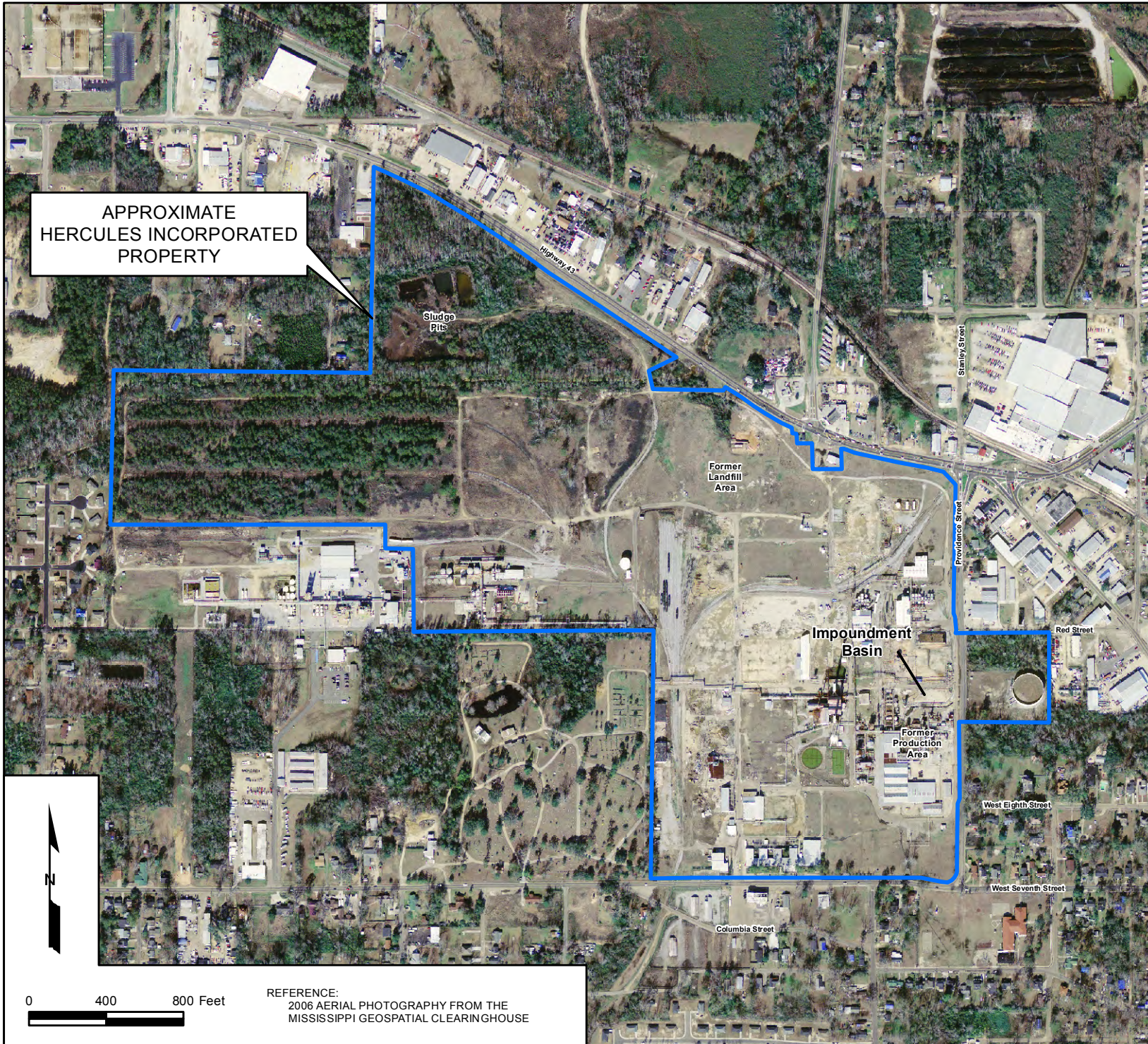
Table 4. Drager Tube Testing Data and Field Results, Odor Characterization, Impoundment Basin, Hercules, Hattiesburg, MS.

Part No.	Draeger-Tube®	Measuring Range	# of pumps	Sample No. 1 (ppm)	Sample No. 2 (ppm)	Sample No. 3 (ppm)
8101991	Hydrogen Sulfide	0.2 - 6 ppm	1	0.2	ND	ND
CH25903	Organic Basic Nitrogen Compounds	> 1 mg/m ³	8	ND	ND	ND
8101841	Benzene	0.5 - 10 ppm	20	ND	0.5	ND
8101021	Carbon Tetrachloride	1 - 15 ppm	5	ND	ND	ND
8103381	Acetone	40 - 800 ppm	1	ND	ND	ND
6728111	Epichlorohydrin	5 - 50 ppm	20	ND	ND	ND
6728961	Ethylene Oxide	1 - 15 ppm	20	ND	ND	ND
8101711	Ammonia	0.25 - 3 ppm	10	ND	ND	ND
8101641	Phenol	1 - 20 ppm	20	ND	ND	ND
8103281	Mercaptan	0.1 - 15 ppm	2	ND	ND	ND

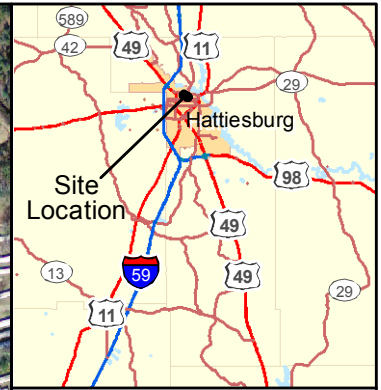
ND - Not detected.

ppm - parts per million by volume.

mg/m³ - Milligrams per cubic meter.



APPROXIMATE
HERCULES INCORPORATED
PROPERTY



**SITE
LAYOUT
MAP

AERIAL**

Odor Characterization
Results Report

HERCULES INCORPORATED
613 W. 7th Street
Hattiesburg, Mississippi

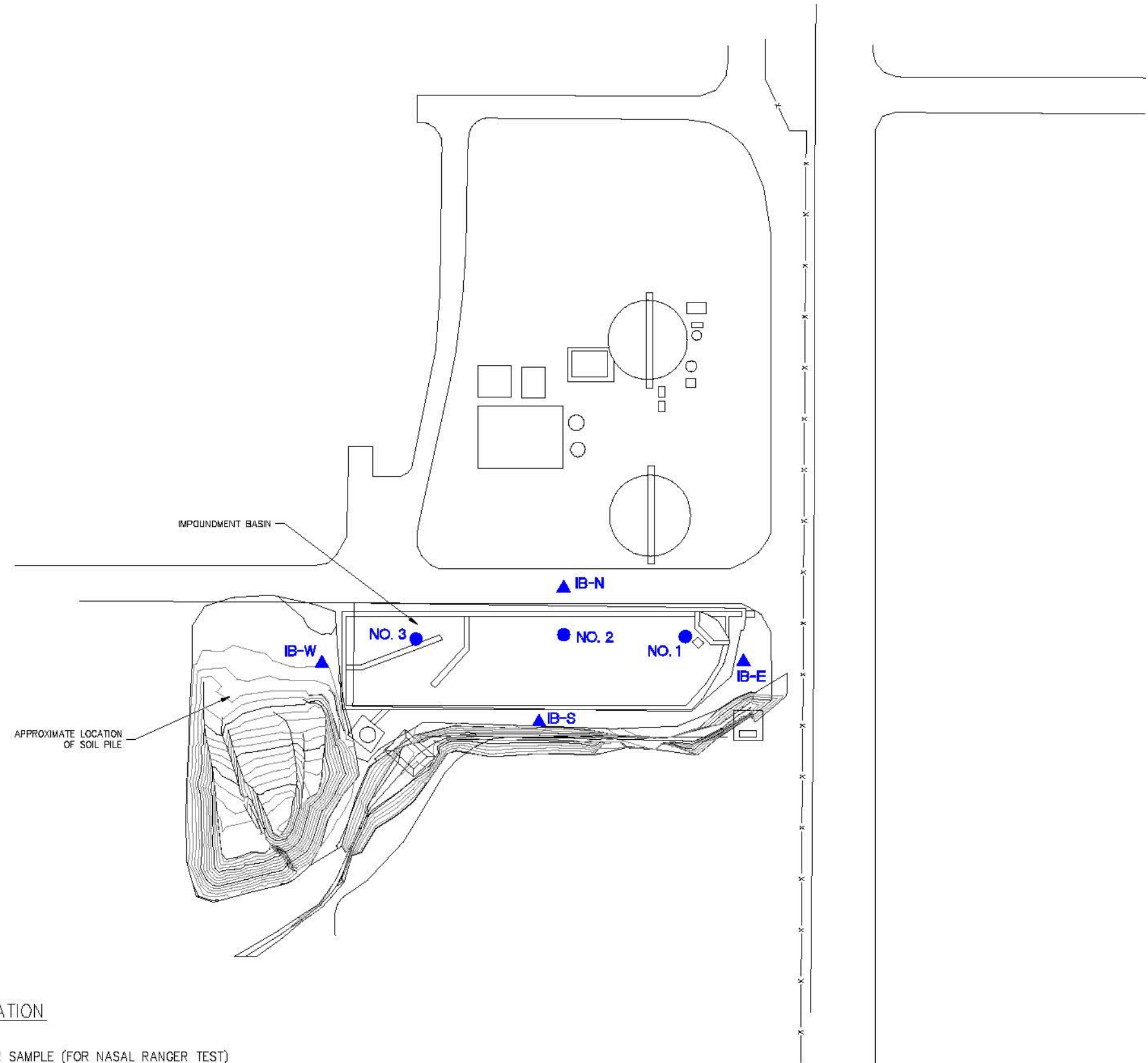


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PROJECT MANAGER: BG	CHECKED BY: CD
DRAWING FILE:	GIS FILE:
DRAWING BY: JEC	DATE: 02/29/2012
PROJECT NUMBER: LA002999.0007	FIGURE NUMBER: 1

REFERENCE:
2006 AERIAL PHOTOGRAPHY FROM THE
MISSISSIPPI GEOSPATIAL CLEARINGHOUSE


DB(S, MEN) LD(Opr) PIC(Opr) PM(Read) TM(Opr) LVR(Opr)ON="OFF=REF"
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EXPLANATION

- NO. 1 AMBIENT AIR SAMPLE (FOR NASAL RANGER TEST)
- ▲ IB-W SLUDGE SAMPLE FOR ODOR CHARACTERIZATION

NOTE: SAMPLE WAS CONDUCTED ON FEBRUARY 13, 2012.

Hercules Incorporated Odor Characterization Results Report Hattiesburg, Mississippi	
SAMPLE LOCATIONS ODOR CHARACTERIZATION STUDY	
	FIGURE 2



Appendix A

Nasal Ranger® Brochure



Nasal Ranger® Field Olfactometer



*Measure odors
with precision.*



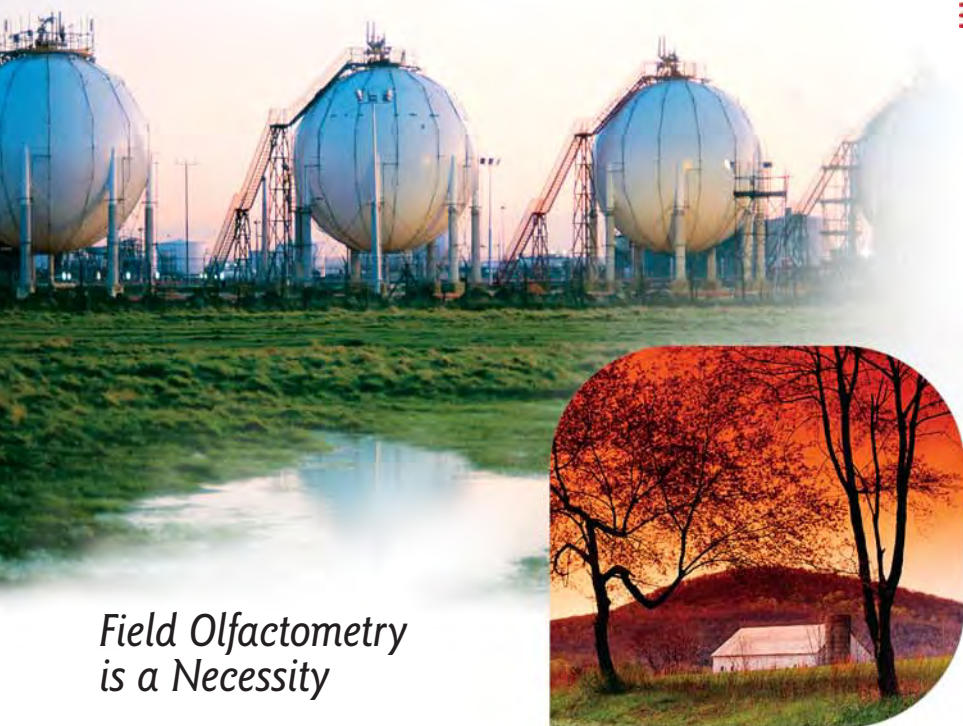
Nasal Ranger® Field Olfactometer

The Nasal Ranger® is a portable odor-measuring device that allows users to quantify odor strength in nearly any location or circumstance. This essential tool offers an innovative, easy-to-use alternative to guessing at odor strength.

Now, facility operators, community inspectors and neighborhood citizens can conduct complete odor monitoring, regulation, enforcement and documentation in the field. The Nasal Ranger® goes beyond traditional estimation methods, easily measuring odor strength at specific locations surrounding a facility.

In 2003, Central Davis Sewer District (Salt Lake City, UT) implemented odor monitoring with the Nasal Ranger into a comprehensive facility-wide odor management plan at their 10 MGD waste water treatment plant (WWTP). The Nasal Ranger was utilized to assist in identifying odor sources throughout the facility, and, after mitigation actions were taken, the Nasal Ranger was used to quantify the success of these changes through weekly community monitoring. With these changes and a new aggressive complaint response program, the WWTP significantly reduced community odor complaints. CDSO plans to continue use of the Nasal Ranger to maintain their good relationship with the neighboring citizens.

BioCycle, Journal of Composting & Organics Recycling,
September 2004



Field Olfactometry is a Necessity

Measuring odor strength is crucial for determining specific odor sources, verifying complaints, monitoring daily industrial operations and documenting specific odor episodes. Its applications are endless: industrial, agricultural, and municipal operations including wastewater treatment, landfills, composting, manufacturing and much more.

With the Nasal Ranger® you can:

- *Monitor daily industrial operations*
- *Evaluate odor mitigation methods*
- *Create credible, defensible evidence*
- *Determine and monitor compliance*
- *Investigate odor control effectiveness*
- *Verify odor dispersion modeling*
- *Determine specific odor sources*
- *Verify odor complaints*



How the Nasal Ranger® Works

The Nasal Ranger® provides a precise odor strength measurement that is consistent from place to place, facility to facility and user to user. It takes the subjectivity out of odor measurement and provides a universal standard for personnel to document odor strength in the field. The Nasal Ranger® provides a cost-effective method to confidently measure odors.

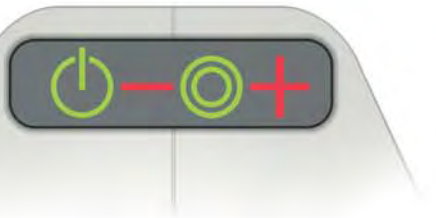
Dilution-to-Threshold

Using the Nasal Ranger® is a reliable way to quantify odor strength in terms of "Dilution-to-Threshold" (D/T) ratios. The D/T measurement is the most common method of measuring odors. This allows experts to quantify odors on a commonly recognized scale.

To make a D/T measurement, carbon-filtered air is mixed with specific volumes of odorous ambient air. The D/T ratio is a measure of the number of dilutions needed to take the odorous air to its threshold.

Calibrated for Accuracy

Because sniff rates vary from user to user, the Nasal Ranger® includes a calibrated flow sensor to increase measurement consistency. When in use, the flow sensor assures users that their "sniff rate reading" is at the inhalation target. Each Nasal Ranger® comes with a calibration certificate to guarantee accuracy.



"The portability and ease of use of the Nasal Ranger allowed the County to quantify odors around a municipal waste handling facility before and after odor mitigation efforts were introduced. The data gave us the confidence that our mitigation efforts were successful and odors from the facility would not impact the neighborhood."

Jake Smith
Senior Environmentalist
Hennepin County, Minnesota

"We have successfully used the Nasal Ranger to determine odor thresholds at animal feeding operations and other odorous industries in the Southern United States."

Susan Schiffman, Ph.D.,
Durham, NC

Researcher in the area of taste and smell and their relation to mood and well-being. She is recognized in the sensory field and specifically in the area of agricultural odors research.



Nasal Ranger® Training

A focused Nasal Ranger® training course is available through the St. Croix Sensory "ODOR SCHOOL®". This complete training program gives Nasal Ranger® users extensive knowledge and experience with its various monitoring and measuring capabilities.

Accessories



The Nasal Ranger® comes complete with Odor Filter Cartridges (4), Nasal Mask with Check Valves, Comfort Seal and storage pouch, Additional Comfort Seals (5), Isopropyl Alcohol Mask Wipes (10), Barrel Cleaning Brush, 9-Volt Battery, Shoulder Strap and Carrying Case.



St. Croix Sensory, Inc.

PO Box 313 | 3549 Lake Elmo Avenue
Lake Elmo, MN 55042
1.800.879.9231
[P] 651.439.0177
[F] 651.439.1065
[E] info@nasalranger.com
www.nasalranger.com
www.fivesenses.com

[Nasal Mask]

Teflon coated, replaceable Nasal Mask is ergonomically designed to fit your nose comfortably. Check valves allow comfortable breathing through the mask.

[Comfort Seal]

The Comfort Seal is a disposable foam seal designed to ensure comfort of the Nasal Mask.

[Mask Wipes]

Individual isopropyl alcohol wipes are used to clean Nasal Masks between uses.

[Universal Odor-Filter Cartridges]

The replaceable odor-filter cartridges contain a proprietary blend of granular activated carbon, which is designed to remove odors from the ambient air to create the odor-free dilution air. Individually wrapped pairs of replacement cartridges attach easily to the Nasal Ranger®.

[High D/T Dial]

An alternate orifice dial allows you to expand your measurement capabilities with D/T's of 60, 100, 200, 300, 400 and 500

[Odor Sensitivity Kit]

Originally designed for physicians to measure the sense of smell, this kit has been adapted for use in the olfactometry field to measure a user's sensitivity and to provide measurable proof of a user's appropriateness for odor detection tasks.



Call today to learn
more about the Nasal Ranger®
1-800-879-9231 or visit www.nasal-ranger.com



Appendix B

Laboratory Analytical Reports

TestAmerica

THE LEADER IN ENVIRONMENTAL TESTING

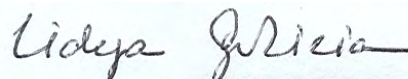
ANALYTICAL REPORT

TestAmerica Laboratories, Inc.
TestAmerica Savannah
5102 LaRoche Avenue
Savannah, GA 31404
Tel: (912)354-7858

TestAmerica Job ID: 680-76905-1
Client Project/Site: HERC Hattiesburg - Air Sampling 2/13/12

For:
Ashland Inc.
Ashland Hercules Research Center
500 Hercules Rd Bldg 8139
Wilmington, Delaware 19808

Attn: Timothy Hassett



Authorized for release by:
2/28/2012 2:58:18 PM

Lidya Gulizia
Project Manager II
lidya.gulizia@testamericainc.com

cc: Bill Golla

LINKS

Review your project
results through
TotalAccess

Have a Question?



Visit us at:
www.testamericainc.com

The test results in this report meet all 2003 NELAC and 2009 TNI requirements for accredited parameters, exceptions are noted in this report. This report may not be reproduced except in full, and with written approval from the laboratory. For questions please contact the Project Manager at the e-mail address or telephone number listed on this page.

This report has been electronically signed and authorized by the signatory. Electronic signature is intended to be the legally binding equivalent of a traditionally handwritten signature.

Results relate only to the items tested and the sample(s) as received by the laboratory.

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Case Narrative

Client: Ashland Inc.
Project/Site: HERC Hattiesburg - Air Sampling 2/13/12

TestAmerica Job ID: 680-76905-1

Job ID: 680-76905-1

Laboratory: TestAmerica Savannah

Narrative

CASE NARRATIVE

Client: Ashland Inc.

Project: HERC Hattiesburg - Air Sampling 2/13/12

Report Number: 680-76905-1

With the exceptions noted as flags or footnotes, standard analytical protocols were followed in the analysis of the samples and no problems were encountered or anomalies observed. In addition all laboratory quality control samples were within established control limits, with any exceptions noted below. Each sample was analyzed to achieve the lowest possible reporting limit within the constraints of the method. In some cases, due to interference or analytes present at high concentrations, samples were diluted. For diluted samples, the reporting limits are adjusted relative to the dilution required.

Calculations are performed before rounding to avoid round-off errors in calculated results.

All holding times were met and proper preservation noted for the methods performed on these samples, unless otherwise detailed in the individual sections below or in the case narrative provided in the subcontractor's analytical report.

RECEIPT

The samples were collected on 02/13/2012, sent to the respective analysis laboratory and samples were received on 02/14/2012 at the subcontract laboratories. The sample submitted to TestAmerica Burlington arrived in good condition, properly preserved and at ambient temperature.

Please refer to the laboratory reports for TestAmerica Phoenix, Columbia Analytical Services and Analytics for receiving information for the samples submitted to these laboratories.

VOLATILE ORGANIC COMPOUNDS

Sample No.2-Summa Cannister (680-76905-6) was analyzed for Volatile Organic Compounds in accordance with EPA Method TO-15. The samples were analyzed on 02/24/2012.

Sample No.2-Summa Cannister (680-76905-6)[211X] required dilution prior to analysis. The reporting limits have been adjusted accordingly.

No difficulties were encountered during the VOC analysis.

All quality control parameters were within the acceptance limits.

Subcontract Work

Method Ethylene Oxide / NIOSH 1614M-OSHA 1010: This method was subcontracted to Analytics - Ashland, VA.

Methods Amines/Basic Nitrogen Compounds (GC/NPD), Sulfide & Mercaptans / ASTM 5504: These methods were subcontracted to Columbia Analytical Services, Inc.

Methods Ammonia / OSHA ID-188, Epichlorohydrin / NIOSH 1010, Phenol / NIOSH 2546: These methods were subcontracted to TestAmerica Phoenix.

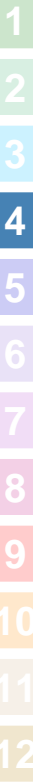
Sample Summary

Client: Ashland Inc.

TestAmerica Job ID: 680-76905-1

Project/Site: HERC Hattiesburg - Air Sampling 2/13/12

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
680-76905-1	No.1	Air	02/13/12 09:00	02/14/12 09:35
680-76905-2	No.2	Air	02/13/12 12:00	02/14/12 09:35
680-76905-3	No.3	Air	02/13/12 16:00	02/14/12 09:35
680-76905-4	No.2	Air	02/13/12 14:00	02/14/12 09:35
680-76905-5	Blank	Air	02/13/12 14:00	02/14/12 09:35
680-76905-6	No.2-Summa Cannister	Air	02/13/12 14:00	02/14/12 09:35
680-76905-7	No.2	Air	02/13/12 16:45	02/14/12 11:10
680-76905-8	No.2-Blank	Air	02/13/12 00:00	02/14/12 11:10
680-76905-9	No.2	Air	02/13/12 21:15	02/14/12 11:45
680-76905-11	No.2-	Air	02/13/12 20:22	02/14/12 11:45
680-76905-13	No.2	Air	02/13/12 19:50	02/14/12 11:45



Method Summary

Client: Ashland Inc.
Project/Site: HERC Hattiesburg - Air Sampling 2/13/12

TestAmerica Job ID: 680-76905-1

Method	Method Description	Protocol	Laboratory
TO-15	Volatile Organic Compounds in Ambient Air	EPA	TAL BUR
Amines/Basic Nitrogen Compounds (GC/NPD)	General Sub Contract Method	NONE	Columbia A
Local Method	General Sub Contract Method	NONE	Analytics
Sulfide & Mercaptans / ASTM 5504	General Sub Contract Method	NONE	Columbia A

Protocol References:

EPA = US Environmental Protection Agency
NONE = NONE

Laboratory References:

Analytics = Analytics - Ashland, VA, PO BOX 25249, Richmond, VA 23005
Columbia A = Columbia Analytical Services, Inc., 1317 South 13th Avenue, PO BOX 1030, Kelso, WA 98626
TAL BUR = TestAmerica Burlington, 30 Community Drive, Suite 11, South Burlington, VT 05403, TEL (802)660-1990



Definitions/Glossary

Client: Ashland Inc.
Project/Site: HERC Hattiesburg - Air Sampling 2/13/12

TestAmerica Job ID: 680-76905-1

Qualifiers

Air - GC/MS VOA

Qualifier	Qualifier Description
U	Indicates the analyte was analyzed for but not detected.

Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
☼	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CNF	Contains no Free Liquid
DL, RA, RE, IN	Indicates a Dilution, Reanalysis, Re-extraction, or additional Initial metals/anion analysis of the sample
EDL	Estimated Detection Limit
EPA	United States Environmental Protection Agency
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
ND	Not detected at the reporting limit (or MDL or EDL if shown)
PQL	Practical Quantitation Limit
QC	Quality Control
RL	Reporting Limit
RPD	Relative Percent Difference, a measure of the relative difference between two points
TEF	Toxicity Equivalent Factor (Dioxin)
TEQ	Toxicity Equivalent Quotient (Dioxin)

Client Sample Results

Client: Ashland Inc.
Project/Site: HERC Hattiesburg - Air Sampling 2/13/12

TestAmerica Job ID: 680-76905-1

Client Sample ID: No.2-Summa Cannister

Lab Sample ID: 680-76905-6

Date Collected: 02/13/12 14:00

Matrix: Air

Date Received: 02/14/12 09:35

Sample Container: Summa Canister 1L

Method: TO-15 - Volatile Organic Compounds in Ambient Air

Analyte	Result ppb v/v	Result ug/m3	Qualifier	RL ppb v/v	MDL ppb v/v	Prepared	Analyzed	Dil Fac
Acetone	1100	2500	U	1100	1100		02/24/12 10:56	211
Benzene	42	130	U	42	42		02/24/12 10:56	211
Carbon tetrachloride	42	270	U	42	42		02/24/12 10:56	211
Toluene	6800	26000		42	42		02/24/12 10:56	211

QC Sample Results

Client: Ashland Inc.
 Project/Site: HERC Hattiesburg - Air Sampling 2/13/12

TestAmerica Job ID: 680-76905-1

Method: TO-15 - Volatile Organic Compounds in Ambient Air

Lab Sample ID: MB 200-34110/16

Matrix: Air

Analysis Batch: 34110

Client Sample ID: Method Blank

Prep Type: Total/NA

Analyte	MB Result ppb v/v	MB Result ug/m3	MB Qualifier	RL	MDL	Prepared	Analyzed	Dil Fac
Acetone	5.0	12	U	5.0	5.0		02/24/12 03:04	1
Benzene	0.20	0.64	U	0.20	0.20		02/24/12 03:04	1
Carbon tetrachloride	0.20	1.3	U	0.20	0.20		02/24/12 03:04	1
Toluene	0.20	0.75	U	0.20	0.20		02/24/12 03:04	1

Lab Sample ID: LCS 200-34110/14

Matrix: Air

Analysis Batch: 34110

Client Sample ID: Lab Control Sample

Prep Type: Total/NA

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Acetone	10.0	10.6		ppb v/v		106	70 - 130
Benzene	10.0	9.30		ppb v/v		93	70 - 130
Carbon tetrachloride	10.0	8.90		ppb v/v		89	70 - 130
Toluene	10.0	8.72		ppb v/v		87	70 - 130

Lab Chronicle

Client: Ashland Inc.
Project/Site: HERC Hattiesburg - Air Sampling 2/13/12

TestAmerica Job ID: 680-76905-1

Client Sample ID: No.2-Summa Cannister

Lab Sample ID: 680-76905-6

Date Collected: 02/13/12 14:00

Matrix: Air

Date Received: 02/14/12 09:35

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	TO-15		211	34110	02/24/12 10:56	WRD	TAL BUR

Laboratory References:

Analytics = Analytics - Ashland, VA, PO BOX 25249, Richmond, VA 23005

Columbia A = Columbia Analytical Services, Inc., 1317 South 13th Avenue, PO BOX 1030, Kelso, WA 98626

TAL BUR = TestAmerica Burlington, 30 Community Drive, Suite 11, South Burlington, VT 05403, TEL (802)660-1990





Analytics Corporation
10329 Stony Run Lane
Ashland, VA 23005
Phone: (804)365-3000
Fax: (804)365-3002

February 17, 2012

Lidya Gulizia
TestAmerica Savannah

5402 LaRoche Ave
Savannah, GA 31404

Lab Workorder ID 9824
Client Project ID HERCULES
Client/Profile TestAmerica Savannah [9722]
Received February 14, 2012
Reported February 17, 2012

Dear Lidya Gulizia:

Attached are the results we obtained on the analysis of your samples submitted to Analytics on February 14, 2012. Any Chains-of-Custody associated by this sample group are enclosed. Air concentrations are calculated as a convenience to the client and the overall accuracy of this result depends on both the accuracy of the air volume and the amount found by analysis. Theoretical air volumes for passive monitors are calculated using the sampling time submitted and the manufacture's listed sampling rate for each compound. Results provided in this report relate only to the items tested.

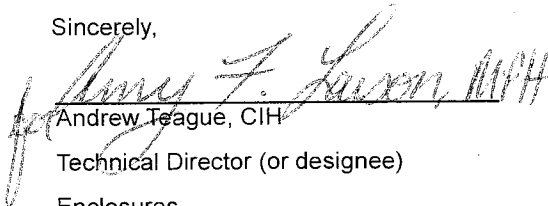
For blanks and non-detects the results indicated with a '<' value represents the reporting limit for the analysis. Unless otherwise noted results are not corrected for blank values.

Calculations for TWA assume all unsampled time is equal to zero concentration.

Unless the signature of the appropriate manager(s) appears on this report, this report should be considered PRELIMINARY and is subject to change.

We appreciate your confidence in allowing Analytics to be your testing laboratory. Any questions regarding this report can be addressed by calling our customer services department at (800) 888-8061.

Sincerely,


Andrew Teague, CIH
Technical Director (or designee)

Enclosures



Analytics Corporation
 10329 Stony Run Lane
 Ashland, VA 23005
 Phone: (804)365-3000 Fax: (804)365-3002
 AIHA Accreditation # 176, ID 100531

Final Report

5402 LaRoche Ave
 Savannah, GA 31404

Customer: 10309020
 Attention: Lidya Gulizia
 Work Requested By:
 Customer PO: N/A

Phone: 912-354-7858
 Location:
 Date Received: 2/14/2012
 Workorder ID: HERCULES

Lab ID: 9824001	Sample ID: SAMPLE NO.2	Media: 226-178, 100/50 HBr-treat	Sampling Date: 2/13/2012
-----------------	------------------------	----------------------------------	--------------------------

Analyte	Method	Analysis Date	Volume	Reporting Limit	RESULT			8-Hour TWA	Qual
					Front	Rear	Total		
Ethylene oxide	OSHA 1010M	2/16/2012		2 ug	<2 ug	ND	<2 ug		

Lab ID: 9824002	Sample ID: SAMPLE NO.2-BLANK	Media: 226-178, 100/50 HBr-treat	Sampling Date: 2/13/2012
-----------------	------------------------------	----------------------------------	--------------------------

Analyte	Method	Analysis Date	Volume	Reporting Limit	RESULT			8-Hour TWA	Qual
					Front	Rear	Total		
Ethylene oxide	OSHA 1010M	2/16/2012		2 ug	<2 ug	ND	<2 ug		





Analytics Corporation
10329 Stony Run Lane
Ashland, VA 23005
Phone: (804)365-3000 Fax: (804)365-3002
AIHA Accreditation # 176, ID 100531

Final Report

5402 LaRoche Ave
Savannah, GA 31404

Customer: 10309020
Attention: Lidya Gulizia
Work Requested By:
Customer PO: N/A

Phone: 912-354-7858
Location:
Date Received: 2/14/2012
Workorder ID: HERCULES

General Laboratory Comments

Abbreviations:

ug = micrograms, mg = milligrams, g = grams
ppm = parts per million (volume), ppb = parts per billion (volume)
mg/M3 = milligrams per cubic meter of air, ug/M3 = micrograms per cubic meter of air
Min = Minutes, Qual = Qualifiers



LABORATORY TEST REQUEST

ACCOUNT NUMBER, NAME AND ADDRESS

Do YOU WANT OR WANT A test (Y/N)? N
 TESTER: LIAVA GABULIZIA



5102 LAGOON AVENUE
 SAVANNAH, GA 31404
 Phone: 912-954-7858
 Fax: 1-912-352-0165
 PROJ#: 10300000

10329 Stony Run Lane
 Ashland, VA 23005
 (804) 365-3000
 TOLL FREE (800) 888-8061
 FAX (804) 365-3002

DATE SHIPPED 2/13/12	# OF SAMPLES 2	SAMPLE TYPE/MEDIA SORBEENT TUBE	PROJECT NAME OR NUMBER HERCULES
PURCHASE ORDER NO.		CONTACT LIAVA GABULIZIA	TELEPHONE NUMBER 912-354-7858
TURN AROUND TIME <input type="checkbox"/> SAMEDAY <input type="checkbox"/> 1 DAY <input type="checkbox"/> CALL FOR AVAILABILITY		SPECIAL INSTRUCTIONS AND/OR UNUSUAL CONDITIONS:	<input type="checkbox"/> FAX RESULTS FAX NUMBER: () _____ <input type="checkbox"/> EMAIL RESULTS - EMAIL: _____
<input type="checkbox"/> 2 DAY <input checked="" type="checkbox"/> STANDARD <input type="checkbox"/> EXTRA CHARGE			

FOR LABORATORY USE ONLY	SAMPLE # OR SAMPLE AREA	SAMPLE DATE	SAMPLE VOLUME/LITERS <i>(CLIPSE)</i>	ANALYSIS REQUESTED-PLEASE USE SEPARATE LABORATORY TEST REQUEST FOR EACH SAMPLE TYPE
	SAMPLE NO. 2	2/13/12	TIME = 16:45	ETHYLENE OXIDE
	SAMPLE NO. 2 BLANK	2/13/12	N/A	ETHYLENE OXIDE

CHAIN OF CUSTODY RECORD

SAMPLES HAVE BEEN SEALED FOR TRANSPORT AND DELIVERED TO LABORATORY VIA:

CARRIER _____ IF "ANALYTICS COURIER" SIGN HERE

Chet Morton
 SIGN HERE TO INITIATE CHAIN OF CUSTODY
2/13/12
 DATE

DATE/TIME	CONDITION OF SAMPLE	SAMPLES RECEIVED BY:	SAMPLES RELEASED BY:
2/14/12 11:10 AM	OK	SIGNATURE(SAMPLE RECEIVING) Holly N Jackson	SIGNATURE(SAMPLE RECEIVING)
		SIGNATURE(SAMPLE ADMINISTRATION) Holly N Jackson	SIGNATURE(SAMPLE ADMINISTRATION)
		SIGNATURE(LAB)	SIGNATURE(LAB)
		SIGNATURE(LAB)	SIGNATURE(LAB)

PLEASE RETAIN PART 3 FOR YOUR RECORDS



LABORATORY REPORT

February 24, 2012

Lidya Gulizia
Test America, Inc.
5102 LaRoche Avenue
Savannah, GA 31404

RE: Hercules

Dear Lidya:

Enclosed are the results of the samples submitted to our laboratory on February 14, 2012. For your reference, these analyses have been assigned our service request number P1200535.

All analyses were performed according to our laboratory's NELAP and DoD-ELAP-approved quality assurance program. The test results meet requirements of the current NELAP and DoD-ELAP standards, where applicable, and except as noted in the laboratory case narrative provided. For a specific list of NELAP and DoD-ELAP-accredited analytes, refer to the certifications section at www.caslab.com. Results are intended to be considered in their entirety and apply only to the samples analyzed and reported herein.

Columbia Analytical Services, Inc. is certified by the California Department of Health Services, NELAP Laboratory Certificate No. 02115CA; Arizona Department of Health Services, Certificate No. AZ0694; Florida Department of Health, NELAP Certification E871020; New Jersey Department of Environmental Protection, NELAP Laboratory Certification ID #CA009; New York State Department of Health, NELAP NY Lab ID No: 11221; Oregon Environmental Laboratory Accreditation Program, NELAP ID: CA20007; The American Industrial Hygiene Association, Laboratory #101661; United States Department of Defense Environmental Laboratory Accreditation Program (DoD-ELAP), Certificate No. L10-3-R2; Pennsylvania Registration No. 68-03307; TX Commission of Environmental Quality, NELAP ID T104704413-11-2; Minnesota Department of Health, NELAP Certificate No. 362188; Washington State Department of Ecology, ELAP Lab ID: C946, State of Utah Department of Health, NELAP Certificate No. CA015272011-1; Los Angeles Department of Building and Safety, Approval No: TA00001. Each of the certifications listed above have an explicit Scope of Accreditation that applies to specific matrices/methods/analytes; therefore, please contact me for information corresponding to a particular certification.

If you have any questions, please call me at (805) 526-7161.

Respectfully submitted,

Columbia Analytical Services, Inc.

For Kate Aguilera
Project Manager

Client: Test America, Inc.
Project: Hercules

CAS Project No: P1200535

CASE NARRATIVE

The samples were received intact under chain of custody on February 14, 2012 and were stored in accordance with the analytical method requirements. Please refer to the sample acceptance check form for additional information. The results reported herein are applicable only to the condition of the samples at the time of sample receipt.

Amine Analysis

The alumina tube sample was analyzed for amines using a gas chromatograph equipped with a nitrogen phosphorus detector (NPD).

Sulfur Analysis

The tedlar bag sample was analyzed for twenty sulfur compounds per ASTM D 5504-08 using a gas chromatograph equipped with a sulfur chemiluminescence detector (SCD). All compounds with the exception of hydrogen sulfide and carbonyl sulfide are quantitated against the initial calibration curve for methyl mercaptan.

The results of analyses are given in the attached laboratory report. All results are intended to be considered in their entirety, and Columbia Analytical Services, Inc. (CAS) is not responsible for utilization of less than the complete report.

Use of Columbia Analytical Services, Inc. (CAS) Name. Client shall not use CAS's name or trademark in any marketing or reporting materials, press releases or in any other manner ("Materials") whatsoever and shall not attribute to CAS any test result, tolerance or specification derived from CAS's data ("Attribution") without CAS's prior written consent, which may be withheld by CAS for any reason in its sole discretion. To request CAS's consent, Client shall provide copies of the proposed Materials or Attribution and describe in writing Client's proposed use of such Materials or Attribution. If CAS has not provided written approval of the Materials or Attribution within ten (10) days of receipt from Client, Client's request to use CAS's name or trademark in any Materials or Attribution shall be deemed denied. CAS may, in its discretion, reasonably charge Client for its time in reviewing Materials or Attribution requests. Client acknowledges and agrees that the unauthorized use of CAS's name or trademark may cause CAS to incur irreparable harm for which the recovery of money damages will be inadequate. Accordingly, Client acknowledges and agrees that a violation shall justify preliminary injunctive relief. For questions contact the laboratory.

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DETAIL SUMMARY REPORT

Client: Test America, Inc.
Project ID: Hercules

Service Request: P1200535

Date Received: 2/14/2012
Time Received: 09:35

ASTM D5504-08 - Sulfur Bag	Amines - Amines
----------------------------	-----------------

Client Sample ID	Lab Code	Matrix	Date Collected	Time Collected	ASTM D5504-08 - Sulfur Bag	Amines - Amines
No. 2	P1200535-002	Air	2/13/2012	12:00	X	
No. 2	P1200535-004	Air	2/13/2012	14:00		X
Blank	P1200535-005	Air	2/13/2012	14:00		X

2655 Park Center Drive, Suite A
 Simi Valley, California 93065
 Phone (805) 526-7161
 Fax (805) 526-7270

Requested Turnaround Time in Business Days (Surcharges) please circle
 1 Day (100%) 2 Day (75%) 3 Day (50%) 4 Day (35%) 5 Day (25%) 10 Day-Standard

CAS Project No. 812100885

Company Name & Address (Reporting Information) <u>TEST AMERICA</u>				Project Name <u>HERCULES</u>				CAS Contact:		Comments e.g. Actual Preservative or specific instructions
Project Manager <u>LIOYA GULIZIA</u>				Project Number				Analysis Method		
Phone <u>912-354-7858</u>		Fax		P.O. # / Billing Information						
Email Address for Result Reporting				Sampler (Print & Sign)						

Client Sample ID	Laboratory ID Number	Date Collected	Time Collected	Canister ID (Bar code # - AC, SC, etc.)	Flow Controller ID (Bar code # - FC #)	Canister Start Pressure "Hg	Canister End Pressure "Hg/psig	Sample Volume	
FEA No. 1		2/13/12	9:00	TEALABSA					ASTM 5504
No. 2		2/13/12	12:00	TEALABSA					"
No. 3		2/13/12	4:00	" "					"
No. 2		2/13/12	14:00	SORBENT TUBE					300
No. 2		2/13/12	14:00	SORBENT TUBE					
BLANK		2/13/12	14:00	SORBENT TUBE					

Report Tier Levels - please select

Tier I - Results (Default if not specified) _____
 Tier II (Results + QC Summaries) _____
 Tier III (Results + QC & Calibration Summaries) _____
 Tier IV (Data Validation Package) 10% Surcharge _____

EDD required Yes / No _____
 Type: _____ Units: _____

Project Requirements (MRLs, QAPP)

Relinquished by: (Signature)	Date:	Time:	Received by: (Signature)	Date:	Time:
			<u>[Signature]</u>	<u>2/13/12</u>	<u>0935</u>
Relinquished by: (Signature)	Date:	Time:	Received by: (Signature)	Date:	Time:

Cooler / Blank Temperature _____ °C

Sample Acceptance Check Form

 Client: Test America, Inc. Work order: P1200535

 Project: Hercules

 Sample(s) received on: 2/14/12 Date opened: 2/14/12 by: MZAMORA

Note: This form is used for all samples received by CAS. The use of this form for custody seals is strictly meant to indicate presence/absence and not as an indication of compliance or nonconformity. Thermal preservation and pH will only be evaluated either at the request of the client and/or as required by the method/SOP.

- | | <u>Yes</u> | <u>No</u> | <u>N/A</u> |
|--|-------------------------------------|-------------------------------------|-------------------------------------|
| 1 Were sample containers properly marked with client sample ID? | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 2 Container(s) supplied by CAS ? | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 3 Did sample containers arrive in good condition? | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 4 Were chain-of-custody papers used and filled out? | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 5 Did sample container labels and/or tags agree with custody papers? | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 6 Was sample volume received adequate for analysis? | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 7 Are samples within specified holding times? | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
| 8 Was proper temperature (thermal preservation) of cooler at receipt adhered to? | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| 9 Was a trip blank received? | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
| 10 Were custody seals on outside of cooler/Box? | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
| Location of seal(s) _____ Sealing Lid? | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| Were signature and date included? | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| Were seals intact? | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| Were custody seals on outside of sample container? | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
| Location of seal(s) _____ Sealing Lid? | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| Were signature and date included? | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| Were seals intact? | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| 11 Do containers have appropriate preservation , according to method/SOP or Client specified information? | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| Is there a client indication that the submitted samples are pH preserved? | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| Were VOA vials checked for presence/absence of air bubbles? | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| Does the client/method/SOP require that the analyst check the sample pH and <u>if necessary</u> alter it? | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| 12 Tubes: Are the tubes capped and intact? | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Do they contain moisture? | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
| 13 Badges: Are the badges properly capped and intact? | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| Are dual bed badges separated and individually capped and intact? | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> |

Lab Sample ID	Container Description	Required pH *	Received pH	Adjusted pH	VOA Headspace (Presence/Absence)	Receipt / Preservation Comments
P1200535-001.01	1 L Zefon Bag					
P1200535-002.01	1 L Zefon Bag					
P1200535-003.01	1 L Zefon Bag					
P1200535-004.01	Treated Alumina Tube					
P1200535-005.01	Treated Alumina Tube					

Explain any discrepancies: (include lab sample ID numbers): _____

Sample -001 was received past hold time for the sulfur analysis.

Per client instruction analysis for -001, -003 & -005 were cancelled.

RESULTS OF ANALYSIS

Page 1 of 1

Client: Test America, Inc.
Client Sample ID: No. 2
Client Project ID: Hercules

CAS Project ID: P1200535
 CAS Sample ID: P1200535-004

Test Code: GC/NPD
Instrument ID: Agilent 6890N/GC14/NPD
Analyst: Zheng Wang/Madeleine Dangazyan
Sampling Media: Treated Alumina Tube
Test Notes: BC, DE

Date Collected: 2/13/12
Date Received: 2/14/12
Date Analyzed: 2/15/12
Desorption Volume: 2.0 ml
Volume Sampled: NA Liter(s)

CAS #	Compound	Result µg/Tube	Result µg/m ³	MRL µg/m ³	Result ppbV	MRL ppbV	Data Qualifier
124-40-3	Dimethylamine	< 0.53	NA	NA	NA	NA	
75-04-7	Ethylamine	< 0.55	NA	NA	NA	NA	
75-50-3	Trimethylamine	< 0.54	NA	NA	NA	NA	
75-31-0	Isopropylamine	< 0.51	NA	NA	NA	NA	
75-64-9	tert-Butylamine	< 1.0	NA	NA	NA	NA	
107-10-8	n-Propylamine	< 0.52	NA	NA	NA	NA	
109-89-7	Diethylamine	< 0.51	NA	NA	NA	NA	
13952-84-6	sec-Butylamine	< 0.51	NA	NA	NA	NA	
78-81-9	Isobutylamine	< 0.51	NA	NA	NA	NA	
109-73-9	n-Butylamine	< 0.52	NA	NA	NA	NA	
108-18-9	Diisopropylamine	< 0.51	NA	NA	NA	NA	
121-44-8	Triethylamine	< 0.52	NA	NA	NA	NA	
142-84-7	Dipropylamine	< 0.50	NA	NA	NA	NA	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

BC = Results reported are not blank corrected.

DE = Results reported are corrected for desorption efficiency.

NA = Not applicable.

RESULTS OF ANALYSIS

Page 1 of 1

Client: Test America, Inc.
Client Sample ID: Method Blank
Client Project ID: Hercules

CAS Project ID: P1200535
 CAS Sample ID: P120215-MB

Test Code: GC/NPD
Instrument ID: Agilent 6890N/GC14/NPD
Analyst: Zheng Wang/Madeleine Dangazyan
Sampling Media: Treated Alumina Tube
Test Notes: BC, DE

Date Collected: NA
Date Received: NA
Date Analyzed: 2/15/12
Desorption Volume: 2.0 ml
Volume Sampled: NA Liter(s)

CAS #	Compound	Result µg/Tube	Result µg/m ³	MRL µg/m ³	Result ppbV	MRL ppbV	Data Qualifier
124-40-3	Dimethylamine	< 0.53	NA	NA	NA	NA	
75-04-7	Ethylamine	< 0.55	NA	NA	NA	NA	
75-50-3	Trimethylamine	< 0.54	NA	NA	NA	NA	
75-31-0	Isopropylamine	< 0.51	NA	NA	NA	NA	
75-64-9	tert-Butylamine	< 1.0	NA	NA	NA	NA	
107-10-8	n-Propylamine	< 0.52	NA	NA	NA	NA	
109-89-7	Diethylamine	< 0.51	NA	NA	NA	NA	
13952-84-6	sec-Butylamine	< 0.51	NA	NA	NA	NA	
78-81-9	Isobutylamine	< 0.51	NA	NA	NA	NA	
109-73-9	n-Butylamine	< 0.52	NA	NA	NA	NA	
108-18-9	Diisopropylamine	< 0.51	NA	NA	NA	NA	
121-44-8	Triethylamine	< 0.52	NA	NA	NA	NA	
142-84-7	Dipropylamine	< 0.50	NA	NA	NA	NA	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

NA = Not applicable.

BC = Results reported are not blank corrected.

DE = Results reported are corrected for desorption efficiency.

LABORATORY CONTROL SAMPLE / DUPLICATE LABORATORY CONTROL SAMPLE SUMMARY

Page 1 of 1

Client: Test America, Inc.
Client Sample ID: Duplicate Lab Control Sample
Client Project ID: Hercules

CAS Project ID: P1200535
 CAS Sample ID: P120215-DLCS

Test Code: GC/NPD
Instrument ID: Agilent 6890N/GC14/NPD
Analyst: Zheng Wang/Madeleine Dangazyan
Sampling Media: Treated Alumina Tube
Test Notes:

Date Collected: NA
Date Received: NA
Date Analyzed: 2/15/12
Volume(s) Analyzed: NA Liter(s)

CAS #	Compound	Spike Amount		Result		% Recovery		CAS	RPD	RPD	Data
		LCS / DLCS	LCS	DLCS	LCS	DLCS	Acceptance	RPD			
		µg/ml	µg/ml	µg/ml	LCS	DLCS	Limits	Limit	Qualifier		
124-40-3	Dimethylamine	12.9	10.8	12.2	84	95	48-128	12	24		
75-04-7	Ethylamine	11.6	9.51	10.9	82	94	45-122	14	28		
75-50-3	Trimethylamine	10.6	8.58	9.02	81	85	44-137	5	31		
75-31-0	Isopropylamine	8.66	7.68	8.36	89	97	57-129	9	19		
75-64-9	tert-Butylamine	13.2	12.1	12.9	92	98	58-131	6	19		
107-10-8	n-Propylamine	14.2	12.6	13.7	89	96	47-129	8	21		
109-89-7	Diethylamine	12.2	11.1	11.6	91	95	57-129	4	18		
13952-84-6	sec-Butylamine	12.5	11.5	12.2	92	98	59-127	6	16		
78-81-9	Isobutylamine	12.0	10.9	11.8	91	98	57-123	7	18		
109-73-9	n-Butylamine	12.4	11.2	11.8	90	95	59-129	5	19		
108-18-9	Diisopropylamine	10.9	9.64	10.6	88	97	58-128	10	19		
121-44-8	Triethylamine	11.6	10.1	11.2	87	97	56-130	11	21		
142-84-7	Dipropylamine	11.9	11.3	11.6	95	97	64-126	2	17		

RESULTS OF ANALYSIS

Page 1 of 1

Client: Test America, Inc.
Client Sample ID: No. 2
Client Project ID: Hercules

CAS Project ID: P1200535
 CAS Sample ID: P1200535-002

Test Code: ASTM D 5504-08
Instrument ID: Agilent 7890A/GC22/SCD
Analyst: Lauryn Keeler
Sampling Media: 1 L Zefon Bag
Test Notes:

Date Collected: 2/13/12
Time Collected: 12:00
Date Received: 2/14/12
Date Analyzed: 2/14/12
Time Analyzed: 11:48
Volume(s) Analyzed: 0.10 ml(s)

CAS #	Compound	Result µg/m ³	MRL µg/m ³	Result ppbV	MRL ppbV	Data Qualifier
7783-06-4	Hydrogen Sulfide	150,000	70	110,000	50	
463-58-1	Carbonyl Sulfide	ND	120	ND	50	
74-93-1	Methyl Mercaptan	500	98	250	50	
75-08-1	Ethyl Mercaptan	ND	130	ND	50	
75-18-3	Dimethyl Sulfide	ND	130	ND	50	
75-15-0	Carbon Disulfide	ND	78	ND	25	
75-33-2	Isopropyl Mercaptan	260	160	84	50	
75-66-1	tert-Butyl Mercaptan	ND	180	ND	50	
107-03-9	n-Propyl Mercaptan	ND	160	ND	50	
624-89-5	Ethyl Methyl Sulfide	ND	160	ND	50	
110-02-1	Thiophene	ND	170	ND	50	
513-44-0	Isobutyl Mercaptan	ND	180	ND	50	
352-93-2	Diethyl Sulfide	ND	180	ND	50	
109-79-5	n-Butyl Mercaptan	ND	180	ND	50	
624-92-0	Dimethyl Disulfide	ND	96	ND	25	
616-44-4	3-Methylthiophene	ND	200	ND	50	
110-01-0	Tetrahydrothiophene	ND	180	ND	50	
638-02-8	2,5-Dimethylthiophene	ND	230	ND	50	
872-55-9	2-Ethylthiophene	ND	230	ND	50	
110-81-6	Diethyl Disulfide	ND	120	ND	25	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

RESULTS OF ANALYSIS

Page 1 of 1

Client: Test America, Inc.
Client Sample ID: Method Blank
Client Project ID: Hercules

CAS Project ID: P1200535
 CAS Sample ID: P120214-MB

Test Code: ASTM D 5504-08
Instrument ID: Agilent 7890A/GC22/SCD
Analyst: Lauryn Keeler
Sampling Media: 1 L Zefon Bag
Test Notes:

Date Collected: NA
Time Collected: NA
Date Received: NA
Date Analyzed: 2/14/12
Time Analyzed: 08:13
Volume(s) Analyzed: 1.0 ml(s)

CAS #	Compound	Result µg/m ³	MRL µg/m ³	Result ppbV	MRL ppbV	Data Qualifier
7783-06-4	Hydrogen Sulfide	ND	7.0	ND	5.0	
463-58-1	Carbonyl Sulfide	ND	12	ND	5.0	
74-93-1	Methyl Mercaptan	ND	9.8	ND	5.0	
75-08-1	Ethyl Mercaptan	ND	13	ND	5.0	
75-18-3	Dimethyl Sulfide	ND	13	ND	5.0	
75-15-0	Carbon Disulfide	ND	7.8	ND	2.5	
75-33-2	Isopropyl Mercaptan	ND	16	ND	5.0	
75-66-1	tert-Butyl Mercaptan	ND	18	ND	5.0	
107-03-9	n-Propyl Mercaptan	ND	16	ND	5.0	
624-89-5	Ethyl Methyl Sulfide	ND	16	ND	5.0	
110-02-1	Thiophene	ND	17	ND	5.0	
513-44-0	Isobutyl Mercaptan	ND	18	ND	5.0	
352-93-2	Diethyl Sulfide	ND	18	ND	5.0	
109-79-5	n-Butyl Mercaptan	ND	18	ND	5.0	
624-92-0	Dimethyl Disulfide	ND	9.6	ND	2.5	
616-44-4	3-Methylthiophene	ND	20	ND	5.0	
110-01-0	Tetrahydrothiophene	ND	18	ND	5.0	
638-02-8	2,5-Dimethylthiophene	ND	23	ND	5.0	
872-55-9	2-Ethylthiophene	ND	23	ND	5.0	
110-81-6	Diethyl Disulfide	ND	12	ND	2.5	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

LABORATORY CONTROL SAMPLE SUMMARY

Page 1 of 1

Client: Test America, Inc.
Client Sample ID: Lab Control Sample
Client Project ID: Hercules

CAS Project ID: P1200535
CAS Sample ID: P120214-LCS

Test Code: ASTM D 5504-08
Instrument ID: Agilent 7890A/GC22/SCD
Analyst: Lauryn Keeler
Sampling Media: 1 L Zefon Bag
Test Notes:

Date Collected: NA
Date Received: NA
Date Analyzed: 2/14/12
Volume(s) Analyzed: NA ml(s)

CAS #	Compound	Spike Amount ppbV	Result ppbV	% Recovery	CAS Acceptance Limits	Data Qualifier
7783-06-4	Hydrogen Sulfide	2,380	2,230	94	51-141	
463-58-1	Carbonyl Sulfide	2,470	1,970	80	63-147	
74-93-1	Methyl Mercaptan	2,360	2,680	114	54-156	



February 28, 2012

LABORATORY REPORT

Client:

TestAmerica Savannah
5102 LaRoche Avenue
Savannah, GA 31404
Attn: Lydia Gulizia

Work Order: PVB0994
Project Name: Arcadis - Ashland Project
Project Number: Arcadis - Ashland Project
Date Received: 02/14/12
Final Report: 02/28/12 10:22

The results listed within this Laboratory Report pertain only to the samples tested in the laboratory. The analyses contained in this report were performed in accordance with the applicable certifications as noted. All soil samples are reported on a wet weight basis unless otherwise noted in the report. This Laboratory Report is confidential and is intended for the sole use of TestAmerica and its client. This report shall not be reproduced, except in full, without written permission from TestAmerica.

TestAmerica Laboratories, Inc., Phoenix Laboratory certifies that the analytical results contained herein apply only to the specific sample(s) analyzed.

This entire report was reviewed and approved for release.

If you have any questions relating to this analytical report, please contact your Laboratory Project Manager at 1-(602)437-3340

Analyses included in this report were performed by the laboratory shown at the top of this report unless otherwise indicated.

CASE NARRATIVE:

- SAMPLE RECEIPT:** Samples were received intact, at 20°C and with chain of custody documentation. All samples designated "Blank" were put on hold per client.
- HOLDING TIMES:** All samples were analyzed within prescribed holding times and/or in accordance with the TestAmerica Sample Acceptance Policy unless otherwise noted in the report.
- PRESERVATION:** Samples requiring preservation were verified prior to sample analysis.
- QA/QC CRITERIA:** All analyses met method criteria, except as noted in the report with data qualifiers.
- COMMENTS:** No significant observations were made.

Approved By:



Denise Harrington
Project Manager

TestAmerica Savannah
5102 LaRoche Avenue
Savannah, GA 31404
Lydia Gulizia

Work Order: PVB0994
Project: Arcadis - Ashland Project
Project Number: Arcadis - Ashland Project

Received: 02/14/12
Reported: 02/28/12 10:22

SAMPLE IDENTIFICATION

LAB NUMBER

COLLECTION DATE

CONTAINER TYPE

No.2	PVB0994-01	02/13/12	Anasorb 747, H2SO4 Treated, 500/250 mg
No.2	PVB0994-03	02/13/12	50/100 mg - Coconut Shell Charcoal Tube
No.2	PVB0994-05	02/13/12	XAD-7 Tube, 50/100 mg

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TestAmerica Savannah
5102 LaRoche Avenue
Savannah, GA 31404
Lydia Gulizia

Work Order: PVB0994
Project: Arcadis - Ashland Project
Project Number: Arcadis - Ashland Project

Received: 02/14/12
Reported: 02/28/12 10:22

ANALYTICAL REPORT

Analyte	Result	Qual	Date Analyzed	Analyst	Rpt Limit ug, Total	Method
Ammonia by OSHA ID-188						
	Sample ID: PVB0994-01 (No.2)	Tube	Sample Air Volume: 10.758L		Sampled: 02/13/12	
	ug, Total	mg/m3	ppm		Prepared: 02/17/12 09:07	
Ammonia	<29.0	<2.70	<3.87	2/17/2012	ZN	29.0 OSHA ID-188
Cresols and Phenol by NIOSH 2546 (Modified)						
	Sample ID: PVB0994-05 (No.2)	Tube	Sample Air Volume: 1.952L		Sampled: 02/13/12	
	ug, Total	mg/m3	ppm		Prepared: 02/17/12 16:07	
m,p-Cresol	<8.56	<4.39	<0.991	2/20/2012	zn	8.56 NIOSH 2546 MOD
o-Cresol	<4.20	<2.15	<0.486	2/20/2012	zn	4.20 NIOSH 2546 MOD
Phenol	<4.02	<2.06	<0.535	L2 2/20/2012	zn	4.02 NIOSH 2546 MOD
Epichlorohydrin by NIOSH 1010 (Modified)						
	Sample ID: PVB0994-03 (No.2)	Tube	Sample Air Volume: 4.082L		Sampled: 02/13/12	
	ug, Total	mg/m3	ppm		Prepared: 02/20/12 11:08	
Epichlorohydrin	<4.70	<1.15	<0.304	2/20/2012	zn	4.70 N1010 (MOD)

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TestAmerica Savannah
5102 LaRoche Avenue
Savannah, GA 31404
Lydia Gulizia

Work Order: PVB0994
Project: Arcadis - Ashland Project
Project Number: Arcadis - Ashland Project

Received: 02/14/12
Reported: 02/28/12 10:22

PROJECT QUALITY CONTROL DATA

Blank

Analyte	Blank Value	Qual	Units	Q.C. Batch	Target Range	Lab Number	Analyzed Date
Cresols and Phenol by NIOSH 2546 (Modified)							
12B0761-BLK1							
o-Cresol	<4.20		ug, Total	12B0761		12B0761-BLK1	02-20-2012
o-Cresol - Back	<4.20		ug, Total	12B0761		12B0761-BLK1	02-20-2012
m,p-Cresol	<8.56		ug, Total	12B0761		12B0761-BLK1	02-20-2012
m,p-Cresol - Back	<8.56		ug, Total	12B0761		12B0761-BLK1	02-20-2012
Phenol	<4.02		ug, Total	12B0761		12B0761-BLK1	02-20-2012
Phenol - Back	<4.02		ug, Total	12B0761		12B0761-BLK1	02-20-2012
Epichlorohydrin by NIOSH 1010 (Modified)							
12B0812-BLK1							
Epichlorohydrin	<4.70		ug, Total	12B0812		12B0812-BLK1	02-20-2012
Epichlorohydrin - Back	<4.70		ug, Total	12B0812		12B0812-BLK1	02-20-2012
Ammonia by OSHA ID-188							
12B0797-BLK1							
Ammonia	<29.0		ug, Total	12B0797		12B0797-BLK1	02-17-2012
Ammonia - Back	<29.0		ug, Total	12B0797		12B0797-BLK1	02-17-2012

LCS

Analyte	Known Val.	Analyzed Val	Qual	Units	% Rec.	Target Range	Batch	Analyzed Date
Cresols and Phenol by NIOSH 2546 (Modified)								
12B0761-BS1								
o-Cresol	8.82	12.8		ug, Total	145%	75-125	12B0761	02-20-2012
m,p-Cresol	18.8	20.6		ug, Total	110%	75-125	12B0761	02-20-2012
Phenol	8.92	7.13	L2	ug, Total	80%	75-125	12B0761	02-20-2012
Epichlorohydrin by NIOSH 1010 (Modified)								
12B0812-BS1								
Epichlorohydrin	11.9	13.2		ug, Total	112%	75-125	12B0812	02-20-2012
Ammonia by OSHA ID-188								
12B0797-BS1								
Ammonia	61.0	52.3		ug, Total	86%	75-125	12B0797	02-17-2012

LCS Dup

Analyte	Orig. Val.	Duplicate	Qual	Units	Spike Conc	% Rec.	Target Range	RPD	Limit	Batch	Sample Duplicated	Analyzed Date
Cresols and Phenol by NIOSH 2546 (Modified)												
12B0761-BSD1												
o-Cresol	12.9			ug, Total	8.82	146%	75-125	0.621	30	12B0761		02-20-2012
m,p-Cresol	20.6			ug, Total	18.8	110%	75-125	0.0822	30	12B0761		02-20-2012
Phenol	7.13		L2	ug, Total	8.92	80%	75-125	0.0722	30	12B0761		02-20-2012
Epichlorohydrin by NIOSH 1010 (Modified)												

TestAmerica Savannah
 5102 LaRoche Avenue
 Savannah, GA 31404
 Lydia Gulizia

Work Order: PVB0994
 Project: Arcadis - Ashland Project
 Project Number: Arcadis - Ashland Project

Received: 02/14/12
 Reported: 02/28/12 10:22

LCS Dup - Cont.

Analyte	Orig. Val.	Duplicate	Qual	Units	Spike Conc	% Rec.	Target Range	RPD	Limit	Batch	Sample Duplicated	Analyzed Date
Epichlorohydrin by NIOSH 1010 (Modified)												
12B0812-BSD1												
Epichlorohydrin		13.1		ug, Total	11.9	111%	75-125	0.691	30	12B0812		02-20-2012
Ammonia by OSHA ID-188												
12B0797-BSD1												
Ammonia		55.2		ug, Total	61.0	91%	75-125	5.38	30	12B0797		02-17-2012



TestAmerica Savannah
5102 LaRoche Avenue
Savannah, GA 31404
Lydia Gulizia

Work Order: PVB0994
Project: Arcadis - Ashland Project
Project Number: Arcadis - Ashland Project

Received: 02/14/12
Reported: 02/28/12 10:22

CERTIFICATION SUMMARY

Analyses included in this report were performed by TestAmerica Phoenix, 4625 E. Cotton Center Boulevard, Building 3, Suite 189, Phoenix, AZ 85040.

TestAmerica Phoenix (Lab ID 154268) is accredited by the American Industrial Hygiene Association (AIHA) in the industrial hygiene program for the analytical techniques noted on the scope of accreditation for the following methods: NIOSH 0500, NIOSH 0600, NIOSH 1003, NIOSH 1005, NIOSH 1007, NIOSH 1010, NIOSH 1015, NIOSH 1022, NIOSH 1300, NIOSH 1400, NIOSH 1401, NIOSH 1403, NIOSH 1405, NIOSH 1450, NIOSH 1457, NIOSH 1500, NIOSH 1501, NIOSH 1550, NIOSH 1602, NIOSH 1604, NIOSH 1606, NIOSH 1609, NIOSH 1610, NIOSH 1611, NIOSH, 1613, NIOSH 1615, NIOSH 2000, NIOSH 2016, NIOSH 2532, NIOSH 2546, NIOSH 2551, NIOSH 5000, NIOSH 5503, NIOSH 5506, NIOSH 5600, NIOSH 6006, NIOSH 6009, NIOSH 6010, NIOSH 7300, NIOSH 7303, NIOSH 7600, NIOSH 7903, NIOSH 9100, NIOSH 9102, EPA IP-6A, EPA IP-6C, OSHA PV2120, OSHA 7, OSHA 42, OSHA 47, OSHA 48, OSHA 64, OSHA 69, OSHA 111, OSHA ID-140, OSHA ID-121, OSHA ID-125G, OSHA IS-215, OSHA 1001, OSHA 1002, OSHA 1003, OSHA 1004, OSHA 1005 and OSHA Chemical and Sampling Information for Silane. Volatile organic compounds on 3M Organic Vapor Monitors, Assay Technology Passive Monitors and SKC Passive Monitors. Formaldehyde and other aldehydes and ketones on Assay Technology Passive Monitor. Aldehydes and ketones by EPA TO-11A.

The TestAmerica Phoenix is also licensed through the State of Arizona (AZ0728) for EPA method TO-15.

TestAmerica Phoenix also holds NELAC accreditation through the State of Oregon (AZ100001) for the analytical techniques noted on the scope of accreditation and the State of New York (11898) for NIOSH 6009.

Samples were analyzed using methods outlined in references such as:

- OSHA - Occupational Safety and Health Administration, U. S. Department of Labor, OSHA Analytical Methods Manual.
- NIOSH - National Institute for Occupational Safety and Health, U. S. Department of Health and Human Services, NIOSH Manual of Analytical Methods, Fourth Edition, 1994, and Updates. NIOSH Method 7300 analyses are performed using a modified digestion procedure to eliminate the use of perchloric acid.
- EPA - U. S. Environmental Protection Agency, Compendium of Methods for the Determination of Toxic Organic Compounds in Ambient Air, Second Edition, 1999.
- EPA - U. S. Environmental Protection Agency, Analytical Methods, Emission Measurement Center (EMC).

Analytical Comments:

Unless otherwise noted, all method blanks and laboratory control spikes met method and/or laboratory quality control objectives for the analyses included in this report.

Unless otherwise noted, sample results have been corrected for method blank values.

For information concerning certifications of this facility or another TestAmerica facility, please visit our website at www.TestAmericaInc.com

TestAmerica Savannah
5102 LaRoche Avenue
Savannah, GA 31404
Lydia Gulizia

Work Order: PVB0994
Project: Arcadis - Ashland Project
Project Number: Arcadis - Ashland Project

Received: 02/14/12
Reported: 02/28/12 10:22

DATA QUALIFIERS AND DEFINITIONS

L2 Laboratory Control Sample and/or Laboratory Control Sample Duplicate recovery was below acceptance limits.

ADDITIONAL COMMENTS



TestAmerica

THE LEADER IN ENVIRONMENTAL TESTING

[X] Main Lab - 4625 E. Cotton Center Blvd., Suite 189, Phoenix, AZ 85040 602.437.3340 - FAX 602.454.9303

www.testamericainc.com or call toll-free 866.772.5227

Lab Number:
PUB0994

Customer Number: _____ Page 1 of 1
 Name: **PLIYA GULIZIA** Sampler: _____
 Address: **5102 LAROCHE AVE** Project Name: _____
 City, State, Zip: **SAVANNAH, GA** Project Number: _____
 Contact: _____ P.O. Number: _____
 Phone: **912-354-7859** Fax: _____ Fax Results: Y N
 E-Mail Address: _____ E-Mail Results: Y N

Sample Receipt	Turn Around Request
Temperature: 20.1A	24 Hours _____ 48 Hours _____
Custody Seals: Yes _____ No 2	72 Hours _____
Custody Seals Intact: Yes _____ No 2	5 working Day _____
Total # of Containers: 6	Standard 10 Working Days _____
Subject to scheduling and availability (surcharges apply)	

Analysis Method(s) Requested	
OSHA - 108	
NIOSH 1010	
NIOSH 2546	

Sample Information

Lab # (Internal Use Only)	IH Media Type (Filter, Passive Badge or Tube)	Flow Rate (Liters/minute)	Sample Identification	Collection Date	Start Time	Stop Time	Total Minutes	Total Volume in Liters	Number of Media per Sample
-01			No. 2		0:00	21:15	21:15		
-02			No. 2 - BLANK						
-03			No. 2		0:00	20:22	20:22		
-04			No. 2 - BLANK						
-05			No. 2		0:00	19:50	19:50		
-06			No. 2 - BLANK						

✓									
✓									
✓									
✓									
✓									

Instructions / Special Requirements:

Date:	Time:	Samples Relinquished By:	Received By:
2/13/12	17:00	Chet Morken	
2/14/12	11:45	Fed t	

All services are performed subject to the Terms & Conditions on the reverse side.

TestAmerica Burlington

30 Community Drive

Suite 11

South Burlington, VT 05403

phone 802-660-1990 fax 802-660-1919

Canister Samples Chain of Custody Record

TestAmerica Analytical Testing Corp. assumes no liability with respect to the collection and shipment of these samples.

Client Contact Information		Project Manager: <i>LIDYA GULIZIA</i>		Samples Collected By: <i>CHET MORTON</i>		L of 1 COCs													
Company: <i>TEST AMERICA</i>		Phone: <i>912-354-7850</i>		914-602-5264															
Address: <i>5102 LAROCHE AVE</i>		Email: <i>LIDYA.GULIZIA@testamericainc.com</i>																	
City/State/Zip: <i>JAVANNAH, GA</i>		Site Contact:																	
Phone:		TA Contact:																	
FAX:																			
Project Name:																			
Site:																			
PO #																			
		Analysis Turnaround Time																	
		Standard (Specify)																	
		Rush (Specify)																	
Sample Identification	Sample Date(s)	Time Start	Time Stop	Canister Vacuum in Field, "Hg (Start)	Canister Vacuum in Field, "Hg (Stop)	Flow Controller ID	Canister ID	TO-16	TO-14A	EPA 3C	EPA 26C	ASTM D-1946	Other (Please specify in notes section)	Sample Type	Indoor Air	Ambient Air	Soil Gas	Landfill Gas	Other (Please specify in notes section)
<i>No. 2 Summit Canister</i>	<i>2/13/12</i>	<i>14:00</i>	<i>14:15</i>	<i>-30</i>	<i>0</i>	<i>3578</i>		<input checked="" type="checkbox"/>											
		Temperature (Fahrenheit)																	
		Interior		Ambient															
		Start																	
		Stop																	
		Pressure (inches of Hg)																	
		Interior		Ambient															
		Start																	
		Stop																	
Special Instructions/QC Requirements & Comments:																			
Samples Shipped by: <i>CHET MORTON</i>		Date/Time: <i>2/13/12, 17:00</i>		Samples Received by:															
Samples Relinquished by: <i>CHET MORTON</i>		Date/Time: <i>2/13/12, 17:00</i>		Received by:															
Relinquished by: <i>Chet Morton</i>		Date/Time: <i>2/13/12, 17:00</i>		Received by: <i>WJ 2/13/12</i>															
				Received by: <i>TASUR 02/13/12 1630</i>															

Page 33 of 35

Lab Use Only Shipper Name: _____ Opened by: _____ Condition: _____



Certification Summary

Client: Ashland Inc.

TestAmerica Job ID: 680-76905-1

Project/Site: HERC Hattiesburg - Air Sampling 2/13/12

Laboratory	Authority	Program	EPA Region	Certification ID
TestAmerica Savannah	A2LA	DoD ELAP		0399-01
TestAmerica Savannah	A2LA	ISO/IEC 17025		399.01
TestAmerica Savannah	Alabama	State Program	4	41450
TestAmerica Savannah	Arkansas	Arkansas DOH	6	N/A
TestAmerica Savannah	Arkansas	State Program	6	88-0692
TestAmerica Savannah	California	NELAC	9	3217CA
TestAmerica Savannah	Colorado	State Program	8	N/A
TestAmerica Savannah	Connecticut	State Program	1	PH-0161
TestAmerica Savannah	Florida	NELAC	4	E87052
TestAmerica Savannah	Georgia	Georgia EPD	4	N/A
TestAmerica Savannah	Georgia	State Program	4	803
TestAmerica Savannah	Guam	State Program	9	09-005r
TestAmerica Savannah	Hawaii	State Program	9	N/A
TestAmerica Savannah	Illinois	NELAC	5	200022
TestAmerica Savannah	Indiana	State Program	5	N/A
TestAmerica Savannah	Iowa	State Program	7	353
TestAmerica Savannah	Kentucky	Kentucky UST	4	18
TestAmerica Savannah	Kentucky	State Program	4	90084
TestAmerica Savannah	Louisiana	NELAC	6	30690
TestAmerica Savannah	Louisiana	NELAC	6	LA100015
TestAmerica Savannah	Maine	State Program	1	GA00006
TestAmerica Savannah	Maryland	State Program	3	250
TestAmerica Savannah	Massachusetts	State Program	1	M-GA006
TestAmerica Savannah	Michigan	State Program	5	9925
TestAmerica Savannah	Mississippi	State Program	4	N/A
TestAmerica Savannah	Montana	State Program	8	CERT0081
TestAmerica Savannah	Nebraska	State Program	7	TestAmerica-Savannah
TestAmerica Savannah	New Jersey	NELAC	2	GA769
TestAmerica Savannah	New Mexico	State Program	6	N/A
TestAmerica Savannah	New York	NELAC	2	10842
TestAmerica Savannah	North Carolina	North Carolina DENR	4	269
TestAmerica Savannah	North Carolina	North Carolina PHL	4	13701
TestAmerica Savannah	Oklahoma	State Program	6	9984
TestAmerica Savannah	Pennsylvania	NELAC	3	68-00474
TestAmerica Savannah	Puerto Rico	State Program	2	GA00006
TestAmerica Savannah	Rhode Island	State Program	1	LAO00244
TestAmerica Savannah	South Carolina	State Program	4	98001
TestAmerica Savannah	Tennessee	State Program	4	TN02961
TestAmerica Savannah	Texas	NELAC	6	T104704185-08-TX
TestAmerica Savannah	USDA	USDA		SAV 3-04
TestAmerica Savannah	Vermont	State Program	1	87052
TestAmerica Savannah	Virginia	NELAC	3	460161
TestAmerica Savannah	Washington	State Program	10	C1794
TestAmerica Savannah	West Virginia	West Virginia DEP	3	94
TestAmerica Savannah	West Virginia	West Virginia DHHR (DW)	3	9950C
TestAmerica Savannah	Wisconsin	State Program	5	999819810
TestAmerica Savannah	Wyoming	State Program	8	8TMS-Q
TestAmerica Burlington	ACCLASS	DoD ELAP		ADE-1492
TestAmerica Burlington	Connecticut	State Program	1	PH-0751
TestAmerica Burlington	Delaware	Delaware DNREC	3	NA
TestAmerica Burlington	Florida	NELAC Secondary AB	4	E87467
TestAmerica Burlington	Louisiana	NELAC Secondary AB	6	176292
TestAmerica Burlington	Maine	State Program	1	VT00008

Certification Summary

Client: Ashland Inc.

TestAmerica Job ID: 680-76905-1

Project/Site: HERC Hattiesburg - Air Sampling 2/13/12

Laboratory	Authority	Program	EPA Region	Certification ID
TestAmerica Burlington	Minnesota	State Program	5	050-999-436
TestAmerica Burlington	New Hampshire	NELAC	1	200610
TestAmerica Burlington	New Jersey	NELAC	2	VT972
TestAmerica Burlington	New York	NELAC	2	10391
TestAmerica Burlington	Pennsylvania	NELAC	3	68-00489
TestAmerica Burlington	Rhode Island	State Program	1	LAO00298
TestAmerica Burlington	USDA	USDA		P330-11-00093
TestAmerica Burlington	Vermont	State Program	1	VT-4000
TestAmerica Burlington	Virginia	NELAC Secondary AB	3	460209

Accreditation may not be offered or required for all methods and analytes reported in this package. Please contact your project manager for the laboratory's current list of certified methods and analytes.





St. Croix Sensory, Inc.

Malcolm Pirnie-Arcadis

Hercules

Odor Evaluation Report

Report No. 1204501

02/14/12

Data Release Authorization:

Natasha Satre
Laboratory Associate

Reviewed and Approved:

Charles M. McGinley, P.E.
Technical Director

St. Croix Sensory is a laboratory dedicated to practicing state-of-the-art sensory evaluation and to advancing the science of sensory perception.

We are a family owned and operated business providing our clients with personal customer service, flexible scheduling, timely results.

Our focus is to provide the best professional services available to help make your project or product a success.

www.fivesenses.com

1150 Stillwater Boulevard North
Stillwater, Minnesota 55082 U.S.A.

Tel: 800-879-9231

Fax: 651-439-1065

Email: stcroix@fivesenses.com

St. Croix Sensory, Inc.

Odor Evaluation Report

Client: Malcolm Pirnie-Arcadis

Report No.: 1204501

Project: Hercules

Evaluation Date: 02/14/12

#	Field No.	Sample Description	ASTM E679 & EN13725		ASTM E544	PERSISTENCY	CHARACTERIZATION		Comments
			Detection Threshold	Recognition Threshold	Intensity	Dose-Response Slope	Hedonic Tone	Principal Odor Descriptors	
1	1	Pond Sample	12,000	10,000			-5.0	Chemical, Offensive, Earthy, Vegetable, Fruity	RT>10,000. Sample observed at 50% dilution for Characterization. Sample not observed for Intensity.
2	2	Pond Sample	14,000	8,600	140		-3.8	Offensive, Chemical, Earthy, Vegetable, Floral	
3	3	Pond Sample	8,000	4,100	130		-4.4	Chemical, Offensive, Earthy, Vegetable, Fruity	
4									
5									
6									
7									
8									
9									
10									

St. Croix Sensory, Inc.

Odor Evaluation Report

Client: Malcolm Pirnie-Arcadis

Report No.: 1204501

Project: Hercules

Evaluation Date: 02/14/12

#	Field No.	Sample Description	ASTM E679 & EN13725		ASTM E544	PERSISTENCY	CHARACTERIZATION		Comments
			Detection Threshold	Recognition Threshold	Intensity	Dose-Response Slope	Hedonic Tone	Principal Odor Descriptors	
11									
12									
13									
14									
15									
16									
17									
18									
19									
20									

Client: Malcolm Pirnie-Arcadis

Field No.: 1

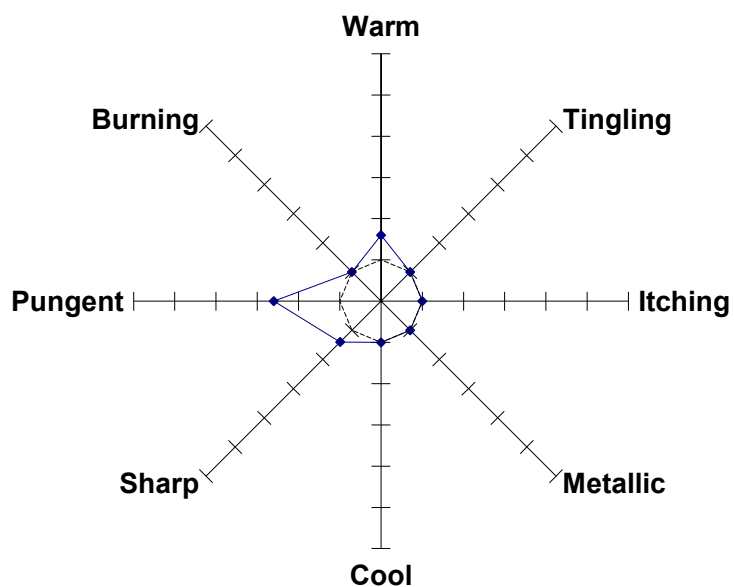
Report No.: 1204501

Project: Hercules

Description: Pond Sample

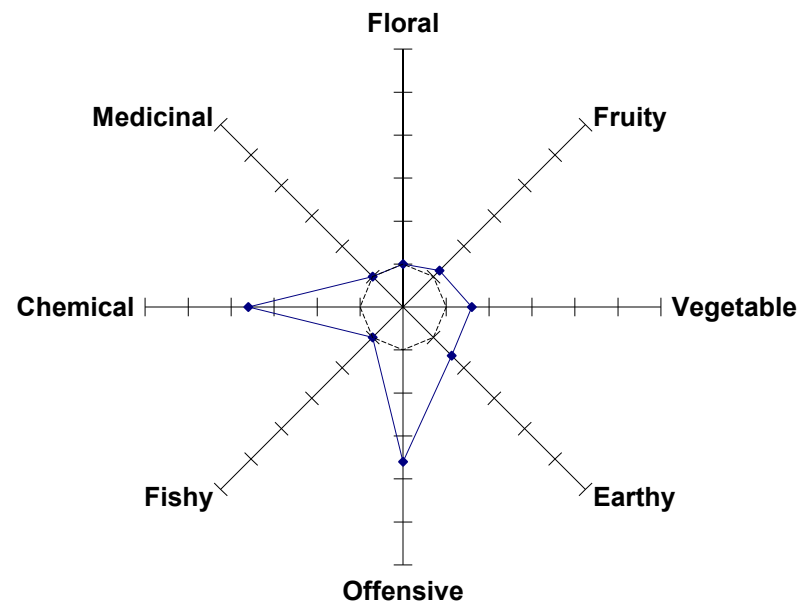
Evaluation Date: 02/14/12

Sensation Descriptor Graph

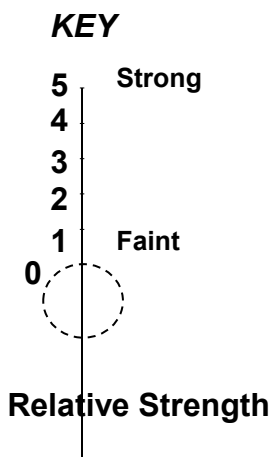


	Average Relative Strength
Warm	0.6
Tingling	0.0
Itching	0.0
Metallic	0.0
Cool	0.0
Sharp	0.4
Pungent	1.6
Burning	0.0

Odor Descriptor Graph



	Average Relative Strength
Floral	0.0
Fruity	0.2
Vegetable	0.6
Earthy	0.6
Offensive	2.6
Fishy	0.0
Chemical	2.6
Medicinal	0.0



St. Croix Sensory, Inc.

Odor Evaluation Report

Client: Malcolm Pirnie-Arcadis

Field No.: 1

Report No.: 1204501

Project: Hercules

Description: Pond Sample

Evaluation Date: 02/14/12

% of Assessors |*****|*****|*****|*****| 100%

- Garlic *****
- Fruity *****
- Tar *****
- Car exhaust *****
- Petroleum *****
- Solvent *****
- Gasoline *****
- Oil *****
- Sulfur *****
- Fecal *****
- Sewer *****
- Sour *****
- Burnt *****
- Rotten eggs *****
- Decay *****
- Septic *****
- Swampy *****
- Smoky *****

Client: Malcolm Pirnie-Arcadis

Field No.: 1

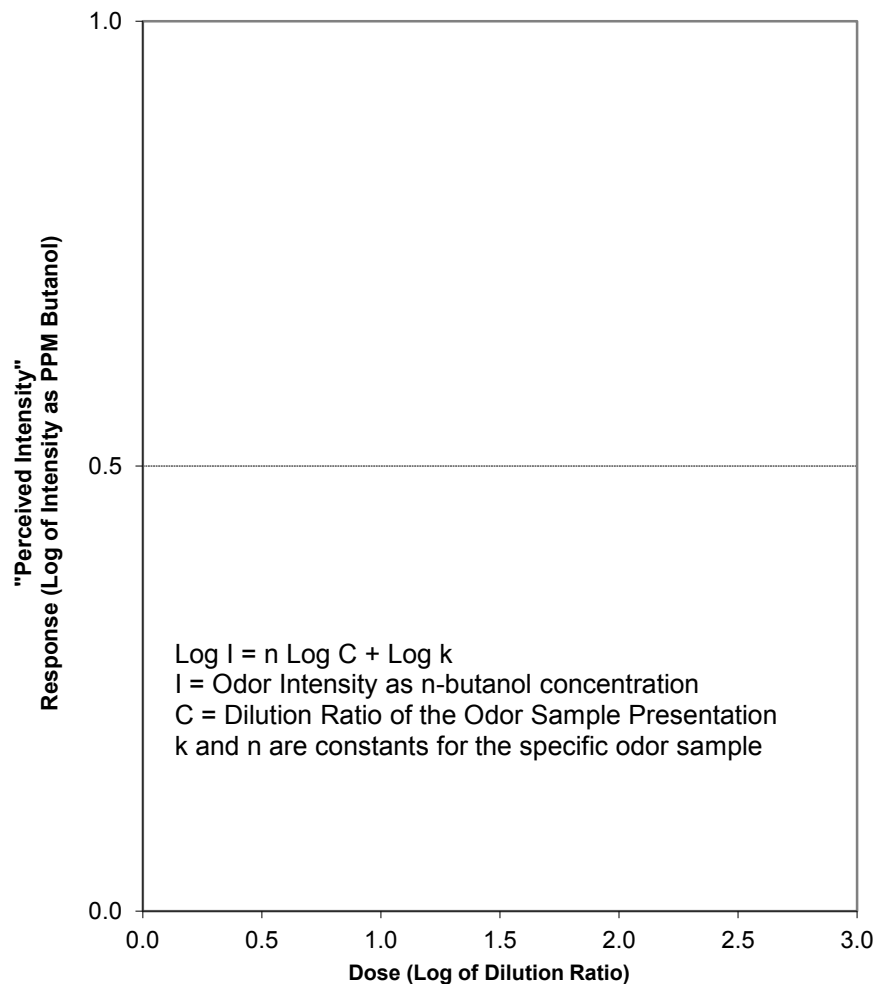
Report No.: 1204501

Project: Hercules

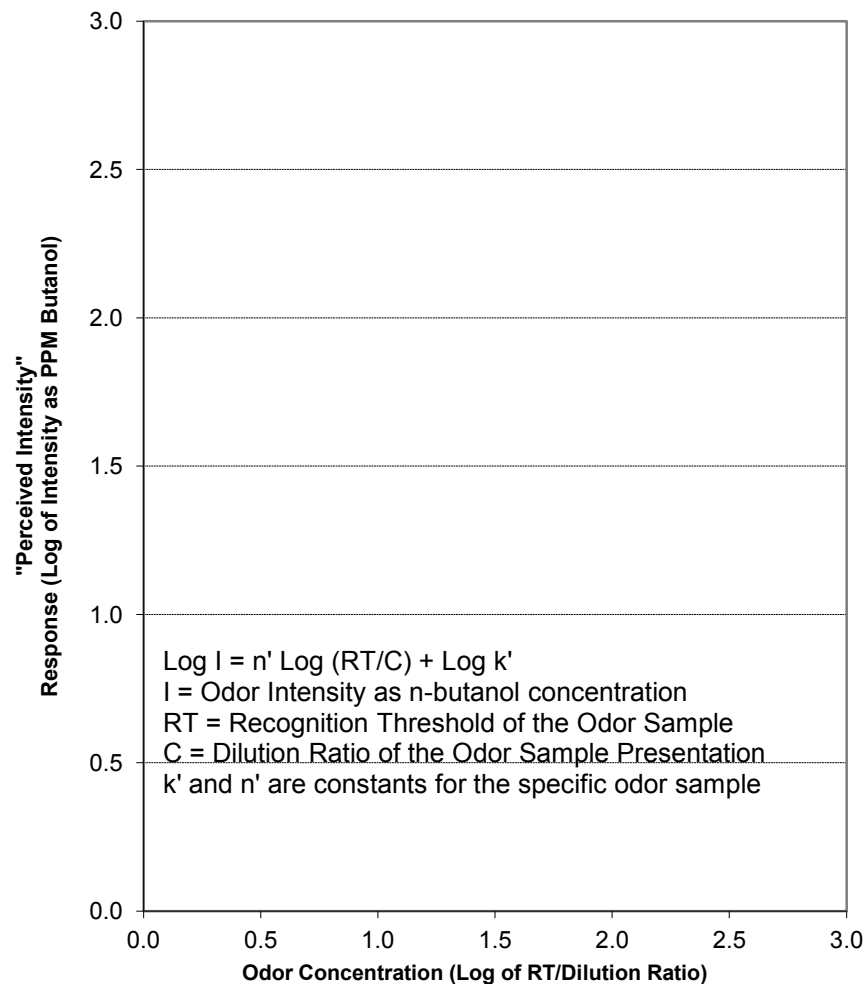
Description: Pond Sample

Evaluation Date: 02/14/12

Dose-Response



Dose-Response as Power Law



Client: Malcolm Pirnie-Arcadis

Field No.: 2

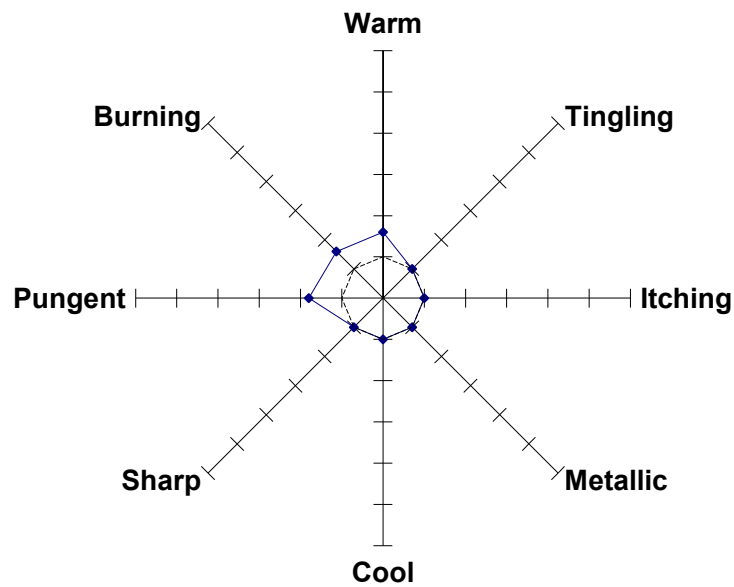
Report No.: 1204501

Project: Hercules

Description: Pond Sample

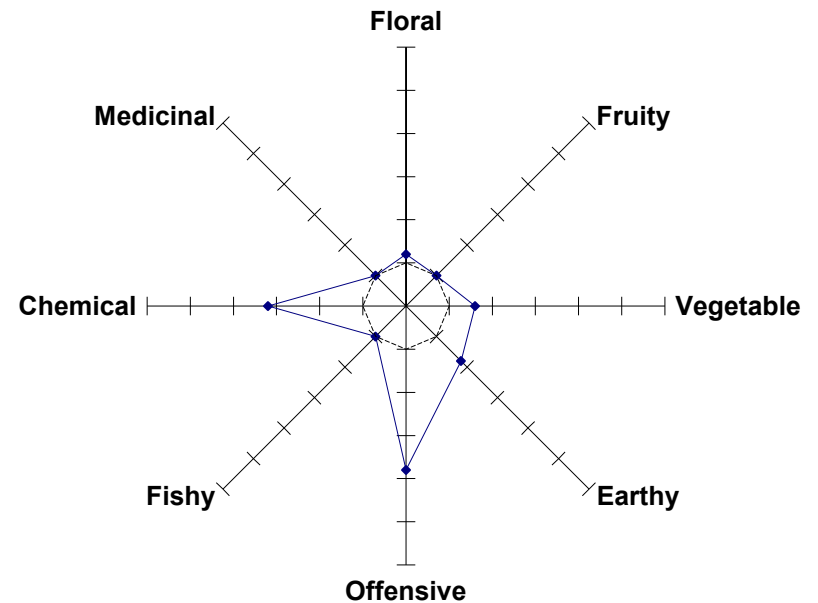
Evaluation Date: 02/14/12

Sensation Descriptor Graph

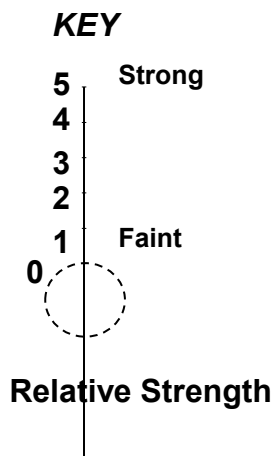


	Average Relative Strength
Warm	0.6
Tingling	0.0
Itching	0.0
Metallic	0.0
Cool	0.0
Sharp	0.0
Pungent	0.8
Burning	0.6

Odor Descriptor Graph



	Average Relative Strength
Floral	0.2
Fruity	0.0
Vegetable	0.6
Earthy	0.8
Offensive	2.8
Fishy	0.0
Chemical	2.2
Medicinal	0.0



St. Croix Sensory, Inc.

Odor Evaluation Report

Client: Malcolm Pirnie-Arcadis

Field No.: 2

Report No.: **1204501**

Project: Hercules

Description: Pond Sample

Evaluation Date: 02/14/12

% of Assessors |*****|*****|*****|*****| 100%

- Garlic *****
- Floral *****
- Tar *****
- Car exhaust *****
- Petroleum *****
- Solvent *****
- Oil *****
- Sulfur *****
- Fecal *****
- Sewer *****
- Sour *****
- Burnt *****
- Decay *****
- Septic *****
- Ashes *****
- Swampy *****
- Smoky *****

Client: Malcolm Pirnie-Arcadis

Field No.: 2

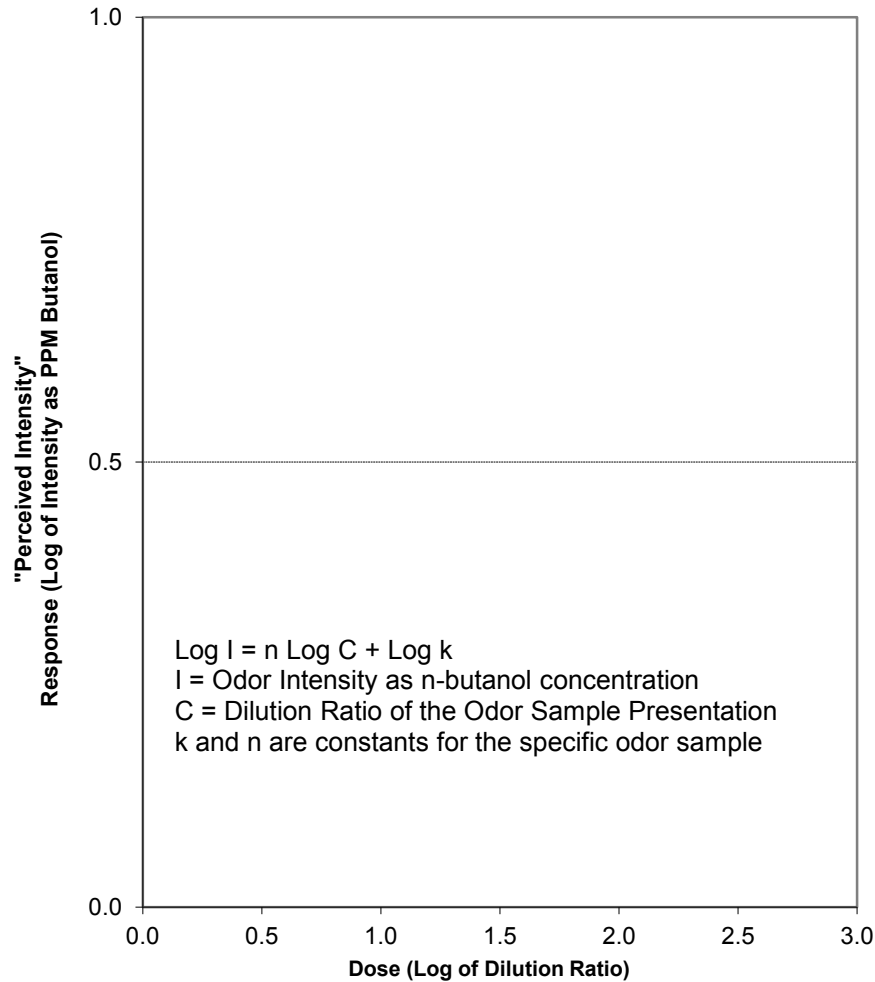
Report No.: 1204501

Project: Hercules

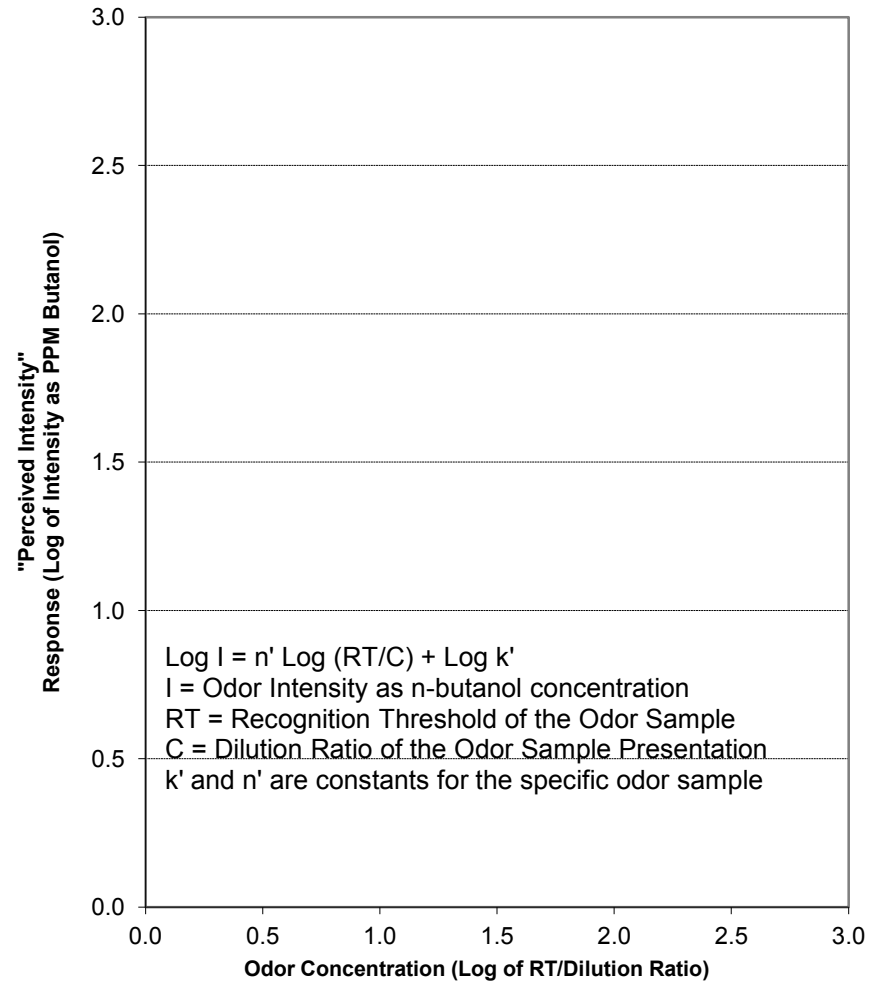
Description: Pond Sample

Evaluation Date: 02/14/12

Dose-Response



Dose-Response as Power Law



Client: Malcolm Pirnie-Arcadis

Field No.: 3

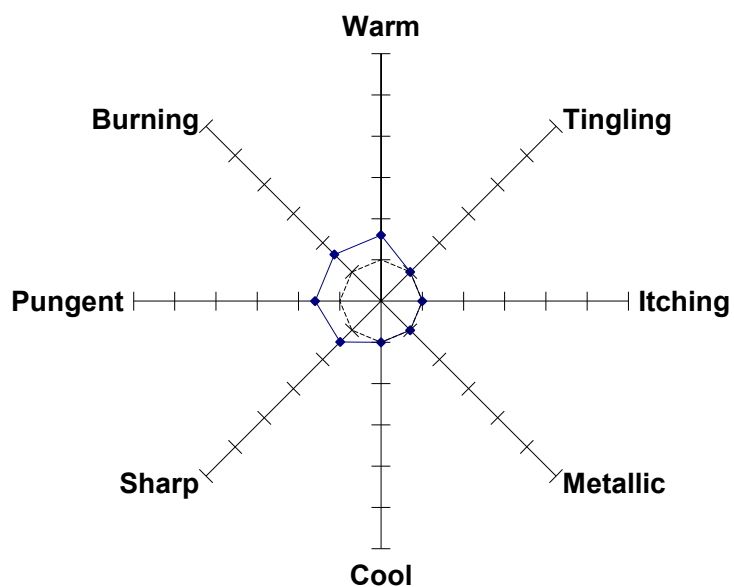
Report No.: 1204501

Project: Hercules

Description: Pond Sample

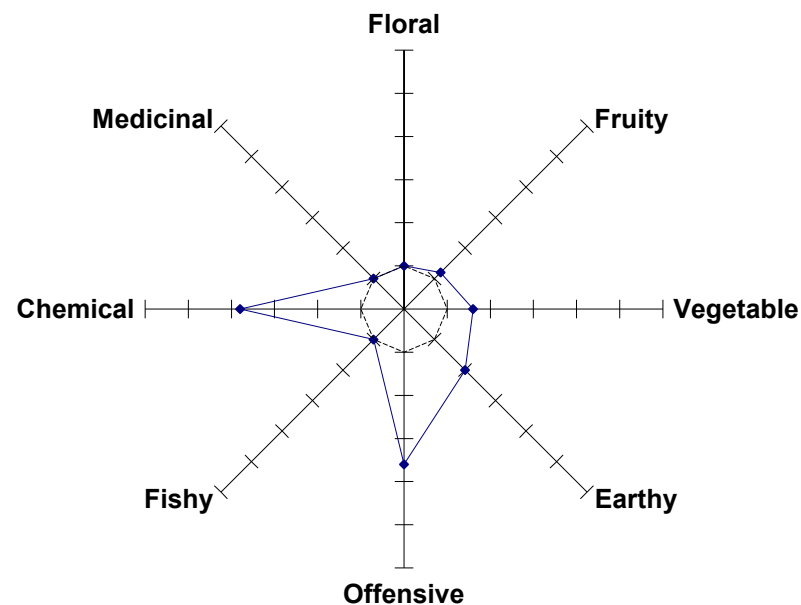
Evaluation Date: 02/14/12

Sensation Descriptor Graph

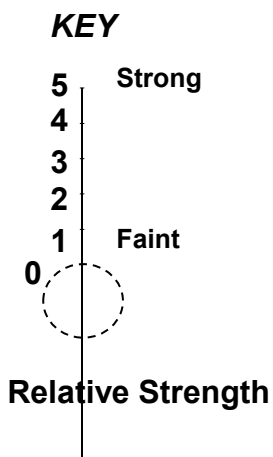


	Average Relative Strength
Warm	0.6
Tingling	0.0
Itching	0.0
Metallic	0.0
Cool	0.0
Sharp	0.4
Pungent	0.6
Burning	0.6

Odor Descriptor Graph



	Average Relative Strength
Floral	0.0
Fruity	0.2
Vegetable	0.6
Earthy	1.0
Offensive	2.6
Fishy	0.0
Chemical	2.8
Medicinal	0.0



St. Croix Sensory, Inc.

Odor Evaluation Report

Client: Malcolm Pirnie-Arcadis

Field No.: 3

Report No.: 1204501

Project: Hercules

Description: Pond Sample

Evaluation Date: 02/14/12

% of Assessors |*****|*****|*****|*****| 100%

- Garlic *****
- Fruity *****
- Grease *****
- Tar *****
- Car exhaust *****
- Petroleum *****
- Solvent *****
- Gasoline *****
- Oil *****
- Sulfur *****
- Offensive *****
- Sewer *****
- Sour *****
- Burnt *****
- Decay *****
- Septic *****
- Earthy *****
- Swampy *****
- Smoky *****

Client: Malcolm Pirnie-Arcadis

Field No.: 3

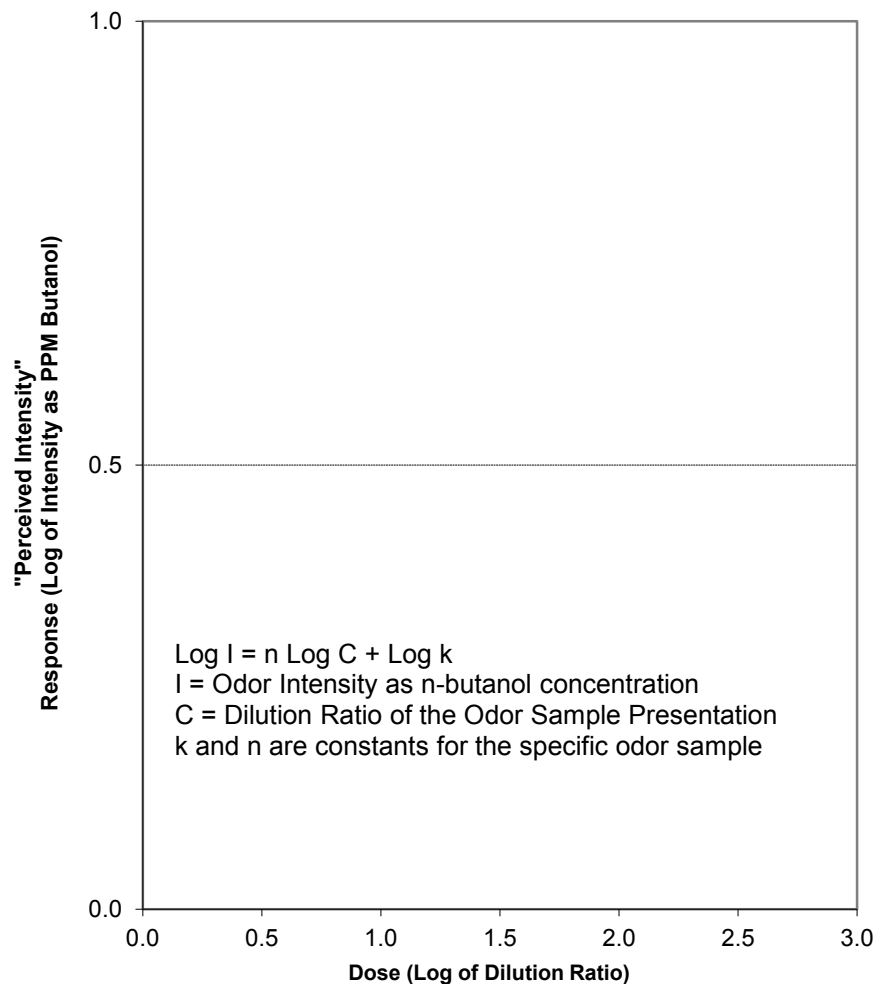
Report No.: 1204501

Project: Hercules

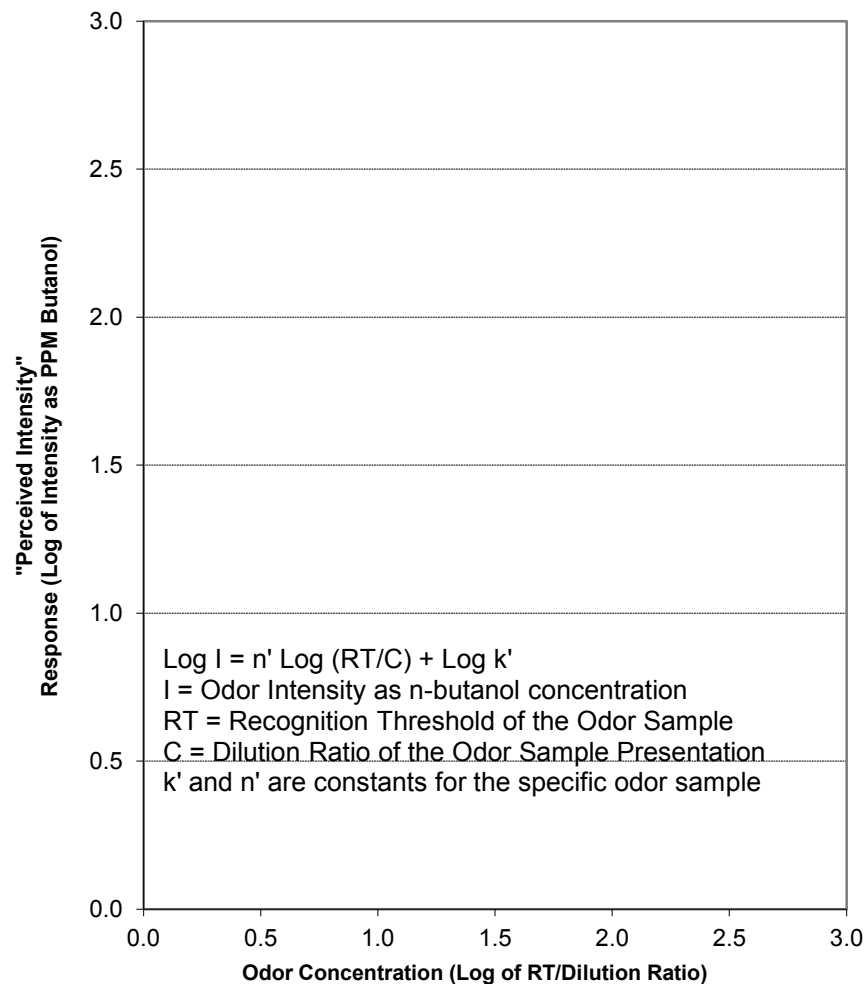
Description: Pond Sample

Evaluation Date: 02/14/12

Dose-Response



Dose-Response as Power Law



CHAIN OF CUSTODY RECORD FOR ODOR SAMPLES

@ | 1 | 0 | 7 | 0

Client: <i>HERCULES</i>					Sampled By: <i>CHET MORTON</i>			Odor Evaluations Requested: (X)		Page <u>1</u> of <u>1</u>	
Project Name: <i>HERCULES</i>					Sampling Date: <i>2/13/12</i>			Odor Concentration* (Detection & Recognition Threshold) Odor Intensity* (PPM 1-Butanol) Odor Characterization (Hedonic Tone & Descriptors) Odor Persistence (“Dose-Response”)		For Laboratory use Only	
Comments:					Odor Evaluation Report No.:		Laboratory Sample No.:				
Line No.	Field No.	Sample Description	Sample Time	Field H ₂ S (ppm)					LN	FN	
1	1	POND SAMPLE		<0.5	✓	✓	✓				
2	2	POND SAMPLE		<0.5	✓	✓	✓				
3	3	POND SAMPLE		<0.5	✓	✓	✓				
4											
5											
6											
7											
8											
9											
10											
11											
12											

Transmittal Number of Shipping Boxes _____	Relinquished By	Date	Time	Accepted By	Date	Time	Comments & Exceptions Noted
	<i>Chet Morton</i>	<i>2/13/12</i>	<i>9:00 am - 4:00 pm</i>	<i>[Signature]</i>	<i>2/14/12</i>	<i>9:45</i>	
Received at St. Croix Sensory Laboratory							