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Analysis of Respirator Cartridge Performance Testing on a Hanford AP Tank Farm Primary Exhauster Slipstream

July 2020

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U.S. DEPARTMENT OF ENERGY

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Richland, Washington 99352

Executive Summary

Washington River Protection Solutions (WRPS) conducted tests on two types of chemical cartridges for use in air purifying respirators (APR) to determine the period of time that the cartridges would provide adequate performance[1] for APRs used to protect workers when exposed to a mixture of Chemicals of Potential Concern (COPCs) from vapors exiting the exhauster for the Hanford AP tank farm. The Occupational Safety and Health Administration (OSHA) identifies cartridge testing as a valid approach for establishing a cartridge change schedules. Testing is commonly applied in situations where mixtures of COPCs exist, and where other approaches, such as manufacturer recommendations and modeling, are less reliable. The tests were designed and conducted to assure measurement and/or control of the key variables OSHA identified as important to estimate cartridge service life, including temperature, humidity, COPC concentration, breathing rate, and cartridge adsorption capacity.

Testing was conducted from June 24-26, 2016, on a slipstream from the AP exhauster fed to a respirator cartridge test stand developed by WRPS in collaboration with HiLine Engineering (Richland, Washington). Multipurpose respirator cartridges, SCOTT 7422-SD1 and SCOTT 7422-SC1 (SCOTT Safety, Monroe, North Carolina) were assessed on separate days. Sample media (sorbent tubes) were used to collect samples of the vapor stream entering and exiting the respirator cartridge and were subsequently analyzed for COPC concentrations. Pacific Northwest National Laboratory was tasked with conducting an independent analysis of the analytical results and making recommendations based on the results for respiratory cartridge performance and service life. Key conclusions from the assessment of the 59 COPCs in this study are described below:

- Based on measured cartridge inlet vapor concentrations from the AP exhauster, only ammonia and N-nitrosodimethylamine (NDMA) exceeded their corresponding Occupational Exposure limits (OEL).[2] Four COPCs—mercury, N-nitrosodiethylamine (NDEA), N-nitrosomethylethylamine, and N-nitrosomorpholine—reported one or more inlet concentration measurements greater than 10% of their corresponding OEL, but less than 100%. Inlet and outlet measurements for all other COPCs did not exceed 10% of their respective OELs.
- Ammonia concentrations at the respirator cartridge inlet reached a maximum of 279% of its OEL (69.7 ppm), which was generally consistent with the maximum historical measurement of 476% of the OEL from the AP exhauster. For both cartridges, ammonia appeared to breakthrough above 10% of its OEL after 4 hours (SCOTT 7422-SD1) and 8 hours (SCOTT 7422-SC1).
- Cartridge inlet concentration measurements for NDMA reached 3629% of its OEL (10.9 ppb), which was also generally consistent with the maximum historical measurements from the AP exhauster of 6333% of the OEL. However, all outlet concentrations were less than the analytical reporting limit (RL) of approximately 10.6% of the OEL, indicating no breakthrough for either cartridge.

[1] "Adequate performance" refers to being below the breakthrough criteria used in this analysis. The breakthrough criteria for this analysis is having sustained cartridge outlet concentrations above 10% of the compound's OEL. Ultimately, Industrial Hygiene professionals will use these results along with specific hazard assessments to determine service life, change schedules, and cartridge selection needed to provide the necessary performance for specific applications in Hanford tank farms.

[2] OELs accepted for Hanford tank farm use are based on OELs established by a U.S. governmental agency or national professional organization (e.g., OSHA, National Institute for Occupational Safety and Health, American Conference of Governmental Industrial Hygienists), or if no U.S. OEL exists, standard toxicological practices are applied to develop OELs based on the best available science. The OEL for NDMA was established in 2005 based on the MAK (Maximale Arbeitsplatzkonzentration) Commission standard adopted in Europe.

- Mercury inlet vapor concentrations measured throughout the testing period for both cartridges ranged from approximately 44% to 56% of the OEL (11 to 14 µg/m^3). Overall, inlet cartridge concentrations of mercury were significantly lower than the historic maximum of 468% of its OEL obtained during waste-disturbing conditions. However, the historic maximum of 84% of the OEL obtained under non-waste-disturbing conditions was generally consistent with the cartridge inlet condition. Mercury outlet concentrations during this study were all below the detection limit (DL),[3] indicating no breakthrough for the testing period.
- The maximum N-nitrosomethylethylamine and N-nitrosomorpholine inlet vapor concentrations of 44.9% of the OEL (0.13 ppb) and 22.7% of the OEL (0.14 ppb), respectively, were lower than the maximum historical measurements from the exhauster of 111% and 52% of the OEL. However, all outlet concentrations for both COPCs were less than the analytical RL of approximately 8.9% and 3.4% of the OEL, respectively, indicating no breakthrough for either cartridge.
- The analytical RL for NDEA, at approximately 23% of the OEL, was above the 10% of the OEL breakthrough criterion for this study. All inlet and outlet NDEA measurements from cartridge testing were below the RL and significantly lower than historic maximum AP exhauster concentration of 328% of the OEL. However, the historic maximum was obtained during a waste-disturbing activity. The highest non-waste-disturbing maximum of 53% of the OEL was not significantly higher than the RL. Although the DL for NDEA was above the 10% OEL action threshold, no evidence of breakthrough was observed.
- The maximum historic concentration of furan measured in the AP exhauster under non-waste-disturbing conditions was 250% of the OEL, which is significantly higher than the maximum cartridge inlet concentration measurement of 2.4% of the OEL[4]. Although most cartridge inlet and outlet measurements of furan were above the DL, all measurements were below the analytical RL of approximately 26% of the OEL, indicating no breakthrough.

Based on the measurements taken for this study, ammonia breakthrough above 10% of its OEL occurred after 4 hours (SCOTT 7422-SD1) and 8 hours (SCOTT 7422-SC1). Inlet concentration measurements of ammonia averaged 252% of its OEL (33.6 ppm) and were consistently above 230% of the OEL for the tests. This experimental result supports a 4-hour service life for the use of SCOTT 7422-SC1 and 7422-SD1 cartridges in APRs employed to protect workers at the Hanford AP tank farm, under the same conditions as those tested. However, variations in humidity, temperature, or cartridge inlet concentration for any COPCs, compared to those measured in the current study, could impact breakthrough time, especially if OEL thresholds are exceeded. In these circumstances, additional respirator cartridge evaluations may be necessary to determine proper respiratory protection requirements. Historic concentrations from the AP exhauster for some COPCs including furan were higher than cartridge testing inlet concentrations and should be carefully considered. These factors, along with the measured breakthrough, should be used to inform an Industrial Hygiene determination of APR applicability and an appropriate respirator cartridge change-out schedule for adequate worker protection.

The *Overview of 2016 through 2018 Testing of Air-Purifying Respirator Cartridge Performance on Multiple Hanford Tank Headspaces and Exhausters* (Freeman et al. [20]) provides additional

[3] The term "detection limit" is used here to refer either to an analytical RL or a DL. The use of either an RL or a DL varied among analytical laboratories. An RL (equivalent to a limit of quantification) was used instead of an analytical method DL by several laboratories for specific COPC analyses. See Appendix C and Appendix F for additional information on the specific use of the RLs or DLs for each COPC.

[4] Furan when measured by the Carbotrap 300 TDU has the maximum cartridge inlet concentration of 392% of the OEL which is very low compared to the historical maximum concentration, a below-report datum that had an RL of 52.3 ppb (<5230% of the OEL) using a Carbotrap 300 TDU tube measurement.

information on the use of the cartridge testing results for the first 28 cartridge tests with the manufacturers service life models.

Revision History

Revision Number	Effective Date	Description of Change
0		Initial issue
1	June 2020	This report has been revised to address external peer review comments on the Rev. 0 report and subsequent test reports from 2016 cartridge testing and to correct data reporting errors. The principal changes included: 1. Applying a sample volume correction to all calculated COPC concentrations reported in tables, plots, and text of Rev. 0 to account for analytical sample volumes that were recorded at non-standard temperature and pressure conditions. Corrections to account for the actual temperature and pressure conditions at the time of sampling had modest impact on all reported COPC concentrations. 2. Switching the SCOTT SD-1 and SC-1 data sets that were mislabeled in the original Rev. 0. 3. Revising the report format to match subsequent cartridge test reports, including reordering of appendices and revising the "Raw Analytical Data" appendix (now Appendix C) to incorporate the full analytical laboratory reports instead of tabulated summary results. 4. Addressing several external peer review comments including: • Incorporating additional information on historic COPC source concentrations and the significance of any differences between cartridge-testing results and historic maxima. (Section 6 and Appendix F) • Adding descriptive information to Appendices A, B, and C to provide additional clarity on the contents and methods applied • Clarifying terminology regarding breakthrough time versus service life and change-out schedule. a. A furans analytical methods review was conducted in 2018 ("Assessment of the Use of Alternate Furan Measurements for Respirator Cartridge Performance Determinations," letter report 69802-01). The assessment recommended the use of the Carbotrap 300 TDU VOC tube analytical results for furan, 2,5-dihydrofuran, and 2-methylfuran in lieu of the TDU Tenax TA tube. The report has been updated to reflect the Carbotrap 300 TDU results for furan, 2,5-dihydrofuran, and 2-methylfuran[5].The impact of the use of the Carbotrap 300 TDU across all the 2016 APR reports is documented in Freeman et al. [20].

[5] Using the Carbotrap 300 TDU measurements, only two influent readings for furan (both on SC1: 319% and 392% of the OEL) were above the reporting limit/detection limit. All other influent and effluent readings for furan, 2,5-dihydrofuran, and 2-methylfuran using the Carbotrap 300 TDU VOC method were below the respective reporting/detection limits.

Acronyms and Abbreviations

ALS	ALS Environmental Salt Lake City
APR	Air purifying respirator
BBI	Best Basis Inventory
CAS	Chemical Abstract Service
CBAL	Columbia Basin Analytical Laboratory, part of the RJ Lee Group
CFR	Code of Federal Regulations
COPC	Chemicals of Potential Concern
CVAA	Cold Vapor Atomic Absorption
DL	Detection Limit
EPA	U.S. Environmental Protection Agency
GC–FID	Gas Chromatography–Flame Ionization Detector
GC/MS	Gas Chromatography/Mass Spectrometry
GC–TEA	Gas Chromatography–Thermal Energy Analyzer
HPLC	High Performance Liquid Chromatography
HPLC–UV	High Performance Liquid Chromatography–Ultraviolet
IC	Ion Chromatography
NDEA	N-nitrosodiethylamine
NDMA	N-nitrosodimethylamine
NIOSH	National Institute of Occupational Safety and Health
NMEA	N-nitrosomethylethylamine
OEL	Occupational Exposure Limit
OSHA	Occupational Safety and Health Administration
SCBA	self-contained breathing apparatus
PNNL	Pacific Northwest National Laboratory
ppm	parts per million
RL	reporting limit
SAR	Supplied Air Respirator
SCBA	self-contained breathing apparatus
SWIHD	Site-Wide Industrial Hygiene Database
TIC	Tentatively Identified Compound
TWINS	Tank Waste Information Network System
VOC	Volatile Organic Compound
WRPS	Washington River Protection Solutions

Contents

Executive Summary iii
Revision History vii
Acronyms and Abbreviations ix
Contents xi
Figures xiii
Tables xiii
1.0 Introduction/Project Description 1.1
2.0 Regulatory Requirements 2.1
2.1 Background on Regulatory Requirements 2.1
2.2 OSHA-Approved Methods for Determining Cartridge Change-Out Times 2.1
3.0 Description of Testing Program 3.1
4.0 Data Analysis 4.1
5.0 Plots of COPCs with Significant Detected Values 5.1
6.0 Factoring in Historical Concentration Data 6.1
7.0 Conclusions 7.1
8.0 Recommendations 8.1
9.0 References 9.1
Appendix A – Description of Respirator Cartridge Testing Setup A.1
Appendix B – Analytical Testing B.1
Appendix C – Raw Analytical Data C.1
C.1 Description C.1
C.2 Experimental Parameters C.4
C.2.1 Flow Rates C.4
C.2.2 Temperature, Pressure, and Relative Humidity C.5
C.3 Raw Analytical Data C.6
C.3.1 SVOC and SVOCTIC C.6
C.3.2 VOC and VOCTIC C.72
C.3.3 Furans C.122
C.3.4 Amines C.148
C.3.5 Acetonitrile C.162
C.3.6 Mercury C.173
C.3.7 Ammonia C.210
C.3.8 Aldehydes C.247
C.3.9 1,3-Butadiene C.272
C.3.10 Pyridines C.292
C.3.11 Nitrosamines C.304

C.3.12 Supporting Emails C.339
Appendix D – Data Reduction Steps D.1
Appendix E – Plots of Other COPCs with Significant (2–10% of the OEL) Detected Values E.1
Appendix F – Historical Data Comparison F.1
F.1 Data Handling and Filtering F.1
F.2 Data Tabulation F.3
F.3 AP Exhauster: Comparison with Historical Data F.3
F.3.1 Nitrous Oxide F.4
F.3.2 Mercury F.4
F.3.3 1,3-Butadiene F.5
F.3.4 Formaldehyde F.5
F.3.5 Furan F.5
F.3.6 2,3-Dihydrofuran F.6
F.3.7 2,5-Dihydrofuran, 2-Methylfuran F.6
F.3.8 2,5-Dimethylfuran, 2-Pentylfuran, 2-Heptylfuran, 2-Propylfuran F.6
F.3.9 Ethylamine F.6
F.3.10 N-nitrosodiethylamine F.7
F.3.11 N-nitrosomethylethylamine F.7
F.3.12 N-nitrosomorpholine F.7
F.3.13 Dibutyl Butylphosphonate (DBBP) F.8
F.3.14 Pyridine F.8
F.3.15 2,4-Dimethylpyridine F.8
F.3.16 Methyl Isocyanate F.8
F.3.17 Summary of Historical Data for the AP Exhauster F.8
Appendix G – Uncertainty Analysis G.1

Figures

Figure 1. Plot of Measured Ammonia Concentrations before the Inlets and after the Outlets of the Two Respirator Cartridges Tested..... 5.1
Figure 2. Plot of Measured Mercury Concentrations before the Inlets and after the Outlets of the Two Respirator Cartridges Tested..... 5.2
Figure 3. Plot of Measured N-nitrosodimethylamine Concentrations before the Inlets and after the Outlets of the Two Respirator Cartridges Tested. 5.3
Figure 4. Plot of Measured N-nitrosodiethylamine Concentrations before the Inlets and after the Outlets of the Two Respirator Cartridges Tested..... 5.4
Figure 5. Plot of Measured N-nitrosomethylethylamine Concentrations before the Inlets and after the Outlets of the Two Respirator Cartridges Tested 5.5
Figure 6. Plot of Measured N-nitrosomorpholine Concentrations before the Inlets and after the Outlets of the Two Respirator Cartridges Tested 5.6
Figure 7. Plot of Measured Furan Concentrations before the Inlets and after the Outlets of the SCOTT 7422-SC1 Respirator Cartridge Test..... 5.7

Tables

1 Summary of Analyzed COPCs 4.2
2 Historical AP Exhauster Data for COPCs with Boiling Points less than 70°C (158°F)..... 6.2

1.0 Introduction/Project Description

As the Tank Operations Contractor for U.S. Department of Energy operations at the Hanford site, Washington River Protection Solutions (WRPS) is responsible for managing highly radioactive wastes stored in tanks at Hanford. WRPS recently identified the need to test air purifying respirator (APR) chemical cartridges commonly used at Hanford tank farms. The tests were conducted to determine the period of time that the cartridges would provide adequate performance for APRs used to protect workers when exposed to a mixture of Chemicals of Potential Concern (COPCs) from any vapors exiting headspaces in the tanks. Occupational Safety and Health Administration (OSHA) Standard 29 Code of Federal Regulations (CFR) 1910.134(d)(3)(iii)(b)(2) specifies that for protection against gases and vapors, employers shall implement a change schedule for cartridges to ensure that change-outs occur before the end of service life.[1-4] The change schedule can be based on objective information or data that ensures cartridge change-outs occur before the end of their service life.[2-5] The primary function of the WRPS APR Cartridge Test Program is to obtain objective data to determine service lives for APR cartridges in use at Hanford tank farms. WRPS contracted Pacific Northwest National Laboratory (PNNL) to analyze the test data and offer an independent analysis and any recommendations. This report summarizes data analyses of cartridge testing on vapors from the AP exhauster on the Hanford AP double shell tank farm at Hanford.

2.0 Regulatory Requirements

2.1 Background on Regulatory Requirements

OSHA Respiratory Protection Standard (29 CFR 1910.134) mandates/requires that employers provide protective equipment, including respirators, to their employees to protect them against potential exposure to contaminants at or above documented Occupational Exposure Limits (OELs) and establish cartridge change-out schedules to ensure cartridges are changed before the end of service life.[1] End of service life is the time when a respirator cartridge can no longer filter/capture harmful contaminants (i.e., the cartridge no longer functions effectively).

Protective respirator cartridges are frequently used in workplaces with low concentrations of contaminants, and where respirators provide essential protection for longer periods of time (greater than 2 hours). If the contaminant concentration in a workplace is high, supplied air respirators (SAR) or self-contained breathing apparatuses (SCBA) must be used to provide additional protection. While the use of SARs or SCBAs offers more protection, a tradeoff exists, particularly for SCBAs that employ a large, heavy (approximately 30 pounds), back-mounted compressed air cylinder.[1]

2.2 OSHA-Approved Methods for Determining Cartridge Change-Out Times

The National Institute for Occupational Safety and Health (NIOSH) certifies organic vapor cartridges using the criteria in 42 CFR 84, Approval of Respiratory Protective Devices. Still, there is no widely accepted, standard protocol for performing service life testing.[4] However, OSHA has identified the following three valid approaches for establishing cartridge change schedules.[3]

- Conduct experimental tests – First, gather all available information about the nature of all contaminants present in the workplace. Obtain breathing rates of workers and estimate worst-case exposures. For most of the employers, this approach is the most time consuming and resources needed to perform these tests may not be available. If an employer has the resources to pursue this approach, it is the most reliable method of estimating cartridge service life. Concentrations at different points in time are obtained using actual respirator cartridges exposed to actual or simulated gases to gather service life information. A safety factor (that includes the assumptions made, variable factors, or conditions) needs to be applied to the service life and used in the respiratory protection program. This approach is commonly used in situations where mixtures of contaminants are present and can also be used to validate an existing cartridge change-out schedule.
- Use the manufacture's recommendation – Once information on airborne contaminants (including concentrations, temperature, and humidity) has been obtained, contact the manufacturer of the respirator to be used and provide all the information. Manufacturers should be able to provide the estimated service life of different cartridges for particular compounds. Manufacturers should also be able to provide the exact objective information they used to project the service life. Using the information obtained, service lives are proposed. This approach is not as reliable as conducting application-specific experiments, and manufacturers may not have all the information for workplace hazards and user factors. If any safety factor is applied considering all the variable factors, it must be clearly identified in the respiratory protection program. For complex mixtures, such as those present in the waste storage tanks at Hanford, manufacturer recommendations may be of limited value, and experimental testing is recommended.

- Use mathematical models – Mathematical models are usually applicable for single contaminant exposure situations. OSHA and NIOSH have worked over the years with researchers and industrial partners to develop mathematical models for predicting respirator cartridge service life.[3, 5-11] OSHA offers guidance on using mathematical models to estimate respirator cartridge service life based on single components, but the models have not been adopted for mixtures. NIOSH has developed a computer tool for estimating breakthrough times and service lives of respirator cartridges. Manufacturers can use those results to make service-life recommendations for their particular product (canister/cartridge) in multi-gas environments. Two types of mathematical models are used: 1) predictive models [3, 5-7] and 2) descriptive models.[9] Each model has its own mathematical basis for its estimations. To estimate the service lives of cartridges, the following information is needed:
  - number of cartridges used by the respirator
  - mass of the sorbent used in each cartridge
  - carbon micro-pore volume
  - density of the packed bed
  - maximum temperature
  - maximum relative humidity
  - maximum concentration of the contaminants and the work (volumetric flow) rate.

The primary advantages of using mathematical models are that they are relatively inexpensive and take little time. However, the estimates are not as accurate as testing; sometimes it might result in a service-life estimate that is shorter than it needs to be because of conservative assumptions used during calculations.

In addition to the methods described above, "rules of thumb" can be allowed as part of the overall workplace organic vapor assessment for determining a cartridge change-out schedule. Chapter 36 of the American Industrial Hygiene Association publication, *The Occupational Environment: Its Evaluation and Control and Management*, outlines the approach.[12] The "rules of thumb" may not work for every chemical or situation, but can provide an estimate of cartridge life. The following are rules of thumb outlined in the publication:

- If the compound's boiling point is >70°C and the concentration is <200 ppm, a service life of 8 hours at a normal work rate can be expected.
- Service life is inversely proportional to worker breathing rate.
- Reducing the concentration of a contaminant by a factor of 10 will increase service life by a factor of 5.
- Relative humidity above 85% will reduce the service life by 50%.

These rules of thumb do not apply in certain situations, including for mixture of hazardous contaminants (e.g., Hanford tank farm vapors) and inorganic gases such as ammonia, sulfur dioxide, and hydrogen sulfide, compositions that vary with time, location, and contaminants that undergo continuous reactions. However, some of the general drivers[6] can help in interpreting the results obtained from experimental testing of respirator cartridges.

[6] The general drivers (a.k.a., rules of thumb) are applicable to certain compounds but not to all compounds in a mixture, such as those in specific Hanford tank mixtures. However, an Industrial Hygiene professional can use these rules of thumb to support interpretation of results from both experiments and predictions.

3.0 Description of Testing Program

Based on the OSHA guidance described in the previous section, a sample testing approach was pursued for quantifying respirator cartridge effectiveness for Hanford tank vapors. WRPS developed a sampling approach outlined in TFC-PLN-168, "Industrial Hygiene Sampling and Analysis Plan for Respirator Cartridge Testing," and "Air Purifying Respirator Cartridge Test Apparatus, RPP-STE-59226."[13-14]

Appendix A provides a description of the respirator cartridge-testing setup developed by WRPS and used for measurements of vapors from the AP primary exhauster.[13-15] The test system and methodology were developed in consultation with recognized subject matter experts to follow the example of tank farm headspace field sampling for the purposes of cartridge testing.

The Sampling and Analysis Plan was developed under the direction and oversight of the Industrial Hygienist in conjunction with the Tank Farms Operations Contractor Retrieval and Closure, and Tank Farms Project and/or Production Operations Project Management Team, as applicable. Trained Industrial Hygiene Technicians under the direction of a qualified Industrial Hygienist collected chemical vapor samples from the influent and effluent sides of the cartridge test apparatus. Training was performed at HiLine Engineering (Richland, Washington) on the test stands for WRPS Sampling Equipment Operators, Industrial Hygiene Technicians, and Field Work Supervisors, prior to transport of the test stands to tank farms.

The APR cartridge test assembly was designed and constructed to operate to the following environmental conditions without negatively impacting system performance:

- Temperature: 32°F to 115°F
- Relative Humidity: 5% to 100%
- Precipitation: Up to 4 inches in 6 hours
- Wind: Up to 20 miles per hour with blowing dust.

WRPS developed a testing program with the following conservative conditions to support robust cartridge service life estimates:

- The flow rate through each cartridge was set at 30 L/min (equivalent to 60 L/min for a pair of cartridges), which corresponds to more than twice the normal breathing rate and is slightly higher than OSHA recommended flow rate of 53.3 L/min.[3,5]
- Tank farm vapors source sampling was performed on headspace or exhauster stack vapors rather than from Tank Farm atmospheric concentrations (i.e., source sampling vs. the breathing zone).
- 10% of the OEL for each COPC was considered as a threshold concentration.

Using the cartridge-testing setup shown in Appendix A, separate test surveys were performed on two NIOSH-approved respiratory protection twin cartridges: SCOTT 7422-SD1 for Survey 1 and SCOTT 7422-SC1[7] for Survey 2.[16] These cartridges were chosen because they are suitable for capturing organic vapors, acid gases, ammonia, formaldehyde, and particulates.[16]

[7] SCOTT part numbers 7422-SC1 and 7422-SD1 are multipurpose APR respirator cartridges for use on Xcel Half-Mask and all SCOTT full facepieces with NIOSH approval for OV/AM/MA/CL/HC/SD/CD/HF/FM/HS application. The -SD1 cartridge has the same multipurpose features as the -SC1 but also includes a P100 particulate filter. https://www.3mscott.com/download/742-series-cartridges-user-instructions-english/

Vapor concentrations upstream and downstream of the APR cartridge were monitored with an array of sorbent tubes (see Appendix B). Influent (upstream) concentrations were measured at the beginning and end of each 16-hour verification survey. Downstream sorbent tubes were changed out every 2 hours until the experiment was finished. A measured quantity of sample air was drawn in through the sorbent tube (see Appendix A).[13-14] Compounds from the sorbent tubes were extracted and analyzed using analytical methods referenced in Appendix B.

The characteristics of 59 COPCs were the primary focus of the testing. The 59 COPCs represent a set of tank vapors chemicals found in a tank farm source greater than 10% of their OELs or are considered “known” or “probable” carcinogens by the International Agency for Research Cancer or other regulatory agencies.[17,18] A full listing of these COPCs is shown in Section 4.0.

4.0 Data Analysis

Respirator cartridge testing on the AP primary exhauster was conducted from June 24-26, 2016.[8] Each cartridge was tested for approximately 16 hours of continuous run time. Testing and analysis focused on the 59 COPCs and other hazardous airborne contaminants. Sorbent tubes were changed every 2 hours, and more than 200 sorbent tubes were sent to the 222S Laboratory at Hanford and dispositioned for analysis. Appendix C lists the raw data for all of contaminants analyzed during the tests, and Appendix D lists the corresponding calculated concentrations for the detected COPCs. Appendix C also gives the temperatures of the sample slipstream during testing, which ranged from 60°F to 86ºF, and the relative humidity ranged from 33% to 100%. Table 1 provides an overview of the results for each of the 59 COPCs. Note that nitrous oxide was not analyzed as it is not susceptible to respirator filtration, and there are no known NIOSH-approved respirator filtration cartridges approved for nitrous oxide. Additionally, methanol was not quantified as part of the COPC data set because it is used as a standard solvent and calibration standard in the analytical procedure for volatile organic compounds (VOCs).

Table 1 shows the measured concentrations in the current study for all of the COPCs tested. This table further provides a summary of the test information. For example, if all of the measurements for a specific compound were less than detection limits (DL),[9] that compound is marked accordingly. Further, if concentrations were detected for a compound, the extent of the detection also is described. Inlet concentrations of two COPCs—ammonia and N-nitrosodimethylamine (NDMA)—exceeded their corresponding OELs. The inlet (or outlet) concentrations for four additional COPCs were below their corresponding OELs but exceeded 10% of the OEL. These were mercury and N-nitrosodiethylamine (NDEA), N-nitrosomethylethylamine (NMEA), and N-nitrosomorpholine. All six of these COPCs (highlighted in yellow in Table 1) are assessed in more detail in Section 5.0. Appendix E shows similar detailed assessments for an additional nine COPCs with respirator cartridge inlet (or outlet) concentrations or DLs less than 10% of the OEL but greater than 2%. These COPCs were 1,3-butadiene, formaldehyde, furan, 2,3-dihydrofuran, 2,5-dihydrofuran, 2-methylfuran, 2,5-dimethylfuran, 2-pentylfuran, and 2-propylfuran. All of the other COPCs had inlet (or outlet) concentrations or DLs less than 2% of their OELs.

A furans analytical methods review was conducted in 2018 ("Assessment of the Use of Alternate Furan Measurements for Respirator Cartridge Performance Determinations," letter report 69802-01). The assessment recommended the use of the Carbotrap 300 TDU VOC tube analytical results for furan, 2,5-dihydrofuran, and 2-methylfuran in lieu of the TDU Tenax TA tube. All of the results for furan, 2,5-dihydrofuran, and 2-methylfuran from 2016 APR cartridge testing have been re-evaluated and documented in Freeman et al. [20].

[8] Subsequent to AP exhauster testing in June 2016, an upgraded AP exhauster system that operates at a higher flowrate and has a higher stack height began operations in September 2016.

[9] The term "detection limit" is used here to refer either to analytical reporting limit (RL) or DL. The use of either an RL or DL varied among analytical laboratories. The RL (equivalent to a limit of quantification) was used instead of a DL by several laboratories for specific COPC analyses. See Appendix C and Appendix F for additional information on the specific use of reporting limits or DLs for each COPC. Nitrosamine analysis results were quantified to a reporting limit.

Table 1. Summary of Analyzed COPCs

COPC Number and Name	CAS Number	Highest Measured Value (this study)	Occupational Exposure Limit (OEL)	Approximate Analytical Detection Limit, DL[1] (% of OEL)	All Data Values (inlet and outlet) < Detection Limit	Highest Detected Value Compared to OEL
Inorganic						
1 Ammonia	7664-41-7	69.7 ppm	25 ppm	2.46%		Up to 279% of OEL for inlet values. All outlets <217%.
2 Nitrous Oxide	10024-97-2	Not Measured	50 ppm			
3 Mercury	7439-97-6	14.0 ug/m3	25 ug/m3	7.12%		Up to 55.9% of OEL for inlet values. All outlets <DL.
Hydrocarbons						
4 1,3-Butadiene	106-99-0	0.0205 ppm	1 ppm	2.05%	X	
5 Benzene	71-43-2	0.0007 ppm	0.5 ppm	0.024%		Up to 0.098% of OEL for inlet values. All outlets <0.15%.
6 Biphenyl	92-52-4	0.0001 ppm	0.2 ppm	0.053%	X	
Alcohols						
7 1-Butanol	71-36-3	0.0612 ppm	20 ppm	0.002%		Up to 0.31% of OEL for inlet values. All outlets <DL
8 Methanol	67-56-1	Not Measured	200 ppm			
Ketones						
9 2-Hexanone	591-78-6	0.0004 ppm	5 ppm	0.003%		Up to 0.008% of OEL for inlet values. All outlets <DL.
10 3-Methyl-3-butene-2-one	814-78-8	Not Detected	0.02 ppm	TIC[2]	X	
11 4-Methyl-2-hexanone	105-42-0	0.0002 ppm	0.5 ppm	0.030%	X	
12 6-Methyl-2-heptanone	928-68-7	Not Detected	8 ppm	TIC	X	
13 3-Buten-2-one	78-94-4	0.0007 ppm	0.2 ppm	0.086%		Up to 0.33% of OEL for inlet values. All outlets <0.16%.
Aldehydes						
14 Formaldehyde	50-00-0	0.0176 ppm	0.3 ppm	0.62%		Up to 5.9% of OEL for inlet values. All outlets <3.4%.
15 Acetaldehyde	75-07-0	0.0264 ppm	25 ppm	0.005%		Up to 0.11% of OEL for inlet values. All outlets <0.06%.
16 Butanal	123-72-8	0.0048 ppm	25 ppm	0.003%		Up to 0.019% of OEL for inlet values. All outlets <0.005%.
17 2-Methyl-2-butenal	1115-11-3	Not Detected	0.03 ppm	TIC	X	
18 2-Ethyl-hex-2-enal	645-62-5	Not Detected	0.1 ppm	TIC	X	

[1] Approximate DL is calculated using the reported DLs (or reporting limit [RL]) from the analytical laboratory and the average volume (from flowrate × time) of vapor exposed to the sorbent tube.

[2] Tentatively Identified Compound (TIC) indicates that a mass spectrometry "peak" not associated with calibrated compounds has been tentatively assigned to a compound based on an adequate match to the analytical methods reference library. Reference standards for the compound are not available to accurately quantify, assign an analytical DL, or definitively confirm the identity of the TIC. TICs are reported when the peak area is sufficiently large, estimated as ≥5 nanograms of TIC mass, and other analytical criteria are met. For the respirator cartridge testing, this mass of TIC represents an approximate concentration of <1.0 ppb, based on the average of all TICs in the COPC list.

[3] The Carbotrap 300 TDU measured values for furan, 2,5-dihydrofuran, and 2-methylfuran have been updated in this table. Only two Influent readings for furan (both on SC1 319% and 392% of the OEL) were above the RL/DL. All other Influent and Effluent readings for furan, 2,5-dihydrofuran, and 2-methylfuran using the Carbotrap 300 TDU method were below their respective RLs/DLs.

Table 1. (continued)

COPC Number and Name	CAS Number	Highest Measured Value (this study)	Occupational Exposure Limit (OEL)	Approximate Analytical Detection Limit, DL[1] (% of OEL)	All Data Values (inlet and outlet) < Detection Limit	Highest Detected Value Compared to OEL
Furans[3]						
19 Furan	110-00-9	3.9 ppb	1 ppb	15.7%		Up to 392% of OEL for inlet values. All outlets <DL.
20 2,3-Dihydrofuran	1191-99-7	0.05 ppb	1 ppb	1.76%		Up to 2.5% of OEL for inlet values. All outlets <5.0%.
21 2,5-Dihydrofuran	1708-29-8	0.2 ppb	1 ppb	20.9%	X	
22 2-Methylfuran	534-22-5	0.1 ppb	1 ppb	10.6%	X	
23 2,5-Dimethylfuran	625-86-5	0.03 ppb	1 ppb	3.06%	X	
24 2-Ethyl-5-methylfuran	1703-52-2	Not Detected	1 ppb	TIC	X	
25 4-(1-Methylpropyl)-2,3-dihydrofuran	34379-54-9	Not Detected	1 ppb	TIC	X	
26 3-(1,1-Dimethylethyl)-2,3-dihydrofuran	34314-82-4	Not Detected	1 ppb	TIC	X	
27 2-Pentylfuran	3777-69-3	0.06 ppb	1 ppb	1.63%		Up to 2.3% of OEL for inlet values. All outlets <5.6%.
28 2-Heptylfuran	3777-71-7	0.02 ppb	1 ppb	1.11%		Up to 1.4% of OEL for inlet values. All outlets <1.6%.
29 2-Propylfuran	4229-91-8	0.030 ppb	1 ppb	2.73%		All inlets <DL. All outlets <3.0%.
30 2-Octylfuran	4179-38-8	Not Detected	1 ppb	TIC	X	
31 2-(3-Oxo-3-phenylprop-1-enyl)furan	717-21-5	Not Detected	1 ppb	TIC	X	
32 2-(2-Methyl-6-oxoheptyl)furan	51595-87-0	Not Detected	1 ppb	TIC	X	
Phthalates						
33 Diethylphthalate	84-66-2	0.0010 mg/m3	5 mg/m3	0.019%	X	
Nitriles						
34 Acetonitrile	75-05-8	0.27 ppm	20 ppm	0.001%		Up to 0.04% of OEL for inlet values. All outlets <1.4%.
35 Propanenitrile	107-12-0	0.0005 ppm	6 ppm	0.004%		Up to 0.008% of OEL for inlet values. All outlets <DL.
36 Butanenitrile	109-74-0	0.0004 ppm	8 ppm	0.003%		Up to 0.005% of OEL for inlet values. All outlets <0.004%.
37 Pentanenitrile	110-59-8	0.0002 ppm	6 ppm	0.003%	X	
38 Hexanenitrile	628-73-9	0.0002 ppm	6 ppm	0.003%	X	
39 Heptanenitrile	629-08-3	Not Detected	6 ppm	TIC	X	
40 2-Methylene butanenitrile	1647-11-6	Not Detected	0.3 ppm	TIC	X	
41 2,4-Pentadienenitrile	1615-70-9	Not Detected	0.3 ppm	TIC	X	

Table 1. (continued)

COPC Number and Name	CAS Number	Highest Measured Value (this study)	Occupational Exposure Limit (OEL)	Approximate Analytical Detection Limit, DL[1] (% of OEL)	All Data Values (inlet and outlet) < Detection Limit	Highest Detected Value Compared to OEL
Amines						
42 Ethylamine	75-04-7	0.0241 ppm	5 ppm	0.098%		Up to 0.48% of OEL for inlet values. All outlets <DL.
Nitrosamines						
43 N-Nitrosodimethylamine	62-75-9	10.9 ppb	0.3 ppb	10.6%		Up to 3629% of OEL for inlet values. All outlets <DL.
44 N-Nitrosodiethylamine	55-18-5	0.02 ppb	0.1 ppb	23.0%	X	All inlets and outlets <DL (23% of OEL)
45 N-Nitrosomethylethylamine	10595-95-6	0.13 ppb	0.3 ppb	8.91%		Up to 44.9% of OEL for inlet values. All outlets <DL.
46 N-Nitrosomorpholine	59-89-2	0.14 ppb	0.6 ppb	3.38%		Up to 22.7% of OEL for inlet values. All outlets <DL.
Organophospates						
47 Tributyl phosphate	126-73-8	0.18 ppb	200 ppb	0.092%	X	
48 Dibutyl butylphosphonate	78-46-6	0.09 ppb	7 ppb	1.35%	X	
Halogenated						
49 Chlorinated Biphenyls	Varies	Not Detected	1 mg/m3	TIC	X	
50 2-Fluoropropene	1184-60-7	Not Detected	0.1 ppm	TIC	X	
Pyridines						
51 Pyridine	110-86-1	2.09 ppb	1000 ppb	0.21%	X	
52 2,4-Dimethylpyridine	108-47-4	1.54 ppb	500 ppb	0.31%	X	
Organonitrites						
53 Methyl nitrite	624-91-9	Not Detected	0.1 ppm	TIC	X	
54 Butyl nitrite	544-16-1	Not Detected	0.1 ppm	TIC	X	
Organonitrates						
55 Butyl nitrate	928-45-0	Not Detected	2.5 ppm	TIC	X	
56 1,4-Butanediol, dinitrate	3457-91-8	Not Detected	0.05 ppm	TIC	X	
57 2-Nitro-2-methylpropane	594-70-7	Not Detected	0.3 ppm	TIC	X	
58 1,2,3-Propanetriol, 1,3-dinitrate	623-87-0	Not Detected	0.05 ppm	TIC	X	
Isocyanates						
59 Methyl Isocyanate	624-83-9	Not Detected	20 ppb	TIC	X	

5.0 Plots of COPCs with Significant Detected Values

A total of seven of the COPCs in Table 1 had detected (cartridge inlet) concentrations greater than 10% of their corresponding OEL (see COPCs highlighted in yellow). The following subsections address each of these COPCs in more detail, along with plots of the corresponding data.

Ammonia (see Figure 1) **–** The DL for ammonia corresponds to approximately 2.5% of its OEL. Inlet values for both cartridges measured up to 279% of the OEL. Outlet concentrations exhibited breakthrough behavior over time, with multiple outlet concentrations for both cartridges exceeding 10% of the OEL after a period of time. Breakthrough above 10% of the OEL occurred after 4 hours for the SCOTT 7422-SD1 cartridge, and after 8 hours for the SCOTT 7422-SC1 cartridge[10].

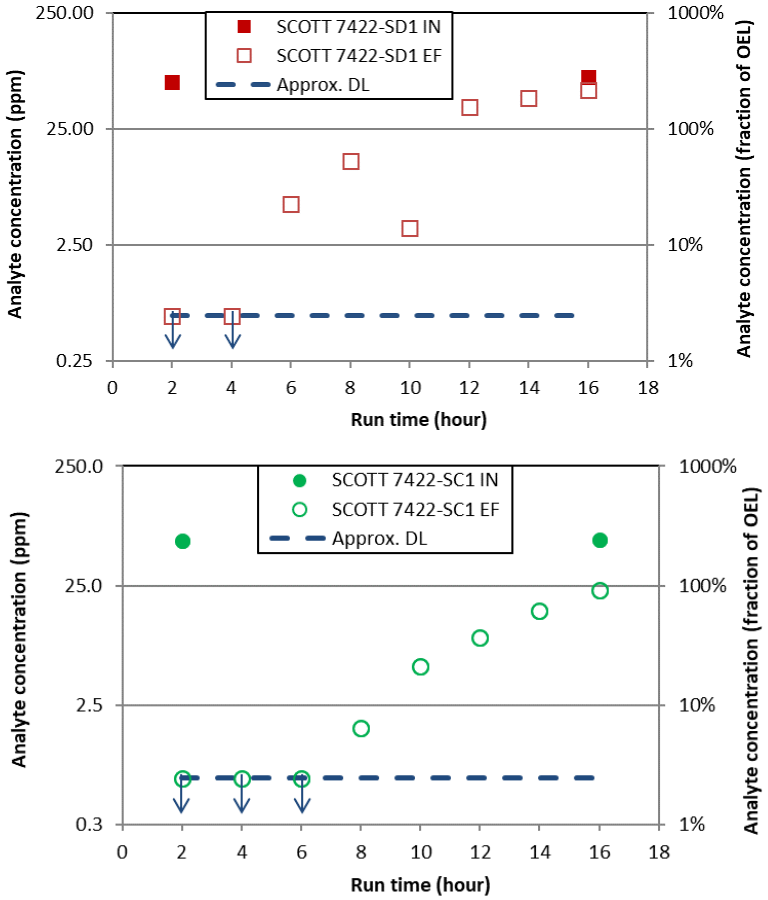

Figure 1. Plot of Measured Ammonia Concentrations before the Inlets and after the Outlets of the Two Respirator Cartridges Tested (SCOTT 7422-SD1 and SCOTT 7422-SC1). Data points noted with ↓ indicates measurements less than the DL or RL.)

[10] Information on the use of manufactures service life models for ammonia is provided in The *Overview of 2016–2018 Testing of Air-Purifying Respirator Cartridge Performance on Multiple Hanford Tank Headspaces and Exhausters* (Freeman et al. [20]) which evaluates cartridge testing results for the first 28 APR cartridge tests with the manufacturers service life models.

***Mercury (see Figure 2)* –** The DL for mercury corresponds to approximately 7.1% of the OEL. All four inlet measurements were higher than the DL (44 to 56% of the OEL). All outlet concentrations for both cartridges were below the DL, indicating no breakthrough for either cartridge.

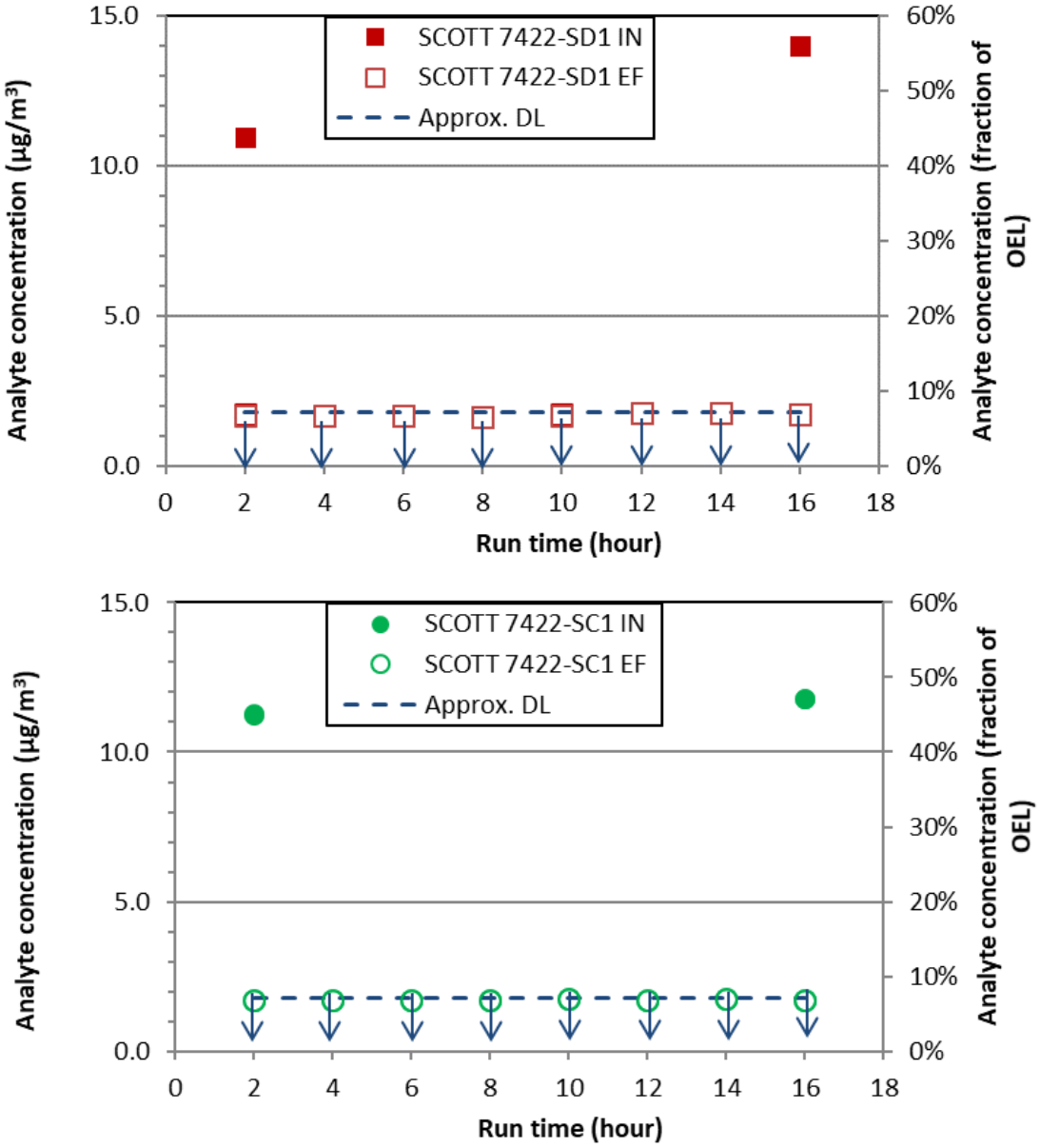

Figure 2. Plot of Measured Mercury Concentrations before the Inlets and after the Outlets of the Two Respirator Cartridges Tested (SCOTT 7422-SD1 and SCOTT 7422-SC1). Data points noted with ↓ indicates measurements less than the DL or RL.

N-nitrosodimethylamine (see Figure 3) – The DL for NDMA corresponds to approximately 10.6% of the OEL. All inlet measurements for both cartridge tests were significantly greater than the DL, ranging from 1231% to 3629% of the OEL. However, all outlet measurements were below the analytical DL. Even though the DL is slightly greater than 10% of the OEL, there is no evidence of breakthrough over the measured time period.

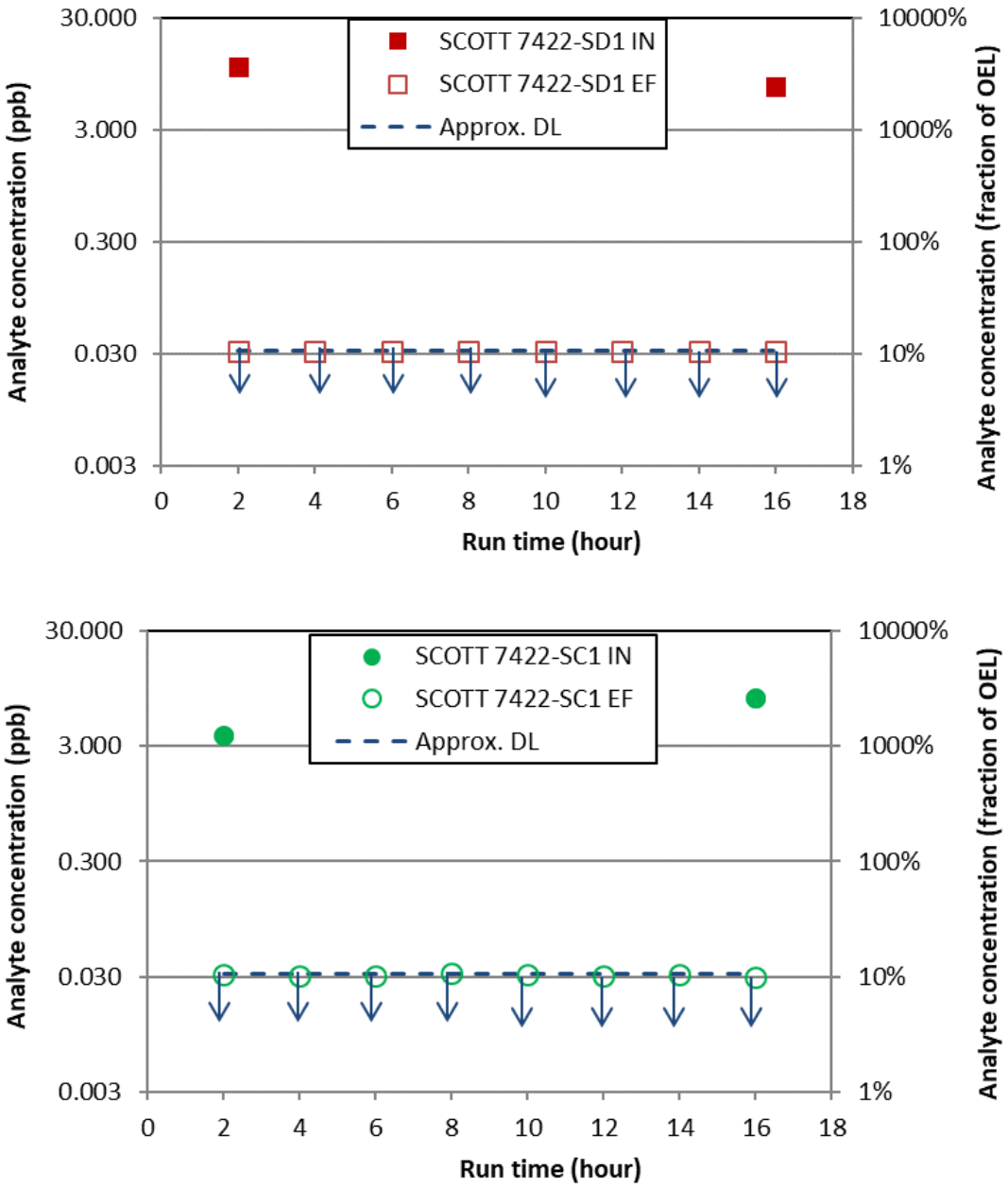

Figure 3. Plot of Measured N-nitrosodimethylamine Concentrations before the Inlets and after the Outlets of the Two Respirator Cartridges Tested (SCOTT 7422-SD1 and SCOTT 7422-SC1**).** Data points noted with ↓ indicates measurements less than the DL or RL.

***N-nitrosodiethylamine (see Figure 4)* –** The DL for NDEA corresponds to approximately 23% of its OEL. For both cartridges tested, all inlet and outlet concentrations were below the DL. Although the NDEA DL is greater than the 10% threshold for breakthrough analysis, quantitation below the DL is not currently possible. Therefore, because the measurements are all below 30% of the OEL, this new threshold, rather than 10%, is recommended for making NDEA cartridge breakthrough determinations.

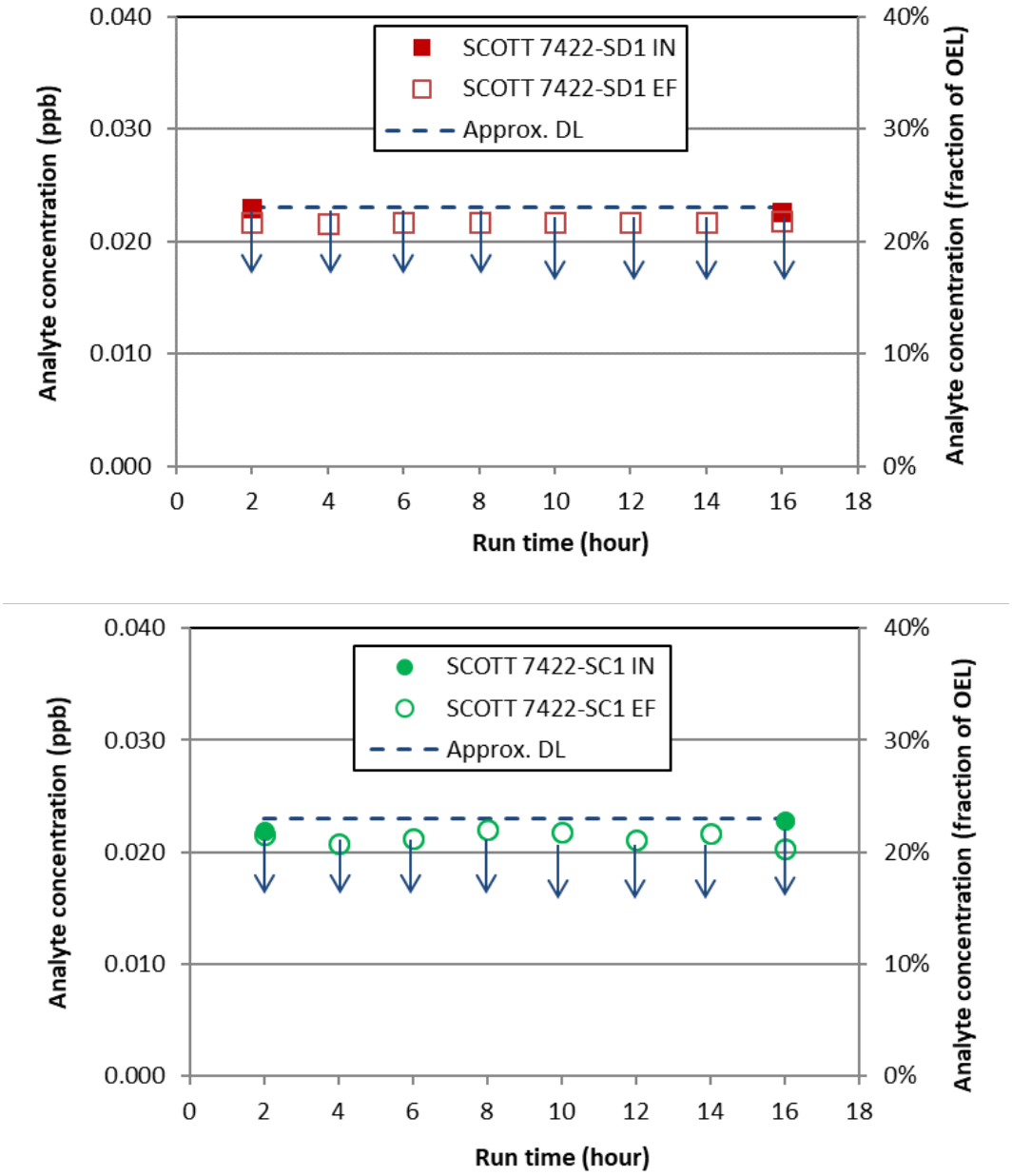

Figure 4. Plot of Measured N-nitrosodiethylamine Concentrations before the Inlets and after the Outlets of the Two Respirator Cartridges Tested (SCOTT 7422-SD1 and SCOTT 7422-SC1). Data points noted with ↓ indicates measurements less than the DL or RL.

N-nitrosomethylethylamine (see Figure 5) **–** The DL for NMEA corresponds to approximately 8.9% of its OEL. Inlet concentrations for the SCOTT 7422-SD1 cartridge were greater than the DL at 29.8% and 44.9% of the OEL. Inlet concentrations for the SCOTT 7422-SC1 cartridge were lower at 23.5% of the OEL at the beginning of the test and less than the DL at the end of the test. All outlet concentrations for both cartridges were less than the DL. Therefore, there is no evidence of breakthrough for either cartridge.

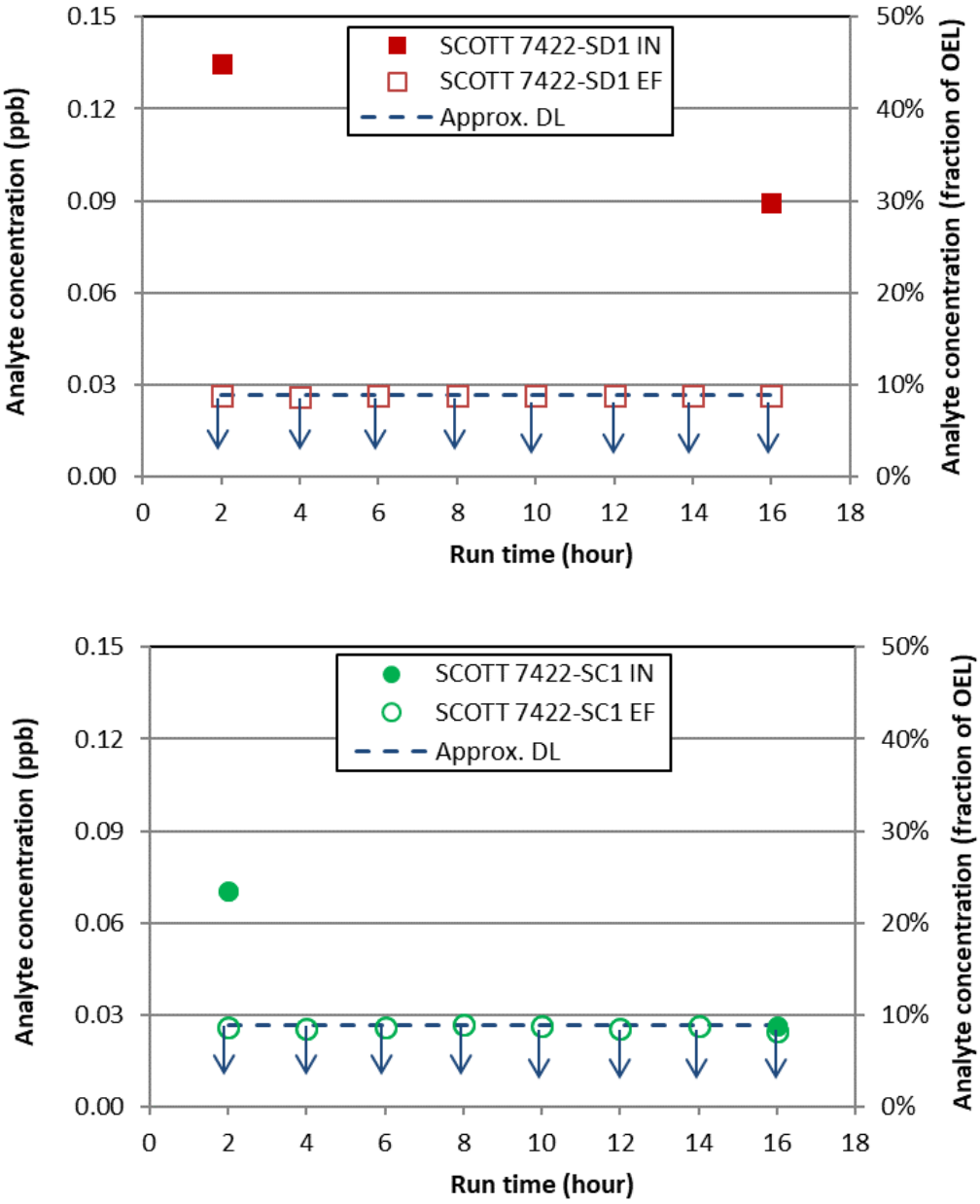

Figure 5. Plot of Measured N-nitrosomethylethylamine Concentrations before the Inlets and after the Outlets of the Two Respirator Cartridges Tested (SCOTT 7422-SD1 and SCOTT 7422-SC1). Data points noted with ↓ indicates measurements less than the DL or RL.

N-nitrosomorpholine (see Figure 6) **–** The DL for N-nitrosomorpholine corresponds to approximately 3.4% of its OEL. For the SCOTT 7422-SD1 cartridge, only one inlet measurement (22.7% of the OEL) was greater than the DL. For the SCOTT 7422-SC1 cartridge, only the last inlet measurement (6.1% of the OEL) was greater than the DL. All outlet concentrations for both cartridges were less than the DL. Therefore, there is no evidence of breakthrough for either cartridge.

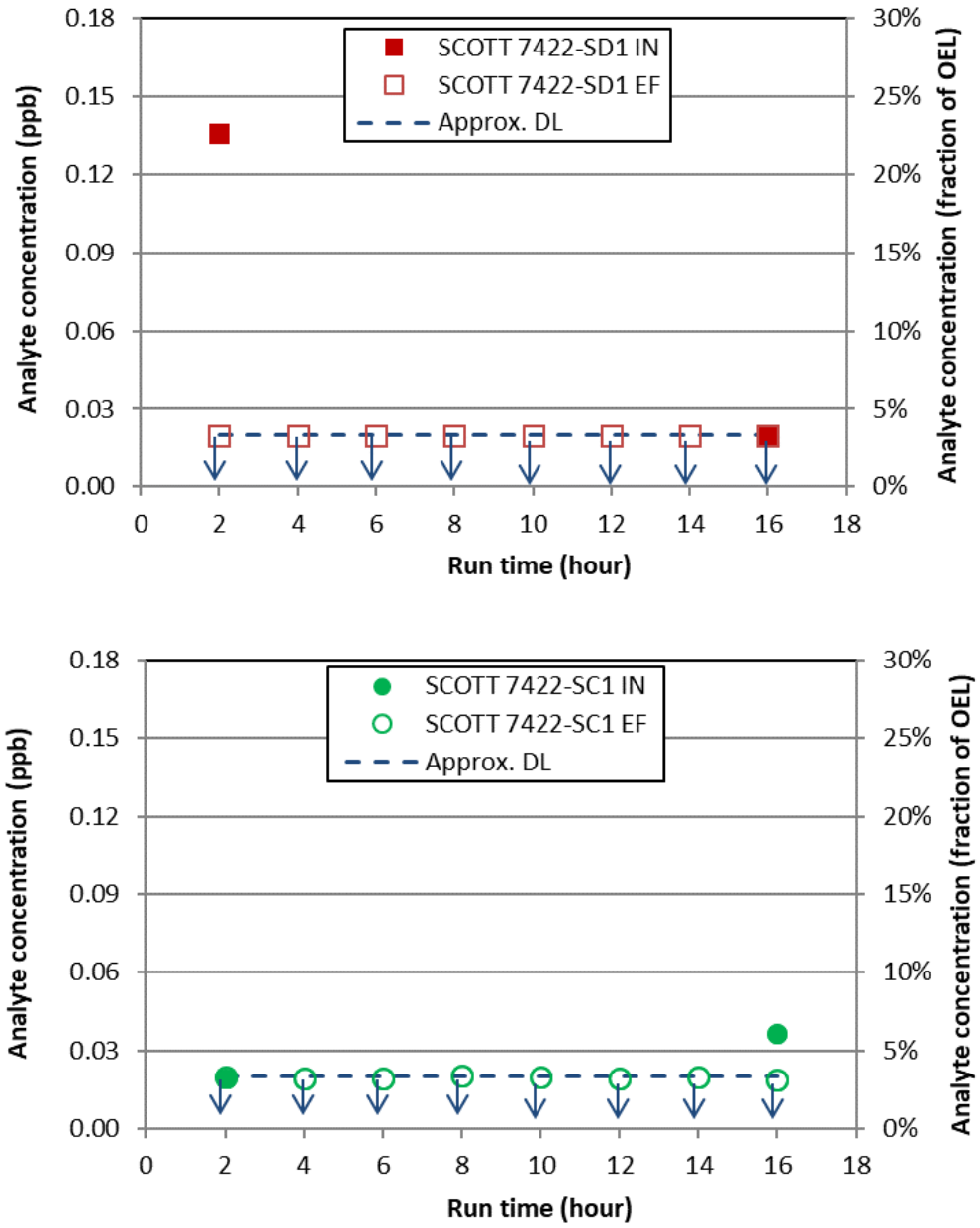

Figure 6. Plot of Measured N-nitrosomorpholine Concentrations before the Inlets and after the Outlets of the Two Respirator Cartridges Tested (SCOTT 7422-SD1 and SCOTT 7422-SC1). Data points noted with ↓ indicates measurements less than the DL or RL.

***Furan (see Figure 7)* –** Using the Carbotrap 300 TDU method, the analytical RL is approximately 15.7% of the OEL. Only two Influent readings for furan (both on SC1 of 319% and 392% of the OEL) were above the RL/DL. All other Influent and Effluent readings on both the SCOTT 7422-SD1 and SCOTT 7422-SC1 cartridges for furan using the Carbotrap 300 TDU method were below the RL/DL. Therefore, there is no indication of breakthrough over the measured time period for either cartridge tested.

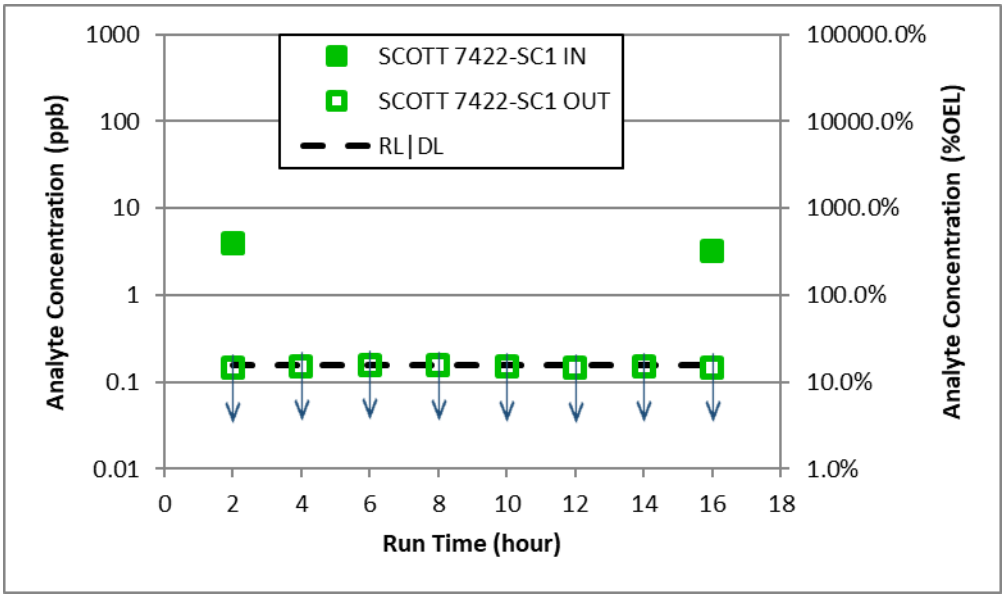

Figure 7. Plot of Measured Furan Concentrations before the Inlets and after the Outlets of the SCOTT 7422-SC1 Respirator Cartridge Test. Data points noted with ↓ indicates measurements less than the DL.

6.0 Factoring in Historical Concentration Data

To fully assess respirator performance for COPC removal, historical data were reviewed to determine if the recent inlet measurements were representative of typical values. Historical AP tank exhauster data from TWINS and the Site-Wide Industrial Hygiene Database were used for this assessment.

A complete table with historical and measured results for all 59 COPCs and their boiling point data is shown in Appendix F, along with a description of the historic source data that were used. Table 2 shows a subset of data for COPCs with boiling points below 70°C because a low boiling point can be a general indicator of poor adsorption on solid media.

In total, 10 COPCs have been previously measured in the AP exhauster stack at concentrations above 10% of their respective OELs and above analytical DLs or RLs. These COPCs include ammonia, nitrous oxide, mercury, formaldehyde, furan, ethylamine, NDMA, NDEA, NMEA, and N-nitrosomorpholine. Of these 10 COPCs:

- Ammonia average inlet concentrations measured in this cartridge study were generally consistent with historic averages and maxima.[11] The cartridge average inlet concentration was nearly 2× higher than the historic average, while the cartridge maximum inlet concentration was approximately 40% lower than the historic maxima (279% of the OEL versus 476% of the OEL).
- The maximum historic nitrous oxide concentration (50% of the OEL) was obtained during a waste-disturbing event involving a 242-A evaporator campaign. The highest non-waste-disturbing measurement from the AP exhauster was 13% of the OEL, below the tank farm action level of 50% of the OEL.
- The maximum mercury inlet concentration measured in this study (56% of the OEL) was significantly lower than the historic maximum of 468% of the OEL. However, the two highest historic AP exhauster measurements were both obtained during waste-disturbing activities including a tank-to-tank transfer and separate waste recirculation activity. The highest non-waste-disturbing historic concentration observed at 84% of the OEL was generally consistent with the maximum cartridge inlet concentration.
- Formaldehyde maximum and average inlet concentrations, 5.9% and 3.1% respectively, were lower than the corresponding historic maximum and average exhauster concentrations of 33% and 7.8%. However, the maximum was measured during a waste transfer activity. The highest non-waste-disturbing maxima was slightly lower at 26% of the OEL, still more than 4× higher than the maximum cartridge inlet measurement, but below the tank farm action level.
- The highest historic exhauster measurements of furan in the AP exhauster are dominated by non-report (<RL) values and an above-report concentration of 280% of the OEL measured during a waste transfer. However, several historic concentrations above the RLs have been measured between 100% and 250% of the OEL under non-waste-disturbing conditions. These historic maxima are lower than the maximum inlet concentration of 392% of the OEL measured by the Carbotrap 300 TDU in cartridge testing.
- Ethylamine has been detected in the AP exhauster at a maximum historic concentration of approximately 17% of the OEL, which is significantly higher than the 0.5% of the OEL maximum inlet concentration measured in cartridge tests, but below the tank farm action level.
- NDMA maximum inlet concentrations during cartridge testing were generally consistent with historic maxima and average exhauster concentrations. The cartridge inlet maximum of over

[11] Inlet concentrations were considered generally consistent if they were within a factor of 2 (-50% to +100%) of historic maximum or average exhauster stack measurements.

3600% of the OEL was within 2× the 6333% of the OEL historic maximum. The maximum NMEA and N-nitrosomorpholine cartridge inlet concentration were approximately 40% of the historic maxima of 111% and 52% of the OEL, respectively. NDEA measurements from cartridge testing all were below the RL (<23% of the OEL) and substantially lower than the maximum and average cartridge inlet concentrations of 328% and 80%, respectively. However, this NDEA maximum was obtained during a tank-to-tank transfer activity. The highest non-waste-disturbing NDEA concentration of 53% of the OEL was approximately 2× higher than the approximate RL value of the cartridge results. Therefore, it is not possible to assess whether the differences between NDEA cartridge inlet and historic concentrations were significant.

Table 2. Historical AP Exhauster Data for COPCs with Boiling Points less than 70°C (158°F)[12][13]

					Historical Measurements[1]				Measurements in this Study	
COPC Number and Name	CAS Number	Boiling Point (°F)	Occupational Exposure Limit (OEL)	# of Values	Max. Value	Average Value	Max. Value (% OEL)	Average Value (% OEL)	Max Inlet Value (% OEL)	Highest Value from Respirator Outlet (% OEL)
2 Nitrous Oxide	10024-97-2	-127	50 ppm	4	25.2	12.7	50.4%	25.4%	Not Measured	
1 Ammonia	7664-41-7	-28	25 ppm	45	119	33.6	476%	134%	279%	217%
50 2-Fluoropropene	1184-60-7	-11	0.1 ppm	1	<RL	<RL	<RL	<RL	Not Detected - TIC	
14 Formaldehyde	50-00-0	-6	0.3 ppm	63	0.099	0.023	32.8%	7.8%	5.9%	3.4%
53 Methyl nitrite	624-91-9	10	0.1 ppm	0	n/a	n/a	n/a	n/a	Not Detected - TIC	
4 1,3-Butadiene	106-99-0	24	1 ppm	55	<RL	<RL	<RL	<RL	2.1% (RL)[2]	2.1% (RL)
42 Ethylamine	75-04-7	62	5 ppm	36	0.83	0.077*	16.6%	1.5%*	0.48%	0.098% (RL)
15 Acetaldehyde	75-07-0	69	25 ppm	27	0.17	0.077*	0.66%	0.31%*	0.11%	0.063%
19 Furan	110-00-9	88	1 ppb	54	<RL	2.6	<RL	260%	2.4%	1.4%
59 Methyl Isocyanate	624-83-9	103	0.02 ppm	1	<RL	<RL	<RL	<RL	Not Detected - TIC	
20 2,3-Dihydrofuran	1191-99-7	130	1 ppb	23	<RL	<RL	<RL	<RL	2.5%	5.0%
22 2-Methylfuran	534-22-5	147	1 ppb	54	<RL	<RL	<RL	<RL	4.6%	2.8%
8 Methanol	67-56-1	148	200 ppm	30	<RL	1.03	<RL	0.52%	Not Measured	
21 2,5-Dihydrofuran	1708-29-8	152	1 ppb	55	<RL	<RL	<RL	<RL	2.8%	2.2% (DL)

[1] Historical data from TWINS industrial hygiene vapor database and SWIH database; see text for links and dates of queries. Values in italics include those data plus data from the TWINS headspace database, all samples earlier than May 2005.

** indicates that the value of the average would differ by a factor of 2 or more (in either direction) if non-reports were excluded.*

"< RL" indicates that all pertinent measurements of the analyte were less than the reporting level

Plain font in the table indicates that only the recent databases (SWIHD headspace and TWINS Industrial Hygiene) were included. Italics mean that the pre-2006 TWINS headspace data were also included.

"n/a" indicates no historical data was found in the databases

[2] "(DL)" indicates value represents approximate detection limit (DL), which is calculated using the reported detection limit (or reporting limit - RL, where noted) from the analytical laboratory and the average volume (from flowrate x time) of vapor exposed to the sorbent tube.

[12] The recommended analytical method for furan, 2,5-dihydrofuran, and 2-methylfuran has been updated. Refer to Freeman [20] for the updated analytical results for these three COPCs.

[13] Using the Carbotrap 300 TDU measurements, only two Influent readings for furan (both on SC1 319% and 392% of the OEL) were above the RL/DL. All other Influent and Effluent readings for furan, 2,5-dihydrofuran, and 2-methylfuran using the Carbotrap 300 TDU VOC method were below their respective RLs/DLs

7.0 Conclusions

Testing was conducted during the period of June 24-26, 2016 using a slipstream from the AP tank farms exhauster under static conditions. The vapors were fed to a respirator cartridge test stand developed by WRPS in collaboration with HiLine Engineering (Richland, Washington). Multipurpose respirator cartridge, SCOTT 7422-SD1 and 7422-SC1 (SCOTT Safety, Monroe, North Carolina) were each assessed with the tank farm exhauster vapors in tests conducted on separate days. Sorbent tubes were used to collect samples of the vapor stream entering and exiting the respirator cartridge and were subsequently analyzed for COPC concentrations. PNNL was tasked to independently analyze the collected data and make recommendations based on the results for respiratory cartridge performance and service life.

The AP exhauster data are expected to provide conservatively high COPC concentrations compared to the ambient concentrations inside and outside the tank farm. Further, the flow rate through each respirator cartridges was maintained conservatively high compared to normal human breathing rates. The temperatures of the sample slipstream during testing ranged from 60°F to 86°F, and the relative humidity ranged from 33°F to 100%. The inlet concentrations measured are shown in Table 1. Thus, any conclusions on respirator cartridge performance pertain to the above stated conditions.

Key conclusions from the assessment of the 59 COPCs in this study are described below:

- Based on measured cartridge inlet vapor concentrations from the AP exhauster, only ammonia and NDMA exceeded their corresponding OELs.[14] Four COPCs—mercury, NDEA, NMEA, and N-nitrosomorpholine—reported one or more inlet concentration measurements greater than 10% of their corresponding OELs, but less than 100%. Inlet and outlet measurements for all other COPCs did not exceed 10% of their respective OELs.
- Ammonia concentrations at the respirator cartridge inlet reached a maximum of 279% of its OEL (69.7 ppm), which was generally consistent with the maximum historical measurement of 476% of the OEL from the AP exhauster. For both cartridges, ammonia appeared to breakthrough, above 10% of its OEL after 4 hours (SCOTT 7422-SD1) and 8 hours (SCOTT 7422-SC1).
- Cartridge inlet concentration measurements for NDMA reached 3629% of its OEL (10.9 ppb), which was also generally consistent with the maximum historical measurements from the AP exhauster of 6333% of the OEL. However, all outlet concentrations were less than the analytical RL of approximately 10.6% of the OEL, indicating no breakthrough for either cartridge.
- Mercury inlet vapor concentrations measured throughout the testing period for both cartridges ranged from approximately 44% to 56% of the OEL (11 to 14 $\mu g/m^3$). Overall, inlet cartridge concentrations of mercury were significantly lower than the historic maximum of 468% of the OEL obtained during waste-disturbing conditions. However, the historic maximum of 84% of the OEL obtained under non-waste-disturbing conditions was generally consistent with the cartridge inlet condition. Mercury outlet concentrations during this study were all below the DL, indicating no breakthrough for the testing period.
- The maximum NMEA and N-nitrosomorpholine inlet vapor concentrations of 44.9% of the OEL (0.13 ppb) and 22.7% of the OEL (0.14 ppb), respectively, were lower than the maximum historical measurements from the exhauster of 111% and 52% of the OEL. However, all outlet concentrations

[14] OEL accepted for Hanford tank farm use are based on OELs established by a U.S. governmental agency or national professional organization (e.g., OSHA, National Institute for Occupational Safety and Health, American Conference of Governmental Industrial Hygienists), or if no U.S. OEL exists, standard toxicological practices are applied to develop OELs based on the best available science. The OEL for NDMA was established in 2005 based on the MAK (Maximale Arbeitsplatzkonzentration) Commission standard adopted in Europe..

for both COPCs were less than the analytical RL of approximately 8.9% and 3.4% of the OEL, respectively, indicating no breakthrough for either cartridge.

- The analytical RL for NDEA, at approximately 23% of the OEL, was above the 10% of the OEL breakthrough criterion for this study. All inlet and outlet NDEA measurements from cartridge testing were below the RL and significantly lower than historic maximum AP exhauster concentration of 328% of the OEL. However, the historic maximum was obtained during a waste-disturbing activity. The highest non-waste-disturbing maximum of 53% of the OEL was not significantly higher than the RL. Although the DL for NDEA was above the 10% of the OEL action threshold, no evidence of breakthrough was observed.
- The maximum historic concentration of furan measured in the AP exhauster under non-waste-disturbing conditions was 250% of the OEL, which is lower than the maximum cartridge inlet concentration measurement of 392%% of the OEL[15].

The *Overview of 2016 through 2018 Testing of Air-Purifying Respirator Cartridge Performance on Multiple Hanford Tank Headspaces and Exhausters* (Freeman et al. [20]) provides additional information on the use of the cartridge testing results for the first 28 APR cartridge tests with the manufacturers service life models.

[15] Furan when measured by the Carbotrap 300 TDU has the maximum cartridge inlet concentration of 392% of the OEL which is very low compared to the historical maximum concentration, a below-report datum that had an RL of 52.3 ppb (<5230% of the OEL) using a Carbotrap 300 TDU tube measurement.

8.0 Recommendations

- Based on the measurements taken for this study, ammonia breakthrough above 10% of its OEL occurred after 4 hours (SCOTT 7422-SD1) and 8 hours (SCOTT 7422-SC1). Inlet concentration measurements of ammonia averaged 252% of its OEL (33.6 ppm) and were consistently above 230% of the OEL for the tests. This experimental result supports a 4-hour service life for the use of SCOTT 7422-SC1 and 7422-SD1 cartridges in APRs employed to protect workers at the Hanford AP tank farm, under the same conditions as those tested. Variations in humidity, temperature, or cartridge inlet concentration for any COPCs, compared to those measured in the current study, could impact the experiment-derived cartridge service life, especially if OEL thresholds are exceeded. Historic concentrations from the AP exhauster for a few COPCs including furan were higher than cartridge testing inlet concentrations and should be carefully considered. These factors, along with the measured breakthrough, should be used to inform an Industrial Hygiene determination of APR applicability and an appropriate respirator cartridge change-out schedule for adequate worker protection.
- The analytical DLs for several nitrosamines, including NDMA and NDEA in these tests corresponded to values near 11% and 23% of their OEL, respectively. It is recommended that the potential for lowering DLs for these COPCs be assessed to improve future respirator cartridge evaluations.
- A number of COPCs are identified as TICs. Reference standards and other potential analytical improvements should be considered for these TICs to aid in detecting and quantifying the concentration of all COPCs.
- It is recommended that future respirator cartridge testing include inlet concentrations measurements at every (2-hour) time interval, not just the first and last measurements. This is currently being implemented by WRPS.
- Further data assessments are recommended for COPCs that had higher historical concentrations compared to the respirator cartridge inlet concentrations in the current study. Specifically, it is recommended that other cartridge performance measurements, from other tank headspace or exhauster testing, be assessed to determine if the inlet concentrations of the COPCs are more consistent with historical values and, if so, whether the corresponding respirator cartridge outlet measurements indicate adequate respiratory protection. This is currently being implemented in additional testing.

9.0 References

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Appendix A

Description of Respirator Cartridge Testing Setup

Appendix A

Description of Respirator Cartridge Testing Setup

The respirator cartridge-testing system was developed by Washington River Protection Solutions and HiLine Engineering (Richland, Washington) as a means to comprehensively test respirator cartridge performance with actual Hanford tank headspace or exhauster slip stream gases. Tank headspace or exhauster slip stream vapors are pulled direct from the source through a flexible hose connecting the tank or exhauster sampling port within the tank farm/exhauster fence line to the respirator cartridge-testing system outside the farm.[13,14] Multiple in-line particulate filters are installed in the line between the tank/exhauster and test system to remove potential radioactive particulates. Each filter unit contains a hydrophobic Fluoropore™ polytetrafluoroethylene filter (Millipore Sigma, Billerica, Massachusetts) that is required pursuant to the radiological work permit. This polytetrafluoroethylene filter medium is the same material used for routine tank vapor area monitoring as well as sampling and analysis of sources (headspace and exhausters) and was selected because of its broad chemical compatibility that minimizes sorption of, or reactions with, chemical compounds. The filter medium is not expected to adversely impact the test objectives because all tank farm vapor sampling uses this type of filter medium.

The test equipment allows for sampling the vapor stream both before and after the cartridge, so that performance for a given Chemical of Potential Concern (COPC) can be quantified. Sorbent media tubes were used to capture the COPCs and other hazardous contaminants. After a given test segment, the sorbent tubes were removed and analyzed. Sampling of the exhaust gas was performed every 2 hours, but this timing can be modified as necessary.

Figure A.1 provides a general schematic diagram for the respirator cartridge test apparatus, and Figure A.2 shows photographs of the actual equipment. The test system operates using vacuum to draw tank gases/vapors into the unit so that the potential for leakage to atmosphere is minimized until the gases/vapors are under positive pressure downstream of the vacuum pumps. By the time gases reach the vacuum pump, COPCs are essentially captured or removed by either the sorbent tubes or the respirator cartridge.[13,14]

Flows through the respirator cartridge and through each sorbent tube are set and controlled/maintained using manual flow control valves on the outlet of each rotameter, and rotameters were calibrated against DryCal primary flow calibrators before and after testing. DryCal flow meters also were used downstream of the sorbent tubes to measure the flow through each sorbent tube. All equipment connections were leak tested prior to initiation of the test. Temperature, relative humidity, and pressure of the inlet gas/vapor stream are monitored by calibrated instrumentation.

Using Industrial Hygiene-approved materials, cartridge test equipment was constructed so that it would not influence/interfere with vapor analysis. Stainless steel or Teflon™ tubing and fittings are used where possible because of their relatively inert nature to the vapors being analyzed. Limited portions of the assembly used acrylic, Viton™, glass, and Masterflex C-flex tubing, which are commonly used for various vapor-sampling applications.

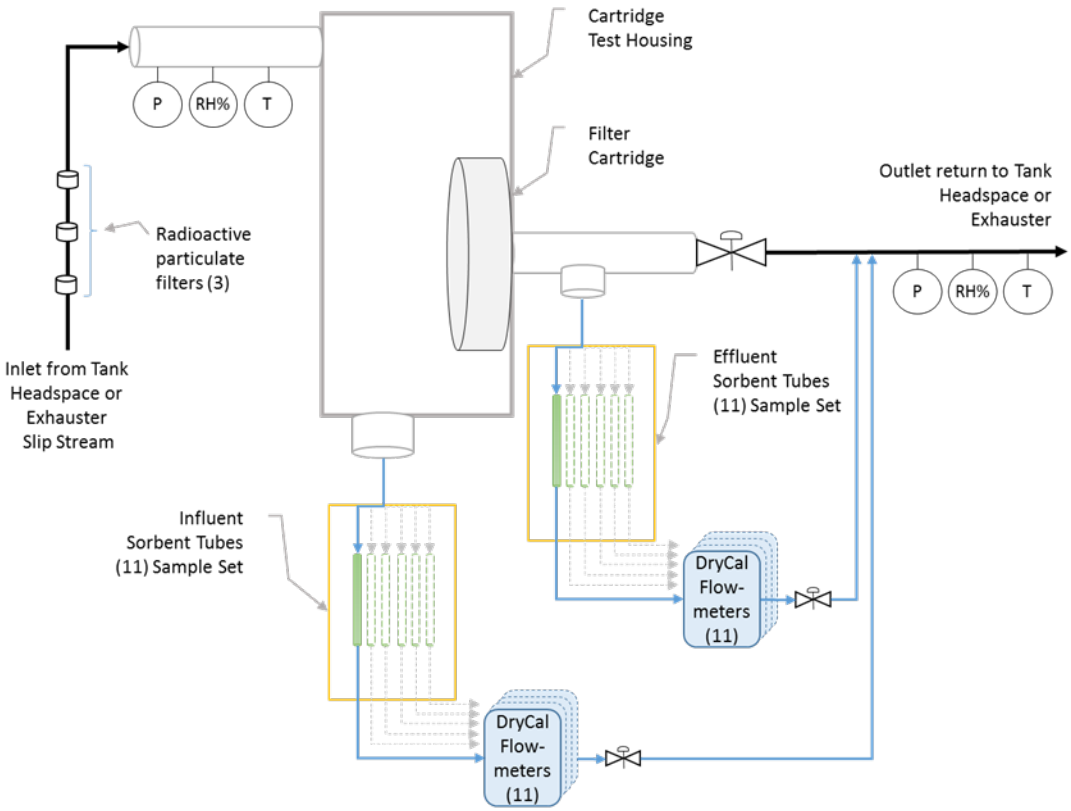

Figure A.1. General Schematic of Respirator Cartridge Test Apparatus

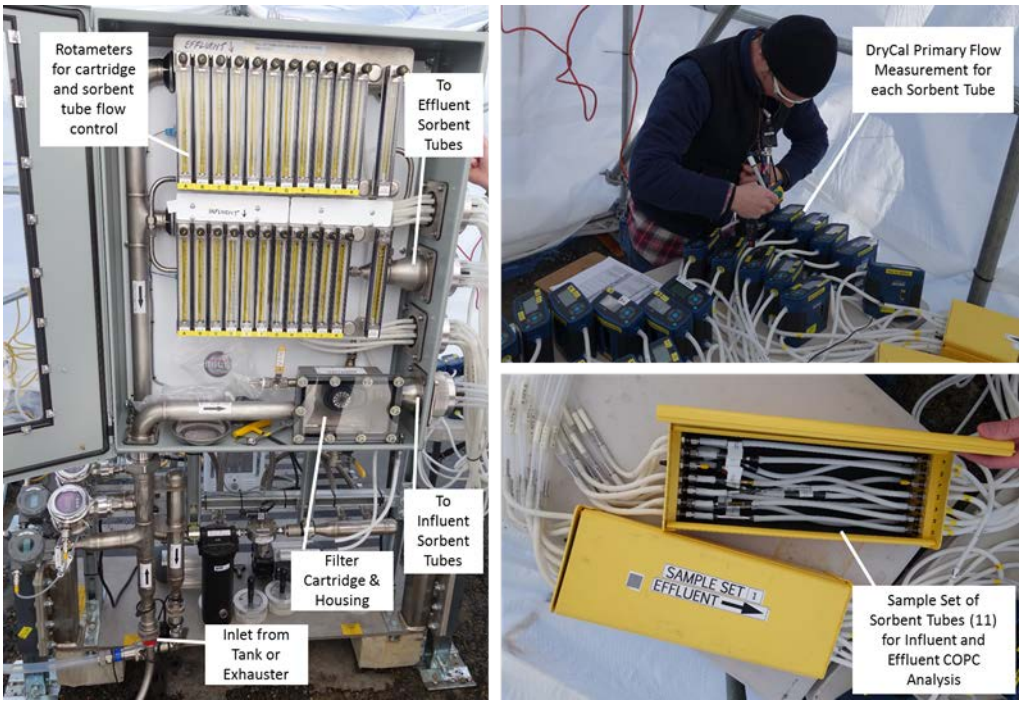

Figure A.2. Photographs of the Respirator Cartridge Test Equipment

Appendix B

Analytical Testing

Appendix B

Analytical Testing

The Sampling and Analysis Plan was developed under the direction and oversight of the Industrial Hygienist in conjunction with the Tank Farms Operations Contractor Retrieval and Closure, and Tank Farms Project and/or Production Operations Project Management Team.

The chemical compounds in the tank samples were analyzed by using approved Industrial Hygiene methods or National Institute of Occupational Safety and Health-approved methods for quantifying hazardous airborne contaminants in the tank farm vapors. Methods including gas chromatography/mass spectrometry were used as primary analytical techniques for the identification of hazardous airborne contaminants (see Table B.1).

Table B.1. Information on Sorbent Media used to Capture Contaminants, Flow Rates Used, Analytical Methods to Extract Analyte from Sorbent Media, and Method Analysis to Quantify or Estimate the Concentrations of Hazardous Contaminant

Analyte	Media	Flow Rate (mL/min)	Analytical Method[a]	Instrument Used[b]	Analysis Location[c]
Acetonitrile	Charcoal Tube, SKC-226-09	100	NIOSH 1606	GC–FID	ALS
Acetonitrile	Carbotrap 300 TDU Tube	33	EPA TO-17 Modified	GC/MS	WRPS
Furans	TDU Tenax TA	33	EPA TO-17 Modified	GC/MS	WRPS
Semivolatile Organic Compounds	Carbotrap 150 TDU Tube	33	EPA TO-17 Modified	GC/MS	WRPS
Volatile Organic Compounds	Carbotrap 300 TDU tube	33	EPA TO-17 Modified	GC/MS	WRPS
Mercury	Anasorb C300, SKC-226-17-1A	250	NIOSH-6009	CVAA	WHL
Ammonia	Anasorb 747 (sulfuric acid), SKC-226-29	200	OSHA-ID-188	IC	WHL
1,3-butadiene	Charcoal, SKC-226-37, (Parts A and B)	200	NIOSH-1024	GC–FID	ALS
Aldehyde	DNPH Treated Silica Gel, SKC-226-119	200	EPA TO-11A	HPLC	ALS
Pyridine	Coconut Shell Charcoal, SKC-226-01offsite	1000	NIOSH-1613	GC–FID	ALS

Analyte	Media	Flow Rate (mL/min)	Analytical Method[a]	Instrument Used[b]	Analysis Location[c]
Nitrosamines	Thermosorb/N	2000	NIOSH-2522 Modified	GC–TEA	CBAL
Ethylamine	XAD-7 (NBD) Chloride), SKC 226-96	200	OSHA-ID-34, 36, 40, and 41	HPLC–UV	ALS

[a] Analytical Method
NIOSH: National Institute of Occupation Safety and Health
EPA: U.S. Environmental Protection Agency
OSHA: Occupational Safety and Health Administration

[b] Instrument Used
GC–FID: Gas Chromatography-Flame Ionization Detector
GC/MS: Gas Chromatography-Mass Spectrometry
CVAA: Cold Vapor Atomic Absorption
IC: Ion Chromatography
HPLC: High Performance Liquid Chromatography
GC–TEA: Gas Chromatography-Thermal Energy Analyzer
HPLC–UV: High Performance Liquid Chromatography–Ultraviolet Detector

[c] Analysis Location
ALS: ALS Environmental Salt Lake City
WRPS–222S: Washington River Protection Solutions, Organic Studies Group
WHL–222S: Wastren Hanford Laboratory
CBAL: Columbia Basin Analytical Laboratory, part of the RJ Lee Group

Appendix C

Raw Analytical Data

Appendix C

Raw Analytical Data

C.1 Description

This appendix includes raw data of flow rates; temperature, pressure, and humidity; and analytical data for the AP exhauster data set. Calculations using this data are given in Appendix D.

The raw analytical data is given only in this appendix. Washington River Protection Solutions (WRPS) converted these data into Excel data spreadsheets that were transmitted to Pacific Northwest National Laboratory. Comments on that conversion are provided below:

The analytical measurements listed in Results spreadsheet columns were transferred from entries labeled 'result' in the raw analytical .pdf files. The results were transferred into three rows in the spreadsheets. The first row contained the relevant information with the appropriate units. Where a results entry was given as 'ND' in the .pdf, a '<' symbol was used. Where a detection limit (DL)/reporting limit (RL) was listed as 'n/a,' the result entry in the spreadsheet was given as '0.0.'

The use of the RL or a DL varied among analytical laboratories. The term RL (equivalent to a limit of quantification) was used instead of a DL by ALS Environmental Salt Lake City, Columbia Basin Analytical Laboratory, and 222S–Wastren Hanford Laboratory (see Table F.1 in Appendix F for a complete correlation of which Chemicals of Potential Concern used an RL or a DL). The WRPS laboratory provided a DL, in contrast to an RL. Neither RLs nor DLs were provided for tentatively identified compounds (TICs).

Chain of custody information is provided clearly in the raw analytical data .pdf files, including analyte name, sample numbers, and laboratory-assigned numbers. Chemical Abstract Service numbers were not provided.

The nomenclature of the sample identification (ID) is the same for every set of chemicals. It is generally composed of a survey number, tank farm ID, test location, sample line, and tube bundle ID. Descriptions of these nomenclatures are given as follows:

'BK' with 'BASE' means blank measurements obtained from sorbent tubes that have not had any vapor stream passed through them. 'BASE' with either 'IN' or 'EF' means measurements obtained for ambient air (fresh air vs. tank vapor) running through the test system from the inlet (IN) or effluent (EF) locations before initiation of tank vapor testing.

'16-001' designations correspond to testing with the SCOTT 7422-SD1 respirator cartridge, whereas '16-002' designations correspond to testing with the SCOTT 7422-SC1 respirator cartridge.

Position designations 'IN' with '###A' and 'EFF' with '###A' correspond to the respirator cartridge inlet and outlet measurements, respectively, at the 0- to 2-hour time intervals. Position designations 'B' through 'H' correspond to the subsequent 2-hour measurements for inlet (IN) and outlet (EF): ###B (2 to 4 hours), ###C (4 to 6 hours), ###D (6 to 8 hours), ###E (8 to 10 hours), ###F (10 to 12 hours), ###G (12 to 14 hours), and ###H (14 to 16 hours).

The sample IDs embed the information given above. For example, sample ID 16-001-AP-EF-009A corresponds to the first cartridge survey (16-001), AP tank farm, outlet (EF) sample bundle, sample line 9, and the first (0 to 2 hours) sample (A).

The flow rate passing through the respirator cartridge was approximately 30 L/min, while the sampling flow rates through the sorption tubes ranged between 30 and 200 mL/min for different chemicals that were being collected. WRPS provided these flow rates in files 'AP Farm 6-24 6-25.xlsx' for the first survey with SCOTT 7422-SD1 and 'AP Farm 6-25 6-26 revised.xlsx' for the second survey with SCOTT 7422-SC1. The information is shown in the tables below. Columns labeled Mach. Base 1 and Mach. Base 2 refer to the 'BASE' baseline samples for influent and effluent, respectively, to verify machine cleanliness prior to experimental measurements.

WRPS provided the temperature and humidity information in files '16-0001 DRI.xls' and '16-0002 DRI.xls.' The information is shown in the tables provided in this appendix. Several terms used in the DRI files are described below.

- 'Pre' and 'Post' indicate the general time signature when the direct read instrument measurements were taken. 'Pre' refers to the beginning of the 2-hour sample duration, and 'Post' refers to the end of the 2-hour sample duration.
- 'Influent' and 'Effluent' indicate the location of the measurement within the test system. 'Influent' measurements are taken at the inlet of the system upstream of the respirator cartridge. 'Effluent' measurements are taken downstream of the respirator cartridge. The pressure, temperature, and humidity effluent sensors are located at the end of the test system near the vacuum pump, whereas the DRI measurements for ammonia and VOCs are from a sampling location between the respirator cartridge and the effluent sorbent tube samples.
- The DRI measurements for ammonia and VOCs could not be taken while the test system sample pumps were operational. 'After Sample Taken' refers to the time signature for these direct read results (e.g., Sample A DRI measurements were taken immediately after the Sample A sorbent tubes were taken and replaced with Sample B sorbent tubes).

Raw analytical data for chemicals in each category are summarized together. Examples of chemicals in each category follow:

- SVOC : Biphenyl, Diethylphthalate, Tributyl phosphate, Dibutyl butylphosphonate, Dodecane, Hexadecane
- SVOCTIC : Undecane, Cyclotetrasiloxane, octamethyl, Decamethlycyclopentasiloxane, Dodecane,4,6-dimethyl
- VOC : Acetone, Acetonitrile, Acetophenone, Benzene, Butanal,1-Butanol, Butanenitrile, 3-Buten-2-one, Cyclohexane, Decane, Ethanol, Ethylbenzene, Furan, Hexane, Hexanone, Methylene Chloride, Propanenitrile, Styrene, Tetrachloroethene, Toluene, Trichlorofluoromethane
- VOCTIC : 2,6-Dimethyldecane, Decane, 2,3,5,8-tetramethyl-, Decane, 3,7-dimethyl-, Methenamine, Undecane, 2,6-dimethyl-
- Furans: 2,3-Dihydrofuran, 2-Pentyfuran, Furan, Tetrafuran
- Ethylamine (amines): Dimethylamine, Ethylamine, Methylamine
- Acetonitrile: Acetonitrile
- Mercury: Mercury

- Ammonia: Ammonia
- Aldehyde: Acetaldehyde, Acetone, Butyraldehyde, Formaldehyde, Hexanal, Propionaldehyde, Valeraldehyde
- 1,3 Butadiene: 1,3-Butadiene
- Pyridines: 2,4-Dimethylpyridine, Pyridine
- Nitrosamines: N-nitrosodimethylamine.

Miscellaneous notes:

- For the AP exhauster in survey 002-A, the influent and effluent concentration needed to be swapped because of a labeling error. Email guidance (August 8, 2015) from WRPS is documented in Section C.#.12, Supporting Emails.
- The cartridge used in the first survey for the AP exhauster was Scott 7422-SD1, and the cartridge used in the second survey was Scott 7422-SC1.

C.2 Experimental Parameters

C.2.1 Flow Rates

SCOTT 7422-SD1 Cartridge (6/24-6/25/16) AP Exhauster

Volumes Air Collected (L)

Sample Box Number		Mach.	Mach.	A1	A2	B1	C1	D1	E1	F1	G1	H1	H2
Analyte	**Line**	Base 1	Base 2										
SVOC	A	4.08	3.60	3.84	3.60	3.36	3.24	3.74	3.79	3.12	3.48	4.39	3.99
VOC	B	4.08	3.81	3.60	3.90	3.84	3.90	3.84	3.94	3.18	3.83	5.52	4.05
Furans	C	4.08	3.72	4.08	3.66	3.84	3.72	3.90	3.78	3.66	3.72	3.93	3.99
Ethylamine	D	12.7	11.8	12.0	11.9	12.5	12.9	12.4	11.7	11.3	11.3	12.1	12.4
Acetonitrile	E	12.2	12.1	11.4	12.0	12.1	12.2	12.4	12.1	11.9	11.9	12.2	11.7
Mercury	F	30.1	30.0	30.0	30.6	31.2	31.0	31.5	30.6	29.5	29.1	30.6	30.5
Ammonia	G	24.9	23.7	23.4	23.9	24.2	27.9	19.2	23.9	23.6	23.4	24.2	23.7
Aldehyde	H	25.2	23.7	23.4	23.9	24.2	24.3	24.8	23.9	23.7	22.5	24.0	24.6
1, 3-Butadiene	I	25.1	23.9	24.4	24.4	24.8	24.9	25.2	24.1	23.1	22.7	24.4	24.4
Pyridine	J	123	123	123	120	121	121	122	121	121	121	122	125
Nitrosamines	K	240	242	239	242	244	242	242	242	241	241	243	241

Flow Rates (ml/min)

Sample Box Number		Mach.	Mach.	A1	A2	B1	C1	D1	E1	F1	G1	H1	H2
Analyte	**Line**	Base 1	Base 2										
SVOC	A	34.0	30.0	32.0	30.0	28.0	27.0	31.1	31.6	26.0	29.0	36.3	33.0
VOC	B	34.0	31.8	30.0	32.5	32.0	32.5	32.0	32.9	26.5	31.9	45.6	33.5
Furans	C	34.0	31.0	34.0	30.5	32.0	31.0	32.5	31.5	30.5	31.0	32.5	33.0
Ethylamine	D	106	98.5	100	99.0	105	108	104	97.5	94.0	94.0	100	103
Acetonitrile	E	102	101	95.0	100	101	102	104	101	99.0	99.0	101	96.5
Mercury	F	251	250	250	255	260	259	263	255	246	243	253	252
Ammonia	G	208	198	195	199	202	233	160	199	197	195	200	196
Aldehyde	H	210	198	195	199	202	203	207	199	198	188	198	203
1, 3-Butadiene	I	210	199	203	203	207	208	210	201	193	189	202	202
Pyridine	J	1025	1025	1025	1000	1010	1010	1020	1010	1005	1005	1005	1030
Nitrosamines	K	1998	2020	1990	2020	2030	2020	2020	2018	2010	2010	2010	1990

SCOTT 7422-SC1 Cartridge (6/25-6/26/16) AP Exhauster

Volumes Air Collected (L)

Sample Box Number		Mach.	Mach.	A1	A2	B1	C1	D1	E1	F1	G1	H1	H2
Analyte	**Line**	Base 1	Base 2										
SVOC	A	3.90	3.94	3.93	4.17	4.24	3.95	4.08	3.57	4.12	3.66	3.97	4.21
VOC	B	3.73	3.90	4.11	3.91	3.94	3.82	3.85	4.00	4.13	4.00	3.87	4.08
Furans	C	3.87	3.95	3.98	4.02	3.97	3.99	3.92	3.97	3.99	3.93	4.04	3.97
Ethylamine	D	11.7	12.2	12.3	12.0	12.4	12.1	12.0	11.7	11.4	12.3	11.5	12.3
Acetonitrile	E	11.9	12.2	12.7	12.3	12.5	12.2	12.2	12.1	12.2	11.9	12.0	12.0
Mercury	F	29.8	29.8	30.2	30.2	30.3	30.1	30.1	29.1	30.4	29.7	31.5	30.5
Ammonia	G	23.6	24.0	24.1	24.2	24.4	24.5	24.2	23.9	25.4	24.9	24.5	25.2
Aldehyde	H	24.0	24.2	24.0	24.1	24.4	24.2	24.1	23.8	23.7	23.3	24.6	25.1
1, 3-Butadiene	I	24.0	23.9	24.5	24.1	24.4	24.5	24.3	24.0	23.7	24.0	24.4	23.7
Pyridine	J	128	131	131	131	132	129	129	125	32	122	128	124
Nitrosamines	K	244	251	245	252	253	248	239	242	250	243	242	259

Flow Rates (ml/min)

Sample Box Number		Mach.	Mach.	A1	A2	B1	C1	D1	E1	F1	G1	H1	H2
Analyte	**Line**	Base 1	Base 2										
SVOC	A	32.5	32.9	32.8	34.8	35.3	32.9	34.0	29.8	34.1	30.5	32.6	34.5
VOC	B	31.1	32.5	34.2	32.6	32.8	31.8	32.1	33.3	34.1	33.4	31.7	33.4
Furans	C	32.3	33.0	33.2	33.5	33.1	33.3	32.7	33.1	33.0	32.7	33.2	32.5
Ethylamine	D	97.4	102	102	99.7	104	101	100	97.2	93.9	103	94.4	101
Acetonitrile	E	99.2	102	106	103	104	102	102	101	101	99.6	98.7	98.3
Mercury	F	249	248	252	251	253	251	251	243	252	247	258	250
Ammonia	G	197	200	200	202	204	204	202	199	210	207	201	206
Aldehyde	H	200	201	200	201	203	202	201	199	196	194	202	206
1, 3-Butadiene	I	200	199	204	201	203	205	202	200	196	200	200	194
Pyridine	J	1070	1090	1090	1090	1100	1075	1075	1040	261	1018	1050	1014
Nitrosamines	K	2035	2095	2040	2100	2110	2065	1995	2019	2067	2021	1985	2123

C.2.2 Temperature, Pressure, and Relative Humidity

SCOTT 7422-SD1 Cartridge (6/24-6/25/16) AP Exhauster

Influent- Pre		After Sample Taken								
Reading	**UOM**	**Baseline**	**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**
Temperature	F	70.5	63.5	77.6	83.8	82.7	73.1	67.8	63.5	62.3
Pressure	Torr	742	734	385	393	396	388	383	389	384
Relative Humidity	%	46.9	48.4	40.3	36.4	33.9	36.7	40.9	40.4	42
NH3	ppm									
VOC	ppm									

Influent - Post		After Sample Taken								
Reading	**UOM**	**Baseline**	**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**
Temperature	F	73.2	78.3							60.2
Pressure	Torr	738	400							397
Relative Humidity	%	44.9	83.3							43.1
NH3	ppm			106						
VOC	ppm			1.90						

Effluent - Pre		After Sample Taken								
Reading	**UOM**	**Baseline**	**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**
Temperature	F	72.2	78.5	84.1	83.4	73.7	69.0	64.4	62.8	62.3
Pressure	Torr	390	320	400	402	403	399	394	396	384
Relative Humidity	%	30.6	39.3	36.7	37.0	34.3	41.4	43.9	41.2	42.0
NH3	ppm									
VOC	ppm									

Effluent- Post		After Sample Taken								
Reading	**UOM**	**Baseline**	**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**
Temperature	F	74.7	80.6							60.2
Pressure	Torr	399	401							397
Relative Humidity	%	26.8	37.0							43.1
NH3	ppm			1.00			38.0		69.0	
VOC	ppm			0.50			1.30		2.10	

SCOTT 7422-SC1 Cartridge (6/25-6/26/16) AP Exhauster

Influent- Pre		After Sample Taken								
Reading	**UOM**	**Baseline**	**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**
Temperature	F	75.7	78.9	82.8	86.2	86.1	83.1	75.5	70.8	67.8
Pressure	Torr	744	729	393	387	386	393	389	385	730
Relative Humidity	%	66.0	93.7	33.4	34.0	33.2	34.6	34.2	38.5	84.5
NH3	ppm									
VOC	ppm									

Influent - Post		After Sample Taken								
Reading	**UOM**	**Baseline**	**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**
Temperature	F	80.2	83.0							67.7
Pressure	Torr	745	7404							730
Relative Humidity	%	58.6	100							84.1
NH3	ppm								103	
VOC	ppm									

Effluent - Pre		After Sample Taken								
Reading	**UOM**	**Baseline**	**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**
Temperature	F	77.4	77.0	88.4	87.9	84.2	77.2	73.0	68.2	67.2
Pressure	Torr	395	392	400	399	401	393	397	392	384
Relative Humidity	%	32.0	34.1	28.7	33.3	35.1	33.3	39.3	41.9	40.5
NH3	ppm									
VOC	ppm									

Effluent- Post		After Sample Taken								
Reading	**UOM**	**Baseline**	**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**
Temperature	F	77.8	83.7							66.3
Pressure	Torr	402	400							392
Relative Humidity	%	28.0	32.0							43.8
NH3	ppm			0.10	20.0				39.0	47.0
VOC	ppm			6.00	0.40				1.00	1.10

C.3 Raw Analytical Data

C.3.1 SVOC and SVOCTIC

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Page: 1

Cartridge Evaluation
Data Summary Report

Sample Group: 20161929
SDG Number:
Customer Sample ID: 16-001-AP-BK-003BASE
Customer Sample ID: 16-001-AP-BK-003BASE

Sample#	R	A#	CAS #	Analyte	Unit	STD %	Blank	Result	Duplicate	Average	RPD %	Spk Rec %	Det Limit	Cnt Err %	Qual Flags
VAPOR-TDU SVOA #2															
S16T0192470			3891-98-3	2,6,10-Trimethyldodecane	NGS	100	<1.1	<1.1	n/a	n/a	n/a	n/a	1.1	n/a	
S16T0192470			95-48-7	2-Methylphenol	NGS	94	<3.4	<3.4	n/a	n/a	n/a	n/a	3.4	n/a	
S16T0192470			108-39-4M	Cresol (m & p)	NGS	100	<2.4	<2.4	n/a	n/a	n/a	n/a	2.4	n/a	
S16T0192470			92-52-4	Biphenyl	NGS	100	<2.0	<2.0	n/a	n/a	n/a	n/a	2.0	n/a	
S16T0192470			78-46-6	Dibutyl butylphosphonate	NGS	110	<2.9	<2.9	n/a	n/a	n/a	n/a	2.9	n/a	
S16T0192470			84-66-2	Diethylphthalate	NGS	120	<2.8	<2.8	n/a	n/a	n/a	n/a	2.8	n/a	
S16T0192470			112-40-3	Dodecane	NGS	98	<0.81	<0.81	n/a	n/a	n/a	n/a	0.81	n/a	
S16T0192470			544-76-3	Hexadecane-	NGS	97	<1.9	<1.9	n/a	n/a	n/a	n/a	1.9	n/a	
S16T0192470			629-59-4	Tetradecane	NGS	100	<1.2	<1.2	n/a	n/a	n/a	n/a	1.2	n/a	
S16T0192470			126-73-8	Tributyl phosphate	NGS	100	<6.0	<6.0	n/a	n/a	n/a	n/a	6.0	n/a	
S16T0192470			629-50-5	Tridecane	NGS	99	<0.50	<0.50	n/a	n/a	n/a	n/a	0.50	n/a	
S16T0192470			629-78-7	Heptadecane	NGS	100	<5.2	<5.2	n/a	n/a	n/a	n/a	5.2	n/a	
S16T0192470			629-62-9	Pentadecane	NGS	100	<2.8	<2.8	n/a	n/a	n/a	n/a	2.8	n/a	

Jann M. Fuge
Jann M Fuge 7/21/16

T - Tentatively Identified Compound J - Estimated N - Named TIC

NA = Not Analyzed, ND = Not Detected

Cartridge Evaluation
Data Summary Report

Sample Group: 20161929
SDG Number:
Customer Sample ID: 16-001-AP-EF-003A
Customer Sample ID: 16-001-AP-EF-003A

Sample#	R	A#	CAS #	Analyte	Unit	STD %	Blank	Result	Duplicate	Average	RPD %	Spk Rec %	Det Limit	Cnt Err %	Qual Flags
VAPOR-TDU SVOA #2															
S16T019243			3891-98-3	2,6,10-Trimethyldodecane	NGS	100	<1.1	<1.1	n/a	n/a	n/a	n/a	1.1	n/a	
S16T019243			95-48-7	2-Methylphenol	NGS	94	<3.4	<3.4	n/a	n/a	n/a	n/a	3.4	n/a	
S16T019243			108-39-4M	Cresol (m & p)	NGS	100	<2.4	<2.4	n/a	n/a	n/a	n/a	2.4	n/a	
S16T019243			92-52-4	Biphenyl	NGS	100	<2.0	<2.0	n/a	n/a	n/a	n/a	2.0	n/a	
S16T019243			78-46-6	Dibutyl butylphosphonate	NGS	110	<2.9	<2.9	n/a	n/a	n/a	n/a	2.9	n/a	
S16T019243			84-66-2	Diethylphthalate	NGS	120	<2.8	<2.8	n/a	n/a	n/a	n/a	2.8	n/a	
S16T019243			112-40-3	Dodecane	NGS	98	<0.81	20	n/a	n/a	n/a	n/a	0.81	n/a	
S16T019243			544-76-3	Hexadecane-	NGS	97	<1.9	<1.9	n/a	n/a	n/a	n/a	1.9	n/a	
S16T019243			629-59-4	Tetradecane	NGS	100	<1.2	1.9	n/a	n/a	n/a	n/a	1.2	n/a	J
S16T019243			126-73-8	Tributyl phosphate	NGS	100	<6.0	<6.0	n/a	n/a	n/a	n/a	6.0	n/a	
S16T019243			629-50-5	Tridecane	NGS	99	<0.50	5.1	n/a	n/a	n/a	n/a	0.46	n/a	J
S16T019243			629-78-7	Heptadecane	NGS	100	<5.2	<5.2	n/a	n/a	n/a	n/a	5.2	n/a	
S16T019243			629-62-9	Pentadecane	NGS	100	<2.8	<2.8	n/a	n/a	n/a	n/a	2.8	n/a	

NA = Not Analyzed, ND = Not Detected

T - Tentatively Identified Compound J - Estimated N - Named TIC

Cartridge Evaluation
Data Summary Report

Sample Group: 20161929
SDG Number:
Customer Sample ID: 16-001-AP-EF-003B
Customer Sample ID: 16-001-AP-EF-003B

Sample#	R	A#	CAS #	Analyte	Unit	STD %	Blank	Result	Duplicate	Average	RPD %	Spk Rec %	Det Limit	Cnt Err %	Qual Flags
VAPOR-TDU SVOA #2															
S16T019242			3891-98-3	2,6,10-Trimethyldodecane	NGS	100	<1.1	<1.1	n/a	n/a	n/a	n/a	1.1	n/a	
S16T019242			95-48-7	2-Methylphenol	NGS	94	<3.4	<3.4	n/a	n/a	n/a	n/a	3.4	n/a	
S16T019242			108-39-4M	Cresol (m & p)	NGS	100	<2.4	<2.4	n/a	n/a	n/a	n/a	2.4	n/a	
S16T019242			92-52-4	Biphenyl	NGS	100	<2.0	<2.0	n/a	n/a	n/a	n/a	2.0	n/a	
S16T019242			78-46-6	Dibutyl butylphosphonate	NGS	110	<2.9	<2.9	n/a	n/a	n/a	n/a	2.9	n/a	
S16T019242			84-66-2	Diethylphthalate	NGS	120	<2.8	<2.8	n/a	n/a	n/a	n/a	2.8	n/a	
S16T019242			112-40-3	Dodecane	NGS	98	<0.81	29	n/a	n/a	n/a	n/a	0.81	n/a	
S16T019242			544-76-3	Hexadecane-	NGS	97	<1.9	<1.9	n/a	n/a	n/a	n/a	1.9	n/a	
S16T019242			629-59-4	Tetradecane	NGS	100	<1.2	2.8	n/a	n/a	n/a	n/a	1.2	n/a	J
S16T019242			126-73-8	Tributyl phosphate	NGS	100	<6.0	<6.0	n/a	n/a	n/a	n/a	6.0	n/a	
S16T019242			629-50-5	Tridecane	NGS	99	<0.50	6.3	n/a	n/a	n/a	n/a	0.46	n/a	J
S16T019242			629-78-7	Heptadecane	NGS	100	<5.2	<5.2	n/a	n/a	n/a	n/a	5.2	n/a	
S16T019242			629-62-9	Pentadecane	NGS	100	<2.8	<2.8	n/a	n/a	n/a	n/a	2.8	n/a	

NA = Not Analyzed, ND = Not Detected

T - Tentatively Identified Compound J - Estimated N - Named TIC

Cartridge Evaluation
Data Summary Report

Sample Group: 20161929
SDG Number:
Customer Sample ID: 16-001-AP-EF-003BASE
Customer Sample ID: 16-001-AP-EF-003BASE

Sample# R	A#	CAS #	Analyte	Unit	STD %	Blank	Result	Duplicate	Average	RPD %	Spk Rec %	Det Limit	Cnt Err %	Qual Flags
VAPOR-TDU SVOA #2														
S16T019245		3891-98-3	2,6,10-Trimethyldodecane	NGS	100	<1.1	<1.1	n/a	n/a	n/a	n/a	1.1	n/a	
S16T019245		95-48-7	2-Methylphenol	NGS	94	<3.4	<3.4	n/a	n/a	n/a	n/a	3.4	n/a	
S16T019245		108-39-4M	Cresol (m & p)	NGS	100	<2.4	<2.4	n/a	n/a	n/a	n/a	2.4	n/a	
S16T019245		92-52-4	Biphenyl	NGS	100	<2.0	<2.0	n/a	n/a	n/a	n/a	2.0	n/a	
S16T019245		78-46-6	Dibutyl butylphosphonate	NGS	110	<2.9	<2.9	n/a	n/a	n/a	n/a	2.9	n/a	
S16T019245		84-66-2	Diethylphthalate	NGS	120	<2.8	<2.8	n/a	n/a	n/a	n/a	2.8	n/a	
S16T019245		112-40-3	Dodecane	NGS	98	<0.81	28	n/a	n/a	n/a	n/a	0.81	n/a	
S16T019245		544-76-3	Hexadecane-	NGS	97	<1.9	<1.9	n/a	n/a	n/a	n/a	1.9	n/a	
S16T019245		629-59-4	Tetradecane	NGS	100	<1.2	1.6	n/a	n/a	n/a	n/a	1.2	n/a	J
S16T019245		126-73-8	Tributyl phosphate	NGS	100	<6.0	<6.0	n/a	n/a	n/a	n/a	6.0	n/a	
S16T019245		629-50-5	Tridecane	NGS	99	<0.50	5.6	n/a	n/a	n/a	n/a	0.46	n/a	J
S16T019245		629-78-7	Heptadecane	NGS	100	<5.2	<5.2	n/a	n/a	n/a	n/a	5.2	n/a	
S16T019245		629-62-9	Pentadecane	NGS	100	<2.8	<2.8	n/a	n/a	n/a	n/a	2.8	n/a	

NA = Not Analyzed, ND = Not Detected

T - Tentatively Identified Compound J - Estimated N - Named TIC

Cartridge Evaluation
Data Summary Report

Sample Group: 20161929
SDG Number:
Customer Sample ID: 16-001-AP-EF-003C
Customer Sample ID: 16-001-AP-EF-003C

Sample#	R	A#	CAS #	Analyte	Unit	STD %	Blank	Result	Duplicate	Average	RPD %	Spk Rec %	Det Limit	Cnt Err %	Qual Flags
VAPOR-TDU SVOA #2															
S16T019241			3891-98-3	2,6,10-Trimethyldodecane	NGS	100	<1.1	<1.1	n/a	n/a	n/a	n/a	1.1	n/a	
S16T019241			95-48-7	2-Methylphenol	NGS	94	<3.4	<3.4	n/a	n/a	n/a	n/a	3.4	n/a	
S16T019241			108-39-4M	Cresol (m & p)	NGS	100	<2.4	<2.4	n/a	n/a	n/a	n/a	2.4	n/a	
S16T019241			92-52-4	Biphenyl	NGS	100	<2.0	<2.0	n/a	n/a	n/a	n/a	2.0	n/a	
S16T019241			78-46-6	Dibutyl butylphosphonate	NGS	110	<2.9	<2.9	n/a	n/a	n/a	n/a	2.9	n/a	
S16T019241			84-66-2	Diethylphthalate	NGS	120	<2.8	<2.8	n/a	n/a	n/a	n/a	2.8	n/a	
S16T019241			112-40-3	Dodecane	NGS	98	<0.81	30	n/a	n/a	n/a	n/a	0.81	n/a	
S16T019241			544-76-3	Hexadecane-	NGS	97	<1.9	<1.9	n/a	n/a	n/a	n/a	1.9	n/a	
S16T019241			629-59-4	Tetradecane	NGS	100	<1.2	3.3	n/a	n/a	n/a	n/a	1.2	n/a	J
S16T019241			126-73-8	Tributyl phosphate	NGS	100	<6.0	<6.0	n/a	n/a	n/a	n/a	6.0	n/a	
S16T019241			629-50-5	Tridecane	NGS	99	<0.50	7.8	n/a	n/a	n/a	n/a	0.46	n/a	J
S16T019241			629-78-7	Heptadecane	NGS	100	<5.2	<5.2	n/a	n/a	n/a	n/a	5.2	n/a	
S16T019241			629-62-9	Pentadecane	NGS	100	<2.8	3.9	n/a	n/a	n/a	n/a	2.8	n/a	J

NA = Not Analyzed, ND = Not Detected

T - Tentatively Identified Compound J - Estimated N - Named TIC

Cartridge Evaluation
Data Summary Report

Sample Group: 20161929
SDG Number:
Customer Sample ID: 16-001-AP-EF-003D
Customer Sample ID: 16-001-AP-EF-003D

Sample# R	A#	CAS #	Analyte	Unit	STD %	Blank	Result	Duplicate	Average	RPD %	Spk Rec %	Det Limit	Cnt Err %	Qual Flags
VAPOR-TDU SVOA #2														
S16T019240		3891-98-3	2,6,10-Trimethyldodecane	NGS	100	<1.1	<1.1	n/a	n/a	n/a	n/a	1.1	n/a	
S16T019240		95-48-7	2-Methylphenol	NGS	94	<3.4	<3.4	n/a	n/a	n/a	n/a	3.4	n/a	
S16T019240		108-39-4M	Cresol (m & p)	NGS	100	<2.4	<2.4	n/a	n/a	n/a	n/a	2.4	n/a	
S16T019240		92-52-4	Biphenyl	NGS	100	<2.0	<2.0	n/a	n/a	n/a	n/a	2.0	n/a	
S16T019240		78-46-6	Dibutyl butylphosphonate	NGS	110	<2.9	<2.9	n/a	n/a	n/a	n/a	2.9	n/a	
S16T019240		84-66-2	Diethylphthalate	NGS	120	<2.8	<2.8	n/a	n/a	n/a	n/a	2.8	n/a	
S16T019240		112-40-3	Dodecane	NGS	98	<0.81	29	n/a	n/a	n/a	n/a	0.81	n/a	
S16T019240		544-76-3	Hexadecane-	NGS	97	<1.9	<1.9	n/a	n/a	n/a	n/a	1.9	n/a	
S16T019240		629-59-4	Tetradecane	NGS	100	<1.2	2.6	n/a	n/a	n/a	n/a	1.2	n/a	J
S16T019240		126-73-8	Tributyl phosphate	NGS	100	<6.0	<6.0	n/a	n/a	n/a	n/a	6.0	n/a	
S16T019240		629-50-5	Tridecane	NGS	99	<0.50	6.9	n/a	n/a	n/a	n/a	0.46	n/a	J
S16T019240		629-78-7	Heptadecane	NGS	100	<5.2	<5.2	n/a	n/a	n/a	n/a	5.2	n/a	
S16T019240		629-62-9	Pentadecane	NGS	100	<2.8	<2.8	n/a	n/a	n/a	n/a	2.8	n/a	

NA = Not Analyzed, ND = Not Detected

T - Tentatively Identified Compound J - Estimated N - Named TIC

Cartridge Evaluation
Data Summary Report

Sample Group: 20161929
SDG Number:
Customer Sample ID: 16-001-AP-EF-003E
Customer Sample ID: 16-001-AP-EF-003E

Sample#	R	A#	CAS #	Analyte	Unit	STD %	Blank	Result	Duplicate	Average	RPD %	Spk Rec %	Det Limit	Cnt Err %	Qual Flags
VAPOR-TDU SVOA #2															
S16T019239			3891-98-3	2,6,10-Trimethyldodecane	NGS	100	<1.1	<1.1	n/a	n/a	n/a	n/a	1.1	n/a	
S16T019239			95-48-7	2-Methylphenol	NGS	94	<3.4	<3.4	n/a	n/a	n/a	n/a	3.4	n/a	
S16T019239			108-39-4M	Cresol (m & p)	NGS	100	<2.4	<2.4	n/a	n/a	n/a	n/a	2.4	n/a	
S16T019239			92-52-4	Biphenyl	NGS	100	<2.0	<2.0	n/a	n/a	n/a	n/a	2.0	n/a	
S16T019239			78-46-6	Dibutyl butylphosphonate	NGS	110	<2.9	<2.9	n/a	n/a	n/a	n/a	2.9	n/a	
S16T019239			84-66-2	Diethylphthalate	NGS	120	<2.8	<2.8	n/a	n/a	n/a	n/a	2.8	n/a	
S16T019239			112-40-3	Dodecane	NGS	98	<0.81	22	n/a	n/a	n/a	n/a	0.81	n/a	
S16T019239			544-76-3	Hexadecane-	NGS	97	<1.9	<1.9	n/a	n/a	n/a	n/a	1.9	n/a	
S16T019239			629-59-4	Tetradecane	NGS	100	<1.2	2.4	n/a	n/a	n/a	n/a	1.2	n/a	J
S16T019239			126-73-8	Tributyl phosphate	NGS	100	<6.0	<6.0	n/a	n/a	n/a	n/a	6.0	n/a	
S16T019239			629-50-5	Tridecane	NGS	99	<0.50	3.6	n/a	n/a	n/a	n/a	0.46	n/a	J
S16T019239			629-78-7	Heptadecane	NGS	100	<5.2	<5.2	n/a	n/a	n/a	n/a	5.2	n/a	
S16T019239			629-62-9	Pentadecane	NGS	100	<2.8	<2.8	n/a	n/a	n/a	n/a	2.8	n/a	

NA = Not Analyzed, ND = Not Detected

T - Tentatively Identified Compound J - Estimated N - Named TIC

Cartridge Evaluation
Data Summary Report

Sample Group: 20161929
SDG Number:
Customer Sample ID: 16-001-AP-EF-003F
Customer Sample ID: 16-001-AP-EF-003F

Sample#	R	A#	CAS #	Analyte	Unit	STD %	Blank	Result	Duplicate	Average	RPD %	Spk Rec %	Det Limit	Cnt Err %	Qual Flags
VAPOR-TDU SVOA #2															
S16T019238			3891-98-3	2,6,10-Trimethyldodecane	NGS	100	<1.1	<1.1	n/a	n/a	n/a	n/a	1.1	n/a	
S16T019238			95-48-7	2-Methylphenol	NGS	94	<3.4	<3.4	n/a	n/a	n/a	n/a	3.4	n/a	
S16T019238			108-39-4M	Cresol (m & p)	NGS	100	<2.4	<2.4	n/a	n/a	n/a	n/a	2.4	n/a	
S16T019238			92-52-4	Biphenyl	NGS	100	<2.0	<2.0	n/a	n/a	n/a	n/a	2.0	n/a	
S16T019238			78-46-6	Dibutyl butylphosphonate	NGS	110	<2.9	<2.9	n/a	n/a	n/a	n/a	2.9	n/a	
S16T019238			84-66-2	Diethylphthalate	NGS	120	<2.8	<2.8	n/a	n/a	n/a	n/a	2.8	n/a	
S16T019238			112-40-3	Dodecane	NGS	98	<0.81	9.9	n/a	n/a	n/a	n/a	0.81	n/a	J
S16T019238			544-76-3	Hexadecane-	NGS	97	<1.9	<1.9	n/a	n/a	n/a	n/a	1.9	n/a	
S16T019238			629-59-4	Tetradecane	NGS	100	<1.2	<1.2	n/a	n/a	n/a	n/a	1.2	n/a	
S16T019238			126-73-8	Tributyl phosphate	NGS	100	<6.0	<6.0	n/a	n/a	n/a	n/a	6.0	n/a	
S16T019238			629-50-5	Tridecane	NGS	99	<0.50	2.5	n/a	n/a	n/a	n/a	0.46	n/a	J
S16T019238			629-78-7	Heptadecane	NGS	100	<5.2	<5.2	n/a	n/a	n/a	n/a	5.2	n/a	
S16T019238			629-62-9	Pentadecane	NGS	100	<2.8	<2.8	n/a	n/a	n/a	n/a	2.8	n/a	

NA = Not Analyzed, ND = Not Detected

T - Tentatively Identified Compound J - Estimated N - Named TIC

Cartridge Evaluation
Data Summary Report

Sample Group: 20161929
SDG Number:
Customer Sample ID: 16-001-AP-EF-003G
Customer Sample ID: 16-001-AP-EF-003G

Sample#	R	A#	CAS #	Analyte	Unit	STD %	Blank	Result	Duplicate	Average	RPD %	Spk Rec %	Det Limit	Cnt Err %	Qual Flags
VAPOR-TDU SVOA #2															
S16T019237			3891-98-3	2,6,10-Trimethyldodecane	NGS	100	<1.1	<1.1	n/a	n/a	n/a	n/a	1.1	n/a	
S16T019237			95-48-7	2-Methylphenol	NGS	94	<3.4	<3.4	n/a	n/a	n/a	n/a	3.4	n/a	
S16T019237			108-39-4M	Cresol (m & p)	NGS	100	<2.4	<2.4	n/a	n/a	n/a	n/a	2.4	n/a	
S16T019237			92-52-4	Biphenyl	NGS	100	<2.0	<2.0	n/a	n/a	n/a	n/a	2.0	n/a	
S16T019237			78-46-6	Dibutyl butylphosphonate	NGS	110	<2.9	<2.9	n/a	n/a	n/a	n/a	2.9	n/a	
S16T019237			84-66-2	Diethylphthalate	NGS	120	<2.8	<2.8	n/a	n/a	n/a	n/a	2.8	n/a	
S16T019237			112-40-3	Dodecane	NGS	98	<0.81	18	n/a	n/a	n/a	n/a	0.81	n/a	
S16T019237			544-76-3	Hexadecane-	NGS	97	<1.9	<1.9	n/a	n/a	n/a	n/a	1.9	n/a	
S16T019237			629-59-4	Tetradecane	NGS	100	<1.2	2.0	n/a	n/a	n/a	n/a	1.2	n/a	J
S16T019237			126-73-8	Tributyl phosphate	NGS	100	<6.0	<6.0	n/a	n/a	n/a	n/a	6.0	n/a	
S16T019237			629-50-5	Tridecane	NGS	99	<0.50	5.0	n/a	n/a	n/a	n/a	0.46	n/a	J
S16T019237			629-78-7	Heptadecane	NGS	100	<5.2	<5.2	n/a	n/a	n/a	n/a	5.2	n/a	
S16T019237			629-62-9	Pentadecane	NGS	100	<2.8	<2.8	n/a	n/a	n/a	n/a	2.8	n/a	

NA = Not Analyzed, ND = Not Detected

T - Tentatively Identified Compound J - Estimated N - Named TIC

Cartridge Evaluation
Data Summary Report

Sample Group: 20161929
SDG Number:
Customer Sample ID: 16-001-AP-IN-003BASE
Customer Sample ID: 16-001-AP-IN-003BASE

Sample#	R	A#	CAS #	Analyte	Unit	STD %	Blank	Result	Duplicate	Average	RPD %	Spk Rec %	Det Limit	Cnt Err %	Qual Flags
VAPOR-TDU SVOA #2															
S16T019246			3891-98-3	2,6,10-Trimethyldodecane	NGS	100	<1.1	<1.1	n/a	n/a	n/a	n/a	1.1	n/a	
S16T019246			95-48-7	2-Methylphenol	NGS	94	<3.4	<3.4	n/a	n/a	n/a	n/a	3.4	n/a	
S16T019246			108-39-4M	Cresol (m & p)	NGS	100	<2.4	<2.4	n/a	n/a	n/a	n/a	2.4	n/a	
S16T019246			92-52-4	Biphenyl	NGS	100	<2.0	<2.0	n/a	n/a	n/a	n/a	2.0	n/a	
S16T019246			78-46-6	Dibutyl butylphosphonate	NGS	110	<2.9	<2.9	n/a	n/a	n/a	n/a	2.9	n/a	
S16T019246			84-66-2	Diethylphthalate	NGS	120	<2.8	<2.8	n/a	n/a	n/a	n/a	2.8	n/a	
S16T019246			112-40-3	Dodecane	NGS	98	<0.81	19	n/a	n/a	n/a	n/a	0.81	n/a	
S16T019246			544-76-3	Hexadecane-	NGS	97	<1.9	<1.9	n/a	n/a	n/a	n/a	1.9	n/a	
S16T019246			629-59-4	Tetradecane	NGS	100	<1.2	1.9	n/a	n/a	n/a	n/a	1.2	n/a	J
S16T019246			126-73-8	Tributyl phosphate	NGS	100	<6.0	<6.0	n/a	n/a	n/a	n/a	6.0	n/a	
S16T019246			629-50-5	Tridecane	NGS	99	<0.50	4.7	n/a	n/a	n/a	n/a	0.46	n/a	J
S16T019246			629-78-7	Heptadecane	NGS	100	<5.2	<5.2	n/a	n/a	n/a	n/a	5.2	n/a	
S16T019246			629-62-9	Pentadecane	NGS	100	<2.8	<2.8	n/a	n/a	n/a	n/a	2.8	n/a	

NA = Not Analyzed, ND = Not Detected

T - Tentatively Identified Compound J - Estimated N - Named TIC

Cartridge Evaluation
Data Summary Report

Sample Group: 20161929
SDG Number:
Customer Sample ID: 16-001-AP-IN-003H
Customer Sample ID: 16-001-AP-IN-003H

Sample#	R	A#	CAS #	Analyte	Unit	STD %	Blank	Result	Duplicate	Average	RPD %	Spk Rec %	Det Limit	Cnt Err %	Qual Flags
VAPOR-TDU SVOA #2															
S16T019236			3891-98-3	2,6,10-Trimethyldodecane	NGS	100	<1.1	<1.1	n/a	n/a	n/a	n/a	1.1	n/a	
S16T019236			95-48-7	2-Methylphenol	NGS	94	<3.4	<3.4	n/a	n/a	n/a	n/a	3.4	n/a	
S16T019236			108-39-4M	Cresol (m & p)	NGS	100	<2.4	<2.4	n/a	n/a	n/a	n/a	2.4	n/a	
S16T019236			92-52-4	Biphenyl	NGS	100	<2.0	<2.0	n/a	n/a	n/a	n/a	2.0	n/a	
S16T019236			78-46-6	Dibutyl butylphosphonate	NGS	110	<2.9	<2.9	n/a	n/a	n/a	n/a	2.9	n/a	
S16T019236			84-66-2	Diethylphthalate	NGS	120	<2.8	<2.8	n/a	n/a	n/a	n/a	2.8	n/a	
S16T019236			112-40-3	Dodecane	NGS	98	<0.81	20	n/a	n/a	n/a	n/a	0.81	n/a	
S16T019236			544-76-3	Hexadecane-	NGS	97	<1.9	<1.9	n/a	n/a	n/a	n/a	1.9	n/a	
S16T019236			629-59-4	Tetradecane	NGS	100	<1.2	1.9	n/a	n/a	n/a	n/a	1.2	n/a	J
S16T019236			126-73-8	Tributyl phosphate	NGS	100	<6.0	<6.0	n/a	n/a	n/a	n/a	6.0	n/a	
S16T019236			629-50-5	Tridecane	NGS	99	<0.50	5.6	n/a	n/a	n/a	n/a	0.46	n/a	J
S16T019236			629-78-7	Heptadecane	NGS	100	<5.2	<5.2	n/a	n/a	n/a	n/a	5.2	n/a	
S16T019236			629-62-9	Pentadecane	NGS	100	<2.8	<2.8	n/a	n/a	n/a	n/a	2.8	n/a	

NA = Not Analyzed, ND = Not Detected

T - Tentatively Identified Compound J - Estimated N - Named TIC

Cartridge Evaluation
Data Summary Report

Sample Group: 20161929
SDG Number:
Customer Sample ID: 16-001-AP-BK-003BASE
Customer Sample ID: 16-001-AP-BK-003BASE

Sample# R	A#	CAS #	Analyte	Unit	STD %	Blank	Result	Duplicate	Average	RPD %	Spk Rec %	Det Limit	Cnt Err %	Qual Flags
VAPOR-TDU SVOA #2														
S16T019247		3891-98-3	2,6,10-Trimethyldodecane	NGS	100	<1.1	<1.1	n/a	n/a	n/a	n/a	1.1	n/a	
S16T019247		95-48-7	2-Methylphenol	NGS	94	<3.4	<3.4	n/a	n/a	n/a	n/a	3.4	n/a	
S16T019247		108-39-4M	Cresol (m & p)	NGS	100	<2.4	<2.4	n/a	n/a	n/a	n/a	2.4	n/a	
S16T019247		92-52-4	Biphenyl	NGS	100	<2.0	<2.0	n/a	n/a	n/a	n/a	2.0	n/a	
S16T019247		78-46-6	Dibutyl butylphosphonate	NGS	110	<2.9	<2.9	n/a	n/a	n/a	n/a	2.9	n/a	
S16T019247		84-66-2	Diethylphthalate	NGS	120	<2.8	<2.8	n/a	n/a	n/a	n/a	2.8	n/a	
S16T019247		112-40-3	Dodecane	NGS	98	<0.81	<0.81	n/a	n/a	n/a	n/a	0.81	n/a	
S16T019247		544-76-3	Hexadecane-	NGS	97	<1.9	<1.9	n/a	n/a	n/a	n/a	1.9	n/a	
S16T019247		629-59-4	Tetradecane	NGS	100	<1.2	<1.2	n/a	n/a	n/a	n/a	1.2	n/a	
S16T019247		126-73-8	Tributyl phosphate	NGS	100	<6.0	<6.0	n/a	n/a	n/a	n/a	6.0	n/a	
S16T019247		629-50-5	Tridecane	NGS	99	<0.50	<0.50	n/a	n/a	n/a	n/a	0.50	n/a	
S16T019247		629-78-7	Heptadecane	NGS	100	<5.2	<5.2	n/a	n/a	n/a	n/a	5.2	n/a	
S16T019247		629-62-9	Pentadecane	NGS	100	<2.8	<2.8	n/a	n/a	n/a	n/a	2.8	n/a	

Joann M. Frye
Joann M Frye 7/21/16

T - Tentatively Identified Compound J - Estimated N - Named TIC

NA = Not Analyzed, ND = Not Detected

Cartridge Evaluation
Data Summary Report

Sample Group: 20161929
SDG Number:
Customer Sample ID: 16-001-AP-EF-003A
Customer Sample ID: 16-001-AP-EF-003A

Sample#	R	A#	CAS #	Analyte	Unit	STD %	Blank	Result	Duplicate	Average	RPD %	Spk Rec %	Det Limit	Cnt Err %	Qual Flags
VAPOR-TDU SVOA #2															
S16T019243			3891-98-3	2,6,10-Trimethyldodecane	NGS	100	<1.1	<1.1	n/a	n/a	n/a	n/a	1.1	n/a	
S16T019243			95-48-7	2-Methylphenol	NGS	94	<3.4	<3.4	n/a	n/a	n/a	n/a	3.4	n/a	
S16T019243			108-39-4M	Cresol (m & p)	NGS	100	<2.4	<2.4	n/a	n/a	n/a	n/a	2.4	n/a	
S16T019243			92-52-4	Biphenyl	NGS	100	<2.0	<2.0	n/a	n/a	n/a	n/a	2.0	n/a	
S16T019243			78-46-6	Dibutyl butylphosphonate	NGS	110	<2.9	<2.9	n/a	n/a	n/a	n/a	2.9	n/a	
S16T019243			84-66-2	Diethylphthalate	NGS	120	<2.8	<2.8	n/a	n/a	n/a	n/a	2.8	n/a	
S16T019243			112-40-3	Dodecane	NGS	98	<0.81	20	n/a	n/a	n/a	n/a	0.81	n/a	
S16T019243			544-76-3	Hexadecane-	NGS	97	<1.9	<1.9	n/a	n/a	n/a	n/a	1.9	n/a	
S16T019243			629-59-4	Tetradecane	NGS	100	<1.2	1.9	n/a	n/a	n/a	n/a	1.2	n/a	J
S16T019243			126-73-8	Tributyl phosphate	NGS	100	<6.0	<6.0	n/a	n/a	n/a	n/a	6.0	n/a	
S16T019243			629-50-5	Tridecane	NGS	99	<0.50	5.1	n/a	n/a	n/a	n/a	0.46	n/a	J
S16T019243			629-78-7	Heptadecane	NGS	100	<5.2	<5.2	n/a	n/a	n/a	n/a	5.2	n/a	
S16T019243			629-62-9	Pentadecane	NGS	100	<2.8	<2.8	n/a	n/a	n/a	n/a	2.8	n/a	

NA = Not Analyzed, ND = Not Detected

T - Tentatively Identified Compound J - Estimated N - Named TIC

Cartridge Evaluation
Data Summary Report

Sample Group: 20161929
SDG Number:
Customer Sample ID: 16-001-AP-EF-003B
Customer Sample ID: 16-001-AP-EF-003B

Sample#	R	A#	CAS #	Analyte	Unit	STD %	Blank	Result	Duplicate	Average	RPD %	Spk Rec %	Det Limit	Cnt Err %	Qual Flags
VAPOR-TDU SVOA #2															
S16T019242			3891-98-3	2,6,10-Trimethyldodecane	NGS	100	<1.1	<1.1	n/a	n/a	n/a	n/a	1.1	n/a	
S16T019242			95-48-7	2-Methylphenol	NGS	94	<3.4	<3.4	n/a	n/a	n/a	n/a	3.4	n/a	
S16T019242			108-39-4M	Cresol (m & p)	NGS	100	<2.4	<2.4	n/a	n/a	n/a	n/a	2.4	n/a	
S16T019242			92-52-4	Biphenyl	NGS	100	<2.0	<2.0	n/a	n/a	n/a	n/a	2.0	n/a	
S16T019242			78-46-6	Dibutyl butylphosphonate	NGS	110	<2.9	<2.9	n/a	n/a	n/a	n/a	2.9	n/a	
S16T019242			84-66-2	Diethylphthalate	NGS	120	<2.8	<2.8	n/a	n/a	n/a	n/a	2.8	n/a	
S16T019242			112-40-3	Dodecane	NGS	98	<0.81	29	n/a	n/a	n/a	n/a	0.81	n/a	
S16T019242			544-76-3	Hexadecane-	NGS	97	<1.9	<1.9	n/a	n/a	n/a	n/a	1.9	n/a	
S16T019242			629-59-4	Tetradecane	NGS	100	<1.2	2.8	n/a	n/a	n/a	n/a	1.2	n/a	J
S16T019242			126-73-8	Tributyl phosphate	NGS	100	<6.0	<6.0	n/a	n/a	n/a	n/a	6.0	n/a	
S16T019242			629-50-5	Tridecane	NGS	99	<0.50	6.3	n/a	n/a	n/a	n/a	0.46	n/a	J
S16T019242			629-78-7	Heptadecane	NGS	100	<5.2	<5.2	n/a	n/a	n/a	n/a	5.2	n/a	
S16T019242			629-62-9	Pentadecane	NGS	100	<2.8	<2.8	n/a	n/a	n/a	n/a	2.8	n/a	

NA = Not Analyzed, ND = Not Detected

T - Tentatively Identified Compound J - Estimated N - Named TIC

Cartridge Evaluation
Data Summary Report

Sample Group: 20161929
SDG Number:
Customer Sample ID: 16-001-AP-EF-003BASE
Customer Sample ID: 16-001-AP-EF-003BASE

Sample# R	A#	CAS #	Analyte	Unit	STD %	Blank	Result	Duplicate	Average	RPD %	Spk Rec %	Det Limit	Cnt Err %	Qual Flags
VAPOR-TDU SVOA #2														
S16T019245		3891-98-3	2,6,10-Trimethyldodecane	NGS	100	<1.1	<1.1	n/a	n/a	n/a	n/a	1.1	n/a	
S16T019245		95-48-7	2-Methylphenol	NGS	94	<3.4	<3.4	n/a	n/a	n/a	n/a	3.4	n/a	
S16T019245		108-39-4M	Cresol (m & p)	NGS	100	<2.4	<2.4	n/a	n/a	n/a	n/a	2.4	n/a	
S16T019245		92-52-4	Biphenyl	NGS	100	<2.0	<2.0	n/a	n/a	n/a	n/a	2.0	n/a	
S16T019245		78-46-6	Dibutyl butylphosphonate	NGS	110	<2.9	<2.9	n/a	n/a	n/a	n/a	2.9	n/a	
S16T019245		84-66-2	Diethylphthalate	NGS	120	<2.8	<2.8	n/a	n/a	n/a	n/a	2.8	n/a	
S16T019245		112-40-3	Dodecane	NGS	98	<0.81	28	n/a	n/a	n/a	n/a	0.81	n/a	
S16T019245		544-76-3	Hexadecane-	NGS	97	<1.9	<1.9	n/a	n/a	n/a	n/a	1.9	n/a	
S16T019245		629-59-4	Tetradecane	NGS	100	<1.2	1.6	n/a	n/a	n/a	n/a	1.2	n/a	J
S16T019245		126-73-8	Tributyl phosphate	NGS	100	<6.0	<6.0	n/a	n/a	n/a	n/a	6.0	n/a	
S16T019245		629-50-5	Tridecane	NGS	99	<0.50	5.6	n/a	n/a	n/a	n/a	0.46	n/a	J
S16T019245		629-78-7	Heptadecane	NGS	100	<5.2	<5.2	n/a	n/a	n/a	n/a	5.2	n/a	
S16T019245		629-62-9	Pentadecane	NGS	100	<2.8	<2.8	n/a	n/a	n/a	n/a	2.8	n/a	

NA = Not Analyzed, ND = Not Detected

T - Tentatively Identified Compound J - Estimated N - Named TIC

Cartridge Evaluation
Data Summary Report

Sample Group: 20161929
SDG Number:
Customer Sample ID: 16-001-AP-EF-003C
Customer Sample ID: 16-001-AP-EF-003C

Sample#	R	A#	CAS #	Analyte	Unit	STD %	Blank	Result	Duplicate	Average	RPD %	Spk Rec %	Det Limit	Cnt Err %	Qual Flags
VAPOR-TDU SVOA #2															
S16T019241			3891-98-3	2,6,10-Trimethyldodecane	NGS	100	<1.1	<1.1	n/a	n/a	n/a	n/a	1.1	n/a	
S16T019241			95-48-7	2-Methylphenol	NGS	94	<3.4	<3.4	n/a	n/a	n/a	n/a	3.4	n/a	
S16T019241			108-39-4M	Cresol (m & p)	NGS	100	<2.4	<2.4	n/a	n/a	n/a	n/a	2.4	n/a	
S16T019241			92-52-4	Biphenyl	NGS	100	<2.0	<2.0	n/a	n/a	n/a	n/a	2.0	n/a	
S16T019241			78-46-6	Dibutyl butylphosphonate	NGS	110	<2.9	<2.9	n/a	n/a	n/a	n/a	2.9	n/a	
S16T019241			84-66-2	Diethylphthalate	NGS	120	<2.8	<2.8	n/a	n/a	n/a	n/a	2.8	n/a	
S16T019241			112-40-3	Dodecane	NGS	98	<0.81	30	n/a	n/a	n/a	n/a	0.81	n/a	
S16T019241			544-76-3	Hexadecane-	NGS	97	<1.9	<1.9	n/a	n/a	n/a	n/a	1.9	n/a	
S16T019241			629-59-4	Tetradecane	NGS	100	<1.2	3.3	n/a	n/a	n/a	n/a	1.2	n/a	J
S16T019241			126-73-8	Tributyl phosphate	NGS	100	<6.0	<6.0	n/a	n/a	n/a	n/a	6.0	n/a	
S16T019241			629-50-5	Tridecane	NGS	99	<0.50	7.8	n/a	n/a	n/a	n/a	0.46	n/a	J
S16T019241			629-78-7	Heptadecane	NGS	100	<5.2	<5.2	n/a	n/a	n/a	n/a	5.2	n/a	
S16T019241			629-62-9	Pentadecane	NGS	100	<2.8	3.9	n/a	n/a	n/a	n/a	2.8	n/a	J

NA = Not Analyzed, ND = Not Detected

T - Tentatively Identified Compound J - Estimated N - Named TIC

Cartridge Evaluation
Data Summary Report

Sample Group: 20161929
SDG Number:
Customer Sample ID: 16-001-AP-EF-003D
Customer Sample ID: 16-001-AP-EF-003D

Sample# R	A#	CAS #	Analyte	Unit	STD %	Blank	Result	Duplicate	Average	RPD %	Spk Rec %	Det Limit	Cnt Err %	Qual Flags
VAPOR-TDU SVOA #2														
S16T019240		3891-98-3	2,6,10-Trimethyldodecane	NGS	100	<1.1	<1.1	n/a	n/a	n/a	n/a	1.1	n/a	
S16T019240		95-48-7	2-Methylphenol	NGS	94	<3.4	<3.4	n/a	n/a	n/a	n/a	3.4	n/a	
S16T019240		108-39-4M	Cresol (m & p)	NGS	100	<2.4	<2.4	n/a	n/a	n/a	n/a	2.4	n/a	
S16T019240		92-52-4	Biphenyl	NGS	100	<2.0	<2.0	n/a	n/a	n/a	n/a	2.0	n/a	
S16T019240		78-46-6	Dibutyl butylphosphonate	NGS	110	<2.9	<2.9	n/a	n/a	n/a	n/a	2.9	n/a	
S16T019240		84-66-2	Diethylphthalate	NGS	120	<2.8	<2.8	n/a	n/a	n/a	n/a	2.8	n/a	
S16T019240		112-40-3	Dodecane	NGS	98	<0.81	29	n/a	n/a	n/a	n/a	0.81	n/a	
S16T019240		544-76-3	Hexadecane-	NGS	97	<1.9	<1.9	n/a	n/a	n/a	n/a	1.9	n/a	
S16T019240		629-59-4	Tetradecane	NGS	100	<1.2	2.6	n/a	n/a	n/a	n/a	1.2	n/a	J
S16T019240		126-73-8	Tributyl phosphate	NGS	100	<6.0	<6.0	n/a	n/a	n/a	n/a	6.0	n/a	
S16T019240		629-50-5	Tridecane	NGS	99	<0.50	6.9	n/a	n/a	n/a	n/a	0.46	n/a	J
S16T019240		629-78-7	Heptadecane	NGS	100	<5.2	<5.2	n/a	n/a	n/a	n/a	5.2	n/a	
S16T019240		629-62-9	Pentadecane	NGS	100	<2.8	<2.8	n/a	n/a	n/a	n/a	2.8	n/a	

NA = Not Analyzed, ND = Not Detected

T - Tentatively Identified Compound J - Estimated N - Named TIC

Cartridge Evaluation
Data Summary Report

Sample Group: 20161929
SDG Number:
Customer Sample ID: 16-001-AP-EF-003E
Customer Sample ID: 16-001-AP-EF-003E

Sample# R	A#	CAS #	Analyte	Unit	STD %	Blank	Result	Duplicate	Average	RPD %	Spk Rec %	Det Limit	Cnt Err %	Qual Flags
VAPOR-TDU SVOA #2														
S16T019239		3891-98-3	2,6,10-Trimethyldodecane	NGS	100	<1.1	<1.1	n/a	n/a	n/a	n/a	1.1	n/a	
S16T019239		95-48-7	2-Methylphenol	NGS	94	<3.4	<3.4	n/a	n/a	n/a	n/a	3.4	n/a	
S16T019239		108-39-4M	Cresol (m & p)	NGS	100	<2.4	<2.4	n/a	n/a	n/a	n/a	2.4	n/a	
S16T019239		92-52-4	Biphenyl	NGS	100	<2.0	<2.0	n/a	n/a	n/a	n/a	2.0	n/a	
S16T019239		78-46-6	Dibutyl butylphosphonate	NGS	110	<2.9	<2.9	n/a	n/a	n/a	n/a	2.9	n/a	
S16T019239		84-66-2	Diethylphthalate	NGS	120	<2.8	<2.8	n/a	n/a	n/a	n/a	2.8	n/a	
S16T019239		112-40-3	Dodecane	NGS	98	<0.81	22	n/a	n/a	n/a	n/a	0.81	n/a	
S16T019239		544-76-3	Hexadecane-	NGS	97	<1.9	<1.9	n/a	n/a	n/a	n/a	1.9	n/a	
S16T019239		629-59-4	Tetradecane	NGS	100	<1.2	2.4	n/a	n/a	n/a	n/a	1.2	n/a	J
S16T019239		126-73-8	Tributyl phosphate	NGS	100	<6.0	<6.0	n/a	n/a	n/a	n/a	6.0	n/a	
S16T019239		629-50-5	Tridecane	NGS	99	<0.50	3.6	n/a	n/a	n/a	n/a	0.46	n/a	J
S16T019239		629-78-7	Heptadecane	NGS	100	<5.2	<5.2	n/a	n/a	n/a	n/a	5.2	n/a	
S16T019239		629-62-9	Pentadecane	NGS	100	<2.8	<2.8	n/a	n/a	n/a	n/a	2.8	n/a	

NA = Not Analyzed, ND = Not Detected

T - Tentatively Identified Compound J - Estimated N - Named TIC

Cartridge Evaluation
Data Summary Report

Sample Group: 20161929
SDG Number:
Customer Sample ID: 16-001-AP-EF-003F
Customer Sample ID: 16-001-AP-EF-003F

Sample#	R	A#	CAS #	Analyte	Unit	STD %	Blank	Result	Duplicate	Average	RPD %	Spk Rec %	Det Limit	Cnt Err %	Qual Flags
VAPOR-TDU SVOA #2															
S16T019238			3891-98-3	2,6,10-Trimethyldodecane	NGS	100	<1.1	<1.1	n/a	n/a	n/a	n/a	1.1	n/a	
S16T019238			95-48-7	2-Methylphenol	NGS	94	<3.4	<3.4	n/a	n/a	n/a	n/a	3.4	n/a	
S16T019238			108-39-4M	Cresol (m & p)	NGS	100	<2.4	<2.4	n/a	n/a	n/a	n/a	2.4	n/a	
S16T019238			92-52-4	Biphenyl	NGS	100	<2.0	<2.0	n/a	n/a	n/a	n/a	2.0	n/a	
S16T019238			78-46-6	Dibutyl butylphosphonate	NGS	110	<2.9	<2.9	n/a	n/a	n/a	n/a	2.9	n/a	
S16T019238			84-66-2	Diethylphthalate	NGS	120	<2.8	<2.8	n/a	n/a	n/a	n/a	2.8	n/a	
S16T019238			112-40-3	Dodecane	NGS	98	<0.81	9.9	n/a	n/a	n/a	n/a	0.81	n/a	J
S16T019238			544-76-3	Hexadecane-	NGS	97	<1.9	<1.9	n/a	n/a	n/a	n/a	1.9	n/a	
S16T019238			629-59-4	Tetradecane	NGS	100	<1.2	<1.2	n/a	n/a	n/a	n/a	1.2	n/a	
S16T019238			126-73-8	Tributyl phosphate	NGS	100	<6.0	<6.0	n/a	n/a	n/a	n/a	6.0	n/a	
S16T019238			629-50-5	Tridecane	NGS	99	<0.50	2.5	n/a	n/a	n/a	n/a	0.46	n/a	J
S16T019238			629-78-7	Heptadecane	NGS	100	<5.2	<5.2	n/a	n/a	n/a	n/a	5.2	n/a	
S16T019238			629-62-9	Pentadecane	NGS	100	<2.8	<2.8	n/a	n/a	n/a	n/a	2.8	n/a	

NA = Not Analyzed, ND = Not Detected

T - Tentatively Identified Compound J - Estimated N - Named TIC

Cartridge Evaluation
Data Summary Report

Sample Group: 20161929
SDG Number:
Customer Sample ID: 16-001-AP-EF-003G
Customer Sample ID: 16-001-AP-EF-003G

Sample#	R	A#	CAS #	Analyte	Unit	STD %	Blank	Result	Duplicate	Average	RPD %	Spk Rec %	Det Limit	Cnt Err %	Qual Flags
VAPOR-TDU SVOA #2															
S16T019237			3891-98-3	2,6,10-Trimethyldodecane	NGS	100	<1.1	<1.1	n/a	n/a	n/a	n/a	1.1	n/a	
S16T019237			95-48-7	2-Methylphenol	NGS	94	<3.4	<3.4	n/a	n/a	n/a	n/a	3.4	n/a	
S16T019237			108-39-4M	Cresol (m & p)	NGS	100	<2.4	<2.4	n/a	n/a	n/a	n/a	2.4	n/a	
S16T019237			92-52-4	Biphenyl	NGS	100	<2.0	<2.0	n/a	n/a	n/a	n/a	2.0	n/a	
S16T019237			78-46-6	Dibutyl butylphosphonate	NGS	110	<2.9	<2.9	n/a	n/a	n/a	n/a	2.9	n/a	
S16T019237			84-66-2	Diethylphthalate	NGS	120	<2.8	<2.8	n/a	n/a	n/a	n/a	2.8	n/a	
S16T019237			112-40-3	Dodecane	NGS	98	<0.81	18	n/a	n/a	n/a	n/a	0.81	n/a	
S16T019237			544-76-3	Hexadecane-	NGS	97	<1.9	<1.9	n/a	n/a	n/a	n/a	1.9	n/a	
S16T019237			629-59-4	Tetradecane	NGS	100	<1.2	2.0	n/a	n/a	n/a	n/a	1.2	n/a	J
S16T019237			126-73-8	Tributyl phosphate	NGS	100	<6.0	<6.0	n/a	n/a	n/a	n/a	6.0	n/a	
S16T019237			629-50-5	Tridecane	NGS	99	<0.50	5.0	n/a	n/a	n/a	n/a	0.46	n/a	J
S16T019237			629-78-7	Heptadecane	NGS	100	<5.2	<5.2	n/a	n/a	n/a	n/a	5.2	n/a	
S16T019237			629-62-9	Pentadecane	NGS	100	<2.8	<2.8	n/a	n/a	n/a	n/a	2.8	n/a	

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T - Tentatively Identified Compound J - Estimated N - Named TIC

Cartridge Evaluation
Data Summary Report

Sample Group: 20161929
SDG Number:
Customer Sample ID: 16-001-AP-IN-003BASE
Customer Sample ID: 16-001-AP-IN-003BASE

Sample#	R	A#	CAS #	Analyte	Unit	STD %	Blank	Result	Duplicate	Average	RPD %	Spk Rec %	Det Limit	Cnt Err %	Qual Flags
VAPOR-TDU SVOA #2															
S16T019246			3891-98-3	2,6,10-Trimethyldodecane	NGS	100	<1.1	<1.1	n/a	n/a	n/a	n/a	1.1	n/a	
S16T019246			95-48-7	2-Methylphenol	NGS	94	<3.4	<3.4	n/a	n/a	n/a	n/a	3.4	n/a	
S16T019246			108-39-4M	Cresol (m & p)	NGS	100	<2.4	<2.4	n/a	n/a	n/a	n/a	2.4	n/a	
S16T019246			92-52-4	Biphenyl	NGS	100	<2.0	<2.0	n/a	n/a	n/a	n/a	2.0	n/a	
S16T019246			78-46-6	Dibutyl butylphosphonate	NGS	110	<2.9	<2.9	n/a	n/a	n/a	n/a	2.9	n/a	
S16T019246			84-66-2	Diethylphthalate	NGS	120	<2.8	<2.8	n/a	n/a	n/a	n/a	2.8	n/a	
S16T019246			112-40-3	Dodecane	NGS	98	<0.81	19	n/a	n/a	n/a	n/a	0.81	n/a	
S16T019246			544-76-3	Hexadecane-	NGS	97	<1.9	<1.9	n/a	n/a	n/a	n/a	1.9	n/a	
S16T019246			629-59-4	Tetradecane	NGS	100	<1.2	1.9	n/a	n/a	n/a	n/a	1.2	n/a	J
S16T019246			126-73-8	Tributyl phosphate	NGS	100	<6.0	<6.0	n/a	n/a	n/a	n/a	6.0	n/a	
S16T019246			629-50-5	Tridecane	NGS	99	<0.50	4.7	n/a	n/a	n/a	n/a	0.46	n/a	J
S16T019246			629-78-7	Heptadecane	NGS	100	<5.2	<5.2	n/a	n/a	n/a	n/a	5.2	n/a	
S16T019246			629-62-9	Pentadecane	NGS	100	<2.8	<2.8	n/a	n/a	n/a	n/a	2.8	n/a	

NA = Not Analyzed, ND = Not Detected

T - Tentatively Identified Compound J - Estimated N - Named TIC

Cartridge Evaluation
Data Summary Report

Sample Group: 20161929
SDG Number:
Customer Sample ID: 16-001-AP-IN-003H
Customer Sample ID: 16-001-AP-IN-003H

Sample#	R	A#	CAS #	Analyte	Unit	STD %	Blank	Result	Duplicate	Average	RPD %	Spk Rec %	Det Limit	Cnt Err %	Qual Flags
VAPOR-TDU SVOA #2															
S16T019236			3891-98-3	2,6,10-Trimethyldodecane	NGS	100	<1.1	<1.1	n/a	n/a	n/a	n/a	1.1	n/a	
S16T019236			95-48-7	2-Methylphenol	NGS	94	<3.4	<3.4	n/a	n/a	n/a	n/a	3.4	n/a	
S16T019236			108-39-4M	Cresol (m & p)	NGS	100	<2.4	<2.4	n/a	n/a	n/a	n/a	2.4	n/a	
S16T019236			92-52-4	Biphenyl	NGS	100	<2.0	<2.0	n/a	n/a	n/a	n/a	2.0	n/a	
S16T019236			78-46-6	Dibutyl butylphosphonate	NGS	110	<2.9	<2.9	n/a	n/a	n/a	n/a	2.9	n/a	
S16T019236			84-66-2	Diethylphthalate	NGS	120	<2.8	<2.8	n/a	n/a	n/a	n/a	2.8	n/a	
S16T019236			112-40-3	Dodecane	NGS	98	<0.81	20	n/a	n/a	n/a	n/a	0.81	n/a	
S16T019236			544-76-3	Hexadecane-	NGS	97	<1.9	<1.9	n/a	n/a	n/a	n/a	1.9	n/a	
S16T019236			629-59-4	Tetradecane	NGS	100	<1.2	1.9	n/a	n/a	n/a	n/a	1.2	n/a	J
S16T019236			126-73-8	Tributyl phosphate	NGS	100	<6.0	<6.0	n/a	n/a	n/a	n/a	6.0	n/a	
S16T019236			629-50-5	Tridecane	NGS	99	<0.50	5.6	n/a	n/a	n/a	n/a	0.46	n/a	J
S16T019236			629-78-7	Heptadecane	NGS	100	<5.2	<5.2	n/a	n/a	n/a	n/a	5.2	n/a	
S16T019236			629-62-9	Pentadecane	NGS	100	<2.8	<2.8	n/a	n/a	n/a	n/a	2.8	n/a	

NA = Not Analyzed, ND = Not Detected

T - Tentatively Identified Compound J - Estimated N - Named TIC

Cartridge Evaluation
Data Summary Report

Sample Group: 20161929
SDG Number:
Customer Sample ID: 16-001-AP-EF-003A
Customer Sample ID: 16-001-AP-EF-003A

Sample# R	A#	QC Type	Analyte	CAS No.	Retention Time (Minutes)	Unit	Result	Qual Flags
VAPOR-TDU SVOA #2								
S16T019243			Cyclotetrasiloxane, octamethyl	556-67-2	4.44	NGS	290	JNT
S16T019243			Decane, 2,4,6-trimethyl-	62108-27-4	5.13	NGS	120	JNT
S16T019243			3,3-Dimethylhexane	563-16-6	5.18	NGS	46	JNT
S16T019243			Acetophenone	98-86-2	5.25	NGS	47	JNT
S16T019243			2,3-Dimethyldecane	17312-44-6	5.47	NGS	28	JNT
S16T019243			Undecane	1120-21-4	5.53	NGS	160	JNT
S16T019243			Undecane, 2,6-dimethyl-	17301-23-4	5.58	NGS	30	JNT
S16T019243			Decamethlycyclopentasiloxane	541-02-6	5.80	NGS	93	JNT
S16T019243			Dodecane, 2,7,10-trimethyl-	74645-98-0	6.99	NGS	41	JNT
S16T019243			Dodecane,4,6-dimethyl	61141-72-8	7.35	NGS	25	JNT
S16T019243			Propanoic acid, 2-methyl-, 1-(	74381-40-1	9.27	NGS	43	JNT

Joann M. Faye
JMFaye 7/21/16

NA = Not Analyzed, ND = Not Detected

T - Tentatively Identified Compound J - Estimated N - Named TIC

Cartridge Evaluation
Data Summary Report

Sample Group: 20161929
SDG Number:
Customer Sample ID: 16-001-AP-EF-003B
Customer Sample ID: 16-001-AP-EF-003B

Sample# R	A#	QC Type	Analyte	CAS No.	Retention Time (Minutes)	Unit	Result	Qual Flags
VAPOR-TDU SVOA #2								
S16T019242			Hexanal	66-25-1	2.82	NGS	30	JNT
S16T019242			?-Pinene	80-56-8	4.07	NGS	38	JNT
S16T019242			Cyclotetrasiloxane, octamethyl	556-67-2	4.44	NGS	370	JNT
S16T019242			1-Hexanol, 2-ethyl-	104-76-7	4.89	NGS	41	JNT
S16T019242			Undecane, 4,7-dimethyl-	17301-32-5	5.13	NGS	170	JNT
S16T019242			Decane, 2,4,6-trimethyl-	62108-27-4	5.18	NGS	69	JNT
S16T019242			Ethanone, 2-(formyloxy)-1-phen	55153-12-3	5.25	NGS	41	JNT
S16T019242			Acetic acid, trifluoro-, 3,7-d	28745-07-5	5.32	NGS	33	JNT
S16T019242			2,3-Dimethyldecane	17312-44-6	5.47	NGS	43	JNT
S16T019242			Undecane	1120-21-4	5.54	NGS	260	JNT
S16T019242			Undecane, 4,6-dimethyl-	17312-82-2	5.58	NGS	34	JNT
S16T019242			Decamethlycyclopentasiloxane	541-02-6	5.80	NGS	110	JNT
S16T019242			Dodecane, 2,7,10-trimethyl-	74645-98-0	6.99	NGS	52	JNT
S16T019242			Heptadecane, 2,6,10,15-tetrame	54833-48-6	7.16	NGS	30	JNT
S16T019242			Unknown-1	--	7.35	NGS	30	JT

NA = Not Analyzed, ND = Not Detected

T - Tentatively Identified Compound J - Estimated N - Named TIC

Cartridge Evaluation
Data Summary Report

Sample Group: 20161929
SDG Number:
Customer Sample ID: 16-001-AP-EF-003BASE
Customer Sample ID: 16-001-AP-EF-003BASE

Sample#	R	A#	QC Type	Analyte	CAS No.	Retention Time (Minutes)	Unit	Result	Qual Flags
VAPOR-TDU SVOA #2									
S16T019245				3-Carene	13466-78-9	4.06	NGS	35	JNT
S16T019245				Cyclotetrasiloxane, octamethyl	556-67-2	4.44	NGS	340	JNT
S16T019245				1-Hexanol, 2-ethyl-	104-76-7	4.89	NGS	41	JNT
S16T019245				Undecane, 4,7-dimethyl-	17301-32-5	5.13	NGS	120	JNT
S16T019245				Decane, 2,4,6-trimethyl-	62108-27-4	5.18	NGS	54	JNT
S16T019245				Cyclohexane, 2-propyl-1,1,3-tr	81983-70-2	5.32	NGS	26	JNT
S16T019245				2,3-Dimethyldecane	17312-44-6	5.46	NGS	42	JNT
S16T019245				Undecane	1120-21-4	5.54	NGS	190	JNT
S16T019245				Undecane, 4,6-dimethyl-	17312-82-2	5.58	NGS	31	JNT
S16T019245				Decamethlycyclopentasiloxane	541-02-6	5.80	NGS	110	JNT
S16T019245				Unknown-1	--	6.98	NGS	41	JT
S16T019245				Propanoic acid, 2-methyl-, 1-(	74381-40-1	9.26	NGS	25	JNT

NA = Not Analyzed, ND = Not Detected

T - Tentatively Identified Compound J - Estimated N - Named TIC

Cartridge Evaluation
Data Summary Report

Sample Group: 20161929
SDG Number:
Customer Sample ID: 16-001-AP-EF-003C
Customer Sample ID: 16-001-AP-EF-003C

Sample# R	A#	QC Type	Analyte	CAS No.	Retention Time (Minutes)	Unit	Result	Qual Flags
VAPOR-TDU SVOA #2								
S16T019241			Cyclotetrasiloxane, octamethyl	556-67-2	4.44	NGS	350	JNT
S16T019241			2,6-Dimethyldecane	13150-81-7	5.13	NGS	110	JNT
S16T019241			Undecane, 4,7-dimethyl-	17301-32-5	5.18	NGS	42	JNT
S16T019241			Ethanone, 2-(formyloxy)-1-phen	55153-12-3	5.25	NGS	48	JNT
S16T019241			Benzeneacetic acid, ?-hydroxy-	4607-38-9	5.42	NGS	28	JNT
S16T019241			Undecane	1120-21-4	5.54	NGS	160	JNT
S16T019241			Decane, 2,4,6-trimethyl-	62108-27-4	5.58	NGS	29	JNT
S16T019241			Decamethlycyclopentasiloxane	541-02-6	5.81	NGS	130	JNT
S16T019241			Dodecane, 2,7,10-trimethyl-	74645-98-0	6.99	NGS	37	JNT
S16T019241			Dodecamethylcyclohexasiloxane	540-97-6	7.16	NGS	32	JNT
S16T019241			Propanoic acid, 2-methyl-, 1-(	74381-40-1	9.27	NGS	43	JNT

NA = Not Analyzed, ND = Not Detected

T - Tentatively Identified Compound J - Estimated N - Named TIC

Cartridge Evaluation
Data Summary Report

Sample Group: 20161929
SDG Number:
Customer Sample ID: 16-001-AP-EF-003D
Customer Sample ID: 16-001-AP-EF-003D

Sample#	R	A#	QC Type	Analyte	CAS No.	Retention Time (Minutes)	Unit	Result	Qual Flags
VAPOR-TDU SVOA #2									
S16T019240				Cyclotetrasiloxane, octamethyl	556-67-2	4.44	NGS	270	JNT
S16T019240				1-Hexanol, 2-ethyl-	104-76-7	4.89	NGS	31	JNT
S16T019240				Decane, 2,4,6-trimethyl-	62108-27-4	5.13	NGS	120	JNT
S16T019240				Undecane, 4,7-dimethyl-	17301-32-5	5.18	NGS	52	JNT
S16T019240				Ethanone, 2-(formyloxy)-1-phen	55153-12-3	5.25	NGS	34	JNT
S16T019240				Acetic acid, trifluoro-, 3,7-d	28745-07-5	5.32	NGS	29	JNT
S16T019240				2,3-Dimethyldecane	17312-44-6	5.47	NGS	35	JNT
S16T019240				Undecane	1120-21-4	5.54	NGS	210	JNT
S16T019240				Undecane, 4,6-dimethyl-	17312-82-2	5.58	NGS	28	JNT
S16T019240				Decamethlycyclopentasiloxane	541-02-6	5.80	NGS	65	JNT
S16T019240				Dodecane, 2,6,11-trimethyl-	31295-56-4	6.99	NGS	37	JNT

NA = Not Analyzed, ND = Not Detected

T - Tentatively Identified Compound J - Estimated N - Named TIC

Cartridge Evaluation
Data Summary Report

Sample Group: 20161929
SDG Number:
Customer Sample ID: 16-001-AP-EF-003E
Customer Sample ID: 16-001-AP-EF-003E

Sample# R	A#	QC Type	Analyte	CAS No.	Retention Time (Minutes)	Unit	Result	Qual Flags
VAPOR-TDU SVOA #2								
S16T019239			Cyclotetrasiloxane, octamethyl	556-67-2	4.44	NGS	210	JNT
S16T019239			Undecane, 4,7-dimethyl-	17301-32-5	5.13	NGS	94	JNT
S16T019239			Decane, 2,4,6-trimethyl-	62108-27-4	5.18	NGS	40	JNT
S16T019239			2,3-Dimethyldecane	17312-44-6	5.47	NGS	26	JNT
S16T019239			Undecane	1120-21-4	5.54	NGS	140	JNT
S16T019239			Undecane, 4,6-dimethyl-	17312-82-2	5.58	NGS	25	JNT
S16T019239			Decamethlycyclopentasiloxane	541-02-6	5.80	NGS	100	JNT
S16T019239			3-Ethyl-3-methylheptane	17302-01-1	6.98	NGS	33	JNT

NA = Not Analyzed, ND = Not Detected

T - Tentatively Identified Compound J - Estimated N - Named TIC

Cartridge Evaluation
Data Summary Report

Sample Group: 20161929
SDG Number:
Customer Sample ID: 16-001-AP-EF-003F
Customer Sample ID: 16-001-AP-EF-003F

Sample#	R	A#	QC Type	Analyte	CAS No.	Retention Time (Minutes)	Unit	Result	Qual Flags
VAPOR-TDU SVOA #2									
S16T019238				Cyclotetrasiloxane, octamethyl	556-67-2	4.44	NGS	140	JNT
S16T019238				2,6-Dimethyldecane	13150-81-7	5.13	NGS	73	JNT
S16T019238				Decane, 2,4,6-trimethyl-	62108-27-4	5.18	NGS	26	JNT
S16T019238				Acetophenone	98-86-2	5.25	NGS	7.2	JNT
S16T019238				Undecane	1120-21-4	5.53	NGS	75	JNT
S16T019238				Undecane, 2,6-dimethyl-	17301-23-4	5.57	NGS	19	JNT
S16T019238				Decamethlycyclopentasiloxane	541-02-6	5.79	NGS	46	JNT

NA = Not Analyzed, ND = Not Detected

T - Tentatively Identified Compound J - Estimated N - Named TIC

Cartridge Evaluation
Data Summary Report

Sample Group: 20161929
SDG Number:
Customer Sample ID: 16-001-AP-EF-003G
Customer Sample ID: 16-001-AP-EF-003G

Sample#	R	A#	QC Type	Analyte	CAS No.	Retention Time (Minutes)	Unit	Result	Qual Flags
VAPOR-TDU SVOA #2									
S16T019237				Cyclotetrasiloxane, octamethyl	556-67-2	4.44	NGS	190	JNT
S16T019237				Undecane, 4,7-dimethyl-	17301-32-5	5.14	NGS	150	JNT
S16T019237				2,6-Dimethyldecane	13150-81-7	5.18	NGS	63	JNT
S16T019237				1-Octene, 3,7-dimethyl-	4984-01-4	5.32	NGS	31	JNT
S16T019237				2,3-Dimethyldecane	17312-44-6	5.47	NGS	31	JNT
S16T019237				Undecane	1120-21-4	5.54	NGS	180	JNT
S16T019237				Undecane, 4,6-dimethyl-	17312-82-2	5.58	NGS	31	JNT
S16T019237				Decamethlycyclopentasiloxane	541-02-6	5.80	NGS	48	JNT
S16T019237				Dodecane, 2,6,11-trimethyl-	31295-56-4	6.98	NGS	25	JNT

T - Tentatively Identified Compound J - Estimated N - Named TIC

NA = Not Analyzed, ND = Not Detected

Cartridge Evaluation
Data Summary Report

Sample Group: 20161929
SDG Number:
Customer Sample ID: 16-001-AP-IN-003BASE
Customer Sample ID: 16-001-AP-IN-003BASE

Sample# R	A#	QC Type	Analyte	CAS No.	Retention Time (Minutes)	Unit	Result	Qual Flags
VAPOR-TDU SVOA #2								
S16T019246			Ethylene Glycol	107-21-1	2.60	NGS	39	JNT
S16T019246			Hexanal	66-25-1	2.82	NGS	34	JNT
S16T019246			Heptanal	111-71-7	3.72	NGS	85	JNT
S16T019246			Cyclotetrasiloxane, octamethyl	556-67-2	4.43	NGS	400	JNT
S16T019246			Azetidine, 3-methyl-3-phenyl-	5961-33-1	4.48	NGS	36	JNT
S16T019246			1-Hexanol, 2-ethyl-	104-76-7	4.89	NGS	35	JNT
S16T019246			3,3-Dimethylhexane	563-16-6	5.13	NGS	240	JNT
S16T019246			Decane, 2,4,6-trimethyl-	62108-27-4	5.18	NGS	62	JNT
S16T019246			Acetophenone	98-86-2	5.25	NGS	54	JNT
S16T019246			Acetic acid, trifluoro-, 3,7-d	28745-07-5	5.32	NGS	32	JNT
S16T019246			2,3-Dimethyldecane	17312-44-6	5.46	NGS	44	JNT
S16T019246			Undecane	1120-21-4	5.53	NGS	240	JNT
S16T019246			2,5,6-Trimethyldecane	62108-23-0	5.57	NGS	30	JNT
S16T019246			Decamethlycyclopentasiloxane	541-02-6	5.80	NGS	97	JNT
S16T019246			Dodecane, 2,7,10-trimethyl-	74645-98-0	6.98	NGS	37	JNT
S16T019246			Propanoic acid, 2-methyl-, 1-(	74381-40-1	9.27	NGS	70	JNT

T - Tentatively Identified Compound J - Estimated N - Named TIC

NA = Not Analyzed, ND = Not Detected

Cartridge Evaluation
Data Summary Report

Sample Group: 20161929
SDG Number:
Customer Sample ID: 16-001-AP-IN-003H
Customer Sample ID: 16-001-AP-IN-003H

Sample#	R	A#	QC Type	Analyte	CAS No.	Retention Time (Minutes)	Unit	Result	Qual Flags
VAPOR-TDU SVOA #2									
S16T019236				Cyclotrisiloxane, hexamethyl-	541-05-9	3.10	NGS	25	JNT
S16T019236				Cyclotetrasiloxane, octamethyl	556-67-2	4.44	NGS	430	JNT
S16T019236				1-Hexanol, 2-ethyl-	104-76-7	4.88	NGS	29	JNT
S16T019236				Decane, 2,4,6-trimethyl-	62108-27-4	5.07	NGS	15	JNT
S16T019236				Undecane, 4,6-dimethyl-	17312-82-2	5.13	NGS	330	JNT
S16T019236				3-Ethyl-3-methylheptane	17302-01-1	5.18	NGS	140	JNT
S16T019236				1-Undecene, 5-methyl-	74630-38-9	5.32	NGS	63	JNT
S16T019236				Acetic acid, trifluoro-, 3,7-d	28745-07-5	5.36	NGS	29	JNT
S16T019236				2-Hexyl-1-octanol	19780-79-1	5.42	NGS	27	JNT
S16T019236				2,3-Dimethyldecane	17312-44-6	5.47	NGS	70	JNT
S16T019236				Undecane	1120-21-4	5.54	NGS	70	JNT
S16T019236				Undecane, 4,7-dimethyl-	17301-32-5	5.58	NGS	30	JNT
S16T019236				Decamethlycyclopentasiloxane	541-02-6	5.80	NGS	74	JNT
S16T019236				Dodecane, 2,7,10-trimethyl-	74645-98-0	6.98	NGS	28	JNT

T - Tentatively Identified Compound J - Estimated N - Named TIC

NA = Not Analyzed, ND = Not Detected

Cartridge Evaluation
Data Summary Report

Sample Group: 20161932
SDG Number:
Customer Sample ID: 16-002-AP-BK-003BASE
Customer Sample ID: 16-002-AP-BK-003BASE

Sample#	R	A#	CAS #	Analyte	Unit	STD %	Blank	Result	Duplicate	Average	RPD %	Spk Rec %	Det Limit	Cnt Err %	Qual Flags
VAPOR-TDU SVOA #2															
S16T019260			3891-98-3	2,6,10-Trimethyldodecane	NGS	96	<1.1	<1.1	n/a	n/a	n/a	n/a	1.1	n/a	
S16T019260			95-48-7	2-Methylphenol	NGS	110	<3.4	<3.4	n/a	n/a	n/a	n/a	3.4	n/a	
S16T019260			108-39-4M	Cresol (m & p)	NGS	120	<2.4	<2.4	n/a	n/a	n/a	n/a	2.4	n/a	
S16T019260			92-52-4	Biphenyl	NGS	92	<2.0	<2.0	n/a	n/a	n/a	n/a	2.0	n/a	
S16T019260			78-46-6	Dibutyl butylphosphonate	NGS	93	<2.9	<2.9	n/a	n/a	n/a	n/a	2.9	n/a	
S16T019260			84-66-2	Diethylphthalate	NGS	82	<2.8	<2.8	n/a	n/a	n/a	n/a	2.8	n/a	
S16T019260			112-40-3	Dodecane	NGS	110	<0.81	<0.81	n/a	n/a	n/a	n/a	0.81	n/a	
S16T019260			544-76-3	Hexadecane-	NGS	98	<1.9	<1.9	n/a	n/a	n/a	n/a	1.9	n/a	
S16T019260			629-59-4	Tetradecane	NGS	95	<1.2	<1.2	n/a	n/a	n/a	n/a	1.2	n/a	
S16T019260			126-73-8	Tributyl phosphate	NGS	85	<6.0	<6.0	n/a	n/a	n/a	n/a	6.0	n/a	
S16T019260			629-50-5	Tridecane	NGS	100	<0.50	<0.50	n/a	n/a	n/a	n/a	0.50	n/a	
S16T019260			629-78-7	Heptadecane	NGS	98	<5.2	<5.2	n/a	n/a	n/a	n/a	5.2	n/a	
S16T019260			629-62-9	Pentadecane	NGS	98	<2.8	<2.8	n/a	n/a	n/a	n/a	2.8	n/a	

7/28/16

NA = Not Analyzed, ND = Not Detected

T - Tentatively Identified Compound
Q - Qualitative

N - Named TIC

E - Outside Calibration Range

J - Estimated

Cartridge Evaluation
Data Summary Report

Sample Group: 20161932
SDG Number:
Customer Sample ID: 16-002-AP-EF-003A
Customer Sample ID: 16-002-AP-EF-003A

Sample#	R	A#	CAS #	Analyte	Unit	STD %	Blank	Result	Duplicate	Average	RPD %	Spk Rec %	Det Limit	Cnt Err %	Qual Flags
VAPOR-TDU SVOA #2															
S16T019256			3891-98-3	2,6,10-Trimethyldodecane	NGS	96	<1.1	<1.1	n/a	n/a	n/a	n/a	1.1	n/a	
S16T019256			95-48-7	2-Methylphenol	NGS	110	<3.4	<3.4	n/a	n/a	n/a	n/a	3.4	n/a	
S16T019256			108-39-4M	Cresol (m & p)	NGS	120	<2.4	<2.4	n/a	n/a	n/a	n/a	2.4	n/a	
S16T019256			92-52-4	Biphenyl	NGS	92	<2.0	<2.0	n/a	n/a	n/a	n/a	2.0	n/a	
S16T019256			78-46-6	Dibutyl butylphosphonate	NGS	93	<2.9	<2.9	n/a	n/a	n/a	n/a	2.9	n/a	
S16T019256			84-66-2	Diethylphthalate	NGS	82	<2.8	<2.8	n/a	n/a	n/a	n/a	2.8	n/a	
S16T019256			112-40-3	Dodecane	NGS	110	<0.81	34	n/a	n/a	n/a	n/a	0.81	n/a	
S16T019256			544-76-3	Hexadecane-	NGS	98	<1.9	<1.9	n/a	n/a	n/a	n/a	1.9	n/a	
S16T019256			629-59-4	Tetradecane	NGS	95	<1.2	3.2	n/a	n/a	n/a	n/a	1.2	n/a	J
S16T019256			126-73-8	Tributyl phosphate	NGS	85	<6.0	<6.0	n/a	n/a	n/a	n/a	6.0	n/a	
S16T019256			629-50-5	Tridecane	NGS	100	<0.50	9.5	n/a	n/a	n/a	n/a	0.46	n/a	J
S16T019256			629-78-7	Heptadecane	NGS	98	<5.2	<5.2	n/a	n/a	n/a	n/a	5.2	n/a	
S16T019256			629-62-9	Pentadecane	NGS	98	<2.8	4.0	n/a	n/a	n/a	n/a	2.8	n/a	J

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T - Tentatively Identified Compound
Q - Qualitative

N - Named TIC

E - Outside Calibration Range

J - Estimated

Cartridge Evaluation
Data Summary Report

Sample Group: 20161932
SDG Number:
Customer Sample ID: 16-002-AP-EF-003B
Customer Sample ID: 16-002-AP-EF-003B

Sample#	R	A#	CAS #	Analyte	Unit	STD %	Blank	Result	Duplicate	Average	RPD %	Spk Rec %	Det Limit	Cnt Err %	Qual Flags
VAPOR-TDU SVOA #2															
S16T019255			3891-98-3	2,6,10-Trimethyldodecane	NGS	96	<1.1	<1.1	n/a	n/a	n/a	n/a	1.1	n/a	
S16T019255			95-48-7	2-Methylphenol	NGS	110	<3.4	<3.4	n/a	n/a	n/a	n/a	3.4	n/a	
S16T019255			108-39-4M	Cresol (m & p)	NGS	120	<2.4	<2.4	n/a	n/a	n/a	n/a	2.4	n/a	
S16T019255			92-52-4	Biphenyl	NGS	92	<2.0	<2.0	n/a	n/a	n/a	n/a	2.0	n/a	
S16T019255			78-46-6	Dibutyl butylphosphonate	NGS	93	<2.9	<2.9	n/a	n/a	n/a	n/a	2.9	n/a	
S16T019255			84-66-2	Diethylphthalate	NGS	82	<2.8	<2.8	n/a	n/a	n/a	n/a	2.8	n/a	
S16T019255			112-40-3	Dodecane	NGS	110	<0.81	48	n/a	n/a	n/a	n/a	0.81	n/a	
S16T019255			544-76-3	Hexadecane-	NGS	98	<1.9	<1.9	n/a	n/a	n/a	n/a	1.9	n/a	
S16T019255			629-59-4	Tetradecane	NGS	95	<1.2	4.3	n/a	n/a	n/a	n/a	1.2	n/a	J
S16T019255			126-73-8	Tributyl phosphate	NGS	85	<6.0	<6.0	n/a	n/a	n/a	n/a	6.0	n/a	
S16T019255			629-50-5	Tridecane	NGS	100	<0.50	12	n/a	n/a	n/a	n/a	0.46	n/a	
S16T019255			629-78-7	Heptadecane	NGS	98	<5.2	<5.2	n/a	n/a	n/a	n/a	5.2	n/a	
S16T019255			629-62-9	Pentadecane	NGS	98	<2.8	4.3	n/a	n/a	n/a	n/a	2.8	n/a	J

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T - Tentatively Identified Compound
Q - Qualitative

N - Named TIC

E - Outside Calibration Range

J - Estimated

Cartridge Evaluation
Data Summary Report

Sample Group: 20161932
SDG Number:
Customer Sample ID: 16-002-AP-EF-003BASE
Customer Sample ID: 16-002-AP-EF-003BASE

Sample# R	A#	CAS #	Analyte	Unit	STD %	Blank	Result	Duplicate	Average	RPD %	Spk Rec %	Det Limit	Cnt Err %	Qual Flags
VAPOR-TDU SVOA #2														
S16T019258		3891-98-3	2,6,10-Trimethyldodecane	NGS	96	<1.1	<1.1	n/a	n/a	n/a	n/a	1.1	n/a	
S16T019258		95-48-7	2-Methylphenol	NGS	110	<3.4	<3.4	n/a	n/a	n/a	n/a	3.4	n/a	
S16T019258		108-39-4M	Cresol (m & p)	NGS	120	<2.4	<2.4	n/a	n/a	n/a	n/a	2.4	n/a	
S16T019258		92-52-4	Biphenyl	NGS	92	<2.0	<2.0	n/a	n/a	n/a	n/a	2.0	n/a	
S16T019258		78-46-6	Dibutyl butylphosphonate	NGS	93	<2.9	<2.9	n/a	n/a	n/a	n/a	2.9	n/a	
S16T019258		84-66-2	Diethylphthalate	NGS	82	<2.8	<2.8	n/a	n/a	n/a	n/a	2.8	n/a	
S16T019258		112-40-3	Dodecane	NGS	110	<0.81	43	n/a	n/a	n/a	n/a	0.81	n/a	
S16T019258		544-76-3	Hexadecane-	NGS	98	<1.9	<1.9	n/a	n/a	n/a	n/a	1.9	n/a	
S16T019258		629-59-4	Tetradecane	NGS	95	<1.2	4.7	n/a	n/a	n/a	n/a	1.2	n/a	J
S16T019258		126-73-8	Tributyl phosphate	NGS	85	<6.0	<6.0	n/a	n/a	n/a	n/a	6.0	n/a	
S16T019258		629-50-5	Tridecane	NGS	100	<0.50	9.1	n/a	n/a	n/a	n/a	0.46	n/a	J
S16T019258		629-78-7	Heptadecane	NGS	98	<5.2	<5.2	n/a	n/a	n/a	n/a	5.2	n/a	
S16T019258		629-62-9	Pentadecane	NGS	98	<2.8	5.1	n/a	n/a	n/a	n/a	2.8	n/a	J

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T - Tentatively Identified Compound
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E - Outside Calibration Range

J - Estimated

Cartridge Evaluation
Data Summary Report

Sample Group: 20161932
SDG Number:
Customer Sample ID: 16-002-AP-EF-003C
Customer Sample ID: 16-002-AP-EF-003C

Sample# R	A#	CAS #	Analyte	Unit	STD %	Blank	Result	Duplicate	Average	RPD %	Spk Rec %	Det Limit	Cnt Err %	Qual Flags
VAPOR-TDU SVOA #2														
S16T019254		3891-98-3	2,6,10-Trimethyldodecane	NGS	96	<1.1	<1.1	n/a	n/a	n/a	n/a	1.1	n/a	
S16T019254		95-48-7	2-Methylphenol	NGS	110	<3.4	<3.4	n/a	n/a	n/a	n/a	3.4	n/a	
S16T019254		108-39-4M	Cresol (m & p)	NGS	120	<2.4	<2.4	n/a	n/a	n/a	n/a	2.4	n/a	
S16T019254		92-52-4	Biphenyl	NGS	92	<2.0	<2.0	n/a	n/a	n/a	n/a	2.0	n/a	
S16T019254		78-46-6	Dibutyl butylphosphonate	NGS	93	<2.9	<2.9	n/a	n/a	n/a	n/a	2.9	n/a	
S16T019254		84-66-2	Diethylphthalate	NGS	82	<2.8	<2.8	n/a	n/a	n/a	n/a	2.8	n/a	
S16T019254		112-40-3	Dodecane	NGS	110	<0.81	65	n/a	n/a	n/a	n/a	0.81	n/a	E
S16T019254		544-76-3	Hexadecane-	NGS	98	<1.9	3.5	n/a	n/a	n/a	n/a	1.9	n/a	J
S16T019254		629-59-4	Tetradecane	NGS	95	<1.2	5.7	n/a	n/a	n/a	n/a	1.2	n/a	J
S16T019254		126-73-8	Tributyl phosphate	NGS	85	<6.0	<6.0	n/a	n/a	n/a	n/a	6.0	n/a	
S16T019254		629-50-5	Tridecane	NGS	100	<0.50	18	n/a	n/a	n/a	n/a	0.46	n/a	
S16T019254		629-78-7	Heptadecane	NGS	98	<5.2	<5.2	n/a	n/a	n/a	n/a	5.2	n/a	
S16T019254		629-62-9	Pentadecane	NGS	98	<2.8	6.7	n/a	n/a	n/a	n/a	2.8	n/a	J

NA = Not Analyzed, ND = Not Detected

T - Tentatively Identified Compound
Q - Qualitative

N - Named TIC

E - Outside Calibration Range

J - Estimated

Cartridge Evaluation
Data Summary Report

Sample Group: 20161932
SDG Number:
Customer Sample ID: 16-002-AP-EF-003D
Customer Sample ID: 16-002-AP-EF-003D

Sample#	R	A#	CAS #	Analyte	Unit	STD %	Blank	Result	Duplicate	Average	RPD %	Spk Rec %	Det Limit	Cnt Err %	Qual Flags
VAPOR-TDU SVOA #2															
S16T019253			3891-98-3	2,6,10-Trimethyldodecane	NGS	96	<1.1	<1.1	n/a	n/a	n/a	n/a	1.1	n/a	
S16T019253			95-48-7	2-Methylphenol	NGS	110	<3.4	<3.4	n/a	n/a	n/a	n/a	3.4	n/a	
S16T019253			108-39-4M	Cresol (m & p)	NGS	120	<2.4	<2.4	n/a	n/a	n/a	n/a	2.4	n/a	
S16T019253			92-52-4	Biphenyl	NGS	92	<2.0	<2.0	n/a	n/a	n/a	n/a	2.0	n/a	
S16T019253			78-46-6	Dibutyl butylphosphonate	NGS	93	<2.9	<2.9	n/a	n/a	n/a	n/a	2.9	n/a	
S16T019253			84-66-2	Diethylphthalate	NGS	82	<2.8	<2.8	n/a	n/a	n/a	n/a	2.8	n/a	
S16T019253			112-40-3	Dodecane	NGS	110	<0.81	51	n/a	n/a	n/a	n/a	0.81	n/a	E
S16T019253			544-76-3	Hexadecane-	NGS	98	<1.9	<1.9	n/a	n/a	n/a	n/a	1.9	n/a	
S16T019253			629-59-4	Tetradecane	NGS	95	<1.2	4.6	n/a	n/a	n/a	n/a	1.2	n/a	J
S16T019253			126-73-8	Tributyl phosphate	NGS	85	<6.0	<6.0	n/a	n/a	n/a	n/a	6.0	n/a	
S16T019253			629-50-5	Tridecane	NGS	100	<0.50	13	n/a	n/a	n/a	n/a	0.46	n/a	
S16T019253			629-78-7	Heptadecane	NGS	98	<5.2	<5.2	n/a	n/a	n/a	n/a	5.2	n/a	
S16T019253			629-62-9	Pentadecane	NGS	98	<2.8	4.8	n/a	n/a	n/a	n/a	2.8	n/a	J

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Q - Qualitative

N - Named TIC

E - Outside Calibration Range

J - Estimated

Cartridge Evaluation
Data Summary Report

Sample Group: 20161932
SDG Number:
Customer Sample ID: 16-002-AP-EF-003E
Customer Sample ID: 16-002-AP-EF-003E

Sample# R	A#	CAS #	Analyte	Unit	STD %	Blank	Result	Duplicate	Average	RPD %	Spk Rec %	Det Limit	Cnt Err %	Qual Flags
VAPOR-TDU SVOA #2														
S16T019252		3891-98-3	2,6,10-Trimethyldodecane	NGS	96	<1.1	<1.1	n/a	n/a	n/a	n/a	1.1	n/a	
S16T019252		95-48-7	2-Methylphenol	NGS	110	<3.4	<3.4	n/a	n/a	n/a	n/a	3.4	n/a	
S16T019252		108-39-4M	Cresol (m & p)	NGS	120	<2.4	<2.4	n/a	n/a	n/a	n/a	2.4	n/a	
S16T019252		92-52-4	Biphenyl	NGS	92	<2.0	<2.0	n/a	n/a	n/a	n/a	2.0	n/a	
S16T019252		78-46-6	Dibutyl butylphosphonate	NGS	93	<2.9	<2.9	n/a	n/a	n/a	n/a	2.9	n/a	
S16T019252		84-66-2	Diethylphthalate	NGS	82	<2.8	<2.8	n/a	n/a	n/a	n/a	2.8	n/a	
S16T019252		112-40-3	Dodecane	NGS	110	<0.81	33	n/a	n/a	n/a	n/a	0.81	n/a	
S16T019252		544-76-3	Hexadecane-	NGS	98	<1.9	2.1	n/a	n/a	n/a	n/a	1.9	n/a	J
S16T019252		629-59-4	Tetradecane	NGS	95	<1.2	3.2	n/a	n/a	n/a	n/a	1.2	n/a	J
S16T019252		126-73-8	Tributyl phosphate	NGS	85	<6.0	<6.0	n/a	n/a	n/a	n/a	6.0	n/a	
S16T019252		629-50-5	Tridecane	NGS	100	<0.50	6.4	n/a	n/a	n/a	n/a	0.46	n/a	J
S16T019252		629-78-7	Heptadecane	NGS	98	<5.2	<5.2	n/a	n/a	n/a	n/a	5.2	n/a	
S16T019252		629-62-9	Pentadecane	NGS	98	<2.8	4.4	n/a	n/a	n/a	n/a	2.8	n/a	J

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Q - Qualitative

N - Named TIC

E - Outside Calibration Range

J - Estimated

Cartridge Evaluation
Data Summary Report

Sample Group: 20161932
SDG Number:
Customer Sample ID: 16-002-AP-EF-003F
Customer Sample ID: 16-002-AP-EF-003F

Sample# R	A#	CAS #	Analyte	Unit	STD %	Blank	Result	Duplicate	Average	RPD %	Spk Rec %	Det Limit	Cnt Err %	Qual Flags
VAPOR-TDU SVOA #2														
S16T019251		3891-98-3	2,6,10-Trimethyldodecane	NGS	96	<1.1	<1.1	n/a	n/a	n/a	n/a	1.1	n/a	
S16T019251		95-48-7	2-Methylphenol	NGS	110	<3.4	<3.4	n/a	n/a	n/a	n/a	3.4	n/a	
S16T019251		108-39-4M	Cresol (m & p)	NGS	120	<2.4	<2.4	n/a	n/a	n/a	n/a	2.4	n/a	
S16T019251		92-52-4	Biphenyl	NGS	92	<2.0	<2.0	n/a	n/a	n/a	n/a	2.0	n/a	
S16T019251		78-46-6	Dibutyl butylphosphonate	NGS	93	<2.9	<2.9	n/a	n/a	n/a	n/a	2.9	n/a	
S16T019251		84-66-2	Diethylphthalate	NGS	82	<2.8	<2.8	n/a	n/a	n/a	n/a	2.8	n/a	
S16T019251		112-40-3	Dodecane	NGS	110	<0.81	18	n/a	n/a	n/a	n/a	0.81	n/a	
S16T019251		544-76-3	Hexadecane-	NGS	98	<1.9	<1.9	n/a	n/a	n/a	n/a	1.9	n/a	
S16T019251		629-59-4	Tetradecane	NGS	95	<1.2	1.8	n/a	n/a	n/a	n/a	1.2	n/a	J
S16T019251		126-73-8	Tributyl phosphate	NGS	85	<6.0	<6.0	n/a	n/a	n/a	n/a	6.0	n/a	
S16T019251		629-50-5	Tridecane	NGS	100	<0.50	4.7	n/a	n/a	n/a	n/a	0.46	n/a	J
S16T019251		629-78-7	Heptadecane	NGS	98	<5.2	<5.2	n/a	n/a	n/a	n/a	5.2	n/a	
S16T019251		629-62-9	Pentadecane	NGS	98	<2.8	<2.8	n/a	n/a	n/a	n/a	2.8	n/a	

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J - Estimated

Cartridge Evaluation
Data Summary Report

Sample Group: 20161932
SDG Number:
Customer Sample ID: 16-002-AP-EF-003G
Customer Sample ID: 16-002-AP-EF-003G

Sample# R	A#	CAS #	Analyte	Unit	STD %	Blank	Result	Duplicate	Average	RPD %	Spk Rec %	Det Limit	Cnt Err %	Qual Flags
VAPOR-TDU SVOA #2														
S16T019250		3891-98-3	2,6,10-Trimethyldodecane	NGS	96	<1.1	<1.1	n/a	n/a	n/a	n/a	1.1	n/a	
S16T019250		95-48-7	2-Methylphenol	NGS	110	<3.4	<3.4	n/a	n/a	n/a	n/a	3.4	n/a	
S16T019250		108-39-4M	Cresol (m & p)	NGS	120	<2.4	<2.4	n/a	n/a	n/a	n/a	2.4	n/a	
S16T019250		92-52-4	Biphenyl	NGS	92	<2.0	<2.0	n/a	n/a	n/a	n/a	2.0	n/a	
S16T019250		78-46-6	Dibutyl butylphosphonate	NGS	93	<2.9	<2.9	n/a	n/a	n/a	n/a	2.9	n/a	
S16T019250		84-66-2	Diethylphthalate	NGS	82	<2.8	<2.8	n/a	n/a	n/a	n/a	2.8	n/a	
S16T019250		112-40-3	Dodecane	NGS	110	<0.81	25	n/a	n/a	n/a	n/a	0.81	n/a	
S16T019250		544-76-3	Hexadecane-	NGS	98	<1.9	<1.9	n/a	n/a	n/a	n/a	1.9	n/a	
S16T019250		629-59-4	Tetradecane	NGS	95	<1.2	2.3	n/a	n/a	n/a	n/a	1.2	n/a	J
S16T019250		126-73-8	Tributyl phosphate	NGS	85	<6.0	<6.0	n/a	n/a	n/a	n/a	6.0	n/a	
S16T019250		629-50-5	Tridecane	NGS	100	<0.50	7.0	n/a	n/a	n/a	n/a	0.46	n/a	J
S16T019250		629-78-7	Heptadecane	NGS	98	<5.2	<5.2	n/a	n/a	n/a	n/a	5.2	n/a	
S16T019250		629-62-9	Pentadecane	NGS	98	<2.8	3.2	n/a	n/a	n/a	n/a	2.8	n/a	J

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J - Estimated

Cartridge Evaluation
Data Summary Report

Sample Group: 20161932
SDG Number:
Customer Sample ID: 16-002-AP-EF-003H
Customer Sample ID: 16-002-AP-EF-003H

Sample# R	A#	CAS #	Analyte	Unit	STD %	Blank	Result	Duplicate	Average	RPD %	Spk Rec %	Det Limit	Cnt Err %	Qual Flags
VAPOR-TDU SVOA #2														
S16T019248		3891-98-3	2,6,10-Trimethyldodecane	NGS	96	<1.1	<1.1	n/a	n/a	n/a	n/a	1.1	n/a	
S16T019248		95-48-7	2-Methylphenol	NGS	110	<3.4	<3.4	n/a	n/a	n/a	n/a	3.4	n/a	
S16T019248		108-39-4M	Cresol (m & p)	NGS	120	<2.4	<2.4	n/a	n/a	n/a	n/a	2.4	n/a	
S16T019248		92-52-4	Biphenyl	NGS	92	<2.0	<2.0	n/a	n/a	n/a	n/a	2.0	n/a	
S16T019248		78-46-6	Dibutyl butylphosphonate	NGS	93	<2.9	<2.9	n/a	n/a	n/a	n/a	2.9	n/a	
S16T019248		84-66-2	Diethylphthalate	NGS	82	<2.8	<2.8	n/a	n/a	n/a	n/a	2.8	n/a	
S16T019248		112-40-3	Dodecane	NGS	110	<0.81	16	n/a	n/a	n/a	n/a	0.81	n/a	
S16T019248		544-76-3	Hexadecane-	NGS	98	<1.9	<1.9	n/a	n/a	n/a	n/a	1.9	n/a	
S16T019248		629-59-4	Tetradecane	NGS	95	<1.2	2.2	n/a	n/a	n/a	n/a	1.2	n/a	J
S16T019248		126-73-8	Tributyl phosphate	NGS	85	<6.0	<6.0	n/a	n/a	n/a	n/a	6.0	n/a	
S16T019248		629-50-5	Tridecane	NGS	100	<0.50	6.0	n/a	n/a	n/a	n/a	0.46	n/a	J
S16T019248		629-78-7	Heptadecane	NGS	98	<5.2	<5.2	n/a	n/a	n/a	n/a	5.2	n/a	
S16T019248		629-62-9	Pentadecane	NGS	98	<2.8	3.1	n/a	n/a	n/a	n/a	2.8	n/a	J

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Cartridge Evaluation
Data Summary Report

Sample Group: 20161932
SDG Number:
Customer Sample ID: 16-002-AP-IN-003A
Customer Sample ID: 16-002-AP-IN-003A

Sample# R	A#	CAS #	Analyte	Unit	STD %	Blank	Result	Duplicate	Average	RPD %	Spk Rec %	Det Limit	Cnt Err %	Qual Flags
VAPOR-TDU SVOA #2														
S16T019257		3891-98-3	2,6,10-Trimethyldodecane	NGS	96	<1.1	<1.1	n/a	n/a	n/a	n/a	1.1	n/a	
S16T019257		95-48-7	2-Methylphenol	NGS	110	<3.4	3.6	n/a	n/a	n/a	n/a	3.4	n/a	J
S16T019257		108-39-4M	Cresol (m & p)	NGS	120	<2.4	<2.4	n/a	n/a	n/a	n/a	2.4	n/a	
S16T019257		92-52-4	Biphenyl	NGS	92	<2.0	<2.0	n/a	n/a	n/a	n/a	2.0	n/a	
S16T019257		78-46-6	Dibutyl butylphosphonate	NGS	93	<2.9	<2.9	n/a	n/a	n/a	n/a	2.9	n/a	
S16T019257		84-66-2	Diethylphthalate	NGS	82	<2.8	<2.8	n/a	n/a	n/a	n/a	2.8	n/a	
S16T019257		112-40-3	Dodecane	NGS	110	<0.81	45	n/a	n/a	n/a	n/a	0.81	n/a	
S16T019257		544-76-3	Hexadecane-	NGS	98	<1.9	2.5	n/a	n/a	n/a	n/a	1.9	n/a	J
S16T019257		629-59-4	Tetradecane	NGS	95	<1.2	4.6	n/a	n/a	n/a	n/a	1.2	n/a	J
S16T019257		126-73-8	Tributyl phosphate	NGS	85	<6.0	<6.0	n/a	n/a	n/a	n/a	6.0	n/a	
S16T019257		629-50-5	Tridecane	NGS	100	<0.50	12	n/a	n/a	n/a	n/a	0.46	n/a	
S16T019257		629-78-7	Heptadecane	NGS	98	<5.2	<5.2	n/a	n/a	n/a	n/a	5.2	n/a	
S16T019257		629-62-9	Pentadecane	NGS	98	<2.8	5.5	n/a	n/a	n/a	n/a	2.8	n/a	J

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Cartridge Evaluation
Data Summary Report

Sample Group: 20161932
SDG Number:
Customer Sample ID: 16-002-AP-IN-003BASE
Customer Sample ID: 16-002-AP-IN-003BASE

Sample# R	A#	CAS #	Analyte	Unit	STD %	Blank	Result	Duplicate	Average	RPD %	Spk Rec %	Det Limit	Cnt Err %	Qual Flags
VAPOR-TDU SVOA #2														
S16T019259		3891-98-3	2,6,10-Trimethyldodecane	NGS	96	<1.1	<1.1	n/a	n/a	n/a	n/a	1.1	n/a	
S16T019259		95-48-7	2-Methylphenol	NGS	110	<3.4	<3.4	n/a	n/a	n/a	n/a	3.4	n/a	
S16T019259		108-39-4M	Cresol (m & p)	NGS	120	<2.4	<2.4	n/a	n/a	n/a	n/a	2.4	n/a	
S16T019259		92-52-4	Biphenyl	NGS	92	<2.0	<2.0	n/a	n/a	n/a	n/a	2.0	n/a	
S16T019259		78-46-6	Dibutyl butylphosphonate	NGS	93	<2.9	<2.9	n/a	n/a	n/a	n/a	2.9	n/a	
S16T019259		84-66-2	Diethylphthalate	NGS	82	<2.8	<2.8	n/a	n/a	n/a	n/a	2.8	n/a	
S16T019259		112-40-3	Dodecane	NGS	110	<0.81	40	n/a	n/a	n/a	n/a	0.81	n/a	
S16T019259		544-76-3	Hexadecane-	NGS	98	<1.9	2.7	n/a	n/a	n/a	n/a	1.9	n/a	J
S16T019259		629-59-4	Tetradecane	NGS	95	<1.2	4.3	n/a	n/a	n/a	n/a	1.2	n/a	J
S16T019259		126-73-8	Tributyl phosphate	NGS	85	<6.0	<6.0	n/a	n/a	n/a	n/a	6.0	n/a	
S16T019259		629-50-5	Tridecane	NGS	100	<0.50	7.0	n/a	n/a	n/a	n/a	0.46	n/a	J
S16T019259		629-78-7	Heptadecane	NGS	98	<5.2	<5.2	n/a	n/a	n/a	n/a	5.2	n/a	
S16T019259		629-62-9	Pentadecane	NGS	98	<2.8	5.8	n/a	n/a	n/a	n/a	2.8	n/a	J

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J - Estimated

Cartridge Evaluation
Data Summary Report

Sample Group: 20161932
SDG Number:
Customer Sample ID: 16-002-AP-IN-003H
Customer Sample ID: 16-002-AP-IN-003H

Sample# R	A#	CAS #	Analyte	Unit	STD %	Blank	Result	Duplicate	Average	RPD %	Spk Rec %	Det Limit	Cnt Err %	Qual Flags
VAPOR-TDU SVOA #2														
S16T019249		3891-98-3	2,6,10-Trimethyldodecane	NGS	96	<1.1	<1.1	n/a	n/a	n/a	n/a	1.1	n/a	
S16T019249		95-48-7	2-Methylphenol	NGS	110	<3.4	<3.4	n/a	n/a	n/a	n/a	3.4	n/a	
S16T019249		108-39-4M	Cresol (m & p)	NGS	120	<2.4	<2.4	n/a	n/a	n/a	n/a	2.4	n/a	
S16T019249		92-52-4	Biphenyl	NGS	92	<2.0	<2.0	n/a	n/a	n/a	n/a	2.0	n/a	
S16T019249		78-46-6	Dibutyl butylphosphonate	NGS	93	<2.9	<2.9	n/a	n/a	n/a	n/a	2.9	n/a	
S16T019249		84-66-2	Diethylphthalate	NGS	82	<2.8	<2.8	n/a	n/a	n/a	n/a	2.8	n/a	
S16T019249		112-40-3	Dodecane	NGS	110	<0.81	31	n/a	n/a	n/a	n/a	0.81	n/a	
S16T019249		544-76-3	Hexadecane-	NGS	98	<1.9	<1.9	n/a	n/a	n/a	n/a	1.9	n/a	
S16T019249		629-59-4	Tetradecane	NGS	95	<1.2	2.8	n/a	n/a	n/a	n/a	1.2	n/a	J
S16T019249		126-73-8	Tributyl phosphate	NGS	85	<6.0	<6.0	n/a	n/a	n/a	n/a	6.0	n/a	
S16T019249		629-50-5	Tridecane	NGS	100	<0.50	9.0	n/a	n/a	n/a	n/a	0.46	n/a	J
S16T019249		629-78-7	Heptadecane	NGS	98	<5.2	<5.2	n/a	n/a	n/a	n/a	5.2	n/a	
S16T019249		629-62-9	Pentadecane	NGS	98	<2.8	3.0	n/a	n/a	n/a	n/a	2.8	n/a	J

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T - Tentatively Identified Compound
Q - Qualitative

N - Named TIC

E - Outside Calibration Range

J - Estimated

Cartridge Evaluation
Data Summary Report

Sample Group: 20161932
SDG Number:
Customer Sample ID: 16-002-AP-EF-003A
Customer Sample ID: 16-002-AP-EF-003A

Sample# R	A#	QC Type	Analyte	CAS No.	Retention Time (Minutes)	Unit	Result	Qual Flags
VAPOR-TDU SVOA #2								
S16T019256			Heptanal	111-71-7	3.73	NGS	56	JNQT
S16T019256			Cyclotetrasiloxane, octamethyl	556-67-2	4.44	NGS	280	JNQT
S16T019256			1-Hexanol, 2-ethyl-	104-76-7	4.89	NGS	32	JNQT
S16T019256			Undecane, 4,7-dimethyl-	17301-32-5	5.13	NGS	120	JNQT
S16T019256			Decane, 2,4,6-trimethyl-	62108-27-4	5.18	NGS	57	JNQT
S16T019256			Ethanone, 2-(formyloxy)-1-phen	55153-12-3	5.25	NGS	59	JNQT
S16T019256			Acetic acid, trifluoro-, 3,7-d	28745-07-5	5.32	NGS	29	JNQT
S16T019256			Benzeneacetic acid, ?-methoxy-	56143-21-6	5.43	NGS	40	JNQT
S16T019256			2,3-Dimethyldecane	17312-44-6	5.47	NGS	26	JNQT
S16T019256			Undecane	1120-21-4	5.53	NGS	280	JNQT
S16T019256			Undecane, 4,6-dimethyl-	17312-82-2	5.58	NGS	28	JNT
S16T019256			Decamethylcyclopentasiloxane	541-02-6	5.80	NGS	90	JNT
S16T019256			Dodecane, 2,7,10-trimethyl-	74645-98-0	6.99	NGS	45	JNT
S16T019256			Unknown-1	--	7.35	NGS	28	JT
S16T019256			Undecane, 2-methyl-	7045-71-8	7.42	NGS	14	JNT

7/28/16

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Cartridge Evaluation
Data Summary Report

Sample Group: 20161932
SDG Number:
Customer Sample ID: 16-002-AP-EF-003B
Customer Sample ID: 16-002-AP-EF-003B

Sample# R	A#	QC Type	Analyte	CAS No.	Retention Time (Minutes)	Unit	Result	Qual Flags
VAPOR-TDU SVOA #2								
S16T019255			Heptanal	111-71-7	3.72	NGS	31	JNQT
S16T019255			Cyclotetrasiloxane, octamethyl	556-67-2	4.44	NGS	360	JNQT
S16T019255			Octanal	124-13-0	4.66	NGS	28	JNQT
S16T019255			1-Hexanol, 2-ethyl-	104-76-7	4.89	NGS	42	JNQT
S16T019255			Undecane, 4,7-dimethyl-	17301-32-5	5.13	NGS	150	JNQT
S16T019255			Decane, 2,4,6-trimethyl-	62108-27-4	5.18	NGS	68	JNQT
S16T019255			Ethanone, 2-(formyloxy)-1-phen	55153-12-3	5.25	NGS	51	JNQT
S16T019255			Acetic acid, trifluoro-, 3,7-d	28745-07-5	5.32	NGS	36	JNQT
S16T019255			2,3-Dimethyldecane	17312-44-6	5.47	NGS	37	JNQT
S16T019255			Undecane	1120-21-4	5.54	NGS	64	JNT
S16T019255			3,3-Dimethylhexane	563-16-6	5.58	NGS	41	JNT
S16T019255			Decamethlycyclopentasiloxane	541-02-6	5.81	NGS	86	JNT
S16T019255			Dodecane, 2,7,10-trimethyl-	74645-98-0	6.99	NGS	58	JNT
S16T019255			Heptadecane, 2,6,10,15-tetrame	54833-48-6	7.16	NGS	35	JNT
S16T019255			3-Ethyl-3-methylheptane	17302-01-1	7.35	NGS	38	JNT

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J - Estimated

Cartridge Evaluation
Data Summary Report

Sample Group: 20161932
SDG Number:
Customer Sample ID: 16-002-AP-EF-003BASE
Customer Sample ID: 16-002-AP-EF-003BASE

Sample#	R	A#	QC Type	Analyte	CAS No.	Retention Time (Minutes)	Unit	Result	Qual Flags
VAPOR-TDU SVOA #2									
S16T019258				Cyclotetrasiloxane, octamethyl	556-67-2	4.44	NGS	500	JNQT
S16T019258				1-Hexanol, 2-ethyl-	104-76-7	4.89	NGS	53	JNQT
S16T019258				Undecane, 4,7-dimethyl-	17301-32-5	5.14	NGS	350	JNQT
S16T019258				3-Ethyl-3-methylheptane	17302-01-1	5.19	NGS	150	JNQT
S16T019258				Acetic acid, trifluoro-, 3,7-d	28745-07-5	5.33	NGS	70	JNQT
S16T019258				5-Ethyl-1-nonene	19780-74-6	5.36	NGS	30	JNQT
S16T019258				2,3-Dimethyldecane	17312-44-6	5.47	NGS	84	JNQT
S16T019258				Undecane	1120-21-4	5.55	NGS	130	JNT
S16T019258				Undecane, 4,6-dimethyl-	17312-82-2	5.60	NGS	51	JNT
S16T019258				Decamethlycyclopentasiloxane	541-02-6	5.81	NGS	92	JNT
S16T019258				Dodecane, 2,6,11-trimethyl-	31295-56-4	6.99	NGS	54	JNT
S16T019258				Decane, 3-ethyl-3-methyl-	17312-66-2	7.35	NGS	30	JNT
S16T019258				Undecane, 2-methyl-	7045-71-8	7.42	NGS	14	JNT

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J - Estimated

Cartridge Evaluation
Data Summary Report

Sample Group: 20161932
SDG Number:
Customer Sample ID: 16-002-AP-EF-003C
Customer Sample ID: 16-002-AP-EF-003C

Sample#	R	A#	QC Type	Analyte	CAS No.	Retention Time (Minutes)	Unit	Result	Qual Flags
VAPOR-TDU SVOA #2									
S16T019254				Cyclotetrasiloxane, octamethyl	556-67-2	4.44	NGS	430	JNQT
S16T019254				Octanal	124-13-0	4.66	NGS	27	JNQT
S16T019254				1-Hexanol, 2-ethyl-	104-76-7	4.89	NGS	28	JNQT
S16T019254				Undecane, 4,7-dimethyl-	17301-32-5	5.13	NGS	130	JNQT
S16T019254				Decane, 2,4,6-trimethyl-	62108-27-4	5.18	NGS	55	JNQT
S16T019254				Ethanone, 2-(formyloxy)-1-phen	55153-12-3	5.25	NGS	62	JNQT
S16T019254				Acetic acid, trifluoro-, 3,7-d	28745-07-5	5.32	NGS	40	JNQT
S16T019254				2,3-Dimethyldecane	17312-44-6	5.47	NGS	30	JNQT
S16T019254				Undecane	1120-21-4	5.54	NGS	390	JNQT
S16T019254				3,3-Dimethylhexane	563-16-6	5.58	NGS	40	JNT
S16T019254				Decamethlycyclopentasiloxane	541-02-6	5.81	NGS	130	JNT
S16T019254				Undecane, 2,6-dimethyl-	17301-23-4	6.49	NGS	5.5	JNT
S16T019254				Dodecane, 2,6,11-trimethyl-	31295-56-4	6.99	NGS	51	JNT
S16T019254				Dodecamethylcyclohexasiloxane	540-97-6	7.16	NGS	57	JNT
S16T019254				Decane, 3-ethyl-3-methyl-	17312-66-2	7.35	NGS	37	JNT

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J - Estimated

Cartridge Evaluation
Data Summary Report

Sample Group: 20161932
SDG Number:
Customer Sample ID: 16-002-AP-EF-003D
Customer Sample ID: 16-002-AP-EF-003D

Sample# R	A#	QC Type	Analyte	CAS No.	Retention Time (Minutes)	Unit	Result	Qual Flags
VAPOR-TDU SVOA #2								
S16T019253			Heptanal	111-71-7	3.72	NGS	27	JNQT
S16T019253			Cyclotetrasiloxane, octamethyl	556-67-2	4.44	NGS	300	JNQT
S16T019253			1-Hexanol, 2-ethyl-	104-76-7	4.89	NGS	30	JNQT
S16T019253			Undecane, 4,7-dimethyl-	17301-32-5	5.13	NGS	170	JNQT
S16T019253			Decane, 2,4,6-trimethyl-	62108-27-4	5.18	NGS	59	JNQT
S16T019253			Ethanone, 2-(formyloxy)-1-phen	55153-12-3	5.25	NGS	48	JNQT
S16T019253			Acetic acid, trifluoro-, 3,7-d	28745-07-5	5.32	NGS	32	JNQT
S16T019253			2,3-Dimethyldecane	17312-44-6	5.47	NGS	35	JNQT
S16T019253			Undecane	1120-21-4	5.54	NGS	350	JNQT
S16T019253			Undecane, 4,6-dimethyl-	17312-82-2	5.58	NGS	39	JNT
S16T019253			Decamethlycyclopentasiloxane	541-02-6	5.80	NGS	82	JNT
S16T019253			Undecane, 2,6-dimethyl-	17301-23-4	6.49	NGS	5.8	JNT
S16T019253			Dodecane, 2,7,10-trimethyl-	74645-98-0	6.99	NGS	56	JNT
S16T019253			1-Iodo-2-methylundecane	73105-67-6	7.16	NGS	34	JNT
S16T019253			Decane, 3-ethyl-3-methyl-	17312-66-2	7.35	NGS	38	JNT
S16T019253			Undecane, 2-methyl-	7045-71-8	7.42	NGS	17	JNT

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Q - Qualitative

N - Named TIC

E - Outside Calibration Range

J - Estimated

Cartridge Evaluation
Data Summary Report

Sample Group: 20161932
SDG Number:
Customer Sample ID: 16-002-AP-EF-003E
Customer Sample ID: 16-002-AP-EF-003E

Sample# R	A#	QC Type	Analyte	CAS No.	Retention Time (Minutes)	Unit	Result	Qual Flags
VAPOR-TDU SVOA #2								
S16T019252			Cyclotetrasiloxane, octamethyl	556-67-2	4.44	NGS	220	JNT
S16T019252			Undecane, 4,7-dimethyl-	17301-32-5	5.13	NGS	100	JNT
S16T019252			Decane, 2,4,6-trimethyl-	62108-27-4	5.18	NGS	41	JNT
S16T019252			Undecane	1120-21-4	5.54	NGS	180	JNT
S16T019252			Undecane, 4,6-dimethyl-	17312-82-2	5.58	NGS	30	JNT
S16T019252			Decamethlycyclopentasiloxane	541-02-6	5.81	NGS	120	JNT
S16T019252			Dodecane, 2,6,11-trimethyl-	31295-56-4	6.99	NGS	43	JNT
S16T019252			Dodecamethylcyclohexasiloxane	540-97-6	7.16	NGS	43	JNT

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Q - Qualitative

N - Named TIC

E - Outside Calibration Range

J - Estimated

Cartridge Evaluation
Data Summary Report

Sample Group: 20161932
SDG Number:
Customer Sample ID: 16-002-AP-EF-003F
Customer Sample ID: 16-002-AP-EF-003F

Sample#	R	A#	QC Type	Analyte	CAS No.	Retention Time (Minutes)	Unit	Result	Qual Flags
VAPOR-TDU SVOA #2									
S16T019251				Cyclotetrasiloxane, octamethyl	556-67-2	4.44	NGS	160	JNT
S16T019251				Undecane, 4,7-dimethyl-	17301-32-5	5.13	NGS	110	JNT
S16T019251				Decane, 2,4,6-trimethyl-	62108-27-4	5.18	NGS	41	JNT
S16T019251				Undecane	1120-21-4	5.53	NGS	130	JNT
S16T019251				Decamethlycyclopentasiloxane	541-02-6	5.80	NGS	65	JNT
S16T019251				3-Ethyl-3-methylheptane	17302-01-1	6.98	NGS	26	JNT
S16T019251				Undecane, 2-methyl-	7045-71-8	7.42	NGS	9.0	JNT

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Q - Qualitative

N - Named TIC

E - Outside Calibration Range

J - Estimated

Cartridge Evaluation
Data Summary Report

Sample Group: 20161932
SDG Number:
Customer Sample ID: 16-002-AP-EF-003G
Customer Sample ID: 16-002-AP-EF-003G

Sample# R	A#	QC Type	Analyte	CAS No.	Retention Time (Minutes)	Unit	Result	Qual Flags
VAPOR-TDU SVOA #2								
S16T019250			Cyclotrisiloxane, hexamethyl-	541-05-9	3.00	NGS	49	JNT
S16T019250			Cyclotetrasiloxane, octamethyl	556-67-2	4.44	NGS	460	JNT
S16T019250			1-Hexanol, 2-ethyl-	104-76-7	4.89	NGS	25	JNT
S16T019250			Undecane, 4,7-dimethyl-	17301-32-5	5.14	NGS	190	JNT
S16T019250			3,3-Dimethylhexane	563-16-6	5.18	NGS	76	JNT
S16T019250			Acetic acid, trifluoro-, 3,7-d	28745-07-5	5.32	NGS	40	JNT
S16T019250			2,3-Dimethyldecane	17312-44-6	5.47	NGS	39	JNT
S16T019250			Undecane	1120-21-4	5.54	NGS	78	JNT
S16T019250			Undecane, 4,6-dimethyl-	17312-82-2	5.58	NGS	34	JNT
S16T019250			Decamethlycyclopentasiloxane	541-02-6	5.80	NGS	81	JNT
S16T019250			Dodecane, 2,6,11-trimethyl-	31295-56-4	6.98	NGS	26	JNT

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Q - Qualitative

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J - Estimated

Cartridge Evaluation
Data Summary Report

Sample Group: 20161932
SDG Number:
Customer Sample ID: 16-002-AP-EF-003H
Customer Sample ID: 16-002-AP-EF-003H

Sample# R	A#	QC Type	Analyte	CAS No.	Retention Time (Minutes)	Unit	Result	Qual Flags
VAPOR-TDU SVOA #2								
S16T019248			Cyclotetrasiloxane, octamethyl	556-67-2	4.44	NGS	170	JNT
S16T019248			Undecane, 4,7-dimethyl-	17301-32-5	5.13	NGS	46	JNT
S16T019248			Decane, 2,4,6-trimethyl-	62108-27-4	5.18	NGS	17	JNT
S16T019248			Undecane	1120-21-4	5.53	NGS	58	JNT
S16T019248			Decamethlycyclopentasiloxane	541-02-6	5.80	NGS	130	JNT

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Q - Qualitative

N - Named TIC

E - Outside Calibration Range

J - Estimated

Cartridge Evaluation
Data Summary Report

Sample Group: 20161932
SDG Number:
Customer Sample ID: 16-002-AP-IN-003A
Customer Sample ID: 16-002-AP-IN-003A

Sample# R	A#	QC Type	Analyte	CAS No.	Retention Time (Minutes)	Unit	Result	Qual Flags
VAPOR-TDU SVOA #2								
S16T019257			Cyclotetrasiloxane, octamethyl	556-67-2	4.44	NGS	290	JNQT
S16T019257			Undecane, 4,7-dimethyl-	17301-32-5	5.13	NGS	90	JNQT
S16T019257			Decane, 2,4,6-trimethyl-	62108-27-4	5.18	NGS	36	JNQT
S16T019257			Ethanone, 2-(formyloxy)-1-phen	55153-12-3	5.25	NGS	48	JNQT
S16T019257			Undecane	1120-21-4	5.54	NGS	210	JNQT
S16T019257			3,3-Dimethylhexane	563-16-6	5.58	NGS	32	JNT
S16T019257			Decamethlycyclopentasiloxane	541-02-6	5.81	NGS	110	JNT
S16T019257			Dodecane, 2,7,10-trimethyl-	74645-98-0	6.99	NGS	43	JNT
S16T019257			Dodecamethylcyclohexasiloxane	540-97-6	7.16	NGS	41	JNT
S16T019257			Decane, 3-ethyl-3-methyl-	17312-66-2	7.35	NGS	27	JNT
S16T019257			Propanoic acid, 2-methyl-, 1-(	74381-40-1	9.27	NGS	31	JNT

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J - Estimated

Cartridge Evaluation
Data Summary Report

Sample Group: 20161932
SDG Number:
Customer Sample ID: 16-002-AP-IN-003BASE
Customer Sample ID: 16-002-AP-IN-003BASE

Sample# R	A#	QC Type	Analyte	CAS No.	Retention Time (Minutes)	Unit	Result	Qual Flags
VAPOR-TDU SVOA #2								
S16T019259			Hexanal	66-25-1	2.83	NGS	45	JNQT
S16T019259			Hydroperoxide, hexyl	4312-76-9	3.43	NGS	38	JNQT
S16T019259			Heptanal	111-71-7	3.73	NGS	130	JNQT
S16T019259			Cyclotetrasiloxane, octamethyl	556-67-2	4.45	NGS	1.4E+03	JNQT
S16T019259			Octanal	124-13-0	4.66	NGS	34	JNQT
S16T019259			1-Hexanol, 2-ethyl-	104-76-7	4.89	NGS	42	JNT
S16T019259			Undecane, 4,7-dimethyl-	17301-32-5	5.13	NGS	230	JNQT
S16T019259			Decane, 2,4,6-trimethyl-	62108-27-4	5.18	NGS	93	JNQT
S16T019259			Ethanone, 2-(formyloxy)-1-phen	55153-12-3	5.25	NGS	25	JNQT
S16T019259			Acetic acid, trifluoro-, 3,7-d	28745-07-5	5.32	NGS	54	JNQT
S16T019259			Benzeneacetic acid, ?-methoxy-	56143-21-6	5.43	NGS	59	JNQT
S16T019259			2,3-Dimethyldecane	17312-44-6	5.47	NGS	77	JNQT
S16T019259			Undecane	1120-21-4	5.54	NGS	710	JNQT
S16T019259			Undecane, 4,6-dimethyl-	17312-82-2	5.58	NGS	41	JNT
S16T019259			Decamethylcyclopentasiloxane	541-02-6	5.81	NGS	210	JNT
S16T019259			Undecane, 2,6-dimethyl-	17301-23-4	6.49	NGS	5.4	JNT
S16T019259			Unknown-1	--	6.99	NGS	55	JT
S16T019259			Decane, 3-ethyl-3-methyl-	17312-66-2	7.35	NGS	30	JNT
S16T019259			Undecane, 2-methyl-	7045-71-8	7.42	NGS	14	JNT

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E - Outside Calibration Range

J - Estimated

Cartridge Evaluation
Data Summary Report

Sample Group: 20161932
SDG Number:
Customer Sample ID: 16-002-AP-IN-003H
Customer Sample ID: 16-002-AP-IN-003H

Sample#	R	A#	QC Type	Analyte	CAS No.	Retention Time (Minutes)	Unit	Result	Qual Flags
VAPOR-TDU SVOA #2									
S16T019249				Cyclotetrasiloxane, octamethyl	556-67-2	4.43	NGS	230	JNQT
S16T019249				Undecane, 4,7-dimethyl-	17301-32-5	5.13	NGS	190	JNQT
S16T019249				Decane, 2,4,6-trimethyl-	62108-27-4	5.18	NGS	81	JNQT
S16T019249				Acetic acid, trifluoro-, 3,7-d	28745-07-5	5.32	NGS	36	JNQT
S16T019249				2,3-Dimethyldecane	17312-44-6	5.47	NGS	51	JNQT
S16T019249				Undecane	1120-21-4	5.54	NGS	61	JNT
S16T019249				Undecane, 4,6-dimethyl-	17312-82-2	5.58	NGS	26	JNT
S16T019249				Decamethlycyclopentasiloxane	541-02-6	5.80	NGS	65	JNT

NA = Not Analyzed, ND = Not Detected

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Q - Qualitative

N - Named TIC

E - Outside Calibration Range

J - Estimated

Cartridge Evaluation
Data Summary Report

Sample Group: 20161929
SDG Number:
Customer Sample ID: 16-001-AP-EF-003A
Customer Sample ID: 16-001-AP-EF-003A

Sample#	R	A#	QC Type	Analyte	CAS No.	Retention Time (Minutes)	Unit	Result	Qual Flags
VAPOR-TDU SVOA #2									
S16T019243				Cyclotetrasiloxane, octamethyl	556-67-2	4.44	NGS	290	JNT
S16T019243				Decane, 2,4,6-trimethyl-	62108-27-4	5.13	NGS	120	JNT
S16T019243				3,3-Dimethylhexane	563-16-6	5.18	NGS	46	JNT
S16T019243				Acetophenone	98-86-2	5.25	NGS	47	JNT
S16T019243				2,3-Dimethyldecane	17312-44-6	5.47	NGS	28	JNT
S16T019243				Undecane	1120-21-4	5.53	NGS	160	JNT
S16T019243				Undecane, 2,6-dimethyl-	17301-23-4	5.58	NGS	30	JNT
S16T019243				Decamethlycyclopentasiloxane	541-02-6	5.80	NGS	93	JNT
S16T019243				Dodecane, 2,7,10-trimethyl-	74645-98-0	6.99	NGS	41	JNT
S16T019243				Dodecane,4,6-dimethyl	61141-72-8	7.35	NGS	25	JNT
S16T019243				Propanoic acid, 2-methyl-, 1-(	74381-40-1	9.27	NGS	43	JNT

Joann M. Foye
JMFoye 7/21/16

NA = Not Analyzed, ND = Not Detected

T - Tentatively Identified Compound J - Estimated N - Named TIC

Cartridge Evaluation
Data Summary Report

Sample Group: 20161929
SDG Number:
Customer Sample ID: 16-001-AP-EF-003B
Customer Sample ID: 16-001-AP-EF-003B

Sample# R	A#	QC Type	Analyte	CAS No.	Retention Time (Minutes)	Unit	Result	Qual Flags
VAPOR-TDU SVOA #2								
S16T019242			Hexanal	66-25-1	2.82	NGS	30	JNT
S16T019242			?-Pinene	80-56-8	4.07	NGS	38	JNT
S16T019242			Cyclotetrasiloxane, octamethyl	556-67-2	4.44	NGS	370	JNT
S16T019242			1-Hexanol, 2-ethyl-	104-76-7	4.89	NGS	41	JNT
S16T019242			Undecane, 4,7-dimethyl-	17301-32-5	5.13	NGS	170	JNT
S16T019242			Decane, 2,4,6-trimethyl-	62108-27-4	5.18	NGS	69	JNT
S16T019242			Ethanone, 2-(formyloxy)-1-phen	55153-12-3	5.25	NGS	41	JNT
S16T019242			Acetic acid, trifluoro-, 3,7-d	28745-07-5	5.32	NGS	33	JNT
S16T019242			2,3-Dimethyldecane	17312-44-6	5.47	NGS	43	JNT
S16T019242			Undecane	1120-21-4	5.54	NGS	260	JNT
S16T019242			Undecane, 4,6-dimethyl-	17312-82-2	5.58	NGS	34	JNT
S16T019242			Decamethlycyclopentasiloxane	541-02-6	5.80	NGS	110	JNT
S16T019242			Dodecane, 2,7,10-trimethyl-	74645-98-0	6.99	NGS	52	JNT
S16T019242			Heptadecane, 2,6,10,15-tetrame	54833-48-6	7.16	NGS	30	JNT
S16T019242			Unknown-1	--	7.35	NGS	30	JT

NA = Not Analyzed, ND = Not Detected

T - Tentatively Identified Compound J - Estimated N - Named TIC

Cartridge Evaluation
Data Summary Report

Sample Group: 20161929
SDG Number:
Customer Sample ID: 16-001-AP-EF-003BASE
Customer Sample ID: 16-001-AP-EF-003BASE

Sample#	R	A#	QC Type	Analyte	CAS No.	Retention Time (Minutes)	Unit	Result	Qual Flags
VAPOR-TDU SVOA #2									
S16T019245				3-Carene	13466-78-9	4.06	NGS	35	JNT
S16T019245				Cyclotetrasiloxane, octamethyl	556-67-2	4.44	NGS	340	JNT
S16T019245				1-Hexanol, 2-ethyl-	104-76-7	4.89	NGS	41	JNT
S16T019245				Undecane, 4,7-dimethyl-	17301-32-5	5.13	NGS	120	JNT
S16T019245				Decane, 2,4,6-trimethyl-	62108-27-4	5.18	NGS	54	JNT
S16T019245				Cyclohexane, 2-propyl-1,1,3-tr	81983-70-2	5.32	NGS	26	JNT
S16T019245				2,3-Dimethyldecane	17312-44-6	5.46	NGS	42	JNT
S16T019245				Undecane	1120-21-4	5.54	NGS	190	JNT
S16T019245				Undecane, 4,6-dimethyl-	17312-82-2	5.58	NGS	31	JNT
S16T019245				Decamethlycyclopentasiloxane	541-02-6	5.80	NGS	110	JNT
S16T019245				Unknown-1	--	6.98	NGS	41	JT
S16T019245				Propanoic acid, 2-methyl-, 1-(	74381-40-1	9.26	NGS	25	JNT

NA = Not Analyzed, ND = Not Detected

T - Tentatively Identified Compound J - Estimated N - Named TIC

Cartridge Evaluation
Data Summary Report

Sample Group: 20161929
SDG Number:
Customer Sample ID: 16-001-AP-EF-003C
Customer Sample ID: 16-001-AP-EF-003C

Sample# R	A#	QC Type	Analyte	CAS No.	Retention Time (Minutes)	Unit	Result	Qual Flags
VAPOR-TDU SVOA #2								
S16T019241			Cyclotetrasiloxane, octamethyl	556-67-2	4.44	NGS	350	JNT
S16T019241			2,6-Dimethyldecane	13150-81-7	5.13	NGS	110	JNT
S16T019241			Undecane, 4,7-dimethyl-	17301-32-5	5.18	NGS	42	JNT
S16T019241			Ethanone, 2-(formyloxy)-1-phen	55153-12-3	5.25	NGS	48	JNT
S16T019241			Benzeneacetic acid, ?-hydroxy-	4607-38-9	5.42	NGS	28	JNT
S16T019241			Undecane	1120-21-4	5.54	NGS	160	JNT
S16T019241			Decane, 2,4,6-trimethyl-	62108-27-4	5.58	NGS	29	JNT
S16T019241			Decamethlycyclopentasiloxane	541-02-6	5.81	NGS	130	JNT
S16T019241			Dodecane, 2,7,10-trimethyl-	74645-98-0	6.99	NGS	37	JNT
S16T019241			Dodecamethylcyclohexasiloxane	540-97-6	7.16	NGS	32	JNT
S16T019241			Propanoic acid, 2-methyl-, 1-(	74381-40-1	9.27	NGS	43	JNT

NA = Not Analyzed, ND = Not Detected

T - Tentatively Identified Compound J - Estimated N - Named TIC

Cartridge Evaluation
Data Summary Report

Sample Group: 20161929
SDG Number:
Customer Sample ID: 16-001-AP-EF-003D
Customer Sample ID: 16-001-AP-EF-003D

Sample#	R	A#	QC Type	Analyte	CAS No.	Retention Time (Minutes)	Unit	Result	Qual Flags
VAPOR-TDU SVOA #2									
S16T019240				Cyclotetrasiloxane, octamethyl	556-67-2	4.44	NGS	270	JNT
S16T019240				1-Hexanol, 2-ethyl-	104-76-7	4.89	NGS	31	JNT
S16T019240				Decane, 2,4,6-trimethyl-	62108-27-4	5.13	NGS	120	JNT
S16T019240				Undecane, 4,7-dimethyl-	17301-32-5	5.18	NGS	52	JNT
S16T019240				Ethanone, 2-(formyloxy)-1-phen	55153-12-3	5.25	NGS	34	JNT
S16T019240				Acetic acid, trifluoro-, 3,7-d	28745-07-5	5.32	NGS	29	JNT
S16T019240				2,3-Dimethyldecane	17312-44-6	5.47	NGS	35	JNT
S16T019240				Undecane	1120-21-4	5.54	NGS	210	JNT
S16T019240				Undecane, 4,6-dimethyl-	17312-82-2	5.58	NGS	28	JNT
S16T019240				Decamethlycyclopentasiloxane	541-02-6	5.80	NGS	65	JNT
S16T019240				Dodecane, 2,6,11-trimethyl-	31295-56-4	6.99	NGS	37	JNT

NA = Not Analyzed, ND = Not Detected

T - Tentatively Identified Compound J - Estimated N - Named TIC

Cartridge Evaluation
Data Summary Report

Sample Group: 20161929
SDG Number:
Customer Sample ID: 16-001-AP-EF-003E
Customer Sample ID: 16-001-AP-EF-003E

Sample#	R	A#	QC Type	Analyte	CAS No.	Retention Time (Minutes)	Unit	Result	Qual Flags
VAPOR-TDU SVOA #2									
S16T019239				Cyclotetrasiloxane, octamethyl	556-67-2	4.44	NGS	210	JNT
S16T019239				Undecane, 4,7-dimethyl-	17301-32-5	5.13	NGS	94	JNT
S16T019239				Decane, 2,4,6-trimethyl-	62108-27-4	5.18	NGS	40	JNT
S16T019239				2,3-Dimethyldecane	17312-44-6	5.47	NGS	26	JNT
S16T019239				Undecane	1120-21-4	5.54	NGS	140	JNT
S16T019239				Undecane, 4,6-dimethyl-	17312-82-2	5.58	NGS	25	JNT
S16T019239				Decamethlycyclopentasiloxane	541-02-6	5.80	NGS	100	JNT
S16T019239				3-Ethyl-3-methylheptane	17302-01-1	6.98	NGS	33	JNT

NA = Not Analyzed, ND = Not Detected

T - Tentatively Identified Compound J - Estimated N - Named TIC

Cartridge Evaluation
Data Summary Report

Sample Group: 20161929
SDG Number:
Customer Sample ID: 16-001-AP-EF-003F
Customer Sample ID: 16-001-AP-EF-003F

Sample#	R	A#	QC Type	Analyte	CAS No.	Retention Time (Minutes)	Unit	Result	Qual Flags
VAPOR-TDU SVOA #2									
S16T019238				Cyclotetrasiloxane, octamethyl	556-67-2	4.44	NGS	140	JNT
S16T019238				2,6-Dimethyldecane	13150-81-7	5.13	NGS	73	JNT
S16T019238				Decane, 2,4,6-trimethyl-	62108-27-4	5.18	NGS	26	JNT
S16T019238				Acetophenone	98-86-2	5.25	NGS	7.2	JNT
S16T019238				Undecane	1120-21-4	5.53	NGS	75	JNT
S16T019238				Undecane, 2,6-dimethyl-	17301-23-4	5.57	NGS	19	JNT
S16T019238				Decamethlycyclopentasiloxane	541-02-6	5.79	NGS	46	JNT

NA = Not Analyzed, ND = Not Detected

T - Tentatively Identified Compound J - Estimated N - Named TIC

Cartridge Evaluation
Data Summary Report

Sample Group: 20161929
SDG Number:
Customer Sample ID: 16-001-AP-EF-003G
Customer Sample ID: 16-001-AP-EF-003G

Sample#	R	A#	QC Type	Analyte	CAS No.	Retention Time (Minutes)	Unit	Result	Qual Flags
VAPOR-TDU SVOA #2									
S16T019237				Cyclotetrasiloxane, octamethyl	556-67-2	4.44	NGS	190	JNT
S16T019237				Undecane, 4,7-dimethyl-	17301-32-5	5.14	NGS	150	JNT
S16T019237				2,6-Dimethyldecane	13150-81-7	5.18	NGS	63	JNT
S16T019237				1-Octene, 3,7-dimethyl-	4984-01-4	5.32	NGS	31	JNT
S16T019237				2,3-Dimethyldecane	17312-44-6	5.47	NGS	31	JNT
S16T019237				Undecane	1120-21-4	5.54	NGS	180	JNT
S16T019237				Undecane, 4,6-dimethyl-	17312-82-2	5.58	NGS	31	JNT
S16T019237				Decamethlycyclopentasiloxane	541-02-6	5.80	NGS	48	JNT
S16T019237				Dodecane, 2,6,11-trimethyl-	31295-56-4	6.98	NGS	25	JNT

NA = Not Analyzed, ND = Not Detected

T - Tentatively Identified Compound J - Estimated N - Named TIC

Cartridge Evaluation
Data Summary Report

Sample Group: 20161929
SDG Number:
Customer Sample ID: 16-001-AP-IN-003H
Customer Sample ID: 16-001-AP-IN-003H

Sample# R	A#	QC Type	Analyte	CAS No.	Retention Time (Minutes)	Unit	Result	Qual Flags
VAPOR-TDU SVOA #2								
S16T019236			Cyclotrisiloxane, hexamethyl-	541-05-9	3.10	NGS	25	JNT
S16T019236			Cyclotetrasiloxane, octamethyl	556-67-2	4.44	NGS	430	JNT
S16T019236			1-Hexanol, 2-ethyl-	104-76-7	4.88	NGS	29	JNT
S16T019236			Decane, 2,4,6-trimethyl-	62108-27-4	5.07	NGS	15	JNT
S16T019236			Undecane, 4,6-dimethyl-	17312-82-2	5.13	NGS	330	JNT
S16T019236			3-Ethyl-3-methylheptane	17302-01-1	5.18	NGS	140	JNT
S16T019236			1-Undecene, 5-methyl-	74630-38-9	5.32	NGS	63	JNT
S16T019236			Acetic acid, trifluoro-, 3,7-d	28745-07-5	5.36	NGS	29	JNT
S16T019236			2-Hexyl-1-octanol	19780-79-1	5.42	NGS	27	JNT
S16T019236			2,3-Dimethyldecane	17312-44-6	5.47	NGS	70	JNT
S16T019236			Undecane	1120-21-4	5.54	NGS	70	JNT
S16T019236			Undecane, 4,7-dimethyl-	17301-32-5	5.58	NGS	30	JNT
S16T019236			Decamethlycyclopentasiloxane	541-02-6	5.80	NGS	74	JNT
S16T019236			Dodecane, 2,7,10-trimethyl-	74645-98-0	6.98	NGS	28	JNT

NA = Not Analyzed, ND = Not Detected

T - Tentatively Identified Compound J - Estimated N - Named TIC

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Cartridge Evaluation
Data Summary Report

Sample Group: 20161928
SDG Number:
Customer Sample ID: 16-002-AP-BK-004BASE
Customer Sample ID: 16-002-AP-BK-004BASE

Sample#	R	A#	CAS #	Analyte	Unit	STD %	Blank	Result	Duplicate	Average	RPD %	Spk Rec %	Det Limit	Cnt Err %	Qual Flags
VAPOR-TDU VOA #2															
S16T019234			79-34-5	1,1,2,2-Tetrachloroethane	NGS	100	<3.0	<3.0	n/a	n/a	n/a	n/a	3.0	n/a	
S16T019234			79-00-5	1,1,2-Trichloroethane	NGS	100	<2.3	<2.3	n/a	n/a	n/a	n/a	2.3	n/a	
S16T019234			75-34-3	1,1-Dichloroethane	NGS	97	<1.7	<1.7	n/a	n/a	n/a	n/a	1.7	n/a	
S16T019234			75-35-4	1,1-Dichloroethene	NGS	94	<1.7	<1.7	n/a	n/a	n/a	n/a	1.7	n/a	
S16T019234			107-06-2	1,2-Dichloroethane	NGS	100	<1.7	<1.7	n/a	n/a	n/a	n/a	1.7	n/a	
S16T019234			542-75-6	1,3-Dichloropropene (Total)	NGS	86	<1.8	<1.8	n/a	n/a	n/a	n/a	1.8	n/a	
S16T019234			106-46-7	1,4-Dichlorobenzene	NGS	110	<4.1	<4.1	n/a	n/a	n/a	n/a	4.1	n/a	
S16T019234			123-91-1	1,4-Dioxane	NGS	100	2.6	<2.0	n/a	n/a	n/a	n/a	2.0	n/a	
S16T019234			71-36-3	1-Butanol	NGS	85	<4.3	<4.3	n/a	n/a	n/a	n/a	4.3	n/a	LY
S16T019234			111-70-6	1-Heptanol	NGS	79	<9.1	<9.1	n/a	n/a	n/a	n/a	9.1	n/a	
S16T019234			71-23-8	1-Propanol	NGS	93	<8.9	<8.9	n/a	n/a	n/a	n/a	8.9	n/a	
S16T019234			108-47-4	2,4-Dimethylpyridine	NGS	87	<4.1	<4.1	n/a	n/a	n/a	n/a	4.1	n/a	
S16T019234			1708-29-8	2,5-Dihydrofuran	NGS	100	<2.2	<2.2	n/a	n/a	n/a	n/a	2.2	n/a	
S16T019234			78-93-3	2-Butanone	NGS	91	<3.1	<3.1	n/a	n/a	n/a	n/a	3.1	n/a	
S16T019234			110-43-0	2-Heptanone	NGS	100	<2.6	<2.6	n/a	n/a	n/a	n/a	2.6	n/a	
S16T019234			591-78-6	2-Hexanone	NGS	96	<2.5	<2.5	n/a	n/a	n/a	n/a	2.5	n/a	
S16T019234			534-22-5	2-Methylfuran	NGS	97	<1.3	<1.3	n/a	n/a	n/a	n/a	1.3	n/a	
S16T019234			78-94-4	3-Buten-2-one	NGS	92	<1.9	<1.9	n/a	n/a	n/a	n/a	1.9	n/a	
S16T019234			106-35-4	3-Heptanone	NGS	100	<2.7	<2.7	n/a	n/a	n/a	n/a	2.7	n/a	
S16T019234			106-68-3	3-Octanone	NGS	100	<3.3	<3.3	n/a	n/a	n/a	n/a	3.3	n/a	
S16T019234			105-42-0	4-Methyl-2-hexanone	NGS	99	<2.6	<2.6	n/a	n/a	n/a	n/a	2.6	n/a	
S16T019234			108-10-1	4-Methyl-2-Pentanone	NGS	110	<2.2	<2.2	n/a	n/a	n/a	n/a	2.2	n/a	
S16T019234			67-64-1	Acetone	NGS	90	8.4	6.3	n/a	n/a	n/a	n/a	2.8	n/a	BJ
S16T019234			75-05-8	Acetonitrile	NGS	100	2.0	1.8	n/a	n/a	n/a	n/a	1.6	n/a	BJ
S16T019234			98-86-2	Acetophenone	NGS	84	<6.2	<6.2	n/a	n/a	n/a	n/a	6.2	n/a	
S16T019234			107-13-1	Acrylonitrile	NGS	100	<2.1	<2.1	n/a	n/a	n/a	n/a	2.1	n/a	
S16T019234			107-18-6	Allyl Alcohol	NGS	87	<2.3	<2.3	n/a	n/a	n/a	n/a	2.3	n/a	

Jann Sage 7/28/16

T - Tentatively Identified Compound
J - Estimated
a - LCS Outside Range
Q - Qualitative
Y - Comment
E - Outside Calibration Range
N - Named TIC
NA = Not Analyzed, ND = Not Detected
B - Blank Contamination
L - LLS Outside Range

Cartridge Evaluation
Data Summary Report

Sample Group: 20161928
SDG Number:
Customer Sample ID: 16-002-AP-BK-004BASE
Customer Sample ID: 16-002-AP-BK-004BASE

Sample# R	A#	CAS #	Analyte	Unit	STD %	Blank	Result	Duplicate	Average	RPD %	Spk Rec %	Det Limit	Cnt Err %	Qual Flags
VAPOR-TDU VOA #2														
S16T019234		107-05-1	Allyl Chloride	NGS	87	<2.5	<2.5	n/a	n/a	n/a	n/a	2.5	n/a	
S16T019234		71-43-2	Benzene	NGS	110	2.6	<1.5	n/a	n/a	n/a	n/a	1.5	n/a	
S16T019234		100-47-0	Benzonitrile	NGS	110	<4.2	<4.2	n/a	n/a	n/a	n/a	4.2	n/a	
S16T019234		123-72-8	Butanal	NGS	95	<3.0	<3.0	n/a	n/a	n/a	n/a	3.0	n/a	
S16T019234		109-74-0	Butanenitrile	NGS	100	<2.1	<2.1	n/a	n/a	n/a	n/a	2.1	n/a	
S16T019234		56-23-5	Carbon tetrachloride	NGS	89	<1.5	<1.5	n/a	n/a	n/a	n/a	1.5	n/a	
S16T019234		108-90-7	Chlorobenzene	NGS	100	<2.5	<2.5	n/a	n/a	n/a	n/a	2.5	n/a	
S16T019234		75-00-3	Chloroethane	NGS	100	<1.6	<1.6	n/a	n/a	n/a	n/a	1.6	n/a	
S16T019234		67-66-3	Chloroform	NGS	100	<1.8	<1.8	n/a	n/a	n/a	n/a	1.8	n/a	
S16T019234		110-82-7	Cyclohexane	NGS	100	<1.4	<1.4	n/a	n/a	n/a	n/a	1.4	n/a	
S16T019234		124-18-5	Decane	NGS	110	<3.3	<3.3	n/a	n/a	n/a	n/a	3.3	n/a	
S16T019234		64-17-5	Ethanol	NGS	71	11	8.8	n/a	n/a	n/a	n/a	3.7	n/a	BJ
S16T019234		141-78-6	Ethyl acetate	NGS	94	<1.8	<1.8	n/a	n/a	n/a	n/a	1.8	n/a	
S16T019234		100-41-4	Ethylbenzene	NGS	110	<2.4	<2.4	n/a	n/a	n/a	n/a	2.4	n/a	
S16T019234		110-00-9	Furan	NGS	94	<1.6	<1.6	n/a	n/a	n/a	n/a	1.6	n/a	
S16T019234		110-54-3	Hexane	NGS	99	<1.3	<1.3	n/a	n/a	n/a	n/a	1.3	n/a	
S16T019234		628-73-9	Hexanenitrile	NGS	100	<2.6	<2.6	n/a	n/a	n/a	n/a	2.6	n/a	
S16T019234		126-98-7	Methacrylonitrile	NGS	100	<1.8	<1.8	n/a	n/a	n/a	n/a	1.8	n/a	
S16T019234		75-09-2	Methylene Chloride	NGS	94	<4.1	<4.1	n/a	n/a	n/a	n/a	4.1	n/a	
S16T019234		91-20-3	Naphthalene	NGS	110	<5.3	<5.3	n/a	n/a	n/a	n/a	5.3	n/a	
S16T019234		98-95-3	Nitrobenzene	NGS	43	<4.7	<4.7	n/a	n/a	n/a	n/a	4.7	n/a	LQa
S16T019234		110-59-8	Pentanenitrile	NGS	100	<2.6	<2.6	n/a	n/a	n/a	n/a	2.6	n/a	
S16T019234		107-12-0	Propanenitrile	NGS	100	<1.8	<1.8	n/a	n/a	n/a	n/a	1.8	n/a	
S16T019234		110-86-1	Pyridine	NGS	98	<2.8	<2.8	n/a	n/a	n/a	n/a	2.8	n/a	
S16T019234		100-42-5	Styrene	NGS	100	<2.7	<2.7	n/a	n/a	n/a	n/a	2.7	n/a	
S16T019234		127-18-4	Tetrachloroethene	NGS	100	<1.8	<1.8	n/a	n/a	n/a	n/a	1.8	n/a	
S16T019234		108-88-3	Toluene	NGS	110	<2.2	<2.2	n/a	n/a	n/a	n/a	2.2	n/a	

NA = Not Analyzed, ND = Not Detected

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J - Estimated
a - LCS Outside Range
Q - Qualitative
Y - Comment
E - Outside Calibration Range
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B - Blank Contamination
L - LLS Outside Range

Cartridge Evaluation
Data Summary Report

Sample Group: 20161928
SDG Number:
Customer Sample ID: 16-002-AP-BK-004BASE
Customer Sample ID: 16-002-AP-BK-004BASE

Sample#	R	A#	CAS #	Analyte	Unit	STD %	Blank	Result	Duplicate	Average	RPD %	Spk Rec %	Det Limit	Cnt Err %	Qual Flags
VAPOR-TDU VOA #2															
S16T019234			79-01-6	Trichloroethene	NGS	100	<1.6	<1.6	n/a	n/a	n/a	n/a	1.6	n/a	
S16T019234			75-69-4	Trichlorofluoromethane	NGS	100	<1.9	<1.9	n/a	n/a	n/a	n/a	1.9	n/a	
S16T019234			10061-01-5	cis-1,3-Dichloropropene	NGS	86	<1.8	<1.8	n/a	n/a	n/a	n/a	1.8	n/a	
S16T019234			123-86-4	n-Butyl acetate	NGS	92	<2.4	<2.4	n/a	n/a	n/a	n/a	2.4	n/a	
S16T019234			142-82-5	n-Heptane	NGS	100	<1.6	<1.6	n/a	n/a	n/a	n/a	1.6	n/a	
S16T019234			10061-02-6	trans-1,3-Dichloropropene	NGS	85	<2.1	<2.1	n/a	n/a	n/a	n/a	2.1	n/a	

T - Tentatively Identified Compound
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NA = Not Analyzed, ND = Not Detected
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Cartridge Evaluation
Data Summary Report

Sample Group: 20161928
SDG Number:
Customer Sample ID: 16-002-AP-EF-004A
Customer Sample ID: 16-002-AP-EF-004A

Sample# R	A#	CAS #	Analyte	Unit	STD %	Blank	Result	Duplicate	Average	RPD %	Spk Rec %	Det Limit	Cnt Err %	Qual Flags
VAPOR-TDU VOA #2														
S16T019230		79-34-5	1,1,2,2-Tetrachloroethane	NGS	100	<3.0	<3.0	n/a	n/a	n/a	n/a	3.0	n/a	
S16T019230		79-00-5	1,1,2-Trichloroethane	NGS	100	<2.3	<2.3	n/a	n/a	n/a	n/a	2.3	n/a	
S16T019230		75-34-3	1,1-Dichloroethane	NGS	97	<1.7	<1.7	n/a	n/a	n/a	n/a	1.7	n/a	
S16T019230		75-35-4	1,1-Dichloroethene	NGS	94	<1.7	<1.7	n/a	n/a	n/a	n/a	1.7	n/a	
S16T019230		107-06-2	1,2-Dichloroethane	NGS	100	<1.7	<1.7	n/a	n/a	n/a	n/a	1.7	n/a	
S16T019230		542-75-6	1,3-Dichloropropene (Total)	NGS	86	<1.8	<1.8	n/a	n/a	n/a	n/a	1.8	n/a	
S16T019230		106-46-7	1,4-Dichlorobenzene	NGS	110	<4.1	<4.1	n/a	n/a	n/a	n/a	4.1	n/a	
S16T019230		123-91-1	1,4-Dioxane	NGS	100	2.6	8.0	n/a	n/a	n/a	n/a	2.0	n/a	BJ
S16T019230		71-36-3	1-Butanol	NGS	85	<4.3	620	n/a	n/a	n/a	n/a	4.3	n/a	LY
S16T019230		111-70-6	1-Heptanol	NGS	79	<9.1	<9.1	n/a	n/a	n/a	n/a	9.1	n/a	
S16T019230		71-23-8	1-Propanol	NGS	93	<8.9	120	n/a	n/a	n/a	n/a	8.9	n/a	
S16T019230		108-47-4	2,4-Dimethylpyridine	NGS	87	<4.1	<4.1	n/a	n/a	n/a	n/a	4.1	n/a	
S16T019230		1708-29-8	2,5-Dihydrofuran	NGS	100	<2.2	<2.2	n/a	n/a	n/a	n/a	2.2	n/a	
S16T019230		78-93-3	2-Butanone	NGS	91	<3.1	7.4	n/a	n/a	n/a	n/a	3.1	n/a	J
S16T019230		110-43-0	2-Heptanone	NGS	100	<2.6	7.3	n/a	n/a	n/a	n/a	2.6	n/a	J
S16T019230		591-78-6	2-Hexanone	NGS	96	<2.5	6.1	n/a	n/a	n/a	n/a	2.5	n/a	J
S16T019230		534-22-5	2-Methylfuran	NGS	97	<1.3	<1.3	n/a	n/a	n/a	n/a	1.3	n/a	
S16T019230		78-94-4	3-Buten-2-one	NGS	92	<1.9	4.1	n/a	n/a	n/a	n/a	1.9	n/a	J
S16T019230		106-35-4	3-Heptanone	NGS	100	<2.7	7.8	n/a	n/a	n/a	n/a	2.7	n/a	J
S16T019230		106-68-3	3-Octanone	NGS	100	<3.3	<3.3	n/a	n/a	n/a	n/a	3.3	n/a	
S16T019230		105-42-0	4-Methyl-2-hexanone	NGS	99	<2.6	<2.6	n/a	n/a	n/a	n/a	2.6	n/a	
S16T019230		108-10-1	4-Methyl-2-Pentanone	NGS	110	<2.2	11	n/a	n/a	n/a	n/a	2.2	n/a	J
S16T019230		67-64-1	Acetone	NGS	90	8.4	590	n/a	n/a	n/a	n/a	2.8	n/a	BE
S16T019230		75-05-8	Acetonitrile	NGS	100	2.0	47	n/a	n/a	n/a	n/a	1.6	n/a	B
S16T019230		98-86-2	Acetophenone	NGS	84	<6.2	21	n/a	n/a	n/a	n/a	6.2	n/a	
S16T019230		107-13-1	Acrylonitrile	NGS	100	<2.1	<2.1	n/a	n/a	n/a	n/a	2.1	n/a	
S16T019230		107-18-6	Allyl Alcohol	NGS	87	<2.3	<2.3	n/a	n/a	n/a	n/a	2.3	n/a	

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Cartridge Evaluation
Data Summary Report

Sample Group: 20161928
SDG Number:
Customer Sample ID: 16-002-AP-EF-004A
Customer Sample ID: 16-002-AP-EF-004A

Sample# R	A#	CAS #	Analyte	Unit	STD %	Blank	Result	Duplicate	Average	RPD %	Spk Rec %	Det Limit	Cnt Err %	Qual Flags
VAPOR-TDU VOA #2														
S16T019230		107-05-1	Allyl Chloride	NGS	87	<2.5	<2.5	n/a	n/a	n/a	n/a	2.5	n/a	
S16T019230		71-43-2	Benzene	NGS	110	2.6	5.9	n/a	n/a	n/a	n/a	1.5	n/a	BJ
S16T019230		100-47-0	Benzonitrile	NGS	110	<4.2	<4.2	n/a	n/a	n/a	n/a	4.2	n/a	
S16T019230		123-72-8	Butanal	NGS	95	<3.0	11	n/a	n/a	n/a	n/a	3.0	n/a	J
S16T019230		109-74-0	Butanenitrile	NGS	100	<2.1	3.4	n/a	n/a	n/a	n/a	2.1	n/a	J
S16T019230		56-23-5	Carbon tetrachloride	NGS	89	<1.5	<1.5	n/a	n/a	n/a	n/a	1.5	n/a	
S16T019230		108-90-7	Chlorobenzene	NGS	100	<2.5	<2.5	n/a	n/a	n/a	n/a	2.5	n/a	
S16T019230		75-00-3	Chloroethane	NGS	100	<1.6	<1.6	n/a	n/a	n/a	n/a	1.6	n/a	
S16T019230		67-66-3	Chloroform	NGS	100	<1.8	<1.8	n/a	n/a	n/a	n/a	1.8	n/a	
S16T019230		110-82-7	Cyclohexane	NGS	100	<1.4	<1.4	n/a	n/a	n/a	n/a	1.4	n/a	
S16T019230		124-18-5	Decane	NGS	110	<3.3	<3.3	n/a	n/a	n/a	n/a	3.3	n/a	
S16T019230		64-17-5	Ethanol	NGS	71	11	470	n/a	n/a	n/a	n/a	3.7	n/a	B
S16T019230		141-78-6	Ethyl acetate	NGS	94	<1.8	<1.8	n/a	n/a	n/a	n/a	1.8	n/a	
S16T019230		100-41-4	Ethylbenzene	NGS	110	<2.4	3.4	n/a	n/a	n/a	n/a	2.4	n/a	J
S16T019230		110-00-9	Furan	NGS	94	<1.6	41	n/a	n/a	n/a	n/a	1.6	n/a	
S16T019230		110-54-3	Hexane	NGS	99	<1.3	<1.3	n/a	n/a	n/a	n/a	1.3	n/a	
S16T019230		628-73-9	Hexanenitrile	NGS	100	<2.6	<2.6	n/a	n/a	n/a	n/a	2.6	n/a	
S16T019230		126-98-7	Methacrylonitrile	NGS	100	<1.8	<1.8	n/a	n/a	n/a	n/a	1.8	n/a	
S16T019230		75-09-2	Methylene Chloride	NGS	94	<4.1	<4.1	n/a	n/a	n/a	n/a	4.1	n/a	
S16T019230		91-20-3	Naphthalene	NGS	110	<5.3	<5.3	n/a	n/a	n/a	n/a	5.3	n/a	
S16T019230		98-95-3	Nitrobenzene	NGS	43	<4.7	<4.7	n/a	n/a	n/a	n/a	4.7	n/a	LQa
S16T019230		110-59-8	Pentanenitrile	NGS	100	<2.6	<2.6	n/a	n/a	n/a	n/a	2.6	n/a	
S16T019230		107-12-0	Propanenitrile	NGS	100	<1.8	3.7	n/a	n/a	n/a	n/a	1.8	n/a	J
S16T019230		110-86-1	Pyridine	NGS	98	<2.8	<2.8	n/a	n/a	n/a	n/a	2.8	n/a	
S16T019230		100-42-5	Styrene	NGS	100	<2.7	2.8	n/a	n/a	n/a	n/a	2.7	n/a	J
S16T019230		127-18-4	Tetrachloroethene	NGS	100	<1.8	17	n/a	n/a	n/a	n/a	1.8	n/a	
S16T019230		108-88-3	Toluene	NGS	110	<2.2	430	n/a	n/a	n/a	n/a	2.2	n/a	E

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Cartridge Evaluation
Data Summary Report

Sample Group: 20161928
SDG Number:
Customer Sample ID: 16-002-AP-EF-004A
Customer Sample ID: 16-002-AP-EF-004A

Sample#	R	A#	CAS #	Analyte	Unit	STD %	Blank	Result	Duplicate	Average	RPD %	Spk Rec %	Det Limit	Cnt Err %	Qual Flags
VAPOR-TDU VOA #2															
S16T019230			79-01-6	Trichloroethene	NGS	100	<1.6	<1.6	n/a	n/a	n/a	n/a	1.6	n/a	
S16T019230			75-69-4	Trichlorofluoromethane	NGS	100	<1.9	19	n/a	n/a	n/a	n/a	1.9	n/a	
S16T019230			10061-01-5	cis-1,3-Dichloropropene	NGS	86	<1.8	<1.8	n/a	n/a	n/a	n/a	1.8	n/a	
S16T019230			123-86-4	n-Butyl acetate	NGS	92	<2.4	<2.4	n/a	n/a	n/a	n/a	2.4	n/a	
S16T019230			142-82-5	n-Heptane	NGS	100	<1.6	<1.6	n/a	n/a	n/a	n/a	1.6	n/a	
S16T019230			10061-02-6	trans-1,3-Dichloropropene	NGS	85	<2.1	<2.1	n/a	n/a	n/a	n/a	2.1	n/a	

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Cartridge Evaluation
Data Summary Report

Sample Group: 20161928
SDG Number:
Customer Sample ID: 16-002-AP-EF-004B
Customer Sample ID: 16-002-AP-EF-004B

Sample# R	A#	CAS #	Analyte	Unit	STD %	Blank	Result	Duplicate	Average	RPD %	Spk Rec %	Det Limit	Cnt Err %	Qual Flags
VAPOR-TDU VOA #2														
S16T019229		79-34-5	1,1,2,2-Tetrachloroethane	NGS	100	<3.0	<3.0	n/a	n/a	n/a	n/a	3.0	n/a	
S16T019229		79-00-5	1,1,2-Trichloroethane	NGS	100	<2.3	<2.3	n/a	n/a	n/a	n/a	2.3	n/a	
S16T019229		75-34-3	1,1-Dichloroethane	NGS	97	<1.7	<1.7	n/a	n/a	n/a	n/a	1.7	n/a	
S16T019229		75-35-4	1,1-Dichloroethene	NGS	94	<1.7	<1.7	n/a	n/a	n/a	n/a	1.7	n/a	
S16T019229		107-06-2	1,2-Dichloroethane	NGS	100	<1.7	<1.7	n/a	n/a	n/a	n/a	1.7	n/a	
S16T019229		542-75-6	1,3-Dichloropropene (Total)	NGS	86	<1.8	<1.8	n/a	n/a	n/a	n/a	1.8	n/a	
S16T019229		106-46-7	1,4-Dichlorobenzene	NGS	110	<4.1	<4.1	n/a	n/a	n/a	n/a	4.1	n/a	
S16T019229		123-91-1	1,4-Dioxane	NGS	100	2.6	2.0	n/a	n/a	n/a	n/a	2.0	n/a	BJ
S16T019229		71-36-3	1-Butanol	NGS	85	<4.3	<4.3	n/a	n/a	n/a	n/a	4.3	n/a	LY
S16T019229		111-70-6	1-Heptanol	NGS	79	<9.1	<9.1	n/a	n/a	n/a	n/a	9.1	n/a	
S16T019229		71-23-8	1-Propanol	NGS	93	<8.9	<8.9	n/a	n/a	n/a	n/a	8.9	n/a	
S16T019229		108-47-4	2,4-Dimethylpyridine	NGS	87	<4.1	<4.1	n/a	n/a	n/a	n/a	4.1	n/a	
S16T019229		1708-29-8	2,5-Dihydrofuran	NGS	100	<2.2	<2.2	n/a	n/a	n/a	n/a	2.2	n/a	
S16T019229		78-93-3	2-Butanone	NGS	91	<3.1	4.8	n/a	n/a	n/a	n/a	3.1	n/a	J
S16T019229		110-43-0	2-Heptanone	NGS	100	<2.6	<2.6	n/a	n/a	n/a	n/a	2.6	n/a	
S16T019229		591-78-6	2-Hexanone	NGS	96	<2.5	<2.5	n/a	n/a	n/a	n/a	2.5	n/a	
S16T019229		534-22-5	2-Methylfuran	NGS	97	<1.3	<1.3	n/a	n/a	n/a	n/a	1.3	n/a	
S16T019229		78-94-4	3-Buten-2-one	NGS	92	<1.9	3.4	n/a	n/a	n/a	n/a	1.9	n/a	J
S16T019229		106-35-4	3-Heptanone	NGS	100	<2.7	<2.7	n/a	n/a	n/a	n/a	2.7	n/a	
S16T019229		106-68-3	3-Octanone	NGS	100	<3.3	<3.3	n/a	n/a	n/a	n/a	3.3	n/a	
S16T019229		105-42-0	4-Methyl-2-hexanone	NGS	99	<2.6	<2.6	n/a	n/a	n/a	n/a	2.6	n/a	
S16T019229		108-10-1	4-Methyl-2-Pentanone	NGS	110	<2.2	<2.2	n/a	n/a	n/a	n/a	2.2	n/a	
S16T019229		67-64-1	Acetone	NGS	90	8.4	45	n/a	n/a	n/a	n/a	2.8	n/a	B
S16T019229		75-05-8	Acetonitrile	NGS	100	2.0	420	n/a	n/a	n/a	n/a	1.6	n/a	BE
S16T019229		98-86-2	Acetophenone	NGS	84	<6.2	21	n/a	n/a	n/a	n/a	6.2	n/a	
S16T019229		107-13-1	Acrylonitrile	NGS	100	<2.1	<2.1	n/a	n/a	n/a	n/a	2.1	n/a	
S16T019229		107-18-6	Allyl Alcohol	NGS	87	<2.3	<2.3	n/a	n/a	n/a	n/a	2.3	n/a	

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Cartridge Evaluation
Data Summary Report

Sample Group: 20161928
SDG Number:
Customer Sample ID: 16-002-AP-EF-004B
Customer Sample ID: 16-002-AP-EF-004B

Sample#	R	A#	CAS #	Analyte	Unit	STD %	Blank	Result	Duplicate	Average	RPD %	Spk Rec %	Det Limit	Cnt Err %	Qual Flags
VAPOR-TDU VOA #2															
S16T019229			107-05-1	Allyl Chloride	NGS	87	<2.5	<2.5	n/a	n/a	n/a	n/a	2.5	n/a	
S16T019229			71-43-2	Benzene	NGS	110	2.6	8.8	n/a	n/a	n/a	n/a	1.5	n/a	BJ
S16T019229			100-47-0	Benzonitrile	NGS	110	<4.2	<4.2	n/a	n/a	n/a	n/a	4.2	n/a	
S16T019229			123-72-8	Butanal	NGS	95	<3.0	<3.0	n/a	n/a	n/a	n/a	3.0	n/a	
S16T019229			109-74-0	Butanenitrile	NGS	100	<2.1	3.0	n/a	n/a	n/a	n/a	2.1	n/a	J
S16T019229			56-23-5	Carbon tetrachloride	NGS	89	<1.5	<1.5	n/a	n/a	n/a	n/a	1.5	n/a	
S16T019229			108-90-7	Chlorobenzene	NGS	100	<2.5	<2.5	n/a	n/a	n/a	n/a	2.5	n/a	
S16T019229			75-00-3	Chloroethane	NGS	100	<1.6	2.0	n/a	n/a	n/a	n/a	1.6	n/a	J
S16T019229			67-66-3	Chloroform	NGS	100	<1.8	<1.8	n/a	n/a	n/a	n/a	1.8	n/a	
S16T019229			110-82-7	Cyclohexane	NGS	100	<1.4	5.6	n/a	n/a	n/a	n/a	1.4	n/a	J
S16T019229			124-18-5	Decane	NGS	110	<3.3	5.2	n/a	n/a	n/a	n/a	3.3	n/a	J
S16T019229			64-17-5	Ethanol	NGS	71	11	42	n/a	n/a	n/a	n/a	3.7	n/a	B
S16T019229			141-78-6	Ethyl acetate	NGS	94	<1.8	<1.8	n/a	n/a	n/a	n/a	1.8	n/a	
S16T019229			100-41-4	Ethylbenzene	NGS	110	<2.4	2.9	n/a	n/a	n/a	n/a	2.4	n/a	J
S16T019229			110-00-9	Furan	NGS	94	<1.6	<1.6	n/a	n/a	n/a	n/a	1.6	n/a	
S16T019229			110-54-3	Hexane	NGS	99	<1.3	16	n/a	n/a	n/a	n/a	1.3	n/a	
S16T019229			628-73-9	Hexanenitrile	NGS	100	<2.6	<2.6	n/a	n/a	n/a	n/a	2.6	n/a	
S16T019229			126-98-7	Methacrylonitrile	NGS	100	<1.8	<1.8	n/a	n/a	n/a	n/a	1.8	n/a	
S16T019229			75-09-2	Methylene Chloride	NGS	94	<4.1	5.2	n/a	n/a	n/a	n/a	4.1	n/a	J
S16T019229			91-20-3	Naphthalene	NGS	110	<5.3	<5.3	n/a	n/a	n/a	n/a	5.3	n/a	
S16T019229			98-95-3	Nitrobenzene	NGS	43	<4.7	<4.7	n/a	n/a	n/a	n/a	4.7	n/a	LQa
S16T019229			110-59-8	Pentanenitrile	NGS	100	<2.6	<2.6	n/a	n/a	n/a	n/a	2.6	n/a	
S16T019229			107-12-0	Propanenitrile	NGS	100	<1.8	<1.8	n/a	n/a	n/a	n/a	1.8	n/a	
S16T019229			110-86-1	Pyridine	NGS	98	<2.8	<2.8	n/a	n/a	n/a	n/a	2.8	n/a	
S16T019229			100-42-5	Styrene	NGS	100	<2.7	<2.7	n/a	n/a	n/a	n/a	2.7	n/a	
S16T019229			127-18-4	Tetrachloroethene	NGS	100	<1.8	70	n/a	n/a	n/a	n/a	1.8	n/a	
S16T019229			108-88-3	Toluene	NGS	110	<2.2	24	n/a	n/a	n/a	n/a	2.2	n/a	

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Q - Qualitative
Y - Comment

E - Outside Calibration Range
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B - Blank Contamination
L - LLS Outside Range

Cartridge Evaluation
Data Summary Report

Sample Group: 20161928
SDG Number:
Customer Sample ID: 16-002-AP-EF-004B
Customer Sample ID: 16-002-AP-EF-004B

Sample#	R	A#	CAS #	Analyte	Unit	STD %	Blank	Result	Duplicate	Average	RPD %	Spk Rec %	Det Limit	Cnt Err %	Qual Flags
VAPOR-TDU VOA #2															
S16T019229			79-01-6	Trichloroethene	NGS	100	<1.6	<1.6	n/a	n/a	n/a	n/a	1.6	n/a	
S16T019229			75-69-4	Trichlorofluoromethane	NGS	100	<1.9	4.1	n/a	n/a	n/a	n/a	1.9	n/a	J
S16T019229			10061-01-5	cis-1,3-Dichloropropene	NGS	86	<1.8	<1.8	n/a	n/a	n/a	n/a	1.8	n/a	
S16T019229			123-86-4	n-Butyl acetate	NGS	92	<2.4	<2.4	n/a	n/a	n/a	n/a	2.4	n/a	
S16T019229			142-82-5	n-Heptane	NGS	100	<1.6	<1.6	n/a	n/a	n/a	n/a	1.6	n/a	
S16T019229			10061-02-6	trans-1,3-Dichloropropene	NGS	85	<2.1	<2.1	n/a	n/a	n/a	n/a	2.1	n/a	

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L - LLS Outside Range

Cartridge Evaluation
Data Summary Report

Sample Group: 20161928
SDG Number:
Customer Sample ID: 16-002-AP-EF-004BASE
Customer Sample ID: 16-002-AP-EF-004BASE

Sample# R	A#	CAS #	Analyte	Unit	STD %	Blank	Result	Duplicate	Average	RPD %	Spk Rec %	Det Limit	Cnt Err %	Qual Flags
VAPOR-TDU VOA #2														
S16T019232		79-34-5	1,1,2,2-Tetrachloroethane	NGS	100	<3.0	<3.0	n/a	n/a	n/a	n/a	3.0	n/a	
S16T019232		79-00-5	1,1,2-Trichloroethane	NGS	100	<2.3	<2.3	n/a	n/a	n/a	n/a	2.3	n/a	
S16T019232		75-34-3	1,1-Dichloroethane	NGS	97	<1.7	<1.7	n/a	n/a	n/a	n/a	1.7	n/a	
S16T019232		75-35-4	1,1-Dichloroethene	NGS	94	<1.7	<1.7	n/a	n/a	n/a	n/a	1.7	n/a	
S16T019232		107-06-2	1,2-Dichloroethane	NGS	100	<1.7	<1.7	n/a	n/a	n/a	n/a	1.7	n/a	
S16T019232		542-75-6	1,3-Dichloropropene (Total)	NGS	86	<1.8	<1.8	n/a	n/a	n/a	n/a	1.8	n/a	
S16T019232		106-46-7	1,4-Dichlorobenzene	NGS	110	<4.1	<4.1	n/a	n/a	n/a	n/a	4.1	n/a	
S16T019232		123-91-1	1,4-Dioxane	NGS	100	2.6	<2.0	n/a	n/a	n/a	n/a	2.0	n/a	
S16T019232		71-36-3	1-Butanol	NGS	85	<4.3	<4.3	n/a	n/a	n/a	n/a	4.3	n/a	LY
S16T019232		111-70-6	1-Heptanol	NGS	79	<9.1	<9.1	n/a	n/a	n/a	n/a	9.1	n/a	
S16T019232		71-23-8	1-Propanol	NGS	93	<8.9	<8.9	n/a	n/a	n/a	n/a	8.9	n/a	
S16T019232		108-47-4	2,4-Dimethylpyridine	NGS	87	<4.1	<4.1	n/a	n/a	n/a	n/a	4.1	n/a	
S16T019232		1708-29-8	2,5-Dihydrofuran	NGS	100	<2.2	<2.2	n/a	n/a	n/a	n/a	2.2	n/a	
S16T019232		78-93-3	2-Butanone	NGS	91	<3.1	4.6	n/a	n/a	n/a	n/a	3.1	n/a	J
S16T019232		110-43-0	2-Heptanone	NGS	100	<2.6	<2.6	n/a	n/a	n/a	n/a	2.6	n/a	
S16T019232		591-78-6	2-Hexanone	NGS	96	<2.5	<2.5	n/a	n/a	n/a	n/a	2.5	n/a	
S16T019232		534-22-5	2-Methylfuran	NGS	97	<1.3	<1.3	n/a	n/a	n/a	n/a	1.3	n/a	
S16T019232		78-94-4	3-Buten-2-one	NGS	92	<1.9	2.6	n/a	n/a	n/a	n/a	1.9	n/a	J
S16T019232		106-35-4	3-Heptanone	NGS	100	<2.7	<2.7	n/a	n/a	n/a	n/a	2.7	n/a	
S16T019232		106-68-3	3-Octanone	NGS	100	<3.3	<3.3	n/a	n/a	n/a	n/a	3.3	n/a	
S16T019232		105-42-0	4-Methyl-2-hexanone	NGS	99	<2.6	<2.6	n/a	n/a	n/a	n/a	2.6	n/a	
S16T019232		108-10-1	4-Methyl-2-Pentanone	NGS	110	<2.2	<2.2	n/a	n/a	n/a	n/a	2.2	n/a	
S16T019232		67-64-1	Acetone	NGS	90	8.4	42	n/a	n/a	n/a	n/a	2.8	n/a	B
S16T019232		75-05-8	Acetonitrile	NGS	100	2.0	21	n/a	n/a	n/a	n/a	1.6	n/a	B
S16T019232		98-86-2	Acetophenone	NGS	84	<6.2	13	n/a	n/a	n/a	n/a	6.2	n/a	
S16T019232		107-13-1	Acrylonitrile	NGS	100	<2.1	<2.1	n/a	n/a	n/a	n/a	2.1	n/a	
S16T019232		107-18-6	Allyl Alcohol	NGS	87	<2.3	<2.3	n/a	n/a	n/a	n/a	2.3	n/a	

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Cartridge Evaluation
Data Summary Report

Sample Group: 20161928
SDG Number:
Customer Sample ID: 16-002-AP-EF-004BASE
Customer Sample ID: 16-002-AP-EF-004BASE

Sample#	R	A#	CAS #	Analyte	Unit	STD %	Blank	Result	Duplicate	Average	RPD %	Spk Rec %	Det Limit	Cnt Err %	Qual Flags
VAPOR-TDU VOA #2															
S16T019232			107-05-1	Allyl Chloride	NGS	87	<2.5	<2.5	n/a	n/a	n/a	n/a	2.5	n/a	
S16T019232			71-43-2	Benzene	NGS	110	2.6	3.2	n/a	n/a	n/a	n/a	1.5	n/a	BJ
S16T019232			100-47-0	Benzonitrile	NGS	110	<4.2	<4.2	n/a	n/a	n/a	n/a	4.2	n/a	
S16T019232			123-72-8	Butanal	NGS	95	<3.0	<3.0	n/a	n/a	n/a	n/a	3.0	n/a	
S16T019232			109-74-0	Butanenitrile	NGS	100	<2.1	<2.1	n/a	n/a	n/a	n/a	2.1	n/a	
S16T019232			56-23-5	Carbon tetrachloride	NGS	89	<1.5	<1.5	n/a	n/a	n/a	n/a	1.5	n/a	
S16T019232			108-90-7	Chlorobenzene	NGS	100	<2.5	<2.5	n/a	n/a	n/a	n/a	2.5	n/a	
S16T019232			75-00-3	Chloroethane	NGS	100	<1.6	<1.6	n/a	n/a	n/a	n/a	1.6	n/a	
S16T019232			67-66-3	Chloroform	NGS	100	<1.8	<1.8	n/a	n/a	n/a	n/a	1.8	n/a	
S16T019232			110-82-7	Cyclohexane	NGS	100	<1.4	1.9	n/a	n/a	n/a	n/a	1.4	n/a	J
S16T019232			124-18-5	Decane	NGS	110	<3.3	9.9	n/a	n/a	n/a	n/a	3.3	n/a	J
S16T019232			64-17-5	Ethanol	NGS	71	11	15	n/a	n/a	n/a	n/a	3.7	n/a	BJ
S16T019232			141-78-6	Ethyl acetate	NGS	94	<1.8	<1.8	n/a	n/a	n/a	n/a	1.8	n/a	
S16T019232			100-41-4	Ethylbenzene	NGS	110	<2.4	<2.4	n/a	n/a	n/a	n/a	2.4	n/a	
S16T019232			110-00-9	Furan	NGS	94	<1.6	<1.6	n/a	n/a	n/a	n/a	1.6	n/a	
S16T019232			628-73-9	Hexanenitrile	NGS	100	<2.6	<2.6	n/a	n/a	n/a	n/a	2.6	n/a	
S16T019232			126-98-7	Methacrylonitrile	NGS	100	<1.8	<1.8	n/a	n/a	n/a	n/a	1.8	n/a	
S16T019232			75-09-2	Methylene Chloride	NGS	94	<4.1	9.8	n/a	n/a	n/a	n/a	4.1	n/a	J
S16T019232			91-20-3	Naphthalene	NGS	110	<5.3	<5.3	n/a	n/a	n/a	n/a	5.3	n/a	
S16T019232			98-95-3	Nitrobenzene	NGS	43	<4.7	<4.7	n/a	n/a	n/a	n/a	4.7	n/a	LQa
S16T019232			110-59-8	Pentanenitrile	NGS	100	<2.6	<2.6	n/a	n/a	n/a	n/a	2.6	n/a	
S16T019232			107-12-0	Propanenitrile	NGS	100	<1.8	<1.8	n/a	n/a	n/a	n/a	1.8	n/a	
S16T019232			110-86-1	Pyridine	NGS	98	<2.8	<2.8	n/a	n/a	n/a	n/a	2.8	n/a	
S16T019232			100-42-5	Styrene	NGS	100	<2.7	5.3	n/a	n/a	n/a	n/a	2.7	n/a	J
S16T019232			127-18-4	Tetrachloroethene	NGS	100	<1.8	80	n/a	n/a	n/a	n/a	1.8	n/a	
S16T019232			108-88-3	Toluene	NGS	110	<2.2	18	n/a	n/a	n/a	n/a	2.2	n/a	
S16T019232			79-01-6	Trichloroethene	NGS	100	<1.6	<1.6	n/a	n/a	n/a	n/a	1.6	n/a	

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Cartridge Evaluation
Data Summary Report

Sample Group: 20161928
SDG Number:
Customer Sample ID: 16-002-AP-EF-004BASE
Customer Sample ID: 16-002-AP-EF-004BASE

Sample# R	A#	CAS #	Analyte	Unit	STD %	Blank	Result	Duplicate	Average	RPD %	Spk Rec %	Det Limit	Cnt Err %	Qual Flags
VAPOR-TDU VOA #2														
S16T019232		75-69-4	Trichlorofluoromethane	NGS	100	<1.9	<1.9	n/a	n/a	n/a	n/a	1.9	n/a	
S16T019232		10061-01-5	cis-1,3-Dichloropropene	NGS	86	<1.8	<1.8	n/a	n/a	n/a	n/a	1.8	n/a	
S16T019232		123-86-4	n-Butyl acetate	NGS	92	<2.4	3.7	n/a	n/a	n/a	n/a	2.4	n/a	J
S16T019232		142-82-5	n-Heptane	NGS	100	<1.6	<1.6	n/a	n/a	n/a	n/a	1.6	n/a	
S16T019232		10061-02-6	trans-1,3-Dichloropropene	NGS	85	<2.1	<2.1	n/a	n/a	n/a	n/a	2.1	n/a	

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Cartridge Evaluation
Data Summary Report

Sample Group: 20161928
SDG Number:
Customer Sample ID: 16-002-AP-EF-004C
Customer Sample ID: 16-002-AP-EF-004C

Sample#	R	A#	CAS #	Analyte	Unit	STD %	Blank	Result	Duplicate	Average	RPD %	Spk Rec %	Det Limit	Cnt Err %	Qual Flags
VAPOR-TDU VOA #2															
S16T019228			79-34-5	1,1,2,2-Tetrachloroethane	NGS	100	<3.0	<3.0	n/a	n/a	n/a	n/a	3.0	n/a	
S16T019228			79-00-5	1,1,2-Trichloroethane	NGS	100	<2.3	<2.3	n/a	n/a	n/a	n/a	2.3	n/a	
S16T019228			75-34-3	1,1-Dichloroethane	NGS	97	<1.7	<1.7	n/a	n/a	n/a	n/a	1.7	n/a	
S16T019228			75-35-4	1,1-Dichloroethene	NGS	94	<1.7	<1.7	n/a	n/a	n/a	n/a	1.7	n/a	
S16T019228			107-06-2	1,2-Dichloroethane	NGS	100	<1.7	<1.7	n/a	n/a	n/a	n/a	1.7	n/a	
S16T019228			542-75-6	1,3-Dichloropropene (Total)	NGS	86	<1.8	<1.8	n/a	n/a	n/a	n/a	1.8	n/a	
S16T019228			106-46-7	1,4-Dichlorobenzene	NGS	110	<4.1	<4.1	n/a	n/a	n/a	n/a	4.1	n/a	
S16T019228			123-91-1	1,4-Dioxane	NGS	100	2.6	2.0	n/a	n/a	n/a	n/a	2.0	n/a	BJ
S16T019228			71-36-3	1-Butanol	NGS	85	<4.3	<4.3	n/a	n/a	n/a	n/a	4.3	n/a	LY
S16T019228			111-70-6	1-Heptanol	NGS	79	<9.1	<9.1	n/a	n/a	n/a	n/a	9.1	n/a	
S16T019228			71-23-8	1-Propanol	NGS	93	<8.9	<8.9	n/a	n/a	n/a	n/a	8.9	n/a	
S16T019228			108-47-4	2,4-Dimethylpyridine	NGS	87	<4.1	<4.1	n/a	n/a	n/a	n/a	4.1	n/a	
S16T019228			1708-29-8	2,5-Dihydrofuran	NGS	100	<2.2	<2.2	n/a	n/a	n/a	n/a	2.2	n/a	
S16T019228			78-93-3	2-Butanone	NGS	91	<3.1	3.3	n/a	n/a	n/a	n/a	3.1	n/a	J
S16T019228			110-43-0	2-Heptanone	NGS	100	<2.6	<2.6	n/a	n/a	n/a	n/a	2.6	n/a	
S16T019228			591-78-6	2-Hexanone	NGS	96	<2.5	<2.5	n/a	n/a	n/a	n/a	2.5	n/a	
S16T019228			534-22-5	2-Methylfuran	NGS	97	<1.3	<1.3	n/a	n/a	n/a	n/a	1.3	n/a	
S16T019228			78-94-4	3-Buten-2-one	NGS	92	<1.9	2.1	n/a	n/a	n/a	n/a	1.9	n/a	J
S16T019228			106-35-4	3-Heptanone	NGS	100	<2.7	<2.7	n/a	n/a	n/a	n/a	2.7	n/a	
S16T019228			106-68-3	3-Octanone	NGS	100	<3.3	<3.3	n/a	n/a	n/a	n/a	3.3	n/a	
S16T019228			105-42-0	4-Methyl-2-hexanone	NGS	99	<2.6	<2.6	n/a	n/a	n/a	n/a	2.6	n/a	
S16T019228			108-10-1	4-Methyl-2-Pentanone	NGS	110	<2.2	<2.2	n/a	n/a	n/a	n/a	2.2	n/a	
S16T019228			67-64-1	Acetone	NGS	90	8.4	13	n/a	n/a	n/a	n/a	2.8	n/a	B
S16T019228			75-05-8	Acetonitrile	NGS	100	2.0	61	n/a	n/a	n/a	n/a	1.6	n/a	B
S16T019228			98-86-2	Acetophenone	NGS	84	<6.2	22	n/a	n/a	n/a	n/a	6.2	n/a	
S16T019228			107-13-1	Acrylonitrile	NGS	100	<2.1	<2.1	n/a	n/a	n/a	n/a	2.1	n/a	
S16T019228			107-18-6	Allyl Alcohol	NGS	87	<2.3	<2.3	n/a	n/a	n/a	n/a	2.3	n/a	

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Cartridge Evaluation
Data Summary Report

Sample Group: 20161928
SDG Number:
Customer Sample ID: 16-002-AP-EF-004C
Customer Sample ID: 16-002-AP-EF-004C

Sample# R	A#	CAS #	Analyte	Unit	STD %	Blank	Result	Duplicate	Average	RPD %	Spk Rec %	Det Limit	Cnt Err %	Qual Flags
VAPOR-TDU VOA #2														
S16T019228		107-05-1	Allyl Chloride	NGS	87	<2.5	<2.5	n/a	n/a	n/a	n/a	2.5	n/a	
S16T019228		71-43-2	Benzene	NGS	110	2.6	3.1	n/a	n/a	n/a	n/a	1.5	n/a	BJ
S16T019228		100-47-0	Benzonitrile	NGS	110	<4.2	<4.2	n/a	n/a	n/a	n/a	4.2	n/a	
S16T019228		123-72-8	Butanal	NGS	95	<3.0	<3.0	n/a	n/a	n/a	n/a	3.0	n/a	
S16T019228		109-74-0	Butanenitrile	NGS	100	<2.1	<2.1	n/a	n/a	n/a	n/a	2.1	n/a	
S16T019228		56-23-5	Carbon tetrachloride	NGS	89	<1.5	<1.5	n/a	n/a	n/a	n/a	1.5	n/a	
S16T019228		108-90-7	Chlorobenzene	NGS	100	<2.5	<2.5	n/a	n/a	n/a	n/a	2.5	n/a	
S16T019228		75-00-3	Chloroethane	NGS	100	<1.6	<1.6	n/a	n/a	n/a	n/a	1.6	n/a	
S16T019228		67-66-3	Chloroform	NGS	100	<1.8	<1.8	n/a	n/a	n/a	n/a	1.8	n/a	
S16T019228		110-82-7	Cyclohexane	NGS	100	<1.4	<1.4	n/a	n/a	n/a	n/a	1.4	n/a	
S16T019228		124-18-5	Decane	NGS	110	<3.3	5.4	n/a	n/a	n/a	n/a	3.3	n/a	J
S16T019228		64-17-5	Ethanol	NGS	71	11	50	n/a	n/a	n/a	n/a	3.7	n/a	B
S16T019228		141-78-6	Ethyl acetate	NGS	94	<1.8	<1.8	n/a	n/a	n/a	n/a	1.8	n/a	
S16T019228		100-41-4	Ethylbenzene	NGS	110	<2.4	<2.4	n/a	n/a	n/a	n/a	2.4	n/a	
S16T019228		110-00-9	Furan	NGS	94	<1.6	<1.6	n/a	n/a	n/a	n/a	1.6	n/a	
S16T019228		110-54-3	Hexane	NGS	99	<1.3	2.7	n/a	n/a	n/a	n/a	1.3	n/a	J
S16T019228		628-73-9	Hexanenitrile	NGS	100	<2.6	<2.6	n/a	n/a	n/a	n/a	2.6	n/a	
S16T019228		126-98-7	Methacrylonitrile	NGS	100	<1.8	<1.8	n/a	n/a	n/a	n/a	1.8	n/a	
S16T019228		75-09-2	Methylene Chloride	NGS	94	<4.1	4.5	n/a	n/a	n/a	n/a	4.1	n/a	J
S16T019228		91-20-3	Naphthalene	NGS	110	<5.3	<5.3	n/a	n/a	n/a	n/a	5.3	n/a	
S16T019228		98-95-3	Nitrobenzene	NGS	43	<4.7	<4.7	n/a	n/a	n/a	n/a	4.7	n/a	LQa
S16T019228		110-59-8	Pentanenitrile	NGS	100	<2.6	<2.6	n/a	n/a	n/a	n/a	2.6	n/a	
S16T019228		107-12-0	Propanenitrile	NGS	100	<1.8	<1.8	n/a	n/a	n/a	n/a	1.8	n/a	
S16T019228		110-86-1	Pyridine	NGS	98	<2.8	<2.8	n/a	n/a	n/a	n/a	2.8	n/a	
S16T019228		100-42-5	Styrene	NGS	100	<2.7	<2.7	n/a	n/a	n/a	n/a	2.7	n/a	
S16T019228		127-18-4	Tetrachloroethene	NGS	100	<1.8	79	n/a	n/a	n/a	n/a	1.8	n/a	
S16T019228		108-88-3	Toluene	NGS	110	<2.2	19	n/a	n/a	n/a	n/a	2.2	n/a	

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Y - Comment

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Cartridge Evaluation
Data Summary Report

Sample Group: 20161928
SDG Number:
Customer Sample ID: 16-002-AP-EF-004C
Customer Sample ID: 16-002-AP-EF-004C

Sample# R	A#	CAS #	Analyte	Unit	STD %	Blank	Result	Duplicate	Average	RPD %	Spk Rec %	Det Limit	Cnt Err %	Qual Flags
VAPOR-TDU VOA #2														
S16T019228		79-01-6	Trichloroethene	NGS	100	<1.6	<1.6	n/a	n/a	n/a	n/a	1.6	n/a	
S16T019228		75-69-4	Trichlorofluoromethane	NGS	100	<1.9	3.2	n/a	n/a	n/a	n/a	1.9	n/a	J
S16T019228		10061-01-5	cis-1,3-Dichloropropene	NGS	86	<1.8	<1.8	n/a	n/a	n/a	n/a	1.8	n/a	
S16T019228		123-86-4	n-Butyl acetate	NGS	92	<2.4	<2.4	n/a	n/a	n/a	n/a	2.4	n/a	
S16T019228		142-82-5	n-Heptane	NGS	100	<1.6	2.7	n/a	n/a	n/a	n/a	1.6	n/a	J
S16T019228		10061-02-6	trans-1,3-Dichloropropene	NGS	85	<2.1	<2.1	n/a	n/a	n/a	n/a	2.1	n/a	

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Cartridge Evaluation
Data Summary Report

Sample Group: 20161928
SDG Number:
Customer Sample ID: 16-002-AP-EF-004D
Customer Sample ID: 16-002-AP-EF-004D

Sample# R	A#	CAS #	Analyte	Unit	STD %	Blank	Result	Duplicate	Average	RPD %	Spk Rec %	Det Limit	Cnt Err %	Qual Flags
VAPOR-TDU VOA #2														
S16T019227		79-34-5	1,1,2,2-Tetrachloroethane	NGS	100	<3.0	<3.0	n/a	n/a	n/a	n/a	3.0	n/a	
S16T019227		79-00-5	1,1,2-Trichloroethane	NGS	100	<2.3	<2.3	n/a	n/a	n/a	n/a	2.3	n/a	
S16T019227		75-34-3	1,1-Dichloroethane	NGS	97	<1.7	<1.7	n/a	n/a	n/a	n/a	1.7	n/a	
S16T019227		75-35-4	1,1-Dichloroethene	NGS	94	<1.7	<1.7	n/a	n/a	n/a	n/a	1.7	n/a	
S16T019227		107-06-2	1,2-Dichloroethane	NGS	100	<1.7	<1.7	n/a	n/a	n/a	n/a	1.7	n/a	
S16T019227		542-75-6	1,3-Dichloropropene (Total)	NGS	86	<1.8	<1.8	n/a	n/a	n/a	n/a	1.8	n/a	
S16T019227		106-46-7	1,4-Dichlorobenzene	NGS	110	<4.1	<4.1	n/a	n/a	n/a	n/a	4.1	n/a	
S16T019227		123-91-1	1,4-Dioxane	NGS	100	2.6	<2.0	n/a	n/a	n/a	n/a	2.0	n/a	
S16T019227		71-36-3	1-Butanol	NGS	85	<4.3	<4.3	n/a	n/a	n/a	n/a	4.3	n/a	LY
S16T019227		111-70-6	1-Heptanol	NGS	79	<9.1	<9.1	n/a	n/a	n/a	n/a	9.1	n/a	
S16T019227		71-23-8	1-Propanol	NGS	93	<8.9	<8.9	n/a	n/a	n/a	n/a	8.9	n/a	
S16T019227		108-47-4	2,4-Dimethylpyridine	NGS	87	<4.1	<4.1	n/a	n/a	n/a	n/a	4.1	n/a	
S16T019227		1708-29-8	2,5-Dihydrofuran	NGS	100	<2.2	<2.2	n/a	n/a	n/a	n/a	2.2	n/a	
S16T019227		78-93-3	2-Butanone	NGS	91	<3.1	4.2	n/a	n/a	n/a	n/a	3.1	n/a	J
S16T019227		110-43-0	2-Heptanone	NGS	100	<2.6	<2.6	n/a	n/a	n/a	n/a	2.6	n/a	
S16T019227		591-78-6	2-Hexanone	NGS	96	<2.5	<2.5	n/a	n/a	n/a	n/a	2.5	n/a	
S16T019227		534-22-5	2-Methylfuran	NGS	97	<1.3	<1.3	n/a	n/a	n/a	n/a	1.3	n/a	
S16T019227		78-94-4	3-Buten-2-one	NGS	92	<1.9	2.9	n/a	n/a	n/a	n/a	1.9	n/a	J
S16T019227		106-35-4	3-Heptanone	NGS	100	<2.7	<2.7	n/a	n/a	n/a	n/a	2.7	n/a	
S16T019227		106-68-3	3-Octanone	NGS	100	<3.3	<3.3	n/a	n/a	n/a	n/a	3.3	n/a	
S16T019227		105-42-0	4-Methyl-2-hexanone	NGS	99	<2.6	<2.6	n/a	n/a	n/a	n/a	2.6	n/a	
S16T019227		108-10-1	4-Methyl-2-Pentanone	NGS	110	<2.2	<2.2	n/a	n/a	n/a	n/a	2.2	n/a	
S16T019227		67-64-1	Acetone	NGS	90	8.4	22	n/a	n/a	n/a	n/a	2.8	n/a	B
S16T019227		75-05-8	Acetonitrile	NGS	100	2.0	1.7E+03	n/a	n/a	n/a	n/a	1.6	n/a	BE
S16T019227		98-86-2	Acetophenone	NGS	84	<6.2	21	n/a	n/a	n/a	n/a	6.2	n/a	
S16T019227		107-13-1	Acrylonitrile	NGS	100	<2.1	<2.1	n/a	n/a	n/a	n/a	2.1	n/a	
S16T019227		107-18-6	Allyl Alcohol	NGS	87	<2.3	<2.3	n/a	n/a	n/a	n/a	2.3	n/a	

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Cartridge Evaluation
Data Summary Report

Sample Group: 20161928
SDG Number:
Customer Sample ID: 16-002-AP-EF-004D
Customer Sample ID: 16-002-AP-EF-004D

Sample# R	A#	CAS #	Analyte	Unit	STD %	Blank	Result	Duplicate	Average	RPD %	Spk Rec %	Det Limit	Cnt Err %	Qual Flags
VAPOR-TDU VOA #2														
S16T019227		107-05-1	Allyl Chloride	NGS	87	<2.5	<2.5	n/a	n/a	n/a	n/a	2.5	n/a	
S16T019227		71-43-2	Benzene	NGS	110	2.6	2.4	n/a	n/a	n/a	n/a	1.5	n/a	BJ
S16T019227		100-47-0	Benzonitrile	NGS	110	<4.2	<4.2	n/a	n/a	n/a	n/a	4.2	n/a	
S16T019227		123-72-8	Butanal	NGS	95	<3.0	<3.0	n/a	n/a	n/a	n/a	3.0	n/a	
S16T019227		109-74-0	Butanenitrile	NGS	100	<2.1	<2.1	n/a	n/a	n/a	n/a	2.1	n/a	
S16T019227		56-23-5	Carbon tetrachloride	NGS	89	<1.5	<1.5	n/a	n/a	n/a	n/a	1.5	n/a	
S16T019227		108-90-7	Chlorobenzene	NGS	100	<2.5	<2.5	n/a	n/a	n/a	n/a	2.5	n/a	
S16T019227		75-00-3	Chloroethane	NGS	100	<1.6	<1.6	n/a	n/a	n/a	n/a	1.6	n/a	
S16T019227		67-66-3	Chloroform	NGS	100	<1.8	<1.8	n/a	n/a	n/a	n/a	1.8	n/a	
S16T019227		110-82-7	Cyclohexane	NGS	100	<1.4	<1.4	n/a	n/a	n/a	n/a	1.4	n/a	
S16T019227		124-18-5	Decane	NGS	110	<3.3	7.2	n/a	n/a	n/a	n/a	3.3	n/a	J
S16T019227		64-17-5	Ethanol	NGS	71	11	73	n/a	n/a	n/a	n/a	3.7	n/a	B
S16T019227		141-78-6	Ethyl acetate	NGS	94	<1.8	<1.8	n/a	n/a	n/a	n/a	1.8	n/a	
S16T019227		100-41-4	Ethylbenzene	NGS	110	<2.4	<2.4	n/a	n/a	n/a	n/a	2.4	n/a	
S16T019227		110-00-9	Furan	NGS	94	<1.6	<1.6	n/a	n/a	n/a	n/a	1.6	n/a	
S16T019227		110-54-3	Hexane	NGS	99	<1.3	1.9	n/a	n/a	n/a	n/a	1.3	n/a	J
S16T019227		628-73-9	Hexanenitrile	NGS	100	<2.6	<2.6	n/a	n/a	n/a	n/a	2.6	n/a	
S16T019227		126-98-7	Methacrylonitrile	NGS	100	<1.8	<1.8	n/a	n/a	n/a	n/a	1.8	n/a	
S16T019227		75-09-2	Methylene Chloride	NGS	94	<4.1	13	n/a	n/a	n/a	n/a	4.1	n/a	
S16T019227		91-20-3	Naphthalene	NGS	110	<5.3	<5.3	n/a	n/a	n/a	n/a	5.3	n/a	
S16T019227		98-95-3	Nitrobenzene	NGS	43	<4.7	<4.7	n/a	n/a	n/a	n/a	4.7	n/a	LQa
S16T019227		110-59-8	Pentanenitrile	NGS	100	<2.6	<2.6	n/a	n/a	n/a	n/a	2.6	n/a	
S16T019227		107-12-0	Propanenitrile	NGS	100	<1.8	<1.8	n/a	n/a	n/a	n/a	1.8	n/a	
S16T019227		110-86-1	Pyridine	NGS	98	<2.8	<2.8	n/a	n/a	n/a	n/a	2.8	n/a	
S16T019227		100-42-5	Styrene	NGS	100	<2.7	<2.7	n/a	n/a	n/a	n/a	2.7	n/a	
S16T019227		127-18-4	Tetrachloroethene	NGS	100	<1.8	56	n/a	n/a	n/a	n/a	1.8	n/a	
S16T019227		108-88-3	Toluene	NGS	110	<2.2	7.5	n/a	n/a	n/a	n/a	2.2	n/a	J

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Cartridge Evaluation
Data Summary Report

Sample Group: 20161928
SDG Number:
Customer Sample ID: 16-002-AP-EF-004D
Customer Sample ID: 16-002-AP-EF-004D

Sample# R	A#	CAS #	Analyte	Unit	STD %	Blank	Result	Duplicate	Average	RPD %	Spk Rec %	Det Limit	Cnt Err %	Qual Flags
VAPOR-TDU VOA #2														
S16T019227		79-01-6	Trichloroethene	NGS	100	<1.6	<1.6	n/a	n/a	n/a	n/a	1.6	n/a	
S16T019227		75-69-4	Trichlorofluoromethane	NGS	100	<1.9	4.9	n/a	n/a	n/a	n/a	1.9	n/a	J
S16T019227		10061-01-5	cis-1,3-Dichloropropene	NGS	86	<1.8	<1.8	n/a	n/a	n/a	n/a	1.8	n/a	
S16T019227		123-86-4	n-Butyl acetate	NGS	92	<2.4	<2.4	n/a	n/a	n/a	n/a	2.4	n/a	
S16T019227		142-82-5	n-Heptane	NGS	100	<1.6	<1.6	n/a	n/a	n/a	n/a	1.6	n/a	
S16T019227		10061-02-6	trans-1,3-Dichloropropene	NGS	85	<2.1	<2.1	n/a	n/a	n/a	n/a	2.1	n/a	

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Cartridge Evaluation
Data Summary Report

Sample Group: 20161928
SDG Number:
Customer Sample ID: 16-002-AP-EF-004E
Customer Sample ID: 16-002-AP-EF-004E

Sample# R	A#	CAS #	Analyte	Unit	STD %	Blank	Result	Duplicate	Average	RPD %	Spk Rec %	Det Limit	Cnt Err %	Qual Flags
VAPOR-TDU VOA #2														
S16T019226		79-34-5	1,1,2,2-Tetrachloroethane	NGS	100	<3.0	<3.0	n/a	n/a	n/a	n/a	3.0	n/a	
S16T019226		79-00-5	1,1,2-Trichloroethane	NGS	100	<2.3	<2.3	n/a	n/a	n/a	n/a	2.3	n/a	
S16T019226		75-34-3	1,1-Dichloroethane	NGS	97	<1.7	<1.7	n/a	n/a	n/a	n/a	1.7	n/a	
S16T019226		75-35-4	1,1-Dichloroethene	NGS	94	<1.7	<1.7	n/a	n/a	n/a	n/a	1.7	n/a	
S16T019226		107-06-2	1,2-Dichloroethane	NGS	100	<1.7	<1.7	n/a	n/a	n/a	n/a	1.7	n/a	
S16T019226		542-75-6	1,3-Dichloropropene (Total)	NGS	86	<1.8	<1.8	n/a	n/a	n/a	n/a	1.8	n/a	
S16T019226		106-46-7	1,4-Dichlorobenzene	NGS	110	<4.1	<4.1	n/a	n/a	n/a	n/a	4.1	n/a	
S16T019226		123-91-1	1,4-Dioxane	NGS	100	2.6	2.2	n/a	n/a	n/a	n/a	2.0	n/a	BJ
S16T019226		71-36-3	1-Butanol	NGS	85	<4.3	<4.3	n/a	n/a	n/a	n/a	4.3	n/a	LY
S16T019226		111-70-6	1-Heptanol	NGS	79	<9.1	<9.1	n/a	n/a	n/a	n/a	9.1	n/a	
S16T019226		71-23-8	1-Propanol	NGS	93	<8.9	<8.9	n/a	n/a	n/a	n/a	8.9	n/a	
S16T019226		108-47-4	2,4-Dimethylpyridine	NGS	87	<4.1	<4.1	n/a	n/a	n/a	n/a	4.1	n/a	
S16T019226		1708-29-8	2,5-Dihydrofuran	NGS	100	<2.2	<2.2	n/a	n/a	n/a	n/a	2.2	n/a	
S16T019226		78-93-3	2-Butanone	NGS	91	<3.1	<3.1	n/a	n/a	n/a	n/a	3.1	n/a	
S16T019226		110-43-0	2-Heptanone	NGS	100	<2.6	<2.6	n/a	n/a	n/a	n/a	2.6	n/a	
S16T019226		591-78-6	2-Hexanone	NGS	96	<2.5	<2.5	n/a	n/a	n/a	n/a	2.5	n/a	
S16T019226		534-22-5	2-Methylfuran	NGS	97	<1.3	<1.3	n/a	n/a	n/a	n/a	1.3	n/a	
S16T019226		78-94-4	3-Buten-2-one	NGS	92	<1.9	<1.9	n/a	n/a	n/a	n/a	1.9	n/a	
S16T019226		106-35-4	3-Heptanone	NGS	100	<2.7	<2.7	n/a	n/a	n/a	n/a	2.7	n/a	
S16T019226		106-68-3	3-Octanone	NGS	100	<3.3	<3.3	n/a	n/a	n/a	n/a	3.3	n/a	
S16T019226		105-42-0	4-Methyl-2-hexanone	NGS	99	<2.6	<2.6	n/a	n/a	n/a	n/a	2.6	n/a	
S16T019226		108-10-1	4-Methyl-2-Pentanone	NGS	110	<2.2	<2.2	n/a	n/a	n/a	n/a	2.2	n/a	
S16T019226		67-64-1	Acetone	NGS	90	8.4	35	n/a	n/a	n/a	n/a	2.8	n/a	B
S16T019226		75-05-8	Acetonitrile	NGS	100	2.0	36	n/a	n/a	n/a	n/a	1.6	n/a	B
S16T019226		98-86-2	Acetophenone	NGS	84	<6.2	13	n/a	n/a	n/a	n/a	6.2	n/a	
S16T019226		107-13-1	Acrylonitrile	NGS	100	<2.1	<2.1	n/a	n/a	n/a	n/a	2.1	n/a	
S16T019226		107-18-6	Allyl Alcohol	NGS	87	<2.3	<2.3	n/a	n/a	n/a	n/a	2.3	n/a	

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Cartridge Evaluation
Data Summary Report

Sample Group: 20161928
SDG Number:
Customer Sample ID: 16-002-AP-EF-004E
Customer Sample ID: 16-002-AP-EF-004E

Sample#	R	A#	CAS #	Analyte	Unit	STD %	Blank	Result	Duplicate	Average	RPD %	Spk Rec %	Det Limit	Cnt Err %	Qual Flags
VAPOR-TDU VOA #2															
S16T019226			107-05-1	Allyl Chloride	NGS	87	<2.5	<2.5	n/a	n/a	n/a	n/a	2.5	n/a	
S16T019226			71-43-2	Benzene	NGS	110	2.6	1.9	n/a	n/a	n/a	n/a	1.5	n/a	BJ
S16T019226			100-47-0	Benzonitrile	NGS	110	<4.2	<4.2	n/a	n/a	n/a	n/a	4.2	n/a	
S16T019226			123-72-8	Butanal	NGS	95	<3.0	<3.0	n/a	n/a	n/a	n/a	3.0	n/a	
S16T019226			109-74-0	Butanenitrile	NGS	100	<2.1	<2.1	n/a	n/a	n/a	n/a	2.1	n/a	
S16T019226			56-23-5	Carbon tetrachloride	NGS	89	<1.5	<1.5	n/a	n/a	n/a	n/a	1.5	n/a	
S16T019226			108-90-7	Chlorobenzene	NGS	100	<2.5	<2.5	n/a	n/a	n/a	n/a	2.5	n/a	
S16T019226			75-00-3	Chloroethane	NGS	100	<1.6	<1.6	n/a	n/a	n/a	n/a	1.6	n/a	
S16T019226			67-66-3	Chloroform	NGS	100	<1.8	<1.8	n/a	n/a	n/a	n/a	1.8	n/a	
S16T019226			110-82-7	Cyclohexane	NGS	100	<1.4	<1.4	n/a	n/a	n/a	n/a	1.4	n/a	
S16T019226			124-18-5	Decane	NGS	110	<3.3	3.4	n/a	n/a	n/a	n/a	3.3	n/a	J
S16T019226			64-17-5	Ethanol	NGS	71	11	120	n/a	n/a	n/a	n/a	3.7	n/a	B
S16T019226			141-78-6	Ethyl acetate	NGS	94	<1.8	<1.8	n/a	n/a	n/a	n/a	1.8	n/a	
S16T019226			100-41-4	Ethylbenzene	NGS	110	<2.4	<2.4	n/a	n/a	n/a	n/a	2.4	n/a	
S16T019226			110-00-9	Furan	NGS	94	<1.6	<1.6	n/a	n/a	n/a	n/a	1.6	n/a	
S16T019226			110-54-3	Hexane	NGS	99	<1.3	<1.3	n/a	n/a	n/a	n/a	1.3	n/a	
S16T019226			628-73-9	Hexanenitrile	NGS	100	<2.6	<2.6	n/a	n/a	n/a	n/a	2.6	n/a	
S16T019226			126-98-7	Methacrylonitrile	NGS	100	<1.8	<1.8	n/a	n/a	n/a	n/a	1.8	n/a	
S16T019226			75-09-2	Methylene Chloride	NGS	94	<4.1	<4.1	n/a	n/a	n/a	n/a	4.1	n/a	
S16T019226			91-20-3	Naphthalene	NGS	110	<5.3	<5.3	n/a	n/a	n/a	n/a	5.3	n/a	
S16T019226			98-95-3	Nitrobenzene	NGS	43	<4.7	<4.7	n/a	n/a	n/a	n/a	4.7	n/a	LQa
S16T019226			110-59-8	Pentanenitrile	NGS	100	<2.6	<2.6	n/a	n/a	n/a	n/a	2.6	n/a	
S16T019226			107-12-0	Propanenitrile	NGS	100	<1.8	<1.8	n/a	n/a	n/a	n/a	1.8	n/a	
S16T019226			110-86-1	Pyridine	NGS	98	<2.8	<2.8	n/a	n/a	n/a	n/a	2.8	n/a	
S16T019226			100-42-5	Styrene	NGS	100	<2.7	<2.7	n/a	n/a	n/a	n/a	2.7	n/a	
S16T019226			127-18-4	Tetrachloroethene	NGS	100	<1.8	46	n/a	n/a	n/a	n/a	1.8	n/a	
S16T019226			108-88-3	Toluene	NGS	110	<2.2	8.3	n/a	n/a	n/a	n/a	2.2	n/a	J

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Cartridge Evaluation
Data Summary Report

Sample Group: 20161928
SDG Number:
Customer Sample ID: 16-002-AP-EF-004E
Customer Sample ID: 16-002-AP-EF-004E

Sample#	R	A#	CAS #	Analyte	Unit	STD %	Blank	Result	Duplicate	Average	RPD %	Spk Rec %	Det Limit	Cnt Err %	Qual Flags
VAPOR-TDU VOA #2															
S16T019226			79-01-6	Trichloroethene	NGS	100	<1.6	<1.6	n/a	n/a	n/a	n/a	1.6	n/a	
S16T019226			75-69-4	Trichlorofluoromethane	NGS	100	<1.9	10	n/a	n/a	n/a	n/a	1.9	n/a	J
S16T019226			10061-01-5	cis-1,3-Dichloropropene	NGS	86	<1.8	<1.8	n/a	n/a	n/a	n/a	1.8	n/a	
S16T019226			123-86-4	n-Butyl acetate	NGS	92	<2.4	<2.4	n/a	n/a	n/a	n/a	2.4	n/a	
S16T019226			142-82-5	n-Heptane	NGS	100	<1.6	<1.6	n/a	n/a	n/a	n/a	1.6	n/a	
S16T019226			10061-02-6	trans-1,3-Dichloropropene	NGS	85	<2.1	<2.1	n/a	n/a	n/a	n/a	2.1	n/a	

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Cartridge Evaluation
Data Summary Report

Sample Group: 20161928
SDG Number:
Customer Sample ID: 16-002-AP-EF-004F
Customer Sample ID: 16-002-AP-EF-004F

Sample#	R	A#	CAS #	Analyte	Unit	STD %	Blank	Result	Duplicate	Average	RPD %	Spk Rec %	Det Limit	Cnt Err %	Qual Flags
VAPOR-TDU VOA #2															
S16T019225			107-05-1	Allyl Chloride	NGS	87	<2.5	<2.5	n/a	n/a	n/a	n/a	2.5	n/a	
S16T019225			71-43-2	Benzene	NGS	110	2.6	2.6	n/a	n/a	n/a	n/a	1.5	n/a	BJ
S16T019225			100-47-0	Benzonitrile	NGS	110	<4.2	<4.2	n/a	n/a	n/a	n/a	4.2	n/a	
S16T019225			123-72-8	Butanal	NGS	95	<3.0	<3.0	n/a	n/a	n/a	n/a	3.0	n/a	
S16T019225			109-74-0	Butanenitrile	NGS	100	<2.1	<2.1	n/a	n/a	n/a	n/a	2.1	n/a	
S16T019225			56-23-5	Carbon tetrachloride	NGS	89	<1.5	<1.5	n/a	n/a	n/a	n/a	1.5	n/a	
S16T019225			108-90-7	Chlorobenzene	NGS	100	<2.5	<2.5	n/a	n/a	n/a	n/a	2.5	n/a	
S16T019225			75-00-3	Chloroethane	NGS	100	<1.6	<1.6	n/a	n/a	n/a	n/a	1.6	n/a	
S16T019225			67-66-3	Chloroform	NGS	100	<1.8	<1.8	n/a	n/a	n/a	n/a	1.8	n/a	
S16T019225			110-82-7	Cyclohexane	NGS	100	<1.4	<1.4	n/a	n/a	n/a	n/a	1.4	n/a	
S16T019225			124-18-5	Decane	NGS	110	<3.3	<3.3	n/a	n/a	n/a	n/a	3.3	n/a	
S16T019225			64-17-5	Ethanol	NGS	71	11	180	n/a	n/a	n/a	n/a	3.7	n/a	B
S16T019225			141-78-6	Ethyl acetate	NGS	94	<1.8	<1.8	n/a	n/a	n/a	n/a	1.8	n/a	
S16T019225			100-41-4	Ethylbenzene	NGS	110	<2.4	<2.4	n/a	n/a	n/a	n/a	2.4	n/a	
S16T019225			110-00-9	Furan	NGS	94	<1.6	<1.6	n/a	n/a	n/a	n/a	1.6	n/a	
S16T019225			110-54-3	Hexane	NGS	99	<1.3	1.4	n/a	n/a	n/a	n/a	1.3	n/a	J
S16T019225			628-73-9	Hexanenitrile	NGS	100	<2.6	<2.6	n/a	n/a	n/a	n/a	2.6	n/a	
S16T019225			126-98-7	Methacrylonitrile	NGS	100	<1.8	<1.8	n/a	n/a	n/a	n/a	1.8	n/a	
S16T019225			75-09-2	Methylene Chloride	NGS	94	<4.1	<4.1	n/a	n/a	n/a	n/a	4.1	n/a	
S16T019225			91-20-3	Naphthalene	NGS	110	<5.3	<5.3	n/a	n/a	n/a	n/a	5.3	n/a	
S16T019225			98-95-3	Nitrobenzene	NGS	43	<4.7	<4.7	n/a	n/a	n/a	n/a	4.7	n/a	LQa
S16T019225			110-59-8	Pentanenitrile	NGS	100	<2.6	<2.6	n/a	n/a	n/a	n/a	2.6	n/a	
S16T019225			107-12-0	Propanenitrile	NGS	100	<1.8	<1.8	n/a	n/a	n/a	n/a	1.8	n/a	
S16T019225			110-86-1	Pyridine	NGS	98	<2.8	<2.8	n/a	n/a	n/a	n/a	2.8	n/a	
S16T019225			100-42-5	Styrene	NGS	100	<2.7	<2.7	n/a	n/a	n/a	n/a	2.7	n/a	
S16T019225			127-18-4	Tetrachloroethene	NGS	100	<1.8	45	n/a	n/a	n/a	n/a	1.8	n/a	
S16T019225			108-88-3	Toluene	NGS	110	<2.2	7.6	n/a	n/a	n/a	n/a	2.2	n/a	J

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Cartridge Evaluation
Data Summary Report

Sample Group: 20161928
SDG Number:
Customer Sample ID: 16-002-AP-EF-004F
Customer Sample ID: 16-002-AP-EF-004F

Sample#	R	A#	CAS #	Analyte	Unit	STD %	Blank	Result	Duplicate	Average	RPD %	Spk Rec %	Det Limit	Cnt Err %	Qual Flags
VAPOR-TDU VOA #2															
S16T019225			79-01-6	Trichloroethene	NGS	100	<1.6	<1.6	n/a	n/a	n/a	n/a	1.6	n/a	
S16T019225			75-69-4	Trichlorofluoromethane	NGS	100	<1.9	18	n/a	n/a	n/a	n/a	1.9	n/a	
S16T019225			10061-01-5	cis-1,3-Dichloropropene	NGS	86	<1.8	<1.8	n/a	n/a	n/a	n/a	1.8	n/a	
S16T019225			123-86-4	n-Butyl acetate	NGS	92	<2.4	<2.4	n/a	n/a	n/a	n/a	2.4	n/a	
S16T019225			142-82-5	n-Heptane	NGS	100	<1.6	<1.6	n/a	n/a	n/a	n/a	1.6	n/a	
S16T019225			10061-02-6	trans-1,3-Dichloropropene	NGS	85	<2.1	<2.1	n/a	n/a	n/a	n/a	2.1	n/a	

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Cartridge Evaluation
Data Summary Report

Sample Group: 20161928
SDG Number:
Customer Sample ID: 16-002-AP-EF-004G
Customer Sample ID: 16-002-AP-EF-004G

Sample#	R	A#	CAS #	Analyte	Unit	STD %	Blank	Result	Duplicate	Average	RPD %	Spk Rec %	Det Limit	Cnt Err %	Qual Flags
VAPOR-TDU VOA #2															
S16T019224			79-34-5	1,1,2,2-Tetrachloroethane	NGS	100	<3.0	<3.0	n/a	n/a	n/a	n/a	3.0	n/a	
S16T019224			79-00-5	1,1,2-Trichloroethane	NGS	100	<2.3	<2.3	n/a	n/a	n/a	n/a	2.3	n/a	
S16T019224			75-34-3	1,1-Dichloroethane	NGS	97	<1.7	<1.7	n/a	n/a	n/a	n/a	1.7	n/a	
S16T019224			75-35-4	1,1-Dichloroethene	NGS	94	<1.7	<1.7	n/a	n/a	n/a	n/a	1.7	n/a	
S16T019224			107-06-2	1,2-Dichloroethane	NGS	100	<1.7	<1.7	n/a	n/a	n/a	n/a	1.7	n/a	
S16T019224			542-75-6	1,3-Dichloropropene (Total)	NGS	86	<1.8	<1.8	n/a	n/a	n/a	n/a	1.8	n/a	
S16T019224			106-46-7	1,4-Dichlorobenzene	NGS	110	<4.1	<4.1	n/a	n/a	n/a	n/a	4.1	n/a	
S16T019224			123-91-1	1,4-Dioxane	NGS	100	2.6	2.4	n/a	n/a	n/a	n/a	2.0	n/a	BJ
S16T019224			71-36-3	1-Butanol	NGS	85	<4.3	<4.3	n/a	n/a	n/a	n/a	4.3	n/a	LY
S16T019224			111-70-6	1-Heptanol	NGS	79	<9.1	<9.1	n/a	n/a	n/a	n/a	9.1	n/a	
S16T019224			71-23-8	1-Propanol	NGS	93	<8.9	<8.9	n/a	n/a	n/a	n/a	8.9	n/a	
S16T019224			108-47-4	2,4-Dimethylpyridine	NGS	87	<4.1	<4.1	n/a	n/a	n/a	n/a	4.1	n/a	
S16T019224			1708-29-8	2,5-Dihydrofuran	NGS	100	<2.2	<2.2	n/a	n/a	n/a	n/a	2.2	n/a	
S16T019224			78-93-3	2-Butanone	NGS	91	<3.1	<3.1	n/a	n/a	n/a	n/a	3.1	n/a	
S16T019224			110-43-0	2-Heptanone	NGS	100	<2.6	<2.6	n/a	n/a	n/a	n/a	2.6	n/a	
S16T019224			591-78-6	2-Hexanone	NGS	96	<2.5	<2.5	n/a	n/a	n/a	n/a	2.5	n/a	
S16T019224			534-22-5	2-Methylfuran	NGS	97	<1.3	<1.3	n/a	n/a	n/a	n/a	1.3	n/a	
S16T019224			78-94-4	3-Buten-2-one	NGS	92	<1.9	<1.9	n/a	n/a	n/a	n/a	1.9	n/a	
S16T019224			106-35-4	3-Heptanone	NGS	100	<2.7	<2.7	n/a	n/a	n/a	n/a	2.7	n/a	
S16T019224			106-68-3	3-Octanone	NGS	100	<3.3	<3.3	n/a	n/a	n/a	n/a	3.3	n/a	
S16T019224			105-42-0	4-Methyl-2-hexanone	NGS	99	<2.6	<2.6	n/a	n/a	n/a	n/a	2.6	n/a	
S16T019224			108-10-1	4-Methyl-2-Pentanone	NGS	110	<2.2	<2.2	n/a	n/a	n/a	n/a	2.2	n/a	
S16T019224			67-64-1	Acetone	NGS	90	8.4	6.5	n/a	n/a	n/a	n/a	2.8	n/a	BJ
S16T019224			75-05-8	Acetonitrile	NGS	100	2.0	28	n/a	n/a	n/a	n/a	1.6	n/a	B
S16T019224			98-86-2	Acetophenone	NGS	84	<6.2	<6.2	n/a	n/a	n/a	n/a	6.2	n/a	
S16T019224			107-13-1	Acrylonitrile	NGS	100	<2.1	<2.1	n/a	n/a	n/a	n/a	2.1	n/a	
S16T019224			107-18-6	Allyl Alcohol	NGS	87	<2.3	<2.3	n/a	n/a	n/a	n/a	2.3	n/a	

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Cartridge Evaluation
Data Summary Report

Sample Group: 20161928
SDG Number:
Customer Sample ID: 16-002-AP-EF-004G
Customer Sample ID: 16-002-AP-EF-004G

Sample#	R	A#	CAS #	Analyte	Unit	STD %	Blank	Result	Duplicate	Average	RPD %	Spk Rec %	Det Limit	Cnt Err %	Qual Flags
VAPOR-TDU VOA #2															
S16T019224			107-05-1	Allyl Chloride	NGS	87	<2.5	<2.5	n/a	n/a	n/a	n/a	2.5	n/a	
S16T019224			71-43-2	Benzene	NGS	110	2.6	<1.5	n/a	n/a	n/a	n/a	1.5	n/a	
S16T019224			100-47-0	Benzonitrile	NGS	110	<4.2	<4.2	n/a	n/a	n/a	n/a	4.2	n/a	
S16T019224			123-72-8	Butanal	NGS	95	<3.0	<3.0	n/a	n/a	n/a	n/a	3.0	n/a	
S16T019224			109-74-0	Butanenitrile	NGS	100	<2.1	<2.1	n/a	n/a	n/a	n/a	2.1	n/a	
S16T019224			56-23-5	Carbon tetrachloride	NGS	89	<1.5	<1.5	n/a	n/a	n/a	n/a	1.5	n/a	
S16T019224			108-90-7	Chlorobenzene	NGS	100	<2.5	<2.5	n/a	n/a	n/a	n/a	2.5	n/a	
S16T019224			75-00-3	Chloroethane	NGS	100	<1.6	<1.6	n/a	n/a	n/a	n/a	1.6	n/a	
S16T019224			67-66-3	Chloroform	NGS	100	<1.8	<1.8	n/a	n/a	n/a	n/a	1.8	n/a	
S16T019224			110-82-7	Cyclohexane	NGS	100	<1.4	<1.4	n/a	n/a	n/a	n/a	1.4	n/a	
S16T019224			124-18-5	Decane	NGS	110	<3.3	<3.3	n/a	n/a	n/a	n/a	3.3	n/a	
S16T019224			64-17-5	Ethanol	NGS	71	11	27	n/a	n/a	n/a	n/a	3.7	n/a	B
S16T019224			141-78-6	Ethyl acetate	NGS	94	<1.8	<1.8	n/a	n/a	n/a	n/a	1.8	n/a	
S16T019224			100-41-4	Ethylbenzene	NGS	110	<2.4	<2.4	n/a	n/a	n/a	n/a	2.4	n/a	
S16T019224			110-00-9	Furan	NGS	94	<1.6	<1.6	n/a	n/a	n/a	n/a	1.6	n/a	
S16T019224			110-54-3	Hexane	NGS	99	<1.3	<1.3	n/a	n/a	n/a	n/a	1.3	n/a	
S16T019224			628-73-9	Hexanenitrile	NGS	100	<2.6	<2.6	n/a	n/a	n/a	n/a	2.6	n/a	
S16T019224			126-98-7	Methacrylonitrile	NGS	100	<1.8	<1.8	n/a	n/a	n/a	n/a	1.8	n/a	
S16T019224			75-09-2	Methylene Chloride	NGS	94	<4.1	<4.1	n/a	n/a	n/a	n/a	4.1	n/a	
S16T019224			91-20-3	Naphthalene	NGS	110	<5.3	<5.3	n/a	n/a	n/a	n/a	5.3	n/a	
S16T019224			98-95-3	Nitrobenzene	NGS	43	<4.7	<4.7	n/a	n/a	n/a	n/a	4.7	n/a	LQa
S16T019224			110-59-8	Pentanenitrile	NGS	100	<2.6	<2.6	n/a	n/a	n/a	n/a	2.6	n/a	
S16T019224			107-12-0	Propanenitrile	NGS	100	<1.8	<1.8	n/a	n/a	n/a	n/a	1.8	n/a	
S16T019224			110-86-1	Pyridine	NGS	98	<2.8	<2.8	n/a	n/a	n/a	n/a	2.8	n/a	
S16T019224			100-42-5	Styrene	NGS	100	<2.7	<2.7	n/a	n/a	n/a	n/a	2.7	n/a	
S16T019224			127-18-4	Tetrachloroethene	NGS	100	<1.8	<1.8	n/a	n/a	n/a	n/a	1.8	n/a	
S16T019224			108-88-3	Toluene	NGS	110	<2.2	<2.2	n/a	n/a	n/a	n/a	2.2	n/a	

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Cartridge Evaluation
Data Summary Report

Sample Group: 20161928
SDG Number:
Customer Sample ID: 16-002-AP-EF-004G
Customer Sample ID: 16-002-AP-EF-004G

Sample#	R	A#	CAS #	Analyte	Unit	STD %	Blank	Result	Duplicate	Average	RPD %	Spk Rec %	Det Limit	Cnt Err %	Qual Flags
VAPOR-TDU VOA #2															
S16T019224			79-01-6	Trichloroethene	NGS	100	<1.6	<1.6	n/a	n/a	n/a	n/a	1.6	n/a	
S16T019224			75-69-4	Trichlorofluoromethane	NGS	100	<1.9	<1.9	n/a	n/a	n/a	n/a	1.9	n/a	
S16T019224			10061-01-5	cis-1,3-Dichloropropene	NGS	86	<1.8	<1.8	n/a	n/a	n/a	n/a	1.8	n/a	
S16T019224			123-86-4	n-Butyl acetate	NGS	92	<2.4	<2.4	n/a	n/a	n/a	n/a	2.4	n/a	
S16T019224			142-82-5	n-Heptane	NGS	100	<1.6	<1.6	n/a	n/a	n/a	n/a	1.6	n/a	
S16T019224			10061-02-6	trans-1,3-Dichloropropene	NGS	85	<2.1	<2.1	n/a	n/a	n/a	n/a	2.1	n/a	

C:97

T - Tentatively Identified Compound
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Q - Qualitative
Y - Comment

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N - Named TIC

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B - Blank Contamination
L - LLS Outside Range

Cartridge Evaluation
Data Summary Report

Sample Group: 20161928
SDG Number:
Customer Sample ID: 16-002-AP-EF-004H
Customer Sample ID: 16-002-AP-EF-004H

Sample# R	A#	CAS #	Analyte	Unit	STD %	Blank	Result	Duplicate	Average	RPD %	Spk Rec %	Det Limit	Cnt Err %	Qual Flags
VAPOR-TDU VOA #2														
S16T019222		79-34-5	1,1,2,2-Tetrachloroethane	NGS	100	<3.0	<3.0	n/a	n/a	n/a	n/a	3.0	n/a	
S16T019222		79-00-5	1,1,2-Trichloroethane	NGS	100	<2.3	<2.3	n/a	n/a	n/a	n/a	2.3	n/a	
S16T019222		75-34-3	1,1-Dichloroethane	NGS	97	<1.7	<1.7	n/a	n/a	n/a	n/a	1.7	n/a	
S16T019222		75-35-4	1,1-Dichloroethene	NGS	94	<1.7	<1.7	n/a	n/a	n/a	n/a	1.7	n/a	
S16T019222		107-06-2	1,2-Dichloroethane	NGS	100	<1.7	<1.7	n/a	n/a	n/a	n/a	1.7	n/a	
S16T019222		542-75-6	1,3-Dichloropropene (Total)	NGS	86	<1.8	<1.8	n/a	n/a	n/a	n/a	1.8	n/a	
S16T019222		106-46-7	1,4-Dichlorobenzene	NGS	110	<4.1	<4.1	n/a	n/a	n/a	n/a	4.1	n/a	
S16T019222		123-91-1	1,4-Dioxane	NGS	100	2.6	2.8	n/a	n/a	n/a	n/a	2.0	n/a	BJ
S16T019222		71-36-3	1-Butanol	NGS	85	<4.3	<4.3	n/a	n/a	n/a	n/a	4.3	n/a	LY
S16T019222		111-70-6	1-Heptanol	NGS	79	<9.1	<9.1	n/a	n/a	n/a	n/a	9.1	n/a	
S16T019222		71-23-8	1-Propanol	NGS	93	<8.9	<8.9	n/a	n/a	n/a	n/a	8.9	n/a	
S16T019222		108-47-4	2,4-Dimethylpyridine	NGS	87	<4.1	<4.1	n/a	n/a	n/a	n/a	4.1	n/a	
S16T019222		1708-29-8	2,5-Dihydrofuran	NGS	100	<2.2	<2.2	n/a	n/a	n/a	n/a	2.2	n/a	
S16T019222		78-93-3	2-Butanone	NGS	91	<3.1	<3.1	n/a	n/a	n/a	n/a	3.1	n/a	
S16T019222		110-43-0	2-Heptanone	NGS	100	<2.6	<2.6	n/a	n/a	n/a	n/a	2.6	n/a	
S16T019222		591-78-6	2-Hexanone	NGS	96	<2.5	<2.5	n/a	n/a	n/a	n/a	2.5	n/a	
S16T019222		534-22-5	2-Methylfuran	NGS	97	<1.3	<1.3	n/a	n/a	n/a	n/a	1.3	n/a	
S16T019222		78-94-4	3-Buten-2-one	NGS	92	<1.9	<1.9	n/a	n/a	n/a	n/a	1.9	n/a	
S16T019222		106-35-4	3-Heptanone	NGS	100	<2.7	<2.7	n/a	n/a	n/a	n/a	2.7	n/a	
S16T019222		106-68-3	3-Octanone	NGS	100	<3.3	<3.3	n/a	n/a	n/a	n/a	3.3	n/a	
S16T019222		105-42-0	4-Methyl-2-hexanone	NGS	99	<2.6	<2.6	n/a	n/a	n/a	n/a	2.6	n/a	
S16T019222		108-10-1	4-Methyl-2-Pentanone	NGS	110	<2.2	<2.2	n/a	n/a	n/a	n/a	2.2	n/a	
S16T019222		67-64-1	Acetone	NGS	90	8.4	49	n/a	n/a	n/a	n/a	2.8	n/a	B
S16T019222		75-05-8	Acetonitrile	NGS	100	2.0	570	n/a	n/a	n/a	n/a	1.6	n/a	BE
S16T019222		98-86-2	Acetophenone	NGS	84	<6.2	<6.2	n/a	n/a	n/a	n/a	6.2	n/a	
S16T019222		107-13-1	Acrylonitrile	NGS	100	<2.1	<2.1	n/a	n/a	n/a	n/a	2.1	n/a	
S16T019222		107-18-6	Allyl Alcohol	NGS	87	<2.3	<2.3	n/a	n/a	n/a	n/a	2.3	n/a	

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Cartridge Evaluation
Data Summary Report

Sample Group: 20161928
SDG Number:
Customer Sample ID: 16-002-AP-EF-004H
Customer Sample ID: 16-002-AP-EF-004H

Sample#	R	A#	CAS #	Analyte	Unit	STD %	Blank	Result	Duplicate	Average	RPD %	Spk Rec %	Det Limit	Cnt Err %	Qual Flags
VAPOR-TDU VOA #2															
S16T019222			107-05-1	Allyl Chloride	NGS	87	<2.5	<2.5	n/a	n/a	n/a	n/a	2.5	n/a	
S16T019222			71-43-2	Benzene	NGS	110	2.6	2.3	n/a	n/a	n/a	n/a	1.5	n/a	BJ
S16T019222			100-47-0	Benzonitrile	NGS	110	<4.2	<4.2	n/a	n/a	n/a	n/a	4.2	n/a	
S16T019222			123-72-8	Butanal	NGS	95	<3.0	<3.0	n/a	n/a	n/a	n/a	3.0	n/a	
S16T019222			109-74-0	Butanenitrile	NGS	100	<2.1	<2.1	n/a	n/a	n/a	n/a	2.1	n/a	
S16T019222			56-23-5	Carbon tetrachloride	NGS	89	<1.5	<1.5	n/a	n/a	n/a	n/a	1.5	n/a	
S16T019222			108-90-7	Chlorobenzene	NGS	100	<2.5	<2.5	n/a	n/a	n/a	n/a	2.5	n/a	
S16T019222			75-00-3	Chloroethane	NGS	100	<1.6	<1.6	n/a	n/a	n/a	n/a	1.6	n/a	
S16T019222			67-66-3	Chloroform	NGS	100	<1.8	<1.8	n/a	n/a	n/a	n/a	1.8	n/a	
S16T019222			110-82-7	Cyclohexane	NGS	100	<1.4	<1.4	n/a	n/a	n/a	n/a	1.4	n/a	
S16T019222			124-18-5	Decane	NGS	110	<3.3	6.0	n/a	n/a	n/a	n/a	3.3	n/a	J
S16T019222			64-17-5	Ethanol	NGS	71	11	190	n/a	n/a	n/a	n/a	3.7	n/a	B
S16T019222			141-78-6	Ethyl acetate	NGS	94	<1.8	<1.8	n/a	n/a	n/a	n/a	1.8	n/a	
S16T019222			100-41-4	Ethylbenzene	NGS	110	<2.4	<2.4	n/a	n/a	n/a	n/a	2.4	n/a	
S16T019222			110-00-9	Furan	NGS	94	<1.6	<1.6	n/a	n/a	n/a	n/a	1.6	n/a	
S16T019222			110-54-3	Hexane	NGS	99	<1.3	<1.3	n/a	n/a	n/a	n/a	1.3	n/a	
S16T019222			628-73-9	Hexanenitrile	NGS	100	<2.6	<2.6	n/a	n/a	n/a	n/a	2.6	n/a	
S16T019222			126-98-7	Methacrylonitrile	NGS	100	<1.8	<1.8	n/a	n/a	n/a	n/a	1.8	n/a	
S16T019222			75-09-2	Methylene Chloride	NGS	94	<4.1	<4.1	n/a	n/a	n/a	n/a	4.1	n/a	
S16T019222			91-20-3	Naphthalene	NGS	110	<5.3	<5.3	n/a	n/a	n/a	n/a	5.3	n/a	
S16T019222			98-95-3	Nitrobenzene	NGS	43	<4.7	<4.7	n/a	n/a	n/a	n/a	4.7	n/a	LQa
S16T019222			110-59-8	Pentanenitrile	NGS	100	<2.6	<2.6	n/a	n/a	n/a	n/a	2.6	n/a	
S16T019222			107-12-0	Propanenitrile	NGS	100	<1.8	<1.8	n/a	n/a	n/a	n/a	1.8	n/a	
S16T019222			110-86-1	Pyridine	NGS	98	<2.8	<2.8	n/a	n/a	n/a	n/a	2.8	n/a	
S16T019222			100-42-5	Styrene	NGS	100	<2.7	<2.7	n/a	n/a	n/a	n/a	2.7	n/a	
S16T019222			127-18-4	Tetrachloroethene	NGS	100	<1.8	24	n/a	n/a	n/a	n/a	1.8	n/a	
S16T019222			108-88-3	Toluene	NGS	110	<2.2	4.3	n/a	n/a	n/a	n/a	2.2	n/a	J

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Cartridge Evaluation
Data Summary Report

Sample Group: 20161928
SDG Number:
Customer Sample ID: 16-002-AP-EF-004H
Customer Sample ID: 16-002-AP-EF-004H

Sample#	R	A#	CAS #	Analyte	Unit	STD %	Blank	Result	Duplicate	Average	RPD %	Spk Rec %	Det Limit	Cnt Err %	Qual Flags
VAPOR-TDU VOA #2															
S16T019222			79-01-6	Trichloroethene	NGS	100	<1.6	<1.6	n/a	n/a	n/a	n/a	1.6	n/a	
S16T019222			75-69-4	Trichlorofluoromethane	NGS	100	<1.9	25	n/a	n/a	n/a	n/a	1.9	n/a	
S16T019222			10061-01-5	cis-1,3-Dichloropropene	NGS	86	<1.8	<1.8	n/a	n/a	n/a	n/a	1.8	n/a	
S16T019222			123-86-4	n-Butyl acetate	NGS	92	<2.4	<2.4	n/a	n/a	n/a	n/a	2.4	n/a	
S16T019222			142-82-5	n-Heptane	NGS	100	<1.6	<1.6	n/a	n/a	n/a	n/a	1.6	n/a	
S16T019222			10061-02-6	trans-1,3-Dichloropropene	NGS	85	<2.1	<2.1	n/a	n/a	n/a	n/a	2.1	n/a	

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Cartridge Evaluation
Data Summary Report

Sample Group: 20161928
SDG Number:
Customer Sample ID: 16-002-AP-IN-004A
Customer Sample ID: 16-002-AP-IN-004A

Sample#	R	A#	CAS #	Analyte	Unit	STD %	Blank	Result	Duplicate	Average	RPD %	Spk Rec %	Det Limit	Cnt Err %	Qual Flags
VAPOR-TDU VOA #2															
S16T019231			79-34-5	1,1,2,2-Tetrachloroethane	NGS	100	<3.0	<3.0	n/a	n/a	n/a	n/a	3.0	n/a	
S16T019231			79-00-5	1,1,2-Trichloroethane	NGS	100	<2.3	<2.3	n/a	n/a	n/a	n/a	2.3	n/a	
S16T019231			75-34-3	1,1-Dichloroethane	NGS	97	<1.7	<1.7	n/a	n/a	n/a	n/a	1.7	n/a	
S16T019231			75-35-4	1,1-Dichloroethene	NGS	94	<1.7	<1.7	n/a	n/a	n/a	n/a	1.7	n/a	
S16T019231			107-06-2	1,2-Dichloroethane	NGS	100	<1.7	<1.7	n/a	n/a	n/a	n/a	1.7	n/a	
S16T019231			542-75-6	1,3-Dichloropropene (Total)	NGS	86	<1.8	<1.8	n/a	n/a	n/a	n/a	1.8	n/a	
S16T019231			106-46-7	1,4-Dichlorobenzene	NGS	110	<4.1	<4.1	n/a	n/a	n/a	n/a	4.1	n/a	
S16T019231			123-91-1	1,4-Dioxane	NGS	100	2.6	2.3	n/a	n/a	n/a	n/a	2.0	n/a	BJ
S16T019231			71-36-3	1-Butanol	NGS	85	<4.3	<4.3	n/a	n/a	n/a	n/a	4.3	n/a	LY
S16T019231			111-70-6	1-Heptanol	NGS	79	<9.1	<9.1	n/a	n/a	n/a	n/a	9.1	n/a	
S16T019231			71-23-8	1-Propanol	NGS	93	<8.9	<8.9	n/a	n/a	n/a	n/a	8.9	n/a	
S16T019231			108-47-4	2,4-Dimethylpyridine	NGS	87	<4.1	<4.1	n/a	n/a	n/a	n/a	4.1	n/a	
S16T019231			1708-29-8	2,5-Dihydrofuran	NGS	100	<2.2	<2.2	n/a	n/a	n/a	n/a	2.2	n/a	
S16T019231			78-93-3	2-Butanone	NGS	91	<3.1	5.4	n/a	n/a	n/a	n/a	3.1	n/a	J
S16T019231			110-43-0	2-Heptanone	NGS	100	<2.6	<2.6	n/a	n/a	n/a	n/a	2.6	n/a	
S16T019231			591-78-6	2-Hexanone	NGS	96	<2.5	<2.5	n/a	n/a	n/a	n/a	2.5	n/a	
S16T019231			534-22-5	2-Methylfuran	NGS	97	<1.3	<1.3	n/a	n/a	n/a	n/a	1.3	n/a	
S16T019231			78-94-4	3-Buten-2-one	NGS	92	<1.9	2.4	n/a	n/a	n/a	n/a	1.9	n/a	J
S16T019231			106-35-4	3-Heptanone	NGS	100	<2.7	<2.7	n/a	n/a	n/a	n/a	2.7	n/a	
S16T019231			106-68-3	3-Octanone	NGS	100	<3.3	<3.3	n/a	n/a	n/a	n/a	3.3	n/a	
S16T019231			105-42-0	4-Methyl-2-hexanone	NGS	99	<2.6	<2.6	n/a	n/a	n/a	n/a	2.6	n/a	
S16T019231			108-10-1	4-Methyl-2-Pentanone	NGS	110	<2.2	<2.2	n/a	n/a	n/a	n/a	2.2	n/a	
S16T019231			67-64-1	Acetone	NGS	90	8.4	40	n/a	n/a	n/a	n/a	2.8	n/a	B
S16T019231			75-05-8	Acetonitrile	NGS	100	2.0	120	n/a	n/a	n/a	n/a	1.6	n/a	B
S16T019231			98-86-2	Acetophenone	NGS	84	<6.2	26	n/a	n/a	n/a	n/a	6.2	n/a	
S16T019231			107-13-1	Acrylonitrile	NGS	100	<2.1	<2.1	n/a	n/a	n/a	n/a	2.1	n/a	
S16T019231			107-18-6	Allyl Alcohol	NGS	87	<2.3	<2.3	n/a	n/a	n/a	n/a	2.3	n/a	

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Cartridge Evaluation
Data Summary Report

Sample Group: 20161928
SDG Number:
Customer Sample ID: 16-002-AP-IN-004A
Customer Sample ID: 16-002-AP-IN-004A

Sample#	R	A#	CAS #	Analyte	Unit	STD %	Blank	Result	Duplicate	Average	RPD %	Spk Rec %	Det Limit	Cnt Err %	Qual Flags
VAPOR-TDU VOA #2															
S16T019231			107-05-1	Allyl Chloride	NGS	87	<2.5	<2.5	n/a	n/a	n/a	n/a	2.5	n/a	
S16T019231			71-43-2	Benzene	NGS	110	2.6	5.8	n/a	n/a	n/a	n/a	1.5	n/a	BJ
S16T019231			100-47-0	Benzonitrile	NGS	110	<4.2	<4.2	n/a	n/a	n/a	n/a	4.2	n/a	
S16T019231			123-72-8	Butanal	NGS	95	<3.0	<3.0	n/a	n/a	n/a	n/a	3.0	n/a	
S16T019231			109-74-0	Butanenitrile	NGS	100	<2.1	<2.1	n/a	n/a	n/a	n/a	2.1	n/a	
S16T019231			56-23-5	Carbon tetrachloride	NGS	89	<1.5	<1.5	n/a	n/a	n/a	n/a	1.5	n/a	
S16T019231			108-90-7	Chlorobenzene	NGS	100	<2.5	<2.5	n/a	n/a	n/a	n/a	2.5	n/a	
S16T019231			75-00-3	Chloroethane	NGS	100	<1.6	<1.6	n/a	n/a	n/a	n/a	1.6	n/a	
S16T019231			67-66-3	Chloroform	NGS	100	<1.8	<1.8	n/a	n/a	n/a	n/a	1.8	n/a	
S16T019231			110-82-7	Cyclohexane	NGS	100	<1.4	<1.4	n/a	n/a	n/a	n/a	1.4	n/a	
S16T019231			124-18-5	Decane	NGS	110	<3.3	<3.3	n/a	n/a	n/a	n/a	3.3	n/a	
S16T019231			64-17-5	Ethanol	NGS	71	11	18	n/a	n/a	n/a	n/a	3.7	n/a	BJ
S16T019231			141-78-6	Ethyl acetate	NGS	94	<1.8	<1.8	n/a	n/a	n/a	n/a	1.8	n/a	
S16T019231			100-41-4	Ethylbenzene	NGS	110	<2.4	<2.4	n/a	n/a	n/a	n/a	2.4	n/a	
S16T019231			110-00-9	Furan	NGS	94	<1.6	<1.6	n/a	n/a	n/a	n/a	1.6	n/a	
S16T019231			110-54-3	Hexane	NGS	99	<1.3	4.0	n/a	n/a	n/a	n/a	1.3	n/a	J
S16T019231			628-73-9	Hexanenitrile	NGS	100	<2.6	<2.6	n/a	n/a	n/a	n/a	2.6	n/a	
S16T019231			126-98-7	Methacrylonitrile	NGS	100	<1.8	<1.8	n/a	n/a	n/a	n/a	1.8	n/a	
S16T019231			75-09-2	Methylene Chloride	NGS	94	<4.1	5.7	n/a	n/a	n/a	n/a	4.1	n/a	J
S16T019231			91-20-3	Naphthalene	NGS	110	<5.3	<5.3	n/a	n/a	n/a	n/a	5.3	n/a	
S16T019231			98-95-3	Nitrobenzene	NGS	43	<4.7	<4.7	n/a	n/a	n/a	n/a	4.7	n/a	LQa
S16T019231			110-59-8	Pentanenitrile	NGS	100	<2.6	<2.6	n/a	n/a	n/a	n/a	2.6	n/a	
S16T019231			107-12-0	Propanenitrile	NGS	100	<1.8	<1.8	n/a	n/a	n/a	n/a	1.8	n/a	
S16T019231			110-86-1	Pyridine	NGS	98	<2.8	<2.8	n/a	n/a	n/a	n/a	2.8	n/a	
S16T019231			100-42-5	Styrene	NGS	100	<2.7	<2.7	n/a	n/a	n/a	n/a	2.7	n/a	
S16T019231			127-18-4	Tetrachloroethene	NGS	100	<1.8	100	n/a	n/a	n/a	n/a	1.8	n/a	
S16T019231			108-88-3	Toluene	NGS	110	<2.2	38	n/a	n/a	n/a	n/a	2.2	n/a	

NA = Not Analyzed, ND = Not Detected

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J - Estimated
a - LCS Outside Range

Q - Qualitative
Y - Comment

E - Outside Calibration Range
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B - Blank Contamination
L - LLS Outside Range

Cartridge Evaluation
Data Summary Report

Sample Group: 20161928
SDG Number:
Customer Sample ID: 16-002-AP-IN-004A
Customer Sample ID: 16-002-AP-IN-004A

Sample#	R	A#	CAS #	Analyte	Unit	STD %	Blank	Result	Duplicate	Average	RPD %	Spk Rec %	Det Limit	Cnt Err %	Qual Flags
VAPOR-TDU VOA #2															
S16T019231			79-01-6	Trichloroethene	NGS	100	<1.6	<1.6	n/a	n/a	n/a	n/a	1.6	n/a	
S16T019231			75-69-4	Trichlorofluoromethane	NGS	100	<1.9	4.5	n/a	n/a	n/a	n/a	1.9	n/a	J
S16T019231			10061-01-5	cis-1,3-Dichloropropene	NGS	86	<1.8	<1.8	n/a	n/a	n/a	n/a	1.8	n/a	
S16T019231			123-86-4	n-Butyl acetate	NGS	92	<2.4	<2.4	n/a	n/a	n/a	n/a	2.4	n/a	
S16T019231			142-82-5	n-Heptane	NGS	100	<1.6	<1.6	n/a	n/a	n/a	n/a	1.6	n/a	
S16T019231			10061-02-6	trans-1,3-Dichloropropene	NGS	85	<2.1	<2.1	n/a	n/a	n/a	n/a	2.1	n/a	

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N - Named TIC

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L - LLS Outside Range

Cartridge Evaluation
Data Summary Report

Sample Group: 20161928
SDG Number:
Customer Sample ID: 16-002-AP-IN-004BASE
Customer Sample ID: 16-002-AP-IN-004BASE

Sample#	R	A#	CAS #	Analyte	Unit	STD %	Blank	Result	Duplicate	Average	RPD %	Spk Rec %	Det Limit	Cnt Err %	Qual Flags
VAPOR-TDU VOA #2															
S16T019233			79-34-5	1,1,2,2-Tetrachloroethane	NGS	100	<3.0	<3.0	n/a	n/a	n/a	n/a	3.0	n/a	
S16T019233			79-00-5	1,1,2-Trichloroethane	NGS	100	<2.3	<2.3	n/a	n/a	n/a	n/a	2.3	n/a	
S16T019233			75-34-3	1,1-Dichloroethane	NGS	97	<1.7	<1.7	n/a	n/a	n/a	n/a	1.7	n/a	
S16T019233			75-35-4	1,1-Dichloroethene	NGS	94	<1.7	<1.7	n/a	n/a	n/a	n/a	1.7	n/a	
S16T019233			107-06-2	1,2-Dichloroethane	NGS	100	<1.7	<1.7	n/a	n/a	n/a	n/a	1.7	n/a	
S16T019233			542-75-6	1,3-Dichloropropene (Total)	NGS	86	<1.8	<1.8	n/a	n/a	n/a	n/a	1.8	n/a	
S16T019233			106-46-7	1,4-Dichlorobenzene	NGS	110	<4.1	<4.1	n/a	n/a	n/a	n/a	4.1	n/a	
S16T019233			123-91-1	1,4-Dioxane	NGS	100	2.6	2.1	n/a	n/a	n/a	n/a	2.0	n/a	BJ
S16T019233			71-36-3	1-Butanol	NGS	85	<4.3	25	n/a	n/a	n/a	n/a	4.3	n/a	LY
S16T019233			111-70-6	1-Heptanol	NGS	79	<9.1	<9.1	n/a	n/a	n/a	n/a	9.1	n/a	
S16T019233			71-23-8	1-Propanol	NGS	93	<8.9	<8.9	n/a	n/a	n/a	n/a	8.9	n/a	
S16T019233			108-47-4	2,4-Dimethylpyridine	NGS	87	<4.1	<4.1	n/a	n/a	n/a	n/a	4.1	n/a	
S16T019233			1708-29-8	2,5-Dihydrofuran	NGS	100	<2.2	<2.2	n/a	n/a	n/a	n/a	2.2	n/a	
S16T019233			78-93-3	2-Butanone	NGS	91	<3.1	5.4	n/a	n/a	n/a	n/a	3.1	n/a	J
S16T019233			110-43-0	2-Heptanone	NGS	100	<2.6	<2.6	n/a	n/a	n/a	n/a	2.6	n/a	
S16T019233			591-78-6	2-Hexanone	NGS	96	<2.5	<2.5	n/a	n/a	n/a	n/a	2.5	n/a	
S16T019233			534-22-5	2-Methylfuran	NGS	97	<1.3	<1.3	n/a	n/a	n/a	n/a	1.3	n/a	
S16T019233			78-94-4	3-Buten-2-one	NGS	92	<1.9	4.1	n/a	n/a	n/a	n/a	1.9	n/a	J
S16T019233			106-35-4	3-Heptanone	NGS	100	<2.7	<2.7	n/a	n/a	n/a	n/a	2.7	n/a	
S16T019233			106-68-3	3-Octanone	NGS	100	<3.3	<3.3	n/a	n/a	n/a	n/a	3.3	n/a	
S16T019233			105-42-0	4-Methyl-2-hexanone	NGS	99	<2.6	<2.6	n/a	n/a	n/a	n/a	2.6	n/a	
S16T019233			108-10-1	4-Methyl-2-Pentanone	NGS	110	<2.2	<2.2	n/a	n/a	n/a	n/a	2.2	n/a	
S16T019233			67-64-1	Acetone	NGS	90	8.4	65	n/a	n/a	n/a	n/a	2.8	n/a	B
S16T019233			75-05-8	Acetonitrile	NGS	100	2.0	28	n/a	n/a	n/a	n/a	1.6	n/a	B
S16T019233			98-86-2	Acetophenone	NGS	84	<6.2	8.5	n/a	n/a	n/a	n/a	6.2	n/a	J
S16T019233			107-13-1	Acrylonitrile	NGS	100	<2.1	<2.1	n/a	n/a	n/a	n/a	2.1	n/a	
S16T019233			107-18-6	Allyl Alcohol	NGS	87	<2.3	<2.3	n/a	n/a	n/a	n/a	2.3	n/a	

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L - LLS Outside Range

Cartridge Evaluation
Data Summary Report

Sample Group: 20161928
SDG Number:
Customer Sample ID: 16-002-AP-IN-004BASE
Customer Sample ID: 16-002-AP-IN-004BASE

Sample#	R	A#	CAS #	Analyte	Unit	STD %	Blank	Result	Duplicate	Average	RPD %	Spk Rec %	Det Limit	Cnt Err %	Qual Flags
VAPOR-TDU VOA #2															
S16T019233			107-05-1	Allyl Chloride	NGS	87	<2.5	<2.5	n/a	n/a	n/a	n/a	2.5	n/a	
S16T019233			71-43-2	Benzene	NGS	110	2.6	7.2	n/a	n/a	n/a	n/a	1.5	n/a	BJ
S16T019233			100-47-0	Benzonitrile	NGS	110	<4.2	<4.2	n/a	n/a	n/a	n/a	4.2	n/a	
S16T019233			123-72-8	Butanal	NGS	95	<3.0	7.4	n/a	n/a	n/a	n/a	3.0	n/a	J
S16T019233			109-74-0	Butanenitrile	NGS	100	<2.1	<2.1	n/a	n/a	n/a	n/a	2.1	n/a	
S16T019233			56-23-5	Carbon tetrachloride	NGS	89	<1.5	<1.5	n/a	n/a	n/a	n/a	1.5	n/a	
S16T019233			108-90-7	Chlorobenzene	NGS	100	<2.5	<2.5	n/a	n/a	n/a	n/a	2.5	n/a	
S16T019233			75-00-3	Chloroethane	NGS	100	<1.6	<1.6	n/a	n/a	n/a	n/a	1.6	n/a	
S16T019233			67-66-3	Chloroform	NGS	100	<1.8	<1.8	n/a	n/a	n/a	n/a	1.8	n/a	
S16T019233			110-82-7	Cyclohexane	NGS	100	<1.4	3.7	n/a	n/a	n/a	n/a	1.4	n/a	J
S16T019233			124-18-5	Decane	NGS	110	<3.3	<3.3	n/a	n/a	n/a	n/a	3.3	n/a	
S16T019233			64-17-5	Ethanol	NGS	71	11	40	n/a	n/a	n/a	n/a	3.7	n/a	
S16T019233			141-78-6	Ethyl acetate	NGS	94	<1.8	<1.8	n/a	n/a	n/a	n/a	1.8	n/a	
S16T019233			100-41-4	Ethylbenzene	NGS	110	<2.4	<2.4	n/a	n/a	n/a	n/a	2.4	n/a	
S16T019233			110-00-9	Furan	NGS	94	<1.6	<1.6	n/a	n/a	n/a	n/a	1.6	n/a	
S16T019233			110-54-3	Hexane	NGS	99	<1.3	12	n/a	n/a	n/a	n/a	1.3	n/a	
S16T019233			628-73-9	Hexanenitrile	NGS	100	<2.6	<2.6	n/a	n/a	n/a	n/a	2.6	n/a	
S16T019233			126-98-7	Methacrylonitrile	NGS	100	<1.8	<1.8	n/a	n/a	n/a	n/a	1.8	n/a	
S16T019233			75-09-2	Methylene Chloride	NGS	94	<4.1	4.5	n/a	n/a	n/a	n/a	4.1	n/a	J
S16T019233			91-20-3	Naphthalene	NGS	110	<5.3	<5.3	n/a	n/a	n/a	n/a	5.3	n/a	
S16T019233			98-95-3	Nitrobenzene	NGS	43	<4.7	<4.7	n/a	n/a	n/a	n/a	4.7	n/a	LQa
S16T019233			110-59-8	Pentanenitrile	NGS	100	<2.6	<2.6	n/a	n/a	n/a	n/a	2.6	n/a	
S16T019233			107-12-0	Propanenitrile	NGS	100	<1.8	<1.8	n/a	n/a	n/a	n/a	1.8	n/a	
S16T019233			110-86-1	Pyridine	NGS	98	<2.8	<2.8	n/a	n/a	n/a	n/a	2.8	n/a	
S16T019233			100-42-5	Styrene	NGS	100	<2.7	<2.7	n/a	n/a	n/a	n/a	2.7	n/a	
S16T019233			127-18-4	Tetrachloroethene	NGS	100	<1.8	19	n/a	n/a	n/a	n/a	1.8	n/a	
S16T019233			108-88-3	Toluene	NGS	110	<2.2	200	n/a	n/a	n/a	n/a	2.2	n/a	

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Cartridge Evaluation
Data Summary Report

Sample Group: 20161928
SDG Number:
Customer Sample ID: 16-002-AP-IN-004BASE
Customer Sample ID: 16-002-AP-IN-004BASE

Sample#	R	A#	CAS #	Analyte	Unit	STD %	Blank	Result	Duplicate	Average	RPD %	Spk Rec %	Det Limit	Cnt Err %	Qual Flags
VAPOR-TDU VOA #2															
S16T019233			79-01-6	Trichloroethene	NGS	100	<1.6	<1.6	n/a	n/a	n/a	n/a	1.6	n/a	
S16T019233			75-69-4	Trichlorofluoromethane	NGS	100	<1.9	6.2	n/a	n/a	n/a	n/a	1.9	n/a	J
S16T019233			10061-01-5	cis-1,3-Dichloropropene	NGS	86	<1.8	<1.8	n/a	n/a	n/a	n/a	1.8	n/a	
S16T019233			123-86-4	n-Butyl acetate	NGS	92	<2.4	<2.4	n/a	n/a	n/a	n/a	2.4	n/a	
S16T019233			142-82-5	n-Heptane	NGS	100	<1.6	<1.6	n/a	n/a	n/a	n/a	1.6	n/a	
S16T019233			10061-02-6	trans-1,3-Dichloropropene	NGS	85	<2.1	<2.1	n/a	n/a	n/a	n/a	2.1	n/a	

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NA = Not Analyzed, ND = Not Detected
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Cartridge Evaluation
Data Summary Report

Sample Group: 20161928
SDG Number:
Customer Sample ID: 16-002-AP-IN-004H
Customer Sample ID: 16-002-AP-IN-004H

Sample#	R	A#	CAS #	Analyte	Unit	STD %	Blank	Result	Duplicate	Average	RPD %	Spk Rec %	Det Limit	Cnt Err %	Qual Flags
VAPOR-TDU VOA #2															
S16T019223			79-34-5	1,1,2,2-Tetrachloroethane	NGS	100	<3.0	<3.0	n/a	n/a	n/a	n/a	3.0	n/a	
S16T019223			79-00-5	1,1,2-Trichloroethane	NGS	100	<2.3	<2.3	n/a	n/a	n/a	n/a	2.3	n/a	
S16T019223			75-34-3	1,1-Dichloroethane	NGS	97	<1.7	<1.7	n/a	n/a	n/a	n/a	1.7	n/a	
S16T019223			75-35-4	1,1-Dichloroethene	NGS	94	<1.7	<1.7	n/a	n/a	n/a	n/a	1.7	n/a	
S16T019223			107-06-2	1,2-Dichloroethane	NGS	100	<1.7	<1.7	n/a	n/a	n/a	n/a	1.7	n/a	
S16T019223			542-75-6	1,3-Dichloropropene (Total)	NGS	86	<1.8	<1.8	n/a	n/a	n/a	n/a	1.8	n/a	
S16T019223			106-46-7	1,4-Dichlorobenzene	NGS	110	<4.1	<4.1	n/a	n/a	n/a	n/a	4.1	n/a	
S16T019223			123-91-1	1,4-Dioxane	NGS	100	2.6	8.2	n/a	n/a	n/a	n/a	2.0	n/a	BJ
S16T019223			71-36-3	1-Butanol	NGS	85	<4.3	690	n/a	n/a	n/a	n/a	4.3	n/a	LY
S16T019223			111-70-6	1-Heptanol	NGS	79	<9.1	<9.1	n/a	n/a	n/a	n/a	9.1	n/a	
S16T019223			71-23-8	1-Propanol	NGS	93	<8.9	160	n/a	n/a	n/a	n/a	8.9	n/a	
S16T019223			108-47-4	2,4-Dimethylpyridine	NGS	87	<4.1	<4.1	n/a	n/a	n/a	n/a	4.1	n/a	
S16T019223			1708-29-8	2,5-Dihydrofuran	NGS	100	<2.2	<2.2	n/a	n/a	n/a	n/a	2.2	n/a	
S16T019223			78-93-3	2-Butanone	NGS	91	<3.1	18	n/a	n/a	n/a	n/a	3.1	n/a	
S16T019223			110-43-0	2-Heptanone	NGS	100	<2.6	3.9	n/a	n/a	n/a	n/a	2.6	n/a	J
S16T019223			591-78-6	2-Hexanone	NGS	96	<2.5	5.2	n/a	n/a	n/a	n/a	2.5	n/a	J
S16T019223			534-22-5	2-Methylfuran	NGS	97	<1.3	<1.3	n/a	n/a	n/a	n/a	1.3	n/a	
S16T019223			78-94-4	3-Buten-2-one	NGS	92	<1.9	7.0	n/a	n/a	n/a	n/a	1.9	n/a	J
S16T019223			106-35-4	3-Heptanone	NGS	100	<2.7	4.3	n/a	n/a	n/a	n/a	2.7	n/a	J
S16T019223			106-68-3	3-Octanone	NGS	100	<3.3	<3.3	n/a	n/a	n/a	n/a	3.3	n/a	
S16T019223			105-42-0	4-Methyl-2-hexanone	NGS	99	<2.6	<2.6	n/a	n/a	n/a	n/a	2.6	n/a	
S16T019223			108-10-1	4-Methyl-2-Pentanone	NGS	110	<2.2	8.5	n/a	n/a	n/a	n/a	2.2	n/a	J
S16T019223			67-64-1	Acetone	NGS	90	8.4	1.2E+03	n/a	n/a	n/a	n/a	2.8	n/a	BE
S16T019223			75-05-8	Acetonitrile	NGS	100	2.0	44	n/a	n/a	n/a	n/a	1.6	n/a	B
S16T019223			98-86-2	Acetophenone	NGS	84	<6.2	6.9	n/a	n/a	n/a	n/a	6.2	n/a	J
S16T019223			107-13-1	Acrylonitrile	NGS	100	<2.1	<2.1	n/a	n/a	n/a	n/a	2.1	n/a	
S16T019223			107-18-6	Allyl Alcohol	NGS	87	<2.3	<2.3	n/a	n/a	n/a	n/a	2.3	n/a	

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Cartridge Evaluation
Data Summary Report

Sample Group: 20161928
SDG Number:
Customer Sample ID: 16-002-AP-IN-004H
Customer Sample ID: 16-002-AP-IN-004H

Sample#	R	A#	CAS #	Analyte	Unit	STD %	Blank	Result	Duplicate	Average	RPD %	Spk Rec %	Det Limit	Cnt Err %	Qual Flags
VAPOR-TDU VOA #2															
S16T019223			107-05-1	Allyl Chloride	NGS	87	<2.5	<2.5	n/a	n/a	n/a	n/a	2.5	n/a	
S16T019223			71-43-2	Benzene	NGS	110	2.6	3.7	n/a	n/a	n/a	n/a	1.5	n/a	BJ
S16T019223			100-47-0	Benzonitrile	NGS	110	<4.2	<4.2	n/a	n/a	n/a	n/a	4.2	n/a	
S16T019223			123-72-8	Butanal	NGS	95	<3.0	10	n/a	n/a	n/a	n/a	3.0	n/a	J
S16T019223			109-74-0	Butanenitrile	NGS	100	<2.1	3.9	n/a	n/a	n/a	n/a	2.1	n/a	J
S16T019223			56-23-5	Carbon tetrachloride	NGS	89	<1.5	<1.5	n/a	n/a	n/a	n/a	1.5	n/a	
S16T019223			108-90-7	Chlorobenzene	NGS	100	<2.5	<2.5	n/a	n/a	n/a	n/a	2.5	n/a	
S16T019223			75-00-3	Chloroethane	NGS	100	<1.6	<1.6	n/a	n/a	n/a	n/a	1.6	n/a	
S16T019223			67-66-3	Chloroform	NGS	100	<1.8	<1.8	n/a	n/a	n/a	n/a	1.8	n/a	
S16T019223			110-82-7	Cyclohexane	NGS	100	<1.4	<1.4	n/a	n/a	n/a	n/a	1.4	n/a	
S16T019223			124-18-5	Decane	NGS	110	<3.3	5.6	n/a	n/a	n/a	n/a	3.3	n/a	J
S16T019223			64-17-5	Ethanol	NGS	71	11	260	n/a	n/a	n/a	n/a	3.7	n/a	B
S16T019223			141-78-6	Ethyl acetate	NGS	94	<1.8	<1.8	n/a	n/a	n/a	n/a	1.8	n/a	
S16T019223			100-41-4	Ethylbenzene	NGS	110	<2.4	<2.4	n/a	n/a	n/a	n/a	2.4	n/a	
S16T019223			110-00-9	Furan	NGS	94	<1.6	33	n/a	n/a	n/a	n/a	1.6	n/a	
S16T019223			110-54-3	Hexane	NGS	99	<1.3	6.0	n/a	n/a	n/a	n/a	1.3	n/a	J
S16T019223			628-73-9	Hexanenitrile	NGS	100	<2.6	<2.6	n/a	n/a	n/a	n/a	2.6	n/a	
S16T019223			126-98-7	Methacrylonitrile	NGS	100	<1.8	<1.8	n/a	n/a	n/a	n/a	1.8	n/a	
S16T019223			75-09-2	Methylene Chloride	NGS	94	<4.1	<4.1	n/a	n/a	n/a	n/a	4.1	n/a	
S16T019223			91-20-3	Naphthalene	NGS	110	<5.3	<5.3	n/a	n/a	n/a	n/a	5.3	n/a	
S16T019223			98-95-3	Nitrobenzene	NGS	43	<4.7	<4.7	n/a	n/a	n/a	n/a	4.7	n/a	LQa
S16T019223			110-59-8	Pentanenitrile	NGS	100	<2.6	<2.6	n/a	n/a	n/a	n/a	2.6	n/a	
S16T019223			107-12-0	Propanenitrile	NGS	100	<1.8	4.2	n/a	n/a	n/a	n/a	1.8	n/a	J
S16T019223			110-86-1	Pyridine	NGS	98	<2.8	<2.8	n/a	n/a	n/a	n/a	2.8	n/a	
S16T019223			100-42-5	Styrene	NGS	100	<2.7	<2.7	n/a	n/a	n/a	n/a	2.7	n/a	
S16T019223			127-18-4	Tetrachloroethene	NGS	100	<1.8	5.3	n/a	n/a	n/a	n/a	1.8	n/a	J
S16T019223			108-88-3	Toluene	NGS	110	<2.2	79	n/a	n/a	n/a	n/a	2.2	n/a	

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Y - Comment

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B - Blank Contamination
L - LLS Outside Range

Cartridge Evaluation
Data Summary Report

Sample Group: 20161928
SDG Number:
Customer Sample ID: 16-002-AP-IN-004H
Customer Sample ID: 16-002-AP-IN-004H

Sample#	R	A#	CAS #	Analyte	Unit	STD %	Blank	Result	Duplicate	Average	RPD %	Spk Rec %	Det Limit	Cnt Err %	Qual Flags
VAPOR-TDU VOA #2															
S16T019223			79-01-6	Trichloroethene	NGS	100	<1.6	<1.6	n/a	n/a	n/a	n/a	1.6	n/a	
S16T019223			75-69-4	Trichlorofluoromethane	NGS	100	<1.9	23	n/a	n/a	n/a	n/a	1.9	n/a	
S16T019223			10061-01-5	cis-1,3-Dichloropropene	NGS	86	<1.8	<1.8	n/a	n/a	n/a	n/a	1.8	n/a	
S16T019223			123-86-4	n-Butyl acetate	NGS	92	<2.4	<2.4	n/a	n/a	n/a	n/a	2.4	n/a	
S16T019223			142-82-5	n-Heptane	NGS	100	<1.6	<1.6	n/a	n/a	n/a	n/a	1.6	n/a	
S16T019223			10061-02-6	trans-1,3-Dichloropropene	NGS	85	<2.1	<2.1	n/a	n/a	n/a	n/a	2.1	n/a	

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Cartridge Evaluation
Data Summary Report

Sample Group: 20161928
SDG Number:
Customer Sample ID: 16-002-AP-EF-004A
Customer Sample ID: 16-002-AP-EF-004A

Sample# R	A#	QC Type	Analyte	CAS No.	Retention Time (Minutes)	Unit	Result	Qual Flags
VAPOR-TDU VOA #2								
S16T019230			DL-2,3-Butanediol	6982-25-8	5.92	NGS	99	JNT
S16T019230			Tetrahydrofuran	109-99-9	11.70	NGS	80	JNT
S16T019230			Pentanal	110-62-3	14.17	NGS	52	JNT
S16T019230			2-Hexene, 5,5-dimethyl-, (Z)-	39761-61-0	14.65	NGS	31	JNT
S16T019230			Hexanal	66-25-1	16.57	NGS	60	JNT
S16T019230			Heptanal	111-71-7	18.62	NGS	31	JNT
S16T019230			Cyclotetrasiloxane, octamethyl	556-67-2	20.08	NGS	75	JNT
S16T019230			Undecane, 5,7-dimethyl-	17312-83-3	22.63	NGS	55	JNT
S16T019230			2,6-Dimethyldecane	13150-81-7	22.78	NGS	26	JNT
S16T019230			Heptane, 2,4,6-trimethyl-	2613-61-8	23.42	NGS	27	JNT
S16T019230			Undecane	1120-21-4	23.53	NGS	68	JNT
S16T019230			2,5,6-Trimethyldecane	62108-23-0	23.63	NGS	49	JNT
S16T019230			Unknown-1	--	23.96	NGS	120	JT
S16T019230			Unknown-2	--	24.59	NGS	33	JT
S16T019230			Decane, 2,6,8-trimethyl-	62108-26-3	24.99	NGS	50	JNT
S16T019230			Decane, 2,4,6-trimethyl-	62108-27-4	26.14	NGS	76	JNT
S16T019230			Decane, 2,3,5,8-tetramethyl-	192823-15-7	26.70	NGS	45	JNT

Jann Frye 7/28/16

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Cartridge Evaluation
Data Summary Report

Sample Group: 20161928
SDG Number:
Customer Sample ID: 16-002-AP-EF-004B
Customer Sample ID: 16-002-AP-EF-004B

Sample# R	A#	QC Type	Analyte	CAS No.	Retention Time (Minutes)	Unit	Result	Qual Flags
VAPOR-TDU VOA #2								
S16T019229			Unknown-1	--	7.88	NGS	76	JT
S16T019229			Formamide	75-12-7	13.84	NGS	60	JNT
S16T019229			Hexanal	66-25-1	16.57	NGS	33	JNT
S16T019229			Cyclotetrasiloxane, octamethyl	556-67-2	20.09	NGS	78	JNT
S16T019229			2,6-Dimethyldecane	13150-81-7	22.64	NGS	110	JNT
S16T019229			Decane, 3,7-dimethyl-	17312-54-8	22.78	NGS	46	JNT
S16T019229			Undecane, 2,6-dimethyl-	17301-23-4	23.42	NGS	48	JNT
S16T019229			2,3-Dimethyldecane	17312-44-6	23.47	NGS	30	JNT
S16T019229			Undecane	1120-21-4	23.53	NGS	120	JNT
S16T019229			Decane, 2,4,6-trimethyl-	62108-27-4	23.64	NGS	92	JNT
S16T019229			Undecane, 4-methyl-	2980-69-0	23.75	NGS	33	JNT
S16T019229			Unknown-2	--	23.96	NGS	160	JT
S16T019229			Decane, 2,5,9-trimethyl-	62108-22-9	24.99	NGS	65	JNT
S16T019229			2-Hydroxy-(Z)9-pentadecenyl pr	77899-00-4	25.19	NGS	30	JNT
S16T019229			Unknown-3	--	26.01	NGS	28	JT
S16T019229			Tetradecane, 1-iodo-	19218-94-1	26.14	NGS	110	JNT
S16T019229			Heptadecane, 2,6,10,15-tetrame	54833-48-6	26.34	NGS	32	JNT
S16T019229			Decane, 2,3,5,8-tetramethyl-	192823-15-7	26.70	NGS	62	JNT

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Cartridge Evaluation
Data Summary Report

Sample Group: 20161928
SDG Number:
Customer Sample ID: 16-002-AP-EF-004BASE
Customer Sample ID: 16-002-AP-EF-004BASE

Sample# R	A#	QC Type	Analyte	CAS No.	Retention Time (Minutes)	Unit	Result	Qual Flags
VAPOR-TDU VOA #2								
S16T019232			Silane	7803-62-5	7.89	NGS	42	JNT
S16T019232			Formamide	75-12-7	13.84	NGS	42	JNT
S16T019232			Heptane, 2,4-dimethyl-	2213-23-2	17.02	NGS	120	JNT
S16T019232			Cyclotetrasiloxane, octamethyl	556-67-2	20.07	NGS	290	JNT
S16T019232			Undecane, 5,7-dimethyl-	17312-83-3	22.54	NGS	39	JNT
S16T019232			3-Ethyl-3-methylheptane	17302-01-1	22.62	NGS	490	JNT
S16T019232			Undecane, 4,6-dimethyl-	17312-82-2	22.77	NGS	190	JNT
S16T019232			Acetic acid, trifluoro-, 3,7-d	28745-07-5	23.15	NGS	67	JNT
S16T019232			1-Octanol, 2-butyl-	3913-02-8	23.23	NGS	41	JNT
S16T019232			Undecane, 2,6-dimethyl-	17301-23-4	23.41	NGS	64	JNT
S16T019232			2,3-Dimethyldecane	17312-44-6	23.46	NGS	66	JNT
S16T019232			Undecane	1120-21-4	23.53	NGS	320	JNT
S16T019232			Undecane, 4,7-dimethyl-	17301-32-5	23.63	NGS	170	JNT
S16T019232			Decane, 3,7-dimethyl-	17312-54-8	23.75	NGS	71	JNT
S16T019232			Unknown-1	--	23.96	NGS	210	JT
S16T019232			2,6-Dimethyldecane	13150-81-7	24.98	NGS	59	JNT
S16T019232			2-Hydroxy-(Z)9-pentadecenyl pr	77899-00-4	25.19	NGS	31	JNT
S16T019232			Methenamine	100-97-0	25.95	NGS	30	JNT
S16T019232			1,2-Benzisothiazole	272-16-2	26.00	NGS	110	JNT
S16T019232			Decane, 2,4,6-trimethyl-	62108-27-4	26.14	NGS	100	JNT
S16T019232			Unknown-2	--	26.34	NGS	25	JT
S16T019232			Decane, 2,3,5,8-tetramethyl-	192823-15-7	26.70	NGS	41	JNT

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Cartridge Evaluation
Data Summary Report

Sample Group: 20161928
SDG Number:
Customer Sample ID: 16-002-AP-EF-004C
Customer Sample ID: 16-002-AP-EF-004C

Sample#	R	A#	QC Type	Analyte	CAS No.	Retention Time (Minutes)	Unit	Result	Qual Flags
VAPOR-TDU VOA #2									
S16T019228				Cyclotetrasiloxane, octamethyl	556-67-2	20.08	NGS	96	JNT
S16T019228				Decane, 3,7-dimethyl-	17312-54-8	22.63	NGS	93	JNT
S16T019228				2,6-Dimethyldecane	13150-81-7	22.78	NGS	36	JNT
S16T019228				Decane, 2,5,9-trimethyl-	62108-22-9	23.42	NGS	62	JNT
S16T019228				Undecane	1120-21-4	23.53	NGS	98	JNT
S16T019228				Decane, 2,4,6-trimethyl-	62108-27-4	23.63	NGS	89	JNT
S16T019228				2,3-Dimethyldecane	17312-44-6	23.75	NGS	28	JNT
S16T019228				Unknown-1	--	23.96	NGS	140	JT
S16T019228				Unknown-2	--	24.59	NGS	34	JT
S16T019228				Undecane, 2,6-dimethyl-	17301-23-4	24.98	NGS	88	JNT
S16T019228				2-Decen-1-ol	22104-80-9	25.19	NGS	35	JNT
S16T019228				Octane, 2,3,6,7-tetramethyl-	52670-34-5	26.13	NGS	95	JNT
S16T019228				1-Iodo-2-methylundecane	73105-67-6	26.33	NGS	31	JNT
S16T019228				Decane, 2,3,5,8-tetramethyl-	192823-15-7	26.70	NGS	52	JNT

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Cartridge Evaluation
Data Summary Report

Sample Group: 20161928
SDG Number:
Customer Sample ID: 16-002-AP-EF-004D
Customer Sample ID: 16-002-AP-EF-004D

Sample#	R	A#	QC Type	Analyte	CAS No.	Retention Time (Minutes)	Unit	Result	Qual Flags
VAPOR-TDU VOA #2									
S16T019227				Methyl isocyanide	593-75-9	5.70	NGS	200	JNT
S16T019227				Hexanal	66-25-1	16.57	NGS	29	JNT
S16T019227				Cyclotetrasiloxane, octamethyl	556-67-2	20.08	NGS	160	JNT
S16T019227				Undecane, 4,7-dimethyl-	17301-32-5	22.63	NGS	110	JNT
S16T019227				2,6-Dimethyldecane	13150-81-7	22.78	NGS	46	JNT
S16T019227				Undecane, 2,6-dimethyl-	17301-23-4	23.42	NGS	56	JNT
S16T019227				2,3-Dimethyldecane	17312-44-6	23.47	NGS	31	JNT
S16T019227				Undecane	1120-21-4	23.53	NGS	120	JNT
S16T019227				Decane, 2,6,8-trimethyl-	62108-26-3	23.63	NGS	95	JNT
S16T019227				Undecane, 4-methyl-	2980-69-0	23.75	NGS	33	JNT
S16T019227				Unknown-1	--	23.96	NGS	250	JT
S16T019227				Dodecane	112-40-3	24.98	NGS	73	JNT
S16T019227				1-Octanol, 2-butyl-	3913-02-8	25.19	NGS	38	JNT
S16T019227				Methenamine	100-97-0	25.89	NGS	140	JNT
S16T019227				Decane, 2,4,6-trimethyl-	62108-27-4	26.14	NGS	100	JNT
S16T019227				1,2,3,4,5-Cyclopentanepentol	56772-25-9	26.34	NGS	37	JNT
S16T019227				Decane, 2,3,5,8-tetramethyl-	192823-15-7	26.70	NGS	51	JNT

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Cartridge Evaluation
Data Summary Report

Sample Group: 20161928
SDG Number:
Customer Sample ID: 16-002-AP-EF-004E
Customer Sample ID: 16-002-AP-EF-004E

Sample# R	A#	QC Type	Analyte	CAS No.	Retention Time (Minutes)	Unit	Result	Qual Flags
VAPOR-TDU VOA #2								
S16T019226			Cyclotetrasiloxane, octamethyl	556-67-2	20.07	NGS	170	JNT
S16T019226			Decane, 3,7-dimethyl-	17312-54-8	22.62	NGS	100	JNT
S16T019226			Undecane, 4,7-dimethyl-	17301-32-5	22.77	NGS	47	JNT
S16T019226			2,6-Dimethyldecane	13150-81-7	23.42	NGS	38	JNT
S16T019226			Undecane	1120-21-4	23.53	NGS	100	JNT
S16T019226			Decane, 2,4,6-trimethyl-	62108-27-4	23.63	NGS	72	JNT
S16T019226			Unknown-1	--	23.96	NGS	230	JT
S16T019226			Unknown-2	--	24.59	NGS	38	JT
S16T019226			Undecane, 2,6-dimethyl-	17301-23-4	24.98	NGS	52	JNT
S16T019226			Methenamine	100-97-0	25.89	NGS	150	JNT
S16T019226			Decane, 2,3,5,8-tetramethyl-	192823-15-7	26.13	NGS	60	JNT
S16T019226			Unknown-3	--	26.34	NGS	31	JT
S16T019226			1-Iodo-2-methylundecane	73105-67-6	26.70	NGS	31	JNT

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Cartridge Evaluation
Data Summary Report

Sample Group: 20161928
SDG Number:
Customer Sample ID: 16-002-AP-EF-004F
Customer Sample ID: 16-002-AP-EF-004F

Sample# R	A#	QC Type	Analyte	CAS No.	Retention Time (Minutes)	Unit	Result	Qual Flags
VAPOR-TDU VOA #2								
S16T019225			Cyclotetrasiloxane, octamethyl	556-67-2	20.08	NGS	66	JNT
S16T019225			Undecane, 5,7-dimethyl-	17312-83-3	22.63	NGS	59	JNT
S16T019225			2,6-Dimethyldecane	13150-81-7	22.78	NGS	25	JNT
S16T019225			Undecane	1120-21-4	23.53	NGS	71	JNT
S16T019225			Undecane, 2,6-dimethyl-	17301-23-4	23.63	NGS	55	JNT
S16T019225			Unknown-1	–	23.96	NGS	94	JT
S16T019225			Hydroxylamine, O-decyl-	29812-79-1	24.98	NGS	34	JNT
S16T019225			Methenamine	100-97-0	25.89	NGS	220	JNT
S16T019225			Decane, 2,4,6-trimethyl-	62108-27-4	26.13	NGS	59	JNT
S16T019225			Decane, 2,3,5,8-tetramethyl-	192823-15-7	26.70	NGS	25	JNT

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Cartridge Evaluation
Data Summary Report

Sample Group: 20161928
SDG Number:
Customer Sample ID: 16-002-AP-EF-004G
Customer Sample ID: 16-002-AP-EF-004G

Sample# R	A#	QC Type	Analyte	CAS No.	Retention Time (Minutes)	Unit	Result	Qual Flags
VAPOR-TDU VOA #2								
S16T019224			Methenamine	100-97-0	25.91	NGS	47	JNT

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Cartridge Evaluation
Data Summary Report

Sample Group: 20161928
SDG Number:
Customer Sample ID: 16-002-AP-EF-004H
Customer Sample ID: 16-002-AP-EF-004H

Sample#	R	A#	QC Type	Analyte	CAS No.	Retention Time (Minutes)	Unit	Result	Qual Flags
VAPOR-TDU VOA #2									
S16T019222				Heptane, 2,4-dimethyl-	2213-23-2	17.01	NGS	36	JNT
S16T019222				Cyclotetrasiloxane, octamethyl	556-67-2	20.06	NGS	130	JNT
S16T019222				3-Ethyl-3-methylheptane	17302-01-1	22.61	NGS	200	JNT
S16T019222				Decane, 3,7-dimethyl-	17312-54-8	22.76	NGS	83	JNT
S16T019222				1-Octanol, 3,7-dimethyl-	106-21-8	23.14	NGS	27	JNT
S16T019222				Undecane	1120-21-4	23.41	NGS	38	JNT
S16T019222				Octane, 2,3,6,7-tetramethyl-	52670-34-5	23.45	NGS	28	JNT
S16T019222				Undecane, 4,7-dimethyl-	17301-32-5	23.52	NGS	140	JNT
S16T019222				Decane, 2,4,6-trimethyl-	62108-27-4	23.63	NGS	74	JNT
S16T019222				2,3-Dimethyldecane	17312-44-6	23.75	NGS	30	JNT
S16T019222				Unknown-1	--	23.96	NGS	110	JT
S16T019222				Decane, 2,6,8-trimethyl-	62108-26-3	24.98	NGS	37	JNT
S16T019222				Methenamine	100-97-0	25.89	NGS	440	JNT
S16T019222				Decane, 2,3,5,8-tetramethyl-	192823-15-7	26.13	NGS	34	JNT

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Cartridge Evaluation
Data Summary Report

Sample Group: 20161928
SDG Number:
Customer Sample ID: 16-002-AP-IN-004A
Customer Sample ID: 16-002-AP-IN-004A

Sample#	R	A#	QC Type	Analyte	CAS No.	Retention Time (Minutes)	Unit	Result	Qual Flags
VAPOR-TDU VOA #2									
S16T019231				Silane	7803-62-5	7.91	NGS	54	JNT
S16T019231				Cyclotetrasiloxane, octamethyl	556-67-2	20.08	NGS	89	JNT
S16T019231				Decane, 3,7-dimethyl-	17312-54-8	22.63	NGS	75	JNT
S16T019231				Undecane, 4,7-dimethyl-	17301-32-5	22.78	NGS	32	JNT
S16T019231				Hydroxylamine, O-decyl-	29812-79-1	23.42	NGS	39	JNT
S16T019231				2,3-Dimethyldecane	17312-44-6	23.47	NGS	26	JNT
S16T019231				Undecane	1120-21-4	23.53	NGS	75	JNT
S16T019231				Undecane, 2,6-dimethyl-	17301-23-4	23.63	NGS	71	JNT
S16T019231				Unknown-1	--	23.96	NGS	120	JT
S16T019231				Decane, 2,6,8-trimethyl-	62108-26-3	24.98	NGS	57	JNT
S16T019231				Methenamine	100-97-0	25.90	NGS	65	JNT
S16T019231				Decane, 2,4,6-trimethyl-	62108-27-4	26.14	NGS	82	JNT
S16T019231				Decane, 2,3,5,8-tetramethyl-	192823-15-7	26.70	NGS	47	JNT

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Cartridge Evaluation
Data Summary Report

Sample Group: 20161928
SDG Number:
Customer Sample ID: 16-002-AP-IN-004BASE
Customer Sample ID: 16-002-AP-IN-004BASE

Sample# R	A#	QC Type	Analyte	CAS No.	Retention Time (Minutes)	Unit	Result	Qual Flags
VAPOR-TDU VOA #2								
S16T019233			Nitric oxide	10102-43-9	7.89	NGS	37	JNT
S16T019233			Ethylene Glycol	107-21-1	13.66	NGS	110	JNT
S16T019233			Pentanal	110-62-3	14.16	NGS	50	JNT
S16T019233			Hexanal	66-25-1	16.56	NGS	83	JNT
S16T019233			Heptanal	111-71-7	18.62	NGS	42	JNT
S16T019233			Cyclotetrasiloxane, octamethyl	556-67-2	20.07	NGS	640	JNT
S16T019233			Heptane, 2,2,4,6,6-pentamethyl	13475-82-6	21.07	NGS	42	JNT
S16T019233			Undecane, 4,7-dimethyl-	17301-32-5	22.63	NGS	200	JNT
S16T019233			Decane, 2,4,6-trimethyl-	62108-27-4	22.78	NGS	87	JNT
S16T019233			Decane, 2,5,9-trimethyl-	62108-22-9	23.41	NGS	46	JNT
S16T019233			2,3-Dimethyldecane	17312-44-6	23.46	NGS	42	JNT
S16T019233			Undecane	1120-21-4	23.53	NGS	180	JNT
S16T019233			Dodecane	112-40-3	23.63	NGS	100	JNT
S16T019233			Undecane, 4-methyl-	2980-69-0	23.75	NGS	36	JNT
S16T019233			Unknown-1	--	23.96	NGS	600	JT
S16T019233			Undecane, 2,6-dimethyl-	17301-23-4	24.98	NGS	54	JNT
S16T019233			Methenamine	100-97-0	25.91	NGS	76	JNT
S16T019233			Decane, 2,3,5,8-tetramethyl-	192823-15-7	26.13	NGS	88	JNT
S16T019233			Silane, trimethyl[2-methylene-	97778-15-9	26.33	NGS	56	JNT
S16T019233			2,6-Dimethyldecane	13150-81-7	26.70	NGS	42	JNT

NA = Not Analyzed, ND = Not Detected

T - Tentatively Identified Compound
J - Estimated
Q - Qualitative
Y - Comment
E - Outside Calibration Range
N - Named TIC
B - Blank Contamination
L - LLS Outside Range

Cartridge Evaluation
Data Summary Report

Sample Group: 20161928
SDG Number:
Customer Sample ID: 16-002-AP-IN-004H
Customer Sample ID: 16-002-AP-IN-004H

Sample#	R	A#	QC Type	Analyte	CAS No.	Retention Time (Minutes)	Unit	Result	Qual Flags
VAPOR-TDU VOA #2									
S16T019223				Allyl(methoxy)dimethylsilane	30535-30-9	8.38	NGS	26	JNT
S16T019223				Tetrahydrofuran	109-99-9	11.65	NGS	140	JNT
S16T019223				Formamide	75-12-7	13.95	NGS	29	JNT
S16T019223				Heptane, 2,4-dimethyl-	2213-23-2	17.02	NGS	34	JNT
S16T019223				Cyclotetrasiloxane, octamethyl	556-67-2	20.07	NGS	150	JNT
S16T019223				Undecane, 4,7-dimethyl-	17301-32-5	22.62	NGS	200	JNT
S16T019223				2,6-Dimethyldecane	13150-81-7	22.77	NGS	79	JNT
S16T019223				Undecane	1120-21-4	23.41	NGS	44	JNT
S16T019223				Undecane, 2,7-dimethyl-	17301-24-5	23.46	NGS	29	JNT
S16T019223				Decane, 3,7-dimethyl-	17312-54-8	23.53	NGS	130	JNT
S16T019223				Decane, 2,4,6-trimethyl-	62108-27-4	23.63	NGS	68	JNT
S16T019223				Unknown-1	--	23.96	NGS	110	JT
S16T019223				Unknown-2	--	24.62	NGS	26	JT
S16T019223				Undecane, 2,6-dimethyl-	17301-23-4	24.98	NGS	43	JNT
S16T019223				Methenamine	100-97-0	25.90	NGS	110	JNT
S16T019223				Decane, 2,3,5,8-tetramethyl-	192823-15-7	26.14	NGS	48	JNT

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Cartridge Evaluation
Data Summary Report

Sample Group: 20161925
SDG Number:
Customer Sample ID: 16-001-AP-BK-002BASE
Customer Sample ID: 16-001-AP-BK-002BASE

Sample#	R	A#	CAS #	Analyte	Unit	STD %	Blank	Result	Duplicate	Average	RPD %	Spk Rec %	Det Limit	Cnt Err %	Qual Flags
Furans in Vapor Samples by SIM															
S16T019195			1191-99-7	2,3-Dihydrofuran	NGS	n/a	n/a	<0.18	n/a	n/a	n/a	n/a	0.18	n/a	
S16T019195			1708-29-8	2,5-Dihydrofuran	NGS	n/a	n/a	<0.23	n/a	n/a	n/a	n/a	0.23	n/a	
S16T019195			625-86-5	2,5-Dimethylfuran	NGS	n/a	n/a	<0.43	n/a	n/a	n/a	n/a	0.43	n/a	
S16T019195			3777-71-7	2-Heptylfuran	NGS	n/a	n/a	<0.27	n/a	n/a	n/a	n/a	0.27	n/a	
S16T019195			534-22-5	2-Methylfuran	NGS	n/a	n/a	<0.23	n/a	n/a	n/a	n/a	0.23	n/a	
S16T019195			3777-69-3	2-Pentylfuran	NGS	n/a	n/a	<0.33	n/a	n/a	n/a	n/a	0.33	n/a	
S16T019195			4229-91-8	2-Propylfuran	NGS	n/a	n/a	<0.44	n/a	n/a	n/a	n/a	0.44	n/a	
S16T019195			110-00-9	Furan	NGS	n/a	n/a	<0.090	n/a	n/a	n/a	n/a	0.090	n/a	
S16T019195			109-99-9	Tetrahydrofuran	NGS	n/a	n/a	<0.10	n/a	n/a	n/a	n/a	0.10	n/a	

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J - Estimated

E - Outside Calibration Range

U - Less Than Detection Limit

NA = Not Analyzed, ND = Not Detected

Cartridge Evaluation
Data Summary Report

Sample Group: 20161925
SDG Number:
Customer Sample ID: 16-001-AP-EF-002A
Customer Sample ID: 16-001-AP-EF-002A

Sample#	R	A#	CAS #	Analyte	Unit	STD %	Blank	Result	Duplicate	Average	RPD %	Spk Rec %	Det Limit	Cnt Err %	Qual Flags
Furans in Vapor Samples by SIM															
S16T019191			1191-99-7	2,3-Dihydrofuran	NGS	n/a	n/a	<0.18	n/a	n/a	n/a	n/a	0.18	n/a	
S16T019191			1708-29-8	2,5-Dihydrofuran	NGS	n/a	n/a	<0.23	n/a	n/a	n/a	n/a	0.23	n/a	
S16T019191			625-86-5	2,5-Dimethylfuran	NGS	n/a	n/a	<0.43	n/a	n/a	n/a	n/a	0.43	n/a	
S16T019191			3777-71-7	2-Heptylfuran	NGS	n/a	n/a	0.29	n/a	n/a	n/a	n/a	0.27	n/a	J
S16T019191			534-22-5	2-Methylfuran	NGS	n/a	n/a	0.30	n/a	n/a	n/a	n/a	0.23	n/a	J
S16T019191			3777-69-3	2-Pentylfuran	NGS	n/a	n/a	<0.33	n/a	n/a	n/a	n/a	0.33	n/a	
S16T019191			4229-91-8	2-Propylfuran	NGS	n/a	n/a	0.48	n/a	n/a	n/a	n/a	0.44	n/a	J
S16T019191			110-00-9	Furan	NGS	n/a	n/a	0.11	n/a	n/a	n/a	n/a	0.090	n/a	J
S16T019191			109-99-9	Tetrahydrofuran	NGS	n/a	n/a	0.12	n/a	n/a	n/a	n/a	0.10	n/a	J

J - Estimated

E - Outside Calibration Range

U - Less Than Detection Limit

NA = Not Analyzed, ND = Not Detected

Cartridge Evaluation
Data Summary Report

Sample Group: 20161925
SDG Number:
Customer Sample ID: 16-001-AP-EF-002B
Customer Sample ID: 16-001-AP-EF-002B

Sample#	R	A#	CAS #	Analyte	Unit	STD %	Blank	Result	Duplicate	Average	RPD %	Spk Rec %	Det Limit	Cnt Err %	Qual Flags
Furans in Vapor Samples by SIM															
S16T019190			1191-99-7	2,3-Dihydrofuran	NGS	n/a	n/a	<0.18	n/a	n/a	n/a	n/a	0.18	n/a	
S16T019190			1708-29-8	2,5-Dihydrofuran	NGS	n/a	n/a	<0.23	n/a	n/a	n/a	n/a	0.23	n/a	
S16T019190			625-86-5	2,5-Dimethylfuran	NGS	n/a	n/a	<0.43	n/a	n/a	n/a	n/a	0.43	n/a	
S16T019190			3777-71-7	2-Heptylfuran	NGS	n/a	n/a	0.35	n/a	n/a	n/a	n/a	0.27	n/a	J
S16T019190			534-22-5	2-Methylfuran	NGS	n/a	n/a	0.35	n/a	n/a	n/a	n/a	0.23	n/a	J
S16T019190			3777-69-3	2-Pentylfuran	NGS	n/a	n/a	<0.33	n/a	n/a	n/a	n/a	0.33	n/a	
S16T019190			4229-91-8	2-Propylfuran	NGS	n/a	n/a	<0.44	n/a	n/a	n/a	n/a	0.44	n/a	
S16T019190			110-00-9	Furan	NGS	n/a	n/a	0.15	n/a	n/a	n/a	n/a	0.090	n/a	J
S16T019190			109-99-9	Tetrahydrofuran	NGS	n/a	n/a	0.16	n/a	n/a	n/a	n/a	0.10	n/a	J

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Cartridge Evaluation
Data Summary Report

Sample Group: 20161925
SDG Number:
Customer Sample ID: 16-001-AP-EF-002BASE
Customer Sample ID: 16-001-AP-EF-002BASE

Sample#	R	A#	CAS #	Analyte	Unit	STD %	Blank	Result	Duplicate	Average	RPD %	Spk Rec %	Det Limit	Cnt Err %	Qual Flags
Furans in Vapor Samples by SIM															
S16T019193			1191-99-7	2,3-Dihydrofuran	NGS	n/a	n/a	<0.18	n/a	n/a	n/a	n/a	0.18	n/a	
S16T019193			1708-29-8	2,5-Dihydrofuran	NGS	n/a	n/a	<0.23	n/a	n/a	n/a	n/a	0.23	n/a	
S16T019193			625-86-5	2,5-Dimethylfuran	NGS	n/a	n/a	<0.43	n/a	n/a	n/a	n/a	0.43	n/a	
S16T019193			3777-71-7	2-Heptylfuran	NGS	n/a	n/a	0.37	n/a	n/a	n/a	n/a	0.27	n/a	J
S16T019193			534-22-5	2-Methylfuran	NGS	n/a	n/a	<0.23	n/a	n/a	n/a	n/a	0.23	n/a	
S16T019193			3777-69-3	2-Pentylfuran	NGS	n/a	n/a	<0.33	n/a	n/a	n/a	n/a	0.33	n/a	
S16T019193			4229-91-8	2-Propylfuran	NGS	n/a	n/a	<0.44	n/a	n/a	n/a	n/a	0.44	n/a	U
S16T019193			110-00-9	Furan	NGS	n/a	n/a	<0.090	n/a	n/a	n/a	n/a	0.090	n/a	
S16T019193			109-99-9	Tetrahydrofuran	NGS	n/a	n/a	<0.10	n/a	n/a	n/a	n/a	0.10	n/a	

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J - Estimated

E - Outside Calibration Range

U - Less Than Detection Limit

Cartridge Evaluation
Data Summary Report

Sample Group: 20161925
SDG Number:
Customer Sample ID: 16-001-AP-EF-002C
Customer Sample ID: 16-001-AP-EF-002C

Sample#	R	A#	CAS #	Analyte	Unit	STD %	Blank	Result	Duplicate	Average	RPD %	Spk Rec %	Det Limit	Cnt Err %	Qual Flags
Furans in Vapor Samples by SIM															
S16T019189			1191-99-7	2,3-Dihydrofuran	NGS	n/a	n/a	0.19	n/a	n/a	n/a	n/a	0.18	n/a	J
S16T019189			1708-29-8	2,5-Dihydrofuran	NGS	n/a	n/a	<0.23	n/a	n/a	n/a	n/a	0.23	n/a	
S16T019189			625-86-5	2,5-Dimethylfuran	NGS	n/a	n/a	<0.43	n/a	n/a	n/a	n/a	0.43	n/a	
S16T019189			3777-71-7	2-Heptylfuran	NGS	n/a	n/a	0.32	n/a	n/a	n/a	n/a	0.27	n/a	J
S16T019189			534-22-5	2-Methylfuran	NGS	n/a	n/a	<0.23	n/a	n/a	n/a	n/a	0.23	n/a	
S16T019189			3777-69-3	2-Pentylfuran	NGS	n/a	n/a	0.39	n/a	n/a	n/a	n/a	0.33	n/a	J
S16T019189			4229-91-8	2-Propylfuran	NGS	n/a	n/a	<0.44	n/a	n/a	n/a	n/a	0.44	n/a	
S16T019189			110-00-9	Furan	NGS	n/a	n/a	0.11	n/a	n/a	n/a	n/a	0.090	n/a	J
S16T019189			109-99-9	Tetrahydrofuran	NGS	n/a	n/a	0.38	n/a	n/a	n/a	n/a	0.10	n/a	J

NA = Not Analyzed, ND = Not Detected

J - Estimated

E - Outside Calibration Range

U - Less Than Detection Limit

Cartridge Evaluation
Data Summary Report

Sample Group: 20161925
SDG Number:
Customer Sample ID: 16-001-AP-EF-002D
Customer Sample ID: 16-001-AP-EF-002D

Sample#	R	A#	CAS #	Analyte	Unit	STD %	Blank	Result	Duplicate	Average	RPD %	Spk Rec %	Det Limit	Cnt Err %	Qual Flags
Furans in Vapor Samples by SIM															
S16T019188			1191-99-7	2,3-Dihydrofuran	NGS	n/a	n/a	<0.18	n/a	n/a	n/a	n/a	0.18	n/a	
S16T019188			1708-29-8	2,5-Dihydrofuran	NGS	n/a	n/a	<0.23	n/a	n/a	n/a	n/a	0.23	n/a	
S16T019188			625-86-5	2,5-Dimethylfuran	NGS	n/a	n/a	<0.43	n/a	n/a	n/a	n/a	0.43	n/a	
S16T019188			3777-71-7	2-Heptylfuran	NGS	n/a	n/a	<0.27	n/a	n/a	n/a	n/a	0.27	n/a	
S16T019188			534-22-5	2-Methylfuran	NGS	n/a	n/a	<0.23	n/a	n/a	n/a	n/a	0.23	n/a	
S16T019188			3777-69-3	2-Pentylfuran	NGS	n/a	n/a	<0.33	n/a	n/a	n/a	n/a	0.33	n/a	
S16T019188			4229-91-8	2-Propylfuran	NGS	n/a	n/a	<0.44	n/a	n/a	n/a	n/a	0.44	n/a	
S16T019188			110-00-9	Furan	NGS	n/a	n/a	0.12	n/a	n/a	n/a	n/a	0.090	n/a	J
S16T019188			109-99-9	Tetrahydrofuran	NGS	n/a	n/a	0.42	n/a	n/a	n/a	n/a	0.10	n/a	J

NA = Not Analyzed, ND = Not Detected

J - Estimated

E - Outside Calibration Range

U - Less Than Detection Limit

Cartridge Evaluation
Data Summary Report

Sample Group: 20161925
SDG Number:
Customer Sample ID: 16-001-AP-EF-002E
Customer Sample ID: 16-001-AP-EF-002E

Sample#	R	A#	CAS #	Analyte	Unit	STD %	Blank	Result	Duplicate	Average	RPD %	Spk Rec %	Det Limit	Cnt Err %	Qual Flags
Furans in Vapor Samples by SIM															
S16T019187			1191-99-7	2,3-Dihydrofuran	NGS	n/a	n/a	<0.18	n/a	n/a	n/a	n/a	0.18	n/a	
S16T019187			1708-29-8	2,5-Dihydrofuran	NGS	n/a	n/a	<0.23	n/a	n/a	n/a	n/a	0.23	n/a	
S16T019187			625-86-5	2,5-Dimethylfuran	NGS	n/a	n/a	<0.43	n/a	n/a	n/a	n/a	0.43	n/a	
S16T019187			3777-71-7	2-Heptylfuran	NGS	n/a	n/a	<0.27	n/a	n/a	n/a	n/a	0.27	n/a	
S16T019187			534-22-5	2-Methylfuran	NGS	n/a	n/a	<0.23	n/a	n/a	n/a	n/a	0.23	n/a	
S16T019187			3777-69-3	2-Pentylfuran	NGS	n/a	n/a	<0.33	n/a	n/a	n/a	n/a	0.33	n/a	
S16T019187			4229-91-8	2-Propylfuran	NGS	n/a	n/a	<0.44	n/a	n/a	n/a	n/a	0.44	n/a	
S16T019187			110-00-9	Furan	NGS	n/a	n/a	0.12	n/a	n/a	n/a	n/a	0.090	n/a	J
S16T019187			109-99-9	Tetrahydrofuran	NGS	n/a	n/a	1.1	n/a	n/a	n/a	n/a	0.10	n/a	J

NA = Not Analyzed, ND = Not Detected

J - Estimated

E - Outside Calibration Range

U - Less Than Detection Limit

Cartridge Evaluation
Data Summary Report

Sample Group: 20161925
SDG Number:
Customer Sample ID: 16-001-AP-EF-002F
Customer Sample ID: 16-001-AP-EF-002F

Sample#	R	A#	CAS #	Analyte	Unit	STD %	Blank	Result	Duplicate	Average	RPD %	Spk Rec %	Det Limit	Cnt Err %	Qual Flags
Furans in Vapor Samples by SIM															
S16T019186			1191-99-7	2,3-Dihydrofuran	NGS	n/a	n/a	<0.18	n/a	n/a	n/a	n/a	0.18	n/a	
S16T019186			1708-29-8	2,5-Dihydrofuran	NGS	n/a	n/a	<0.23	n/a	n/a	n/a	n/a	0.23	n/a	
S16T019186			625-86-5	2,5-Dimethylfuran	NGS	n/a	n/a	<0.43	n/a	n/a	n/a	n/a	0.43	n/a	
S16T019186			3777-71-7	2-Heptylfuran	NGS	n/a	n/a	<0.27	n/a	n/a	n/a	n/a	0.27	n/a	
S16T019186			534-22-5	2-Methylfuran	NGS	n/a	n/a	<0.23	n/a	n/a	n/a	n/a	0.23	n/a	
S16T019186			3777-69-3	2-Pentylfuran	NGS	n/a	n/a	<0.33	n/a	n/a	n/a	n/a	0.33	n/a	
S16T019186			4229-91-8	2-Propylfuran	NGS	n/a	n/a	<0.44	n/a	n/a	n/a	n/a	0.44	n/a	
S16T019186			110-00-9	Furan	NGS	n/a	n/a	0.090	n/a	n/a	n/a	n/a	0.090	n/a	J
S16T019186			109-99-9	Tetrahydrofuran	NGS	n/a	n/a	2.9	n/a	n/a	n/a	n/a	0.10	n/a	J

J - Estimated

E - Outside Calibration Range

U - Less Than Detection Limit

NA = Not Analyzed, ND = Not Detected

Cartridge Evaluation
Data Summary Report

Sample Group: 20161925
SDG Number:
Customer Sample ID: 16-001-AP-EF-002G
Customer Sample ID: 16-001-AP-EF-002G

Sample#	R	A#	CAS #	Analyte	Unit	STD %	Blank	Result	Duplicate	Average	RPD %	Spk Rec %	Det Limit	Cnt Err %	Qual Flags
Furans in Vapor Samples by SIM															
S16T019185			1191-99-7	2,3-Dihydrofuran	NGS	n/a	n/a	<0.18	n/a	n/a	n/a	n/a	0.18	n/a	
S16T019185			1708-29-8	2,5-Dihydrofuran	NGS	n/a	n/a	<0.23	n/a	n/a	n/a	n/a	0.23	n/a	
S16T019185			625-86-5	2,5-Dimethylfuran	NGS	n/a	n/a	<0.43	n/a	n/a	n/a	n/a	0.43	n/a	
S16T019185			3777-71-7	2-Heptylfuran	NGS	n/a	n/a	<0.27	n/a	n/a	n/a	n/a	0.27	n/a	
S16T019185			534-22-5	2-Methylfuran	NGS	n/a	n/a	<0.23	n/a	n/a	n/a	n/a	0.23	n/a	
S16T019185			3777-69-3	2-Pentylfuran	NGS	n/a	n/a	<0.33	n/a	n/a	n/a	n/a	0.33	n/a	
S16T019185			4229-91-8	2-Propylfuran	NGS	n/a	n/a	<0.44	n/a	n/a	n/a	n/a	0.44	n/a	
S16T019185			110-00-9	Furan	NGS	n/a	n/a	<0.090	n/a	n/a	n/a	n/a	0.090	n/a	
S16T019185			109-99-9	Tetrahydrofuran	NGS	n/a	n/a	0.12	n/a	n/a	n/a	n/a	0.10	n/a	J

NA = Not Analyzed, ND = Not Detected

J - Estimated

E - Outside Calibration Range

U - Less Than Detection Limit

Cartridge Evaluation
Data Summary Report

Sample Group: 20161925
SDG Number:
Customer Sample ID: 16-001-AP-EF-002H
Customer Sample ID: 16-001-AP-EF-002H

Sample#	R	A#	CAS #	Analyte	Unit	STD %	Blank	Result	Duplicate	Average	RPD %	Spk Rec %	Det Limit	Cnt Err %	Qual Flags
Furans in Vapor Samples by SIM															
S16T019183			1191-99-7	2,3-Dihydrofuran	NGS	n/a	n/a	0.56	n/a	n/a	n/a	n/a	0.18	n/a	J
S16T019183			1708-29-8	2,5-Dihydrofuran	NGS	n/a	n/a	<0.23	n/a	n/a	n/a	n/a	0.23	n/a	
S16T019183			625-86-5	2,5-Dimethylfuran	NGS	n/a	n/a	<0.43	n/a	n/a	n/a	n/a	0.43	n/a	
S16T019183			3777-71-7	2-Heptylfuran	NGS	n/a	n/a	<0.27	n/a	n/a	n/a	n/a	0.27	n/a	
S16T019183			534-22-5	2-Methylfuran	NGS	n/a	n/a	<0.23	n/a	n/a	n/a	n/a	0.23	n/a	
S16T019183			3777-69-3	2-Pentylfuran	NGS	n/a	n/a	0.40	n/a	n/a	n/a	n/a	0.33	n/a	J
S16T019183			4229-91-8	2-Propylfuran	NGS	n/a	n/a	<0.44	n/a	n/a	n/a	n/a	0.44	n/a	
S16T019183			110-00-9	Furan	NGS	n/a	n/a	<0.090	n/a	n/a	n/a	n/a	0.090	n/a	
S16T019183			109-99-9	Tetrahydrofuran	NGS	n/a	n/a	5.9	n/a	n/a	n/a	n/a	0.10	n/a	

NA = Not Analyzed, ND = Not Detected

J - Estimated

E - Outside Calibration Range

U - Less Than Detection Limit

Cartridge Evaluation
Data Summary Report

Sample Group: 20161925
SDG Number:
Customer Sample ID: 16-001-AP-IN-002A
Customer Sample ID: 16-001-AP-IN-002A

Sample#	R	A#	CAS #	Analyte	Unit	STD %	Blank	Result	Duplicate	Average	RPD %	Spk Rec %	Det Limit	Cnt Err %	Qual Flags
Furans in Vapor Samples by SIM															
S16T019192			1191-99-7	2,3-Dihydrofuran	NGS	n/a	n/a	0.29	n/a	n/a	n/a	n/a	0.18	n/a	J
S16T019192			1708-29-8	2,5-Dihydrofuran	NGS	n/a	n/a	<0.23	n/a	n/a	n/a	n/a	0.23	n/a	
S16T019192			625-86-5	2,5-Dimethylfuran	NGS	n/a	n/a	<0.43	n/a	n/a	n/a	n/a	0.43	n/a	
S16T019192			3777-71-7	2-Heptylfuran	NGS	n/a	n/a	<0.27	n/a	n/a	n/a	n/a	0.27	n/a	
S16T019192			534-22-5	2-Methylfuran	NGS	n/a	n/a	<0.23	n/a	n/a	n/a	n/a	0.23	n/a	
S16T019192			3777-69-3	2-Pentylfuran	NGS	n/a	n/a	0.39	n/a	n/a	n/a	n/a	0.33	n/a	J
S16T019192			4229-91-8	2-Propylfuran	NGS	n/a	n/a	<0.44	n/a	n/a	n/a	n/a	0.44	n/a	
S16T019192			110-00-9	Furan	NGS	n/a	n/a	0.23	n/a	n/a	n/a	n/a	0.090	n/a	J
S16T019192			109-99-9	Tetrahydrofuran	NGS	n/a	n/a	190	n/a	n/a	n/a	n/a	0.10	n/a	E

NA = Not Analyzed, ND = Not Detected

J - Estimated

E - Outside Calibration Range

U - Less Than Detection Limit

Cartridge Evaluation
Data Summary Report

Sample Group: 20161925
SDG Number:
Customer Sample ID: 16-001-AP-IN-002BASE
Customer Sample ID: 16-001-AP-IN-002BASE

Sample#	R	A#	CAS #	Analyte	Unit	STD %	Blank	Result	Duplicate	Average	RPD %	Spk Rec %	Det Limit	Cnt Err %	Qual Flags
Furans in Vapor Samples by SIM															
S16T019194			1191-99-7	2,3-Dihydrofuran	NGS	n/a	n/a	0.31	n/a	n/a	n/a	n/a	0.18	n/a	J
S16T019194			1708-29-8	2,5-Dihydrofuran	NGS	n/a	n/a	<0.23	n/a	n/a	n/a	n/a	0.23	n/a	
S16T019194			625-86-5	2,5-Dimethylfuran	NGS	n/a	n/a	<0.43	n/a	n/a	n/a	n/a	0.43	n/a	
S16T019194			3777-71-7	2-Heptylfuran	NGS	n/a	n/a	<0.27	n/a	n/a	n/a	n/a	0.27	n/a	
S16T019194			534-22-5	2-Methylfuran	NGS	n/a	n/a	<0.23	n/a	n/a	n/a	n/a	0.23	n/a	
S16T019194			3777-69-3	2-Pentylfuran	NGS	n/a	n/a	<0.33	n/a	n/a	n/a	n/a	0.33	n/a	
S16T019194			4229-91-8	2-Propylfuran	NGS	n/a	n/a	<0.44	n/a	n/a	n/a	n/a	0.44	n/a	
S16T019194			110-00-9	Furan	NGS	n/a	n/a	<0.090	n/a	n/a	n/a	n/a	0.090	n/a	
S16T019194			109-99-9	Tetrahydrofuran	NGS	n/a	n/a	0.10	n/a	n/a	n/a	n/a	0.10	n/a	J

NA = Not Analyzed, ND = Not Detected

J - Estimated

E - Outside Calibration Range

U - Less Than Detection Limit

Cartridge Evaluation
Data Summary Report

Sample Group: 20161925
SDG Number:
Customer Sample ID: 16-001-AP-IN-002H
Customer Sample ID: 16-001-AP-IN-002H

Sample#	R	A#	CAS #	Analyte	Unit	STD %	Blank	Result	Duplicate	Average	RPD %	Spk Rec %	Det Limit	Cnt Err %	Qual Flags
Furans in Vapor Samples by SIM															
S16T019184			1191-99-7	2,3-Dihydrofuran	NGS	n/a	n/a	<0.18	n/a	n/a	n/a	n/a	0.18	n/a	
S16T019184			1708-29-8	2,5-Dihydrofuran	NGS	n/a	n/a	0.31	n/a	n/a	n/a	n/a	0.23	n/a	J
S16T019184			625-86-5	2,5-Dimethylfuran	NGS	n/a	n/a	<0.43	n/a	n/a	n/a	n/a	0.43	n/a	
S16T019184			3777-71-7	2-Heptylfuran	NGS	n/a	n/a	0.28	n/a	n/a	n/a	n/a	0.27	n/a	J
S16T019184			534-22-5	2-Methylfuran	NGS	n/a	n/a	<0.23	n/a	n/a	n/a	n/a	0.23	n/a	
S16T019184			3777-69-3	2-Pentylfuran	NGS	n/a	n/a	<0.33	n/a	n/a	n/a	n/a	0.33	n/a	
S16T019184			4229-91-8	2-Propylfuran	NGS	n/a	n/a	<0.44	n/a	n/a	n/a	n/a	0.44	n/a	
S16T019184			110-00-9	Furan	NGS	n/a	n/a	0.15	n/a	n/a	n/a	n/a	0.090	n/a	J
S16T019184			109-99-9	Tetrahydrofuran	NGS	n/a	n/a	220	n/a	n/a	n/a	n/a	0.10	n/a	E

NA = Not Analyzed, ND = Not Detected

J - Estimated

E - Outside Calibration Range

U - Less Than Detection Limit

Cartridge Evaluation
Data Summary Report

Sample Group: 20161926
SDG Number:
Customer Sample ID: 16-002-AP-BK-002BASE
Customer Sample ID: 16-002-AP-BK-002BASE

Sample#	R	A#	CAS #	Analyte	Unit	STD %	Blank	Result	Duplicate	Average	RPD %	Spk Rec %	Det Limit	Cnt Err %	Qual Flags
Furans in Vapor Samples by SIM															
S16T019208			1191-99-7	2,3-Dihydrofuran	NGS	n/a	n/a	<0.18	n/a	n/a	n/a	n/a	0.18	n/a	
S16T019208			1708-29-8	2,5-Dihydrofuran	NGS	n/a	n/a	<0.23	n/a	n/a	n/a	n/a	0.23	n/a	
S16T019208			625-86-5	2,5-Dimethylfuran	NGS	n/a	n/a	<0.43	n/a	n/a	n/a	n/a	0.43	n/a	
S16T019208			3777-71-7	2-Heptylfuran	NGS	n/a	n/a	<0.27	n/a	n/a	n/a	n/a	0.27	n/a	
S16T019208			534-22-5	2-Methylfuran	NGS	n/a	n/a	<0.23	n/a	n/a	n/a	n/a	0.23	n/a	
S16T019208			3777-69-3	2-Pentylfuran	NGS	n/a	n/a	<0.33	n/a	n/a	n/a	n/a	0.33	n/a	
S16T019208			4229-91-8	2-Propylfuran	NGS	n/a	n/a	<0.44	n/a	n/a	n/a	n/a	0.44	n/a	
S16T019208			110-00-9	Furan	NGS	n/a	n/a	<0.090	n/a	n/a	n/a	n/a	0.090	n/a	
S16T019208			109-99-9	Tetrahydrofuran	NGS	n/a	n/a	<0.10	n/a	n/a	n/a	n/a	0.10	n/a	

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E - Outside Calibration Range

J - Estimated

Cartridge Evaluation
Data Summary Report

Sample Group: 20161926
SDG Number:
Customer Sample ID: 16-002-AP-EF-002A
Customer Sample ID: 16-002-AP-EF-002A

Sample#	R	A#	CAS #	Analyte	Unit	STD %	Blank	Result	Duplicate	Average	RPD %	Spk Rec %	Det Limit	Cnt Err %	Qual Flags
Furans in Vapor Samples by SIM															
S16T019204			1191-99-7	2,3-Dihydrofuran	NGS	n/a	n/a	<0.18	n/a	n/a	n/a	n/a	0.18	n/a	
S16T019204			1708-29-8	2,5-Dihydrofuran	NGS	n/a	n/a	<0.23	n/a	n/a	n/a	n/a	0.23	n/a	
S16T019204			625-86-5	2,5-Dimethylfuran	NGS	n/a	n/a	<0.43	n/a	n/a	n/a	n/a	0.43	n/a	
S16T019204			3777-71-7	2-Heptylfuran	NGS	n/a	n/a	0.37	n/a	n/a	n/a	n/a	0.27	n/a	J
S16T019204			534-22-5	2-Methylfuran	NGS	n/a	n/a	0.61	n/a	n/a	n/a	n/a	0.23	n/a	J
S16T019204			3777-69-3	2-Pentylfuran	NGS	n/a	n/a	0.50	n/a	n/a	n/a	n/a	0.33	n/a	J
S16T019204			4229-91-8	2-Propylfuran	NGS	n/a	n/a	<0.44	n/a	n/a	n/a	n/a	0.44	n/a	
S16T019204			110-00-9	Furan	NGS	n/a	n/a	0.26	n/a	n/a	n/a	n/a	0.090	n/a	J
S16T019204			109-99-9	Tetrahydrofuran	NGS	n/a	n/a	140	n/a	n/a	n/a	n/a	0.10	n/a	E

NA = Not Analyzed, ND = Not Detected

E - Outside Calibration Range

J - Estimated

Cartridge Evaluation
Data Summary Report

Sample Group: 20161926
SDG Number:
Customer Sample ID: 16-002-AP-EF-002B
Customer Sample ID: 16-002-AP-EF-002B

Sample#	R	A#	CAS #	Analyte	Unit	STD %	Blank	Result	Duplicate	Average	RPD %	Spk Rec %	Det Limit	Cnt Err %	Qual Flags
Furans in Vapor Samples by SIM															
S16T019203			1191-99-7	2,3-Dihydrofuran	NGS	n/a	n/a	0.19	n/a	n/a	n/a	n/a	0.18	n/a	J
S16T019203			1708-29-8	2,5-Dihydrofuran	NGS	n/a	n/a	<0.23	n/a	n/a	n/a	n/a	0.23	n/a	
S16T019203			625-86-5	2,5-Dimethylfuran	NGS	n/a	n/a	<0.43	n/a	n/a	n/a	n/a	0.43	n/a	
S16T019203			3777-71-7	2-Heptylfuran	NGS	n/a	n/a	0.40	n/a	n/a	n/a	n/a	0.27	n/a	J
S16T019203			534-22-5	2-Methylfuran	NGS	n/a	n/a	<0.23	n/a	n/a	n/a	n/a	0.23	n/a	
S16T019203			3777-69-3	2-Pentylfuran	NGS	n/a	n/a	0.43	n/a	n/a	n/a	n/a	0.33	n/a	J
S16T019203			4229-91-8	2-Propylfuran	NGS	n/a	n/a	<0.44	n/a	n/a	n/a	n/a	0.44	n/a	
S16T019203			110-00-9	Furan	NGS	n/a	n/a	0.15	n/a	n/a	n/a	n/a	0.090	n/a	J
S16T019203			109-99-9	Tetrahydrofuran	NGS	n/a	n/a	0.10	n/a	n/a	n/a	n/a	0.10	n/a	J

NA = Not Analyzed, ND = Not Detected

E - Outside Calibration Range

J - Estimated

Cartridge Evaluation
Data Summary Report

Sample Group: 20161926
SDG Number:
Customer Sample ID: 16-002-AP-EF-002BASE
Customer Sample ID: 16-002-AP-EF-002BASE

Sample#	R	A#	CAS #	Analyte	Unit	STD %	Blank	Result	Duplicate	Average	RPD %	Spk Rec %	Det Limit	Cnt Err %	Qual Flags
Furans in Vapor Samples by SIM															
S16T019206			1191-99-7	2,3-Dihydrofuran	NGS	n/a	n/a	<0.18	n/a	n/a	n/a	n/a	0.18	n/a	
S16T019206			1708-29-8	2,5-Dihydrofuran	NGS	n/a	n/a	0.26	n/a	n/a	n/a	n/a	0.23	n/a	J
S16T019206			625-86-5	2,5-Dimethylfuran	NGS	n/a	n/a	<0.43	n/a	n/a	n/a	n/a	0.43	n/a	
S16T019206			3777-71-7	2-Heptylfuran	NGS	n/a	n/a	0.49	n/a	n/a	n/a	n/a	0.27	n/a	J
S16T019206			534-22-5	2-Methylfuran	NGS	n/a	n/a	<0.23	n/a	n/a	n/a	n/a	0.23	n/a	
S16T019206			3777-69-3	2-Pentylfuran	NGS	n/a	n/a	0.83	n/a	n/a	n/a	n/a	0.33	n/a	J
S16T019206			4229-91-8	2-Propylfuran	NGS	n/a	n/a	<0.44	n/a	n/a	n/a	n/a	0.44	n/a	
S16T019206			110-00-9	Furan	NGS	n/a	n/a	0.090	n/a	n/a	n/a	n/a	0.090	n/a	J
S16T019206			109-99-9	Tetrahydrofuran	NGS	n/a	n/a	0.29	n/a	n/a	n/a	n/a	0.10	n/a	J

NA = Not Analyzed, ND = Not Detected

E - Outside Calibration Range

J - Estimated

Cartridge Evaluation
Data Summary Report

Sample Group: 20161926
SDG Number:
Customer Sample ID: 16-002-AP-EF-002C
Customer Sample ID: 16-002-AP-EF-002C

Sample#	R	A#	CAS #	Analyte	Unit	STD %	Blank	Result	Duplicate	Average	RPD %	Spk Rec %	Det Limit	Cnt Err %	Qual Flags
Furans in Vapor Samples by SIM															
S16T019202			1191-99-7	2,3-Dihydrofuran	NGS	n/a	n/a	<0.18	n/a	n/a	n/a	n/a	0.18	n/a	
S16T019202			1708-29-8	2,5-Dihydrofuran	NGS	n/a	n/a	<0.23	n/a	n/a	n/a	n/a	0.23	n/a	
S16T019202			625-86-5	2,5-Dimethylfuran	NGS	n/a	n/a	<0.43	n/a	n/a	n/a	n/a	0.43	n/a	
S16T019202			3777-71-7	2-Heptylfuran	NGS	n/a	n/a	0.41	n/a	n/a	n/a	n/a	0.27	n/a	J
S16T019202			534-22-5	2-Methylfuran	NGS	n/a	n/a	<0.23	n/a	n/a	n/a	n/a	0.23	n/a	
S16T019202			3777-69-3	2-Pentylfuran	NGS	n/a	n/a	0.41	n/a	n/a	n/a	n/a	0.33	n/a	J
S16T019202			4229-91-8	2-Propylfuran	NGS	n/a	n/a	<0.44	n/a	n/a	n/a	n/a	0.44	n/a	
S16T019202			110-00-9	Furan	NGS	n/a	n/a	0.10	n/a	n/a	n/a	n/a	0.090	n/a	J
S16T019202			109-99-9	Tetrahydrofuran	NGS	n/a	n/a	<0.10	n/a	n/a	n/a	n/a	0.10	n/a	

NA = Not Analyzed, ND = Not Detected

E - Outside Calibration Range

J - Estimated

Cartridge Evaluation
Data Summary Report

Sample Group: 20161926
SDG Number:
Customer Sample ID: 16-002-AP-EF-002D
Customer Sample ID: 16-002-AP-EF-002D

Sample#	R	A#	CAS #	Analyte	Unit	STD %	Blank	Result	Duplicate	Average	RPD %	Spk Rec %	Det Limit	Cnt Err %	Qual Flags
Furans in Vapor Samples by SIM															
S16T019201			1191-99-7	2,3-Dihydrofuran	NGS	n/a	n/a	<0.18	n/a	n/a	n/a	n/a	0.18	n/a	
S16T019201			1708-29-8	2,5-Dihydrofuran	NGS	n/a	n/a	<0.23	n/a	n/a	n/a	n/a	0.23	n/a	
S16T019201			625-86-5	2,5-Dimethylfuran	NGS	n/a	n/a	<0.43	n/a	n/a	n/a	n/a	0.43	n/a	
S16T019201			3777-71-7	2-Heptylfuran	NGS	n/a	n/a	0.32	n/a	n/a	n/a	n/a	0.27	n/a	J
S16T019201			534-22-5	2-Methylfuran	NGS	n/a	n/a	<0.23	n/a	n/a	n/a	n/a	0.23	n/a	
S16T019201			3777-69-3	2-Pentylfuran	NGS	n/a	n/a	<0.33	n/a	n/a	n/a	n/a	0.33	n/a	
S16T019201			4229-91-8	2-Propylfuran	NGS	n/a	n/a	<0.44	n/a	n/a	n/a	n/a	0.44	n/a	
S16T019201			110-00-9	Furan	NGS	n/a	n/a	0.14	n/a	n/a	n/a	n/a	0.090	n/a	J
S16T019201			109-99-9	Tetrahydrofuran	NGS	n/a	n/a	0.10	n/a	n/a	n/a	n/a	0.10	n/a	J

NA = Not Analyzed, ND = Not Detected

E - Outside Calibration Range

J - Estimated

Cartridge Evaluation
Data Summary Report

Sample Group: 20161926
SDG Number:
Customer Sample ID: 16-002-AP-EF-002E
Customer Sample ID: 16-002-AP-EF-002E

Sample#	R	A#	CAS #	Analyte	Unit	STD %	Blank	Result	Duplicate	Average	RPD %	Spk Rec %	Det Limit	Cnt Err %	Qual Flags
Furans in Vapor Samples by SIM															
S16T019200			1191-99-7	2,3-Dihydrofuran	NGS	n/a	n/a	<0.18	n/a	n/a	n/a	n/a	0.18	n/a	
S16T019200			1708-29-8	2,5-Dihydrofuran	NGS	n/a	n/a	<0.23	n/a	n/a	n/a	n/a	0.23	n/a	
S16T019200			625-86-5	2,5-Dimethylfuran	NGS	n/a	n/a	<0.43	n/a	n/a	n/a	n/a	0.43	n/a	
S16T019200			3777-71-7	2-Heptylfuran	NGS	n/a	n/a	<0.27	n/a	n/a	n/a	n/a	0.27	n/a	
S16T019200			534-22-5	2-Methylfuran	NGS	n/a	n/a	<0.23	n/a	n/a	n/a	n/a	0.23	n/a	
S16T019200			3777-69-3	2-Pentylfuran	NGS	n/a	n/a	<0.33	n/a	n/a	n/a	n/a	0.33	n/a	
S16T019200			4229-91-8	2-Propylfuran	NGS	n/a	n/a	<0.44	n/a	n/a	n/a	n/a	0.44	n/a	
S16T019200			110-00-9	Furan	NGS	n/a	n/a	0.10	n/a	n/a	n/a	n/a	0.090	n/a	J
S16T019200			109-99-9	Tetrahydrofuran	NGS	n/a	n/a	0.28	n/a	n/a	n/a	n/a	0.10	n/a	J

E - Outside Calibration Range

J - Estimated

NA = Not Analyzed, ND = Not Detected

Cartridge Evaluation
Data Summary Report

Sample Group: 20161926
SDG Number:
Customer Sample ID: 16-002-AP-EF-002F
Customer Sample ID: 16-002-AP-EF-002F

Sample#	R	A#	CAS #	Analyte	Unit	STD %	Blank	Result	Duplicate	Average	RPD %	Spk Rec %	Det Limit	Cnt Err %	Qual Flags
Furans in Vapor Samples by SIM															
S16T019199			1191-99-7	2,3-Dihydrofuran	NGS	n/a	n/a	<0.18	n/a	n/a	n/a	n/a	0.18	n/a	
S16T019199			1708-29-8	2,5-Dihydrofuran	NGS	n/a	n/a	<0.23	n/a	n/a	n/a	n/a	0.23	n/a	
S16T019199			625-86-5	2,5-Dimethylfuran	NGS	n/a	n/a	<0.43	n/a	n/a	n/a	n/a	0.43	n/a	
S16T019199			3777-71-7	2-Heptylfuran	NGS	n/a	n/a	<0.27	n/a	n/a	n/a	n/a	0.27	n/a	
S16T019199			534-22-5	2-Methylfuran	NGS	n/a	n/a	<0.23	n/a	n/a	n/a	n/a	0.23	n/a	
S16T019199			3777-69-3	2-Pentylfuran	NGS	n/a	n/a	<0.33	n/a	n/a	n/a	n/a	0.33	n/a	
S16T019199			4229-91-8	2-Propylfuran	NGS	n/a	n/a	<0.44	n/a	n/a	n/a	n/a	0.44	n/a	
S16T019199			110-00-9	Furan	NGS	n/a	n/a	0.10	n/a	n/a	n/a	n/a	0.090	n/a	J
S16T019199			109-99-9	Tetrahydrofuran	NGS	n/a	n/a	0.49	n/a	n/a	n/a	n/a	0.10	n/a	J

NA = Not Analyzed, ND = Not Detected

E - Outside Calibration Range

J - Estimated

Cartridge Evaluation
Data Summary Report

Sample Group: 20161926
SDG Number:
Customer Sample ID: 16-002-AP-EF-002G
Customer Sample ID: 16-002-AP-EF-002G

Sample#	R	A#	CAS #	Analyte	Unit	STD %	Blank	Result	Duplicate	Average	RPD %	Spk Rec %	Det Limit	Cnt Err %	Qual Flags
Furans in Vapor Samples by SIM															
S16T019198			1191-99-7	2,3-Dihydrofuran	NGS	n/a	n/a	<0.18	n/a	n/a	n/a	n/a	0.18	n/a	
S16T019198			1708-29-8	2,5-Dihydrofuran	NGS	n/a	n/a	<0.23	n/a	n/a	n/a	n/a	0.23	n/a	
S16T019198			625-86-5	2,5-Dimethylfuran	NGS	n/a	n/a	<0.43	n/a	n/a	n/a	n/a	0.43	n/a	
S16T019198			3777-71-7	2-Heptylfuran	NGS	n/a	n/a	0.36	n/a	n/a	n/a	n/a	0.27	n/a	J
S16T019198			534-22-5	2-Methylfuran	NGS	n/a	n/a	<0.23	n/a	n/a	n/a	n/a	0.23	n/a	
S16T019198			3777-69-3	2-Pentylfuran	NGS	n/a	n/a	1.2	n/a	n/a	n/a	n/a	0.33	n/a	J
S16T019198			4229-91-8	2-Propylfuran	NGS	n/a	n/a	<0.44	n/a	n/a	n/a	n/a	0.44	n/a	
S16T019198			110-00-9	Furan	NGS	n/a	n/a	<0.090	n/a	n/a	n/a	n/a	0.090	n/a	
S16T019198			109-99-9	Tetrahydrofuran	NGS	n/a	n/a	0.99	n/a	n/a	n/a	n/a	0.10	n/a	J

NA = Not Analyzed, ND = Not Detected

E - Outside Calibration Range

J - Estimated

Cartridge Evaluation
Data Summary Report

Sample Group: 20161926
SDG Number:
Customer Sample ID: 16-002-AP-EF-002H
Customer Sample ID: 16-002-AP-EF-002H

Sample#	R	A#	CAS #	Analyte	Unit	STD %	Blank	Result	Duplicate	Average	RPD %	Spk Rec %	Det Limit	Cnt Err %	Qual Flags
Furans in Vapor Samples by SIM															
S16T019196			1191-99-7	2,3-Dihydrofuran	NGS	n/a	n/a	<0.18	n/a	n/a	n/a	n/a	0.18	n/a	
S16T019196			1708-29-8	2,5-Dihydrofuran	NGS	n/a	n/a	<0.23	n/a	n/a	n/a	n/a	0.23	n/a	
S16T019196			625-86-5	2,5-Dimethylfuran	NGS	n/a	n/a	<0.43	n/a	n/a	n/a	n/a	0.43	n/a	
S16T019196			3777-71-7	2-Heptylfuran	NGS	n/a	n/a	0.28	n/a	n/a	n/a	n/a	0.27	n/a	J
S16T019196			534-22-5	2-Methylfuran	NGS	n/a	n/a	<0.23	n/a	n/a	n/a	n/a	0.23	n/a	
S16T019196			3777-69-3	2-Pentylfuran	NGS	n/a	n/a	0.45	n/a	n/a	n/a	n/a	0.33	n/a	J
S16T019196			4229-91-8	2-Propylfuran	NGS	n/a	n/a	<0.44	n/a	n/a	n/a	n/a	0.44	n/a	
S16T019196			110-00-9	Furan	NGS	n/a	n/a	0.12	n/a	n/a	n/a	n/a	0.090	n/a	J
S16T019196			109-99-9	Tetrahydrofuran	NGS	n/a	n/a	1.9	n/a	n/a	n/a	n/a	0.10	n/a	J

NA = Not Analyzed, ND = Not Detected

E - Outside Calibration Range

J - Estimated

Cartridge Evaluation
Data Summary Report

Sample Group: 20161926
SDG Number:
Customer Sample ID: 16-002-AP-IN-002A
Customer Sample ID: 16-002-AP-IN-002A

Sample#	R	A#	CAS #	Analyte	Unit	STD %	Blank	Result	Duplicate	Average	RPD %	Spk Rec %	Det Limit	Cnt Err %	Qual Flags
Furans in Vapor Samples by SIM															
S16T019205			1191-99-7	2,3-Dihydrofuran	NGS	n/a	n/a	<0.18	n/a	n/a	n/a	n/a	0.18	n/a	
S16T019205			1708-29-8	2,5-Dihydrofuran	NGS	n/a	n/a	<0.23	n/a	n/a	n/a	n/a	0.23	n/a	
S16T019205			625-86-5	2,5-Dimethylfuran	NGS	n/a	n/a	<0.43	n/a	n/a	n/a	n/a	0.43	n/a	
S16T019205			3777-71-7	2-Heptylfuran	NGS	n/a	n/a	<0.27	n/a	n/a	n/a	n/a	0.27	n/a	
S16T019205			534-22-5	2-Methylfuran	NGS	n/a	n/a	0.26	n/a	n/a	n/a	n/a	0.23	n/a	J
S16T019205			3777-69-3	2-Pentylfuran	NGS	n/a	n/a	0.33	n/a	n/a	n/a	n/a	0.33	n/a	J
S16T019205			4229-91-8	2-Propylfuran	NGS	n/a	n/a	<0.44	n/a	n/a	n/a	n/a	0.44	n/a	
S16T019205			110-00-9	Furan	NGS	n/a	n/a	0.13	n/a	n/a	n/a	n/a	0.090	n/a	J
S16T019205			109-99-9	Tetrahydrofuran	NGS	n/a	n/a	0.12	n/a	n/a	n/a	n/a	0.10	n/a	J

NA = Not Analyzed, ND = Not Detected

E - Outside Calibration Range

J - Estimated

Cartridge Evaluation
Data Summary Report

Sample Group: 20161926
SDG Number:
Customer Sample ID: 16-002-AP-IN-002BASE
Customer Sample ID: 16-002-AP-IN-002BASE

Sample#	R	A#	CAS #	Analyte	Unit	STD %	Blank	Result	Duplicate	Average	RPD %	Spk Rec %	Det Limit	Cnt Err %	Qual Flags
Furans in Vapor Samples by SIM															
S16T019207			1191-99-7	2,3-Dihydrofuran	NGS	n/a	n/a	0.22	n/a	n/a	n/a	n/a	0.18	n/a	J
S16T019207			1708-29-8	2,5-Dihydrofuran	NGS	n/a	n/a	<0.23	n/a	n/a	n/a	n/a	0.23	n/a	
S16T019207			625-86-5	2,5-Dimethylfuran	NGS	n/a	n/a	<0.43	n/a	n/a	n/a	n/a	0.43	n/a	
S16T019207			3777-71-7	2-Heptylfuran	NGS	n/a	n/a	0.54	n/a	n/a	n/a	n/a	0.27	n/a	J
S16T019207			534-22-5	2-Methylfuran	NGS	n/a	n/a	<0.23	n/a	n/a	n/a	n/a	0.23	n/a	
S16T019207			3777-69-3	2-Pentylfuran	NGS	n/a	n/a	<0.33	n/a	n/a	n/a	n/a	0.33	n/a	
S16T019207			4229-91-8	2-Propylfuran	NGS	n/a	n/a	<0.44	n/a	n/a	n/a	n/a	0.44	n/a	
S16T019207			110-00-9	Furan	NGS	n/a	n/a	<0.090	n/a	n/a	n/a	n/a	0.090	n/a	
S16T019207			109-99-9	Tetrahydrofuran	NGS	n/a	n/a	1.1	n/a	n/a	n/a	n/a	0.10	n/a	J

NA = Not Analyzed, ND = Not Detected

E - Outside Calibration Range

J - Estimated

Cartridge Evaluation
Data Summary Report

Sample Group: 20161926
SDG Number:
Customer Sample ID: 16-002-AP-IN-002H
Customer Sample ID: 16-002-AP-IN-002H

Sample#	R	A#	CAS #	Analyte	Unit	STD %	Blank	Result	Duplicate	Average	RPD %	Spk Rec %	Det Limit	Cnt Err %	Qual Flags
Furans in Vapor Samples by SIM															
S16T019197			1191-99-7	2,3-Dihydrofuran	NGS	n/a	n/a	0.21	n/a	n/a	n/a	n/a	0.18	n/a	J
S16T019197			1708-29-8	2,5-Dihydrofuran	NGS	n/a	n/a	<0.23	n/a	n/a	n/a	n/a	0.23	n/a	
S16T019197			625-86-5	2,5-Dimethylfuran	NGS	n/a	n/a	<0.43	n/a	n/a	n/a	n/a	0.43	n/a	
S16T019197			3777-71-7	2-Heptylfuran	NGS	n/a	n/a	0.29	n/a	n/a	n/a	n/a	0.27	n/a	J
S16T019197			534-22-5	2-Methylfuran	NGS	n/a	n/a	<0.23	n/a	n/a	n/a	n/a	0.23	n/a	
S16T019197			3777-69-3	2-Pentylfuran	NGS	n/a	n/a	0.43	n/a	n/a	n/a	n/a	0.33	n/a	J
S16T019197			4229-91-8	2-Propylfuran	NGS	n/a	n/a	<0.44	n/a	n/a	n/a	n/a	0.44	n/a	
S16T019197			110-00-9	Furan	NGS	n/a	n/a	0.24	n/a	n/a	n/a	n/a	0.090	n/a	J
S16T019197			109-99-9	Tetrahydrofuran	NGS	n/a	n/a	200	n/a	n/a	n/a	n/a	0.10	n/a	E

NA = Not Analyzed, ND = Not Detected

E - Outside Calibration Range

J - Estimated

C.3.4 Amines

ANALYTICAL REPORT
Amended-20160728

Report Date: July 28, 2016

Robert (Buddy) Sosa
Washington River Protection So
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Workorder: 34-1618261
Client Project ID: CARTRIDGE EVALUATION
Purchase Order: 55502 Rel9
Project Manager: Rand Potter

Analytical Results

Sample ID: **S16T019095** Collected: 06/25/2016
Lab ID: 1618261001 Sampling Location: CARTRIDGE EVALUATION Received: 06/30/2016
Method: **Amines-VOA Aliphatic VAA-1** Media: SKC 226-96, XAD-7 Tube 50/100mg [(NBD) Chloride] Analyzed: 07/13/2016
Sampling Parameter: **Air Volume Not Provided**

Analyte	Result (ug/sample)	Result (mg/m³)	Result (ppm)	RL (ug/sample)
Dimethylamine	<0.10	NA	NA	0.10
Ethylamine	<0.10	NA	NA	0.10
Methylamine	<0.10	NA	NA	0.10

Sample ID: **S16T019096** Collected: 06/25/2016
Lab ID: 1618261002 Sampling Location: CARTRIDGE EVALUATION Received: 06/30/2016
Method: **Amines-VOA Aliphatic VAA-1** Media: SKC 226-96, XAD-7 Tube 50/100mg [(NBD) Chloride] Analyzed: 07/13/2016
Sampling Parameter: **Air Volume Not Provided**

Analyte	Result (ug/sample)	Result (mg/m³)	Result (ppm)	RL (ug/sample)
Dimethylamine	<0.10	NA	NA	0.10
Ethylamine	**0.47**	NA	NA	0.10
Methylamine	**1.4**	NA	NA	0.10

Sample ID: **S16T019097** Collected: 06/25/2016
Lab ID: 1618261003 Sampling Location: CARTRIDGE EVALUATION Received: 06/30/2016
Method: **Amines-VOA Aliphatic VAA-1** Media: SKC 226-96, XAD-7 Tube 50/100mg [(NBD) Chloride] Analyzed: 07/13/2016
Sampling Parameter: **Air Volume Not Provided**

Analyte	Result (ug/sample)	Result (mg/m³)	Result (ppm)	RL (ug/sample)
Dimethylamine	<0.10	NA	NA	0.10
Ethylamine	<0.10	NA	NA	0.10
Methylamine	<0.10	NA	NA	0.10

ANALYTICAL REPORT

Amended-20160728

Workorder: 34-1618261
Client Project ID: CARTRIDGE EVALUATION
Purchase Order: 55502 Rel9
Project Manager: Rand Potter

Analytical Results

Sample ID: **S16T019098** Collected: 06/25/2016
Lab ID: 1618261004 Sampling Location: CARTRIDGE EVALUATION Received: 06/30/2016
Method: **Amines-VOA Aliphatic VAA-1** Media: SKC 226-96, XAD-7 Tube 50/100mg [(NBD) Chloride] Analyzed: 07/13/2016
Sampling Parameter: **Air Volume Not Provided**

Analyte	Result (ug/sample)	Result (mg/m³)	Result (ppm)	RL (ug/sample)
Dimethylamine	<0.10	NA	NA	0.10
Ethylamine	<0.10	NA	NA	0.10
Methylamine	<0.10	NA	NA	0.10

Sample ID: **S16T019099** Collected: 06/24/2016
Lab ID: 1618261005 Sampling Location: CARTRIDGE EVALUATION Received: 06/30/2016
Method: **Amines-VOA Aliphatic VAA-1** Media: SKC 226-96, XAD-7 Tube 50/100mg [(NBD) Chloride] Analyzed: 07/13/2016
Sampling Parameter: **Air Volume Not Provided**

Analyte	Result (ug/sample)	Result (mg/m³)	Result (ppm)	RL (ug/sample)
Dimethylamine	<0.10	NA	NA	0.10
Ethylamine	<0.10	NA	NA	0.10
Methylamine	<0.10	NA	NA	0.10

Sample ID: **S16T019100** Collected: 06/24/2016
Lab ID: 1618261006 Sampling Location: CARTRIDGE EVALUATION Received: 06/30/2016
Method: **Amines-VOA Aliphatic VAA-1** Media: SKC 226-96, XAD-7 Tube 50/100mg [(NBD) Chloride] Analyzed: 07/13/2016
Sampling Parameter: **Air Volume Not Provided**

Analyte	Result (ug/sample)	Result (mg/m³)	Result (ppm)	RL (ug/sample)
Dimethylamine	<0.10	NA	NA	0.10
Ethylamine	<0.10	NA	NA	0.10
Methylamine	<0.10	NA	NA	0.10

Sample ID: **S16T019101** Collected: 06/24/2016
Lab ID: 1618261007 Sampling Location: CARTRIDGE EVALUATION Received: 06/30/2016
Method: **Amines-VOA Aliphatic VAA-1** Media: SKC 226-96, XAD-7 Tube 50/100mg [(NBD) Chloride] Analyzed: 07/13/2016
Sampling Parameter: **Air Volume Not Provided**

Analyte	Result (ug/sample)	Result (mg/m³)	Result (ppm)	RL (ug/sample)
Dimethylamine	<0.10	NA	NA	0.10
Ethylamine	<0.10	NA	NA	0.10
Methylamine	<0.10	NA	NA	0.10

ANALYTICAL REPORT

Amended-20160728

Workorder: 34-1618261
Client Project ID: CARTRIDGE EVALUATION
Purchase Order: 55502 Rel9
Project Manager: Rand Potter

Analytical Results

Sample ID: **S16T019102** Collected: 06/24/2016
Lab ID: 1618261008 Sampling Location: CARTRIDGE EVALUATION Received: 06/30/2016
Method: **Amines-VOA Aliphatic VAA-1** Media: SKC 226-96, XAD-7 Tube 50/100mg [(NBD) Chloride] Analyzed: 07/13/2016
Sampling Parameter: **Air Volume Not Provided**

Analyte	Result (ug/sample)	Result (mg/m³)	Result (ppm)	RL (ug/sample)
Dimethylamine	<0.10	NA	NA	0.10
Ethylamine	<0.10	NA	NA	0.10
Methylamine	<0.10	NA	NA	0.10

Sample ID: **S16T019103** Collected: 06/24/2016
Lab ID: 1618261009 Sampling Location: CARTRIDGE EVALUATION Received: 06/30/2016
Method: **Amines-VOA Aliphatic VAA-1** Media: SKC 226-96, XAD-7 Tube 50/100mg [(NBD) Chloride] Analyzed: 07/13/2016
Sampling Parameter: **Air Volume Not Provided**

Analyte	Result (ug/sample)	Result (mg/m³)	Result (ppm)	RL (ug/sample)
Dimethylamine	<0.10	NA	NA	0.10
Ethylamine	<0.10	NA	NA	0.10
Methylamine	<0.10	NA	NA	0.10

Sample ID: **S16T019104** Collected: 06/24/2016
Lab ID: 1618261010 Sampling Location: CARTRIDGE EVALUATION Received: 06/30/2016
Method: **Amines-VOA Aliphatic VAA-1** Media: SKC 226-96, XAD-7 Tube 50/100mg [(NBD) Chloride] Analyzed: 07/13/2016
Sampling Parameter: **Air Volume Not Provided**

Analyte	Result (ug/sample)	Result (mg/m³)	Result (ppm)	RL (ug/sample)
Dimethylamine	<0.10	NA	NA	0.10
Ethylamine	**0.26**	NA	NA	0.10
Methylamine	**0.80**	NA	NA	0.10

Sample ID: **S16T019105** Collected: 06/24/2016
Lab ID: 1618261011 Sampling Location: CARTRIDGE EVALUATION Received: 06/30/2016
Method: **Amines-VOA Aliphatic VAA-1** Media: SKC 226-96, XAD-7 Tube 50/100mg [(NBD) Chloride] Analyzed: 07/13/2016
Sampling Parameter: **Air Volume Not Provided**

Analyte	Result (ug/sample)	Result (mg/m³)	Result (ppm)	RL (ug/sample)
Dimethylamine	**0.17**	NA	NA	0.10
Ethylamine	<0.10	NA	NA	0.10
Methylamine	<0.10	NA	NA	0.10

ANALYTICAL REPORT

Amended-20160728

Workorder: **34-1618261**
Client Project ID: CARTRIDGE EVALUATION
Purchase Order: 55502 Rel9
Project Manager: Rand Potter

Analytical Results

Sample ID: **S16T019106** Collected: 06/24/2016
Lab ID: 1618261012 Sampling Location: CARTRIDGE EVALUATION Received: 06/30/2016
Method: **Amines-VOA Aliphatic VAA-1** Media: SKC 226-96, XAD-7 Tube 50/100mg [(NBD) Chloride] Analyzed: 07/13/2016
Sampling Parameter: **Air Volume Not Provided**

Analyte	Result (ug/sample)	Result (mg/m³)	Result (ppm)	RL (ug/sample)
Dimethylamine	<0.10	NA	NA	0.10
Ethylamine	<0.10	NA	NA	0.10
Methylamine	<0.10	NA	NA	0.10

Sample ID: **S16T019107** Collected: 06/24/2016
Lab ID: 1618261013 Sampling Location: CARTRIDGE EVALUATION Received: 06/30/2016
Method: **Amines-VOA Aliphatic VAA-1** Media: SKC 226-96, XAD-7 Tube 50/100mg [(NBD) Chloride] Analyzed: 07/13/2016
Sampling Parameter: **Air Volume Not Provided**

Analyte	Result (ug/sample)	Result (mg/m³)	Result (ppm)	RL (ug/sample)
Dimethylamine	<0.10	NA	NA	0.10
Ethylamine	<0.10	NA	NA	0.10
Methylamine	<0.10	NA	NA	0.10

Sample ID: **S16T019108** Collected: 06/26/2016
Lab ID: 1618261014 Sampling Location: CARTRIDGE EVALUATION Received: 06/30/2016
Method: **Amines-VOA Aliphatic VAA-1** Media: SKC 226-96, XAD-7 Tube 50/100mg [(NBD) Chloride] Analyzed: 07/13/2016
Sampling Parameter: **Air Volume Not Provided**

Analyte	Result (ug/sample)	Result (mg/m³)	Result (ppm)	RL (ug/sample)
Dimethylamine	<0.10	NA	NA	0.10
Ethylamine	<0.10	NA	NA	0.10
Methylamine	<0.10	NA	NA	0.10

Sample ID: **S16T019109** Collected: 06/26/2016
Lab ID: 1618261015 Sampling Location: CARTRIDGE EVALUATION Received: 06/30/2016
Method: **Amines-VOA Aliphatic VAA-1** Media: SKC 226-96, XAD-7 Tube 50/100mg [(NBD) Chloride] Analyzed: 07/13/2016
Sampling Parameter: **Air Volume Not Provided**

Analyte	Result (ug/sample)	Result (mg/m³)	Result (ppm)	RL (ug/sample)
Dimethylamine	<0.10	NA	NA	0.10
Ethylamine	**0.50**	NA	NA	0.10
Methylamine	**1.5**	NA	NA	0.10

ANALYTICAL REPORT

Amended-20160728

Workorder: 34-1618261
Client Project ID: CARTRIDGE EVALUATION
Purchase Order: 55502 Rel9
Project Manager: Rand Potter

Analytical Results

Sample ID: **S16T019110** Collected: 06/26/2016
Lab ID: 1618261016 Sampling Location: CARTRIDGE EVALUATION Received: 06/30/2016

Method: **Amines-VOA Aliphatic VAA-1** Media: SKC 226-96, XAD-7 Tube 50/100mg [(NBD) Chloride] Analyzed: 07/13/2016
Sampling Parameter: **Air Volume Not Provided**

Analyte	Result (ug/sample)	Result (mg/m³)	Result (ppm)	RL (ug/sample)
Dimethylamine	<0.10	NA	NA	0.10
Ethylamine	<0.10	NA	NA	0.10
Methylamine	<0.10	NA	NA	0.10

Sample ID: **S16T019111** Collected: 06/25/2016
Lab ID: 1618261017 Sampling Location: CARTRIDGE EVALUATION Received: 06/30/2016

Method: **Amines-VOA Aliphatic VAA-1** Media: SKC 226-96, XAD-7 Tube 50/100mg [(NBD) Chloride] Analyzed: 07/13/2016
Sampling Parameter: **Air Volume Not Provided**

Analyte	Result (ug/sample)	Result (mg/m³)	Result (ppm)	RL (ug/sample)
Dimethylamine	<0.10	NA	NA	0.10
Ethylamine	<0.10	NA	NA	0.10
Methylamine	<0.10	NA	NA	0.10

Sample ID: **S16T019112** Collected: 06/25/2016
Lab ID: 1618261018 Sampling Location: CARTRIDGE EVALUATION Received: 06/30/2016

Method: **Amines-VOA Aliphatic VAA-1** Media: SKC 226-96, XAD-7 Tube 50/100mg [(NBD) Chloride] Analyzed: 07/13/2016
Sampling Parameter: **Air Volume Not Provided**

Analyte	Result (ug/sample)	Result (mg/m³)	Result (ppm)	RL (ug/sample)
Dimethylamine	<0.10	NA	NA	0.10
Ethylamine	<0.10	NA	NA	0.10
Methylamine	<0.10	NA	NA	0.10

Sample ID: **S16T019113** Collected: 06/25/2016
Lab ID: 1618261019 Sampling Location: CARTRIDGE EVALUATION Received: 06/30/2016

Method: **Amines-VOA Aliphatic VAA-1** Media: SKC 226-96, XAD-7 Tube 50/100mg [(NBD) Chloride] Analyzed: 07/13/2016
Sampling Parameter: **Air Volume Not Provided**

Analyte	Result (ug/sample)	Result (mg/m³)	Result (ppm)	RL (ug/sample)
Dimethylamine	<0.10	NA	NA	0.10
Ethylamine	<0.10	NA	NA	0.10
Methylamine	<0.10	NA	NA	0.10

ANALYTICAL REPORT

Amended-20160728

Workorder: 34-1618261
Client Project ID: CARTRIDGE EVALUATION
Purchase Order: 55502 Rel9
Project Manager: Rand Potter

Analytical Results

Sample ID: **S16T019114** Collected: 06/25/2016
Lab ID: 1618261020 Sampling Location: CARTRIDGE EVALUATION Received: 06/30/2016
Method: **Amines-VOA Aliphatic VAA-1** Media: SKC 226-96, XAD-7 Tube 50/100mg [(NBD) Chloride] Analyzed: 07/13/2016
Sampling Parameter: **Air Volume Not Provided**

Analyte	Result (ug/sample)	Result (mg/m³)	Result (ppm)	RL (ug/sample)
Dimethylamine	<0.10	NA	NA	0.10
Ethylamine	<0.10	NA	NA	0.10
Methylamine	<0.10	NA	NA	0.10

Sample ID: **S16T019115** Collected: 06/25/2016
Lab ID: 1618261021 Sampling Location: CARTRIDGE EVALUATION Received: 06/30/2016
Method: **Amines-VOA Aliphatic VAA-1** Media: SKC 226-96, XAD-7 Tube 50/100mg [(NBD) Chloride] Analyzed: 07/13/2016
Sampling Parameter: **Air Volume Not Provided**

Analyte	Result (ug/sample)	Result (mg/m³)	Result (ppm)	RL (ug/sample)
Dimethylamine	<0.10	NA	NA	0.10
Ethylamine	<0.10	NA	NA	0.10
Methylamine	<0.10	NA	NA	0.10

Sample ID: **S16T019116** Collected: 06/25/2016
Lab ID: 1618261022 Sampling Location: CARTRIDGE EVALUATION Received: 06/30/2016
Method: **Amines-VOA Aliphatic VAA-1** Media: SKC 226-96, XAD-7 Tube 50/100mg [(NBD) Chloride] Analyzed: 07/13/2016
Sampling Parameter: **Air Volume Not Provided**

Analyte	Result (ug/sample)	Result (mg/m³)	Result (ppm)	RL (ug/sample)
Dimethylamine	<0.10	NA	NA	0.10
Ethylamine	<0.10	NA	NA	0.10
Methylamine	**0.36**	NA	NA	0.10

Sample ID: **S16T019117** Collected: 06/25/2016
Lab ID: 1618261023 Sampling Location: CARTRIDGE EVALUATION Received: 06/30/2016
Method: **Amines-VOA Aliphatic VAA-1** Media: SKC 226-96, XAD-7 Tube 50/100mg [(NBD) Chloride] Analyzed: 07/13/2016
Sampling Parameter: **Air Volume Not Provided**

Analyte	Result (ug/sample)	Result (mg/m³)	Result (ppm)	RL (ug/sample)
Dimethylamine	<0.10	NA	NA	0.10
Ethylamine	<0.10	NA	NA	0.10
Methylamine	<0.10	NA	NA	0.10

ANALYTICAL REPORT

Amended-20160728

Workorder: **34-1618261**
Client Project ID: CARTRIDGE EVALUATION
Purchase Order: 55502 Rel9
Project Manager: Rand Potter

Analytical Results

Sample ID: **S16T019118** Collected: 06/25/2016
Lab ID: 1618261024 Sampling Location: CARTRIDGE EVALUATION Received: 06/30/2016
Method: **Amines-VOA Aliphatic VAA-1** Media: SKC 226-96, XAD-7 Tube 50/100mg [(NBD) Chloride] Analyzed: 07/13/2016
Sampling Parameter: **Air Volume Not Provided**

Analyte	Result (ug/sample)	Result (mg/m³)	Result (ppm)	RL (ug/sample)
Dimethylamine	<0.10	NA	NA	0.10
Ethylamine	<0.10	NA	NA	0.10
Methylamine	<0.10	NA	NA	0.10

Sample ID: **S16T019119** Collected: 06/25/2016
Lab ID: 1618261025 Sampling Location: CARTRIDGE EVALUATION Received: 06/30/2016
Method: **Amines-VOA Aliphatic VAA-1** Media: SKC 226-96, XAD-7 Tube 50/100mg [(NBD) Chloride] Analyzed: 07/13/2016
Sampling Parameter: **Air Volume Not Provided**

Analyte	Result (ug/sample)	Result (mg/m³)	Result (ppm)	RL (ug/sample)
Dimethylamine	<0.10	NA	NA	0.10
Ethylamine	<0.10	NA	NA	0.10
Methylamine	<0.10	NA	NA	0.10

Sample ID: **S16T019120** Collected: 06/25/2016
Lab ID: 1618261026 Sampling Location: CARTRIDGE EVALUATION Received: 06/30/2016
Method: **Amines-VOA Aliphatic VAA-1** Media: SKC 226-96, XAD-7 Tube 50/100mg [(NBD) Chloride] Analyzed: 07/13/2016
Sampling Parameter: **Air Volume Not Provided**

Analyte	Result (ug/sample)	Result (mg/m³)	Result (ppm)	RL (ug/sample)
Dimethylamine	<0.10	NA	NA	0.10
Ethylamine	<0.10	NA	NA	0.10
Methylamine	<0.10	NA	NA	0.10

Comments

Workorder: **1618261**

This is an amended report to correct and elaborate on the previous comment.

Quality Control: **Amines-VOA Aliphatic VAA-1 - (HBN: 172575)**

The first set of QC samples (507628, 507629 and 507630) are associated with samples 001-020 only. The second set of QC samples (507631, 507632 and 507633) are associated with samples 021-026 only.

Dimethylamine was found above the reporting limit for the second method blank (507631), but the associated samples (021-026) were all non-detect for Dimethylamine.

ANALYTICAL REPORT

Amended-20160728

Workorder: 34-1618261
Client Project ID: CARTRIDGE EVALUATION
Purchase Order: 55502 Rel9
Project Manager: Rand Potter

Report Authorization (/S/ is an electronic signature that complies with 21 CFR Part 11)

Method	Analyst	Peer Review
Amines-VOA Aliphatic VAA-1	/S/ David Teynor 07/14/2016 14:03	/S/ Thomas Bosch 07/14/2016 15:13

Laboratory Contact Information

ALS Environmental
960 W Levoy Drive
Salt Lake City, Utah 84123

Phone: (801) 266-7700
Email: alslt.lab@ALSGlobal.com
Web: www.alsslc.com

General Lab Comments

The results provided in this report relate only to the items tested.
Samples were received in acceptable condition unless otherwise noted.
Samples have not been blank corrected unless otherwise noted.
This test report shall not be reproduced, except in full, without written approval of ALS.

ALS provides professional analytical services for all samples submitted. ALS is not in a position to interpret the data and assumes no responsibility for the quality of the samples submitted.

All quality control samples processed with the samples in this report yielded acceptable results unless otherwise noted.

ALS is accredited for specific fields of testing (scopes) in the following testing sectors. The quality system implemented at ALS conforms to accreditation requirements and is applied to all analytical testing performed by ALS. The following table lists testing sector, accreditation body, accreditation number and website. Please contact these accrediting bodies or your ALS project manager for the current scope of accreditation that applies to your analytical testing.

Testing Sector	Accreditation Body (Standard)	Certificate Number	Website
Environmental	ACLASS (DoD ELAP)	ADE-1420	http://www.aclasscorp.com
	Utah (NELAC)	DATA1	http://health.utah.gov/lab/labimp/
	Nevada	UT00009	http://ndep.nv.gov/bsdw/labservice.htm
	Oklahoma	UT00009	http://www.deq.state.ok.us/CSDnew/
	Iowa	IA# 376	http://www.iowadnr.gov/InsideDNR/RegulatoryWater.aspx
	Florida (TNI)	E871067	http://www.dep.state.fl.us/labs/bars/sas/qa/
	Texas (TNI)	T104704456-11-1	http://www.tceq.texas.gov/field/qa/lab_accred_certif.html
Industrial Hygiene	AIHA-LAP, LLC (ISO 17025 and AIHA-LAP, LLC IHLAP/ELLAP)	101574	http://www.aihaaccreditedlabs.org
Lead Testing:			
CPSC	ACLASS (ISO 17025, CPSC)	ADE-1420	http://www.aclasscorp.com
Soil, Dust, Paint ,Air	AIHA-LAP, LLC (ISO 17025, AIHA-LAP, LLC ELLAP and NLLAP)	101574	http://www.aihaaccreditedlabs.org
Dietary Supplements	ACLASS (ISO 17025)	ADE-1420	http://www.aclasscorp.com

ANALYTICAL REPORT

Amended-20160728

Workorder: 34-1618261
Client Project ID: CARTRIDGE EVALUATION
Purchase Order: 55502 Rel9
Project Manager: Rand Potter

Definitions

LOD = Limit of Detection = MDL = Method Detection Limit, A statistical estimate of method/media/instrument sensitivity.
LOQ = Limit of Quantitation = RL = Reporting Limit, A verified value of method/media/instrument sensitivity.
ND = Not Detected, Testing result not detected above the LOD or LOQ.
NA = Not Applicable.
** No result could be reported, see sample comments for details.
< This testing result is less than the numerical value.
( ) This testing result is between the LOD and LOQ and has higher analytical uncertainty than values at or above the LOQ.

ALS Envrionmental certifies this analytical report is in compliance with the Hanford SOW, both technically and for completeness. Release of the data contained in this report has been electronically authorized by the following laboratory representative:

Rand Potter, Project Manager, ALS Environmental

Quality Control Sample
Batch Report

Analysis Information

Workorder: 1618261

Limits: Historical/Performance	**Preparation:** NA	**Analysis:** IH Aliphatic Amines
Basis: ALS Laboratory Group	**Batch:** NA	**Batch:** ILC/12232 (HBN: 172575)
	Prepared By: NA	**Analyzed By:** David Teynor

Blank

LMB: 507628
Analyzed: 07/13/2016 00:00
Units: ug/sample

Analyte	Result	MDL	RL
Dimethylamine	ND	NA	0.100
Ethylamine	ND	NA	0.100
Methylamine	ND	NA	0.100

LMB: 507631
Analyzed: 07/13/2016 00:00
Units: ug/sample

Analyte	Result	MDL	RL
Dimethylamine	0.642	NA	0.100
Ethylamine	ND	NA	0.100
Methylamine	ND	NA	0.100

Laboratory Control Sample - Laboratory Control Sample Duplicate

LCS: 507629
Analyzed: 07/13/2016 00:00
Dilution: 1
Units: ug/sample

LCSD: 507630
Analyzed: 07/13/2016 00:00
Dilution: 1
Units: ug/sample

Analyte	Result	Target	% Rec	QC Limits		Result	% Rec		RPD	QC Limits	
Dimethylamine	1.51	2.00	75.5	60.4	134.6	1.69	84.5		11.3	0.0	20.0
Ethylamine	0.995	2.00	49.8	40.0	160.0	1.37	68.5	*	31.7	0.0	20.0
Methylamine	1.04	2.00	52.0	40.0	160.0	1.49	74.5	*	35.6	0.0	20.0

LCS: 507632
Analyzed: 07/13/2016 00:00
Dilution: 1
Units: ug/sample

LCSD: 507633
Analyzed: 07/13/2016 00:00
Dilution: 1
Units: ug/sample

Analyte	Result	Target	% Rec	QC Limits		Result	% Rec		RPD	QC Limits	
Dimethylamine	2.02	2.00	101	60.4	134.6	2.03	102		0.494	0.0	20.0
Ethylamine	0.990	2.00	49.5	40.0	160.0	1.31	65.5	*	27.8	0.0	20.0
Methylamine	1.05	2.00	52.5	40.0	160.0	1.41	70.5	*	29.3	0.0	20.0

Comments

The first set of QC samples (507628, 507629 and 507630) are associated with samples 001-020 only. The second set of QC samples (507631, 507632 and 507633) are associated with samples 021-026 only.

Dimethylamine was found above the reporting limit for the second method blank (507631), but the associated samples (021-026) were all non-detect for Dimethylamine.

Quality Control Sample
Batch Report

Analysis Information

Workorder: 1618261

Limits: Historical/Performance	**Preparation:** NA	**Analysis:** IH Aliphatic Amines
Basis: ALS Laboratory Group	**Batch:** NA	**Batch:** ILC/12232 (HBN: 172575)
	Prepared By: NA	**Analyzed By:** David Teynor

QC Report Authorization (/S/ is an electronic signature that complies with 21 CFR Part 11)

Analyst	Peer Review
/S/ David Teynor	/S/ Thomas Bosch
07/14/2016 14:03	07/14/2016 15:13

Symbols and Definitions

* - Analyte above reporting limit or outside of control limits
▲ - Sample result is greater than 4 times the spike added
◓ - Sample and Matrix Duplicate less than 5 times the reporting limit
● - Result is above the calibration range

RPD - Relative % Difference (Spike / Spike Duplicate)
ND - Not Detected (U - Qualifier also flags analyte as not detected)
NA - Not Applicable
QC results are not adjusted for moisture correction, where applicable

1618261

1618261

CHAIN OF CUSTODY/SAMPLE ANALYSIS REQUEST

Assembler: N/A		C.O.C. No.: 20161914	Page 1 of 3
Collector: JONES	Contact/Requestor: CARL HOWALD IV	Telephone No.: 373-6861	MSIN: T6-05 FAX: 372-1878
SAF No.: N/A	Sample Origin: CARTRIDGE EVALUATION	Purchase Order/Charge Code: 202003/CB20	
Project Title: CARTRIDGE EVALUATION	Logbook/ Work Package No.: N/A	Ice Chest No.: wts-055	Temp.: ON ICE
Shipped To (Lab): ALS	Method of Shipment	Bill of Lading/Air Bill No.: 7766 3723 2822	
Protocol: N/A	Data Turnaround: 10 DAYS	Parts and Return No.: 40958	

Sample No.	Lab ID	*	Date	Time	No./Type Container	Sample Analysis	Preservative
	S16T019095	VA	6/25/16		XAD-7-NBD	AMINES 16-001-AP-EF-012H	N/A
	S16T019096	VA	6/25/16		XAD-7-NBD	AMINES 16-001-AP-IN-012H	N/A
	S16T019097	VA	6/25/16		XAD-7-NBD	AMINES 16-001-AP-EF-012G	N/A
	S16T019098	VA	6/25/16		XAD-7-NBD	AMINES 16-001-AP-EF-012F	N/A
	S16T019099	VA	6/24/16		XAD-7-NBD	AMINES 16-001-AP-EF-012E	N/A
	S16T019100	VA	6/24/16		XAD-7-NBD	AMINES 16-001-AP-EF-012D	N/A
	S16T019101	VA	6/24/16		XAD-7-NBD	AMINES 16-001-AP-EF-012C	N/A
	S16T019102	VA	6/24/16		XAD-7-NBD	AMINES 16-001-AP-EF-012B	N/A
	S16T019103	VA	6/24/16		XAD-7-NBD	AMINES 16-001-AP-EF-012A	N/A
	S16T019104	VA	6/24/16		XAD-7-NBD	AMINES 16-001-AP-IN-012A	N/A

POSSIBLE SAMPLE HAZARDS/REMARKS (List all known wastes) MSDS ○ Yes ◉ No

SPECIAL INSTRUCTIONS — Hold Time

Send Results to Robert Sosa & Greg Moore
Robert_W_Sosa@rl.gov and Gregory_S_Moore@rl.gov see SOW for email

CONTRACT 55502

RELEASE 9

Relinquished By (Print / Sign)	Date/Time	Received By (Print / Sign)	Date/Time
Leslie Diaz Leslie Diaz	6/29/16 10:00	Julie Gadsby Julie Gadsby	6/29/16 1000
Julie Gadsby Julie Gadsby	6/29/16 1400	FEDEX	
Fedex			
			(Date/Time)

Matrix*

S = Soil		DL = Drum Liquids	
SE = Sediment		T = Tissue	
SO = Solid		WI = Wipe	
SL = Sludge		L = Liquid	
W = Water		V = Vegetation	
O = Oil		VA = Vapor	
A = Air		X = Other	
DS = Drum Solids			

FINAL SAMPLE DISPOSITION — Disposal Method (e.g., Return to customer, per lab procedure, used in process): DOT — Disposed By: CONSUMED — Date/Time: 07/11/16 1400

All samples containing hazardous materials shall be picked up by requestor and returned to parent container or site of origin.

A-6003-962 (03/05)

Assembler	CHAIN OF CUSTODY/SAMPLE ANALYSIS REQUEST	C.O.C. No.
N/A		20161914
		Page 2 of 3

Collector: JONES	Contact/Requestor: CARL HOWALD IV	Telephone No. 373-6861 MSIN T6-05 FAX 372-1878
SAF No.: N/A	Sample Origin: CARTRIDGE EVALUATION	Purchase Order/Charge Code: 202003/CB20
Project Title: CARTRIDGE EVALUATION	Logbook/ Work Package No.: N/A	Ice Chest No. WTS-055 Temp. ON ICE
Shipped To (Lab): ALS	Method of Shipment	Bill of Lading/Air Bill No. 7766 3723 2822
Protocol: N/A	Data Turnaround: 10 DAYS	Parts and Return No. 40958

Sample No.	Lab ID	*	Date	Time	No./Type Container	Sample Analysis	Preservative
	S16T019105	VA	6/24/16		XAD-7-NBD	AMINES 16-001-AP-EF-012BASE	N/A
	S16T019106	VA	6/24/16		XAD-7-NBD	AMINES 16-001-AP-IN-012BASE	N/A
	S16T019107	VA	6/24/16		XAD-7-NBD	AMINES 16-001-AP-BK-012BASE	N/A
	S16T019108	VA	6/26/16		XAD-7-NBD	AMINES 16-002-AP-EF-011H	N/A
	S16T019109	VA	6/26/16		XAD-7-NBD	AMINES 16-002-AP-IN-011H	N/A
	S16T019110	VA	6/26/16		XAD-7-NBD	AMINES 16-002-AP-EF-012G	N/A
	S16T019111	VA	6/25/16		XAD-7-NBD	AMINES 16-002-AP-EF-011F	N/A
	S16T019112	VA	6/25/16		XAD-7-NBD	AMINES 16-002-AP-EF-012E	N/A
	S16T019113	VA	6/25/16		XAD-7-NBD	AMINES 16-002-AP-EF-012D	N/A
	S16T019114	VA	6/25/16		XAD-7-NBD	AMINES 16-002-AP-EF-012C	N/A

POSSIBLE SAMPLE HAZARDS/REMARKS (List all known wastes) MSDS ○ Yes ◉ No

SPECIAL INSTRUCTIONS Hold Time

Send Results to Robert Sosa & Greg Moore
Robert_W_Sosa@rl.gov and Gregory_S_Moore@rl.gov see SOW for email

CONTRACT 55502

RELEASE 9

Relinquished By (Print / Sign)	Date/Time	Received By (Print / Sign)	Date/Time
Leslie Diaz Leslie Diaz	6/29/16 10:00	Julie Gradish Julie Gradish	6/29/16 1000
Julie Gradish Julie Gradish	6/29/16 1400	FEDEX	

Matrix*

S = Soil		DL = Drum Liquids	
SE = Sediment		T = Tissue	
SO = Solid		WI = Wipe	
SL = Sludge		L = Liquid	
W = Water		V = Vegetation	
O = Oil		VA = Vapor	
A = Air		X = Other	
DS = Drum Solids			

FINAL SAMPLE DISPOSITION: Disposal Method (e.g., Return to customer, per lab procedure, used in process): DOT — Disposed By: CONSUMED — Date/Time: 07/11/16 1400

All samples containing hazardous materials shall be picked up by requestor and returned to parent container or site of origin.

A-6003-962 (03/05)

3613

Assembler	CHAIN OF CUSTODY/SAMPLE ANALYSIS REQUEST	C.O.C. No.
N/A		20161914
		Page 3 of 3

Collector: JONES	Contact/Requestor: CARL HOWALD IV	Telephone No. 373-6861 MSIN T6-05 FAX 372-1878
SAF No.: N/A	Sample Origin: CARTRIDGE EVALUATION	Purchase Order/Charge Code: 202003/CB20
Project Title: CARTRIDGE EVALUATION	Logbook/ Work Package No.: N/A	Ice Chest No. WTS-055 Temp. ON ICE
Shipped To (Lab): ALS	Method of Shipment	Bill of Lading/Air Bill No. 7766 3723 2822
Protocol: N/A	Data Turnaround: 10 DAYS	Parts and Return No. 40958

Sample No.	Lab ID	*	Date	Time	No./Type Container	Sample Analysis	Preservative
	S16T019115	VA	6/25/16		XAD-7-NBD	AMINES 16-002-AP-EF-012B	N/A
	S16T019116	VA	6/25/16		XAD-7-NBD	AMINES 16-002-AP-EF-012A	N/A
	S16T019117	VA	6/25/16		XAD-7-NBD	AMINES 16-002-AP-IN-012A	N/A
	S16T019118	VA	6/25/16		XAD-7-NBD	AMINES 16-002-AP-EF-012BASE	N/A
	S16T019119	VA	6/25/16		XAD-7-NBD	AMINES 16-002-AP-IN-012BASE	N/A
	S16T019120	VA	6/25/16		XAD-7-NBD	AMINES 16-002-AP-BK-012BASE	N/A
						* Methylamine, Ethylamine, Dimethylamine per Buddy 6/30 RP	

30

POSSIBLE SAMPLE HAZARDS/REMARKS (List all known wastes) MSDS ○ Yes ◉ No

SPECIAL INSTRUCTIONS Hold Time

Send Results to Robert Sosa & Greg Moore Robert_W_Sosa@rl.gov and Gregory_S_Moore@rl.gov see SOW for email

CONTRACT 55502

RELEASE 9

Relinquished By (Print / Sign)	Date/Time	Received By (Print / Sign)	Date/Time
LESLIE DIAZ Leslie Diaz	6/29/16 10:00	Julie Gradoln Julie Gradoln	6/29/16 1000
Julie Gradoln Julie Gradoln	6/29/16 1400	FEDEX	
		Alexandra Edwards Mark Edwards	6/30/16 920

Matrix*

S = Soil		DL = Drum Liquids	
SE = Sediment		T = Tissue	
SO = Solid		WI = Wipe	
SL = Sludge		L = Liquid	
W = Water		V = Vegetation	
O = Oil		VA = Vapor	
A = Air		X = Other	
DS = Drum Solids			

FINAL SAMPLE DISPOSITION	Disposal Method (e.g., Return to customer, per lab procedure, used in process)	Disposed By	Date/Time
	DOT	CONSUMED	07/11/16 1400

All samples containing hazardous materials shall be picked up by requestor and returned to parent container or site of origin.

A-6003-962 (03/05)

C.3.5 Acetonitrile

ANALYTICAL REPORT

Report Date: July 08, 2016

Robert (Buddy) Sosa
Washington River Protection So
PO Box 850, MSIN T6-02
Richland, WA 99352

Phone: (509) 373-1262

E-mail: robert_w_sosa@rl.gov

20161913

Workorder: 34-1618258
Client Project ID: CARTRIDGE EVALUATION
Purchase Order: 55502 Rel9
Project Manager: Rand Potter

Analytical Results

Sample ID: S16T019069 — Collected: 06/25/2016
Lab ID: 1618258001 — Sampling Location: CARTRIDGE EVALUATION — Received: 06/30/2016
Method: NIOSH 1606 — Media: SKC 226-09, Charcoal Tube 400/200mg — Analyzed: 07/02/2016
Sampling Parameter: Air Volume Not Provided

Analyte	Result (mg/sample)	Result (mg/m³)	Result (ppm)	RL (mg/sample)
Acetonitrile	<0.010	NA	NA	0.010

Sample ID: S16T019070 — Collected: 06/25/2016
Lab ID: 1618258002 — Sampling Location: CARTRIDGE EVALUATION — Received: 06/30/2016
Method: NIOSH 1606 — Media: SKC 226-09, Charcoal Tube 400/200mg — Analyzed: 07/02/2016
Sampling Parameter: Air Volume Not Provided

Analyte	Result (mg/sample)	Result (mg/m³)	Result (ppm)	RL (mg/sample)
Acetonitrile	<0.010	NA	NA	0.010

Sample ID: S16T019071 — Collected: 06/25/2016
Lab ID: 1618258003 — Sampling Location: CARTRIDGE EVALUATION — Received: 06/30/2016
Method: NIOSH 1606 — Media: SKC 226-09, Charcoal Tube 400/200mg — Analyzed: 07/02/2016
Sampling Parameter: Air Volume Not Provided

Analyte	Result (mg/sample)	Result (mg/m³)	Result (ppm)	RL (mg/sample)
Acetonitrile	<0.010	NA	NA	0.010

ANALYTICAL REPORT

Workorder: **34-1618258**
Client Project ID: CARTRIDGE EVALUATION
Purchase Order: 55502 Rel9
Project Manager: Rand Potter

Analytical Results

Sample ID: **S16T019072** Collected: 06/25/2016
Lab ID: 1618258004 Sampling Location: CARTRIDGE EVALUATION Received: 06/30/2016
Method: **NIOSH 1606** Media: SKC 226-09, Charcoal Tube 400/200mg Analyzed: 07/02/2016
Sampling Parameter: **Air Volume Not Provided**

Analyte	Result (mg/sample)	Result (mg/m³)	Result (ppm)	RL (mg/sample)
Acetonitrile	<0.010	NA	NA	0.010

Sample ID: **S16T019073** Collected: 06/24/2016
Lab ID: 1618258005 Sampling Location: CARTRIDGE EVALUATION Received: 06/30/2016
Method: **NIOSH 1606** Media: SKC 226-09, Charcoal Tube 400/200mg Analyzed: 07/02/2016
Sampling Parameter: **Air Volume Not Provided**

Analyte	Result (mg/sample)	Result (mg/m³)	Result (ppm)	RL (mg/sample)
Acetonitrile	<0.010	NA	NA	0.010

Sample ID: **S16T019074** Collected: 06/24/2016
Lab ID: 1618258006 Sampling Location: CARTRIDGE EVALUATION Received: 06/30/2016
Method: **NIOSH 1606** Media: SKC 226-09, Charcoal Tube 400/200mg Analyzed: 07/02/2016
Sampling Parameter: **Air Volume Not Provided**

Analyte	Result (mg/sample)	Result (mg/m³)	Result (ppm)	RL (mg/sample)
Acetonitrile	<0.010	NA	NA	0.010

Sample ID: **S16T019075** Collected: 06/24/2016
Lab ID: 1618258007 Sampling Location: CARTRIDGE EVALUATION Received: 06/30/2016
Method: **NIOSH 1606** Media: SKC 226-09, Charcoal Tube 400/200mg Analyzed: 07/02/2016
Sampling Parameter: **Air Volume Not Provided**

Analyte	Result (mg/sample)	Result (mg/m³)	Result (ppm)	RL (mg/sample)
Acetonitrile	<0.010	NA	NA	0.010

Sample ID: **S16T019076** Collected: 06/24/2016
Lab ID: 1618258008 Sampling Location: CARTRIDGE EVALUATION Received: 06/30/2016
Method: **NIOSH 1606** Media: SKC 226-09, Charcoal Tube 400/200mg Analyzed: 07/02/2016
Sampling Parameter: **Air Volume Not Provided**

Analyte	Result (mg/sample)	Result (mg/m³)	Result (ppm)	RL (mg/sample)
Acetonitrile	<0.010	NA	NA	0.010

ANALYTICAL REPORT

Workorder: **34-1618258**
Client Project ID: CARTRIDGE EVALUATION
Purchase Order: 55502 Rel9
Project Manager: Rand Potter

Analytical Results

Sample ID: **S16T019077** Collected: 06/24/2016
Lab ID: 1618258009 Sampling Location: CARTRIDGE EVALUATION Received: 06/30/2016
Method: **NIOSH 1606** Media: SKC 226-09, Charcoal Tube 400/200mg Analyzed: 07/02/2016
Sampling Parameter: **Air Volume Not Provided**

Analyte	Result (mg/sample)	Result (mg/m³)	Result (ppm)	RL (mg/sample)
Acetonitrile	<0.010	NA	NA	0.010

Sample ID: **S16T019078** Collected: 06/24/2016
Lab ID: 1618258010 Sampling Location: CARTRIDGE EVALUATION Received: 06/30/2016
Method: **NIOSH 1606** Media: SKC 226-09, Charcoal Tube 400/200mg Analyzed: 07/02/2016
Sampling Parameter: **Air Volume Not Provided**

Analyte	Result (mg/sample)	Result (mg/m³)	Result (ppm)	RL (mg/sample)
Acetonitrile	<0.010	NA	NA	0.010

Sample ID: **S16T019079** Collected: 06/24/2016
Lab ID: 1618258011 Sampling Location: CARTRIDGE EVALUATION Received: 06/30/2016
Method: **NIOSH 1606** Media: SKC 226-09, Charcoal Tube 400/200mg Analyzed: 07/02/2016
Sampling Parameter: **Air Volume Not Provided**

Analyte	Result (mg/sample)	Result (mg/m³)	Result (ppm)	RL (mg/sample)
Acetonitrile	<0.010	NA	NA	0.010

Sample ID: **S16T019080** Collected: 06/24/2016
Lab ID: 1618258012 Sampling Location: CARTRIDGE EVALUATION Received: 06/30/2016
Method: **NIOSH 1606** Media: SKC 226-09, Charcoal Tube 400/200mg Analyzed: 07/02/2016
Sampling Parameter: **Air Volume Not Provided**

Analyte	Result (mg/sample)	Result (mg/m³)	Result (ppm)	RL (mg/sample)
Acetonitrile	<0.010	NA	NA	0.010

Sample ID: **S16T019081** Collected: 06/24/2016
Lab ID: 1618258013 Sampling Location: CARTRIDGE EVALUATION Received: 06/30/2016
Method: **NIOSH 1606** Media: SKC 226-09, Charcoal Tube 400/200mg Analyzed: 07/02/2016
Sampling Parameter: **Air Volume Not Provided**

Analyte	Result (mg/sample)	Result (mg/m³)	Result (ppm)	RL (mg/sample)
Acetonitrile	<0.010	NA	NA	0.010

ANALYTICAL REPORT

Workorder: **34-1618258**
Client Project ID: CARTRIDGE EVALUATION
Purchase Order: 55502 Rel9
Project Manager: Rand Potter

Analytical Results

Sample ID: **S16T019082** — Collected: 06/26/2016
Lab ID: 1618258014 — Sampling Location: CARTRIDGE EVALUATION — Received: 06/30/2016
Method: NIOSH 1606 — Media: SKC 226-09, Charcoal Tube 400/200mg — **Analyzed:** 07/02/2016
Sampling Parameter: **Air Volume Not Provided**

Analyte	Result (mg/sample)	Result (mg/m³)	Result (ppm)	RL (mg/sample)
Acetonitrile	<0.010	NA	NA	0.010

Sample ID: **S16T019083** — Collected: 06/26/2016
Lab ID: 1618258015 — Sampling Location: CARTRIDGE EVALUATION — Received: 06/30/2016
Method: NIOSH 1606 — Media: SKC 226-09, Charcoal Tube 400/200mg — **Analyzed:** 07/02/2016
Sampling Parameter: **Air Volume Not Provided**

Analyte	Result (mg/sample)	Result (mg/m³)	Result (ppm)	RL (mg/sample)
Acetonitrile	<0.010	NA	NA	0.010

Sample ID: **S16T019084** — Collected: 06/26/2016
Lab ID: 1618258016 — Sampling Location: CARTRIDGE EVALUATION — Received: 06/30/2016
Method: NIOSH 1606 — Media: SKC 226-09, Charcoal Tube 400/200mg — **Analyzed:** 07/02/2016
Sampling Parameter: **Air Volume Not Provided**

Analyte	Result (mg/sample)	Result (mg/m³)	Result (ppm)	RL (mg/sample)
Acetonitrile	<0.010	NA	NA	0.010

Sample ID: **S16T019085** — Collected: 06/25/2016
Lab ID: 1618258017 — Sampling Location: CARTRIDGE EVALUATION — Received: 06/30/2016
Method: NIOSH 1606 — Media: SKC 226-09, Charcoal Tube 400/200mg — **Analyzed:** 07/02/2016
Sampling Parameter: **Air Volume Not Provided**

Analyte	Result (mg/sample)	Result (mg/m³)	Result (ppm)	RL (mg/sample)
Acetonitrile	**0.072**	NA	NA	0.010

Sample ID: **S16T019086** — Collected: 06/25/2016
Lab ID: 1618258018 — Sampling Location: CARTRIDGE EVALUATION — Received: 06/30/2016
Method: NIOSH 1606 — Media: SKC 226-09, Charcoal Tube 400/200mg — **Analyzed:** 07/02/2016
Sampling Parameter: **Air Volume Not Provided**

Analyte	Result (mg/sample)	Result (mg/m³)	Result (ppm)	RL (mg/sample)
Acetonitrile	<0.010	NA	NA	0.010

ANALYTICAL REPORT

Workorder: **34-1618258**
Client Project ID: CARTRIDGE EVALUATION
Purchase Order: 55502 Rel9
Project Manager: Rand Potter

Analytical Results

Sample ID: **S16T019087** Collected: 06/25/2016
Lab ID: 1618258019 Sampling Location: CARTRIDGE EVALUATION Received: 06/30/2016
Method: **NIOSH 1606** Media: SKC 226-09, Charcoal Tube 400/200mg Analyzed: 07/02/2016
Sampling Parameter: **Air Volume Not Provided**

Analyte	Result (mg/sample)	Result (mg/m³)	Result (ppm)	RL (mg/sample)
Acetonitrile	<0.010	NA	NA	0.010

Sample ID: **S16T019088** Collected: 06/25/2016
Lab ID: 1618258020 Sampling Location: CARTRIDGE EVALUATION Received: 06/30/2016
Method: **NIOSH 1606** Media: SKC 226-09, Charcoal Tube 400/200mg Analyzed: 07/02/2016
Sampling Parameter: **Air Volume Not Provided**

Analyte	Result (mg/sample)	Result (mg/m³)	Result (ppm)	RL (mg/sample)
Acetonitrile	<0.010	NA	NA	0.010

Sample ID: **S16T019089** Collected: 06/25/2016
Lab ID: 1618258021 Sampling Location: CARTRIDGE EVALUATION Received: 06/30/2016
Method: **NIOSH 1606** Media: SKC 226-09, Charcoal Tube 400/200mg Analyzed: 07/02/2016
Sampling Parameter: **Air Volume Not Provided**

Analyte	Result (mg/sample)	Result (mg/m³)	Result (ppm)	RL (mg/sample)
Acetonitrile	<0.010	NA	NA	0.010

Sample ID: **S16T019090** Collected: 06/25/2016
Lab ID: 1618258022 Sampling Location: CARTRIDGE EVALUATION Received: 06/30/2016
Method: **NIOSH 1606** Media: SKC 226-09, Charcoal Tube 400/200mg Analyzed: 07/02/2016
Sampling Parameter: **Air Volume Not Provided**

Analyte	Result (mg/sample)	Result (mg/m³)	Result (ppm)	RL (mg/sample)
Acetonitrile	<0.010	NA	NA	0.010

Sample ID: **S16T019091** Collected: 06/25/2016
Lab ID: 1618258023 Sampling Location: CARTRIDGE EVALUATION Received: 06/30/2016
Method: **NIOSH 1606** Media: SKC 226-09, Charcoal Tube 400/200mg Analyzed: 07/02/2016
Sampling Parameter: **Air Volume Not Provided**

Analyte	Result (mg/sample)	Result (mg/m³)	Result (ppm)	RL (mg/sample)
Acetonitrile	<0.010	NA	NA	0.010

ANALYTICAL REPORT

Workorder: **34-1618258**
Client Project ID: CARTRIDGE EVALUATION
Purchase Order: 55502 Rel9
Project Manager: Rand Potter

Analytical Results

Sample ID: **S16T019092**			Collected: 06/25/2016
Lab ID: 1618258024	Sampling Location: CARTRIDGE EVALUATION		Received: 06/30/2016
Method: NIOSH 1606	**Media:** SKC 226-09, Charcoal Tube 400/200mg		**Analyzed:** 07/02/2016
	Sampling Parameter: Air Volume Not Provided		

Analyte	Result (mg/sample)	Result (mg/m³)	Result (ppm)	RL (mg/sample)
Acetonitrile	<0.010	NA	NA	0.010

Sample ID: **S16T019093**			Collected: 06/25/2016
Lab ID: 1618258025	Sampling Location: CARTRIDGE EVALUATION		Received: 06/30/2016
Method: NIOSH 1606	**Media:** SKC 226-09, Charcoal Tube 400/200mg		**Analyzed:** 07/02/2016
	Sampling Parameter: Air Volume Not Provided		

Analyte	Result (mg/sample)	Result (mg/m³)	Result (ppm)	RL (mg/sample)
Acetonitrile	<0.010	NA	NA	0.010

Sample ID: **S16T019094**			Collected: 06/25/2016
Lab ID: 1618258026	Sampling Location: CARTRIDGE EVALUATION		Received: 06/30/2016
Method: NIOSH 1606	**Media:** SKC 226-09, Charcoal Tube 400/200mg		**Analyzed:** 07/02/2016
	Sampling Parameter: Air Volume Not Provided		

Analyte	Result (mg/sample)	Result (mg/m³)	Result (ppm)	RL (mg/sample)
Acetonitrile	<0.010	NA	NA	0.010

Comments

Sample: 1618258017

47 % of reported amount of acetonitrile was found in the B section.

Report Authorization (/S/ is an electronic signature that complies with 21 CFR Part 11)

Method	Analyst	Peer Review
NIOSH 1606	/S/ Young Hee Yoon 07/07/2016 17:54	/S/ Thomas J. Masoian 07/08/2016 08:44

Laboratory Contact Information

ALS Environmental
960 W Levoy Drive
Salt Lake City, Utah 84123

Phone: (801) 266-7700
Email: alslt.lab@ALSGlobal.com
Web: www.alsslc.com

ANALYTICAL REPORT

Workorder: **34-1618258**
Client Project ID: CARTRIDGE EVALUATION
Purchase Order: 55502 Rel9
Project Manager: Rand Potter

General Lab Comments

The results provided in this report relate only to the items tested.
Samples were received in acceptable condition unless otherwise noted.
Samples have not been blank corrected unless otherwise noted.
This test report shall not be reproduced, except in full, without written approval of ALS.

ALS provides professional analytical services for all samples submitted. ALS is not in a position to interpret the data and assumes no responsibility for the quality of the samples submitted.

All quality control samples processed with the samples in this report yielded acceptable results unless otherwise noted.

ALS is accredited for specific fields of testing (scopes) in the following testing sectors. The quality system implemented at ALS conforms to accreditation requirements and is applied to all analytical testing performed by ALS. The following table lists testing sector, accreditation body, accreditation number and website. Please contact these accrediting bodies or your ALS project manager for the current scope of accreditation that applies to your analytical testing.

Testing Sector	Accreditation Body (Standard)	Certificate Number	Website
Environmental	ACLASS (DoD ELAP)	ADE-1420	http://www.aclasscorp.com
	Utah (NELAC)	DATA1	http://health.utah.gov/lab/labimp/
	Nevada	UT00009	http://ndep.nv.gov/bsdw/labservice.htm
	Oklahoma	UT00009	http://www.deq.state.ok.us/CSDnew/
	Iowa	IA# 376	http://www.iowadnr.gov/InsideDNR/RegulatoryWater.aspx
	Florida (TNI)	E871067	http://www.dep.state.fl.us/labs/bars/sas/qa/
	Texas (TNI)	T104704456-11-1	http://www.tceq.texas.gov/field/qa/lab_accred_certif.html
Industrial Hygiene	AIHA-LAP, LLC (ISO 17025 and AIHA-LAP, LLC IHLAP/ELLAP)	101574	http://www.aihaaccreditedlabs.org
Lead Testing:			
CPSC	ACLASS (ISO 17025, CPSC)	ADE-1420	http://www.aclasscorp.com
Soil, Dust, Paint ,Air	AIHA-LAP, LLC (ISO 17025, AIHA-LAP, LLC ELLAP and NLLAP)	101574	http://www.aihaaccreditedlabs.org
Dietary Supplements	ACLASS (ISO 17025)	ADE-1420	http://www.aclasscorp.com

Definitions

LOD = Limit of Detection = MDL = Method Detection Limit, A statistical estimate of method/media/instrument sensitivity.
LOQ = Limit of Quantitation = RL = Reporting Limit, A verified value of method/media/instrument sensitivity.
ND = Not Detected, Testing result not detected above the LOD or LOQ.
NA = Not Applicable.
** No result could be reported, see sample comments for details.
< This testing result is less than the numerical value.
( ) This testing result is between the LOD and LOQ and has higher analytical uncertainty than values at or above the LOQ.

ALS Envrionmental certifies this analytical report is in compliance with the Hanford SOW, both technically and for completeness. Release of the data contained in this report has been electronically authorized by the following laboratory representative:

Rand Potter, Project Manager, ALS Environmental

Quality Control Sample
Batch Report

Analysis Information

Workorder: 1618258

Limits: Historical/Performance	**Preparation:** NA	**Analysis:** IH GC-FID QC
Basis: ALS Laboratory Group	**Batch:** NA	**Batch:** IFID/7555 (HBN: 172127)
	Prepared By: NA	**Analyzed By:** Young Hee Yoon

Blank

MB: 506729
Analyzed: 07/02/2016 00:00
Units: mg/sample

Analyte	Result	MDL	RL
Acetonitrile	ND	NA	0.0100

MB: 506732
Analyzed: 07/02/2016 00:00
Units: mg/sample

Analyte	Result	MDL	RL
Acetonitrile	ND	NA	0.0100

Laboratory Control Sample - Laboratory Control Sample Duplicate

LCS: 506730
Analyzed: 07/02/2016 00:00
Dilution: 1
Units: mg/sample

LCSD: 506731
Analyzed: 07/02/2016 00:00
Dilution: 1
Units: mg/sample

Analyte	Result	Target	% Rec	QC Limits		Result	% Rec	RPD	QC Limits	
Acetonitrile	0.288	0.281	103	86.6	115.3	0.272	96.8	5.71	0.0	20.0

LCS: 506733
Analyzed: 07/02/2016 00:00
Dilution: 1
Units: mg/sample

LCSD: 506734
Analyzed: 07/02/2016 00:00
Dilution: 1
Units: mg/sample

Analyte	Result	Target	% Rec	QC Limits		Result	% Rec	RPD	QC Limits	
Acetonitrile	0.282	0.281	100	86.6	115.3	0.262	93.3	7.35	0.0	20.0

QC Report Authorization (/S/ is an electronic signature that complies with 21 CFR Part 11)

Analyst	Peer Review
/S/ Young Hee Yoon	/S/ Thomas J. Masoian
07/07/2016 17:54	07/08/2016 08:44

Symbols and Definitions

* - Analyte above reporting limit or outside of control limits
▲ - Sample result is greater than 4 times the spike added
◓ - Sample and Matrix Duplicate less than 5 times the reporting limit
● - Result is above the calibration range

RPD - Relative % Difference (Spike / Spike Duplicate)
ND - Not Detected (U - Qualifier also flags analyte as not detected)
NA - Not Applicable
QC results are not adjusted for moisture correction, where applicable

1618258

1618258

Assembler	CHAIN OF CUSTODY/SAMPLE ANALYSIS REQUEST	C.O.C. No. 20161913
N/A		Page 1 of 3

Collector: JONES	Contact/Requestor: CARL HOWALD IV	Telephone No. 373-6861 MSIN T6-05 FAX 372-1878
SAF No.: N/A	Sample Origin: CARTRIDGE EVALUATION	Purchase Order/Charge Code: 202003/CB20
Project Title: CARTRIDGE EVALUATION	Logbook/ Work Package No.: N/A	Ice Chest No. WTS-055 Temp. ON ICE
Shipped To (Lab): ALS	Method of Shipment	Bill of Lading/Air Bill No. 7766 3723 2822
Protocol: N/A	Data Turnaround: 10 DAYS	Parts and Return No. 40958

Sample No.	Lab ID	*	Date	Time	No./Type Container	Sample Analysis	Preservative
	S16T019069	VA	6/25/16		CHARCOAL TUBE	Acetonitrile 16-001-AP-EF-001H	N/A
	S16T019070	VA	6/25/16		CHARCOAL TUBE	Acetonitrile 16-001-AP-IN-001H	N/A
	S16T019071	VA	6/25/16		CHARCOAL TUBE	Acetonitrile 16-001-AP-EF-001G	N/A
	S16T019072	VA	6/25/16		CHARCOAL TUBE	Acetonitrile 16-001-AP-EF-001F	N/A
	S16T019073	VA	6/24/16		CHARCOAL TUBE	Acetonitrile 16-001-AP-EF-001E	N/A
	S16T019074	VA	6/24/16		CHARCOAL TUBE	Acetonitrile 16-001-AP-EF-001D	N/A
	S16T019075	VA	6/24/16		CHARCOAL TUBE	Acetonitrile 16-001-AP-EF-001C	N/A
	S16T019076	VA	6/24/16		CHARCOAL TUBE	Acetonitrile 16-001-AP-EF-001B	N/A
	S16T019077	VA	6/24/16		CHARCOAL TUBE	Acetonitrile 16-001-AP-EF-001A	N/A
	S16T019078	VA	6/24/16		CHARCOAL TUBE	Acetonitrile 16-001-AP-IN-001A	N/A

POSSIBLE SAMPLE HAZARDS/REMARKS (List all known wastes) MSDS ○ Yes ◉ No

SPECIAL INSTRUCTIONS Hold Time

Send Results to Robert Sosa & Greg Moore
Robert_W_Sosa@rl.gov and Gregory_S_Moore@rl.gov for email

RELEASE 9
Reference Contract # 55502

Relinquished By	Print	Sign	Date/Time	Received By	Print	Sign	Date/Time
	Leslie Diaz		6/29/16 10:00		Julie Godish	Julie Godish	6/29/16 10:00
Julie Godish Julie Godish			6/29/16 1400	FEDEX			

Matrix*

S = Soil	DL = Drum Liquids		
SE = Sediment	T = Tissue		
SO = Solid	WI = Wipe		
SL = Sludge	L = Liquid		
W = Water	V = Vegetation		
O = Oil	VA = Vapor		
A = Air	X = Other		
DS = Drum Solids			

FINAL SAMPLE DISPOSITION: Disposal Method (e.g., Return to customer, per lab procedure, used in process) Disposed By Date/Time July 3, 2018 4:00 pm

All samples containing hazardous materials shall be picked up by requestor and returned to parent container or site of origin.

A-6003-962 (03/05)

Assembler	CHAIN OF CUSTODY/SAMPLE ANALYSIS REQUEST	C.O.C. No. 20161913
N/A		Page 2 of 3

Collector: JONES	Contact/Requestor: CARL HOWALD IV	Telephone No. 373-6861 MSIN T6-05 FAX 372-1878
SAF No.: N/A	Sample Origin: CARTRIDGE EVALUATION	Purchase Order/Charge Code: 202003/CB20
Project Title: CARTRIDGE EVALUATION	Logbook/ Work Package No.: N/A	Ice Chest No. 5 Temp. ON ICE
Shipped To (Lab): ALS	Method of Shipment	Bill of Lading/Air Bill No. 7766 3723 2822
Protocol: N/A	Data Turnaround: 10 DAYS	Parts and Return No. 40958

Sample No.	Lab ID	*	Date	Time	No./Type Container	Sample Analysis	Preservative
	S16T019079	VA	6/24/16		CHARCOAL TUBE	Acetonitrile 16-001-AP-EF-001BASE	N/A
	S16T019080	VA	6/24/16		CHARCOAL TUBE	Acetonitrile 16-001-AP-IN-001BASE	N/A
	S16T019081	VA	6/24/16		CHARCOAL TUBE	Acetonitrile 16-001-AP-BK-001BASE	N/A
	S16T019082	VA	6/26/16		CHARCOAL TUBE	Acetonitrile 16-002-AP-EF-001H	N/A
	S16T019083	VA	6/26/16		CHARCOAL TUBE	Acetonitrile 16-002-AP-IN-001H	N/A
	S16T019084	VA	6/26/16		CHARCOAL TUBE	Acetonitrile 16-002-AP-EF-001G	N/A
	S16T019085	VA	6/25/16		CHARCOAL TUBE	Acetonitrile 16-002-AP-EF-001F	N/A
	S16T019086	VA	6/25/16		CHARCOAL TUBE	Acetonitrile 16-002-AP-EF-001E	N/A
	S16T019087	VA	6/25/16		CHARCOAL TUBE	Acetonitrile 16-002-AP-EF-001D	N/A
	S16T019088	VA	6/25/16		CHARCOAL TUBE	Acetonitrile 16-002-AP-EF-001C LAD 6-29-16	N/A

POSSIBLE SAMPLE HAZARDS/REMARKS (List all known wastes) MSDS ○ Yes ◉ No

SPECIAL INSTRUCTIONS — Hold Time

Send Results to Robert Sosa & Greg Moore
Robert_W_Sosa@rl.gov and Gregory_S_Moore@rl.gov for email

RELEASE 9
Reference Contract # 55502

Relinquished By (Print / Sign)	Date/Time	Received By (Print / Sign)	Date/Time
Leslie Diaz	6/29/16 10:00	Julie Gadsden	6/29/16 10:00
Julie Gadsden	6/29/16 1400	FEDEX	

Matrix*

S = Soil		DL = Drum Liquids	
SE = Sediment		T = Tissue	
SO = Solid		WI = Wipe	
SL = Sludge		L = Liquid	
W = Water		V = Vegetation	
O = Oil		VA = Vapor	
A = Air		X = Other	
DS = Drum Solids			

FINAL SAMPLE DISPOSITION — Disposal Method (e.g., Return to customer, per lab procedure, used in process): Disposed By: July 3, 2016 4:00 PM — Date/Time

All samples containing hazardous materials shall be picked up by requestor and returned to parent container or site of origin.

A-6003-962 (03/05)

Assembler	CHAIN OF CUSTODY/SAMPLE ANALYSIS REQUEST	C.O.C. No.
N/A		20161913
		Page 3 of 3

Collector: JONES	Contact/Requestor: CARL HOWALD IV	Telephone No.: 373-6861	MSIN: T6-05 FAX: 372-1878
SAF No.: N/A	Sample Origin: CARTRIDGE EVALUATION	Purchase Order/Charge Code: 202003/CB20	
Project Title: CARTRIDGE EVALUATION	Logbook/ Work Package No.: N/A	Ice Chest No.: WTS-055	Temp.: ON ICE
Shipped To (Lab): ALS	Method of Shipment	Bill of Lading/Air Bill No.: 7766 3723 2822	
Protocol: N/A	Data Turnaround: 10 DAYS	Parts and Return No.: 40958	

Sample No.	Lab ID	*	Date	Time	No./Type Container	Sample Analysis	Preservative
	S16T019089	VA	6/25/16		CHARCOAL TUBE	Acetonitrile 16-002-AP-EF-001B	N/A
	S16T019090	VA	6/25/16		CHARCOAL TUBE	Acetonitrile 16-002-AP-EF-001A	N/A
	S16T019091	VA	6/25/16		CHARCOAL TUBE	Acetonitrile 16-002-AP-IN-001A	N/A
	S16T019092	VA	6/25/16		CHARCOAL TUBE	Acetonitrile 16-002-AP-EF-001BASE	N/A
	S16T019093	VA	6/25/16		CHARCOAL TUBE	Acetonitrile 16-002-AP-IN-001BASE	N/A
	S16T019094	VA	6/25/16		CHARCOAL TUBE	Acetonitrile 16-002-AP-BK-001BASE	N/A

POSSIBLE SAMPLE HAZARDS/REMARKS (List all known wastes) MSDS ○ Yes ◉ No

SPECIAL INSTRUCTIONS — Hold Time

Send Results to Robert Sosa & Greg Moore
Robert_W_Sosa@rl.gov and Gregory_S_Moore@rl.gov for email

RELEASE 9
Reference Contract # 55502

	Print	Sign	Date/Time
Relinquished By	Leslie Diaz		6/29/16 0100
Relinquished By	Julie Gradish	Julie Gradish	6/29/16 1400
Relinquished By			
Relinquished By			

	Print	Sign	Date/Time
Received By	Julie Gradish	Julie Gradish	6/29/16 0100
Received By	FEDEX		
Received By			
Received By			

Matrix*

S = Soil		DL = Drum Liquids	
SE = Sediment		T = Tissue	
SO = Solid		WI = Wipe	
SL = Sludge		L = Liquid	
W = Water		V = Vegetation	
O = Oil		VA = Vapor	
A = Air		X = Other	
DS = Drum Solids			

FINAL SAMPLE DISPOSITION — Disposal Method (e.g., Return to customer, per lab procedure, used in process) — Disposed By: — Date/Time: July 3, 2016 4:00 pm

All samples containing hazardous materials shall be picked up by requestor and returned to parent container or site of origin.

A-6003-962 (03/05)

C.3.6 Mercury

FINAL REPORT ON MERCURY VAPOR TUBES FOR CARTRIDGE EVALUATION COLLECTED JUNE 24 - 26, 2016

Document No.: 20161908 Rev. 0

Michael A. Purcell
WAI Hanford Laboratory

Date Published
July 12, 2016

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509-373-3240

July 12, 2016
Michael A. Purcell, WHL Project Coordinator

NARRATIVE

FINAL REPORT ON MERCURY VAPOR TUBES FOR CARTRIDGE EVALUATION COLLECTED JUNE 24 - 26, 2016

This final report presents the results of twenty-six mercury vapor tubes received at the 222-S Laboratory from on June 27, 2016, in good condition and with adequate paperwork. The mercury vapor tubes were logged into sample delivery group 20161908.

DISCLAIMERS

- The information contained in this report is intended only for the use of the addressee and should be considered confidential.
- This report shall not be reproduced, except in full, without written approval of the laboratory.
- The results shown in this report pertain only to the actual samples tested.
- These results conform to the requirements specified in the referenced methods/procedures and specifications provided verbally or electronically by the customer. Any deviations or modifications are discussed in the following narrative.
- This report only addresses laboratory activities related to the listed surveys. Requirements or anomalies concerning field sampling are not addressed in this report.

PROCEDURES

Method	Preparation Procedure	Analysis Procedure
Mercury by OSHA ID-140	LA-325-109, Rev. C-3	LA-325-109, Rev. C-3

ANALYTICAL SUMMARY

The vapor tubes were tested for mercury, as specified on the chain of custody. Standard laboratory procedures for digestions and cold vapor atomic absorption for mercury were followed as well as the requirements in WHL-MP-1029, *WHL Industrial Hygiene Quality Assurance Project Plan for 222-S Laboratory* (QAPP). Program specific work authorization instructions have been provided for WRPS IH sample analysis through verbal and electronic communication with the customer point of contact, and are kept as a record by the laboratory. When applicable, any client communication specific to the samples in this report will be included herein. All quality control criteria in the QAPP were met.

The measurement uncertainty was estimated based on the historical behavior of laboratory control standards (LCS). For mercury, the results of 178 LCS determinations indicate a mean recovery of 98% with a standard deviation of 6%. Statistical process control limits for the LCS are 81 – 115%, with no significant bias. The overall estimate of uncertainty is 12%, with coverage factor (k) = 2.

Background levels of mercury or interfering compounds can be present in the sorbent tube media used for collecting vapor samples. OSHA ID-140 recommends that the laboratory determine the average background for each lot of media and subtract it from the sample results prior to reporting. However, per agreement with the client, this background is being determined by the client using blank media submitted as blind samples to the laboratory. Any blank subtraction from the sample results will be performed by the client. The laboratory is using the same media

for QC samples. These QC samples may not match the lot numbers of the samples being submitted and the background for this QC sample media has not been determined. Over the past several years the results from preparation blanks, field blanks, and the vast majority of samples have been below the laboratory's method detection limit, which is an order of magnitude below the reporting limit. In general, the laboratory believes there is no need for background subtraction using the current sample media (Hydrar, SKC 226-17-1A).

For the mercury analysis, the blank results for tube lot numbers 9473 and 10187were below the detection limit; therefore, no blank correction was required. All mercury results for this sample group were below the reporting limit of 0.05 µg/sample, except for samples 16-001-AP-IN-005A, 16-001-AP-IN-005H, 16-002-AP-EF-005A, and 16-002-AP-IN-005H. For each of these samples, the total result includes the contribution from the glass wool portion even though the glass wool portion result is lower than the reporting limit (see Attachment 1).

Attachment 1

DATA SUMMARY REPORT

DATA SUMMARY REPORT FOR SAMPLE GROUP 20161908

Customer Sample ID	Vapor Tube Portion	Laboratory Sample ID	Analyte	Result Unit	Standard % Recovery	Blank	Result	Reporting Limit
16-001-AP-EF-005BASE	Total	S16T018812	Mercury	µg/sample	n/a	<0.0500	<0.0500	0.0500
16-001-AP-EF-005BASE	Resin	S16T018813	Mercury	µg/sample	89.4	<0.0500	<0.0500	0.0500
16-001-AP-EF-005BASE	Glass Wool	S16T018814	Mercury	µg/sample	89.4	<0.0500	<0.0500	0.0500
16-001-AP-IN-005BASE	Total	S16T018815	Mercury	µg/sample	n/a	<0.0500	<0.0500	0.0500
16-001-AP-IN-005BASE	Resin	S16T018816	Mercury	µg/sample	89.4	<0.0500	<0.0500	0.0500
16-001-AP-IN-005BASE	Glass Wool	S16T018817	Mercury	µg/sample	89.4	<0.0500	<0.0500	0.0500
16-001-AP-BK-005BASE	Total	S16T018818	Mercury	µg/sample	n/a	<0.0500	<0.0500	0.0500
16-001-AP-BK-005BASE	Resin	S16T018819	Mercury	µg/sample	89.4	<0.0500	<0.0500	0.0500
16-001-AP-BK-005BASE	Glass Wool	S16T018820	Mercury	µg/sample	89.4	<0.0500	<0.0500	0.0500
16-001-AP-EF-005A	Total	S16T018821	Mercury	µg/sample	n/a	<0.0500	<0.0500	0.0500
16-001-AP-EF-005A	Resin	S16T018822	Mercury	µg/sample	89.4	<0.0500	<0.0500	0.0500
16-001-AP-EF-005A	Glass Wool	S16T018823	Mercury	µg/sample	89.4	<0.0500	<0.0500	0.0500
16-001-AP-IN-005A	Total	S16T018824	Mercury	µg/sample	n/a	<0.0500	0.319	0.0500
16-001-AP-IN-005A	Resin	S16T018825	Mercury	µg/sample	89.4	<0.0500	0.314	0.0500
16-001-AP-IN-005A	Glass Wool	S16T018826	Mercury	µg/sample	89.4	<0.0500	<0.0500	0.0500
16-001-AP-EF-005B	Total	S16T018827	Mercury	µg/sample	n/a	<0.0500	<0.0500	0.0500
16-001-AP-EF-005B	Resin	S16T018828	Mercury	µg/sample	89.4	<0.0500	<0.0500	0.0500
16-001-AP-EF-005B	Glass Wool	S16T018829	Mercury	µg/sample	89.4	<0.0500	<0.0500	0.0500
16-001-AP-EF-005C	Total	S16T018830	Mercury	µg/sample	n/a	<0.0500	<0.0500	0.0500
16-001-AP-EF-005C	Resin	S16T018831	Mercury	µg/sample	89.4	<0.0500	<0.0500	0.0500
16-001-AP-EF-005C	Glass Wool	S16T018832	Mercury	µg/sample	89.4	<0.0500	<0.0500	0.0500
16-001-AP-EF-005D	Total	S16T018833	Mercury	µg/sample	n/a	<0.0500	<0.0500	0.0500
16-001-AP-EF-005D	Resin	S16T018834	Mercury	µg/sample	89.4	<0.0500	<0.0500	0.0500
16-001-AP-EF-005D	Glass Wool	S16T018835	Mercury	µg/sample	89.4	<0.0500	<0.0500	0.0500
16-001-AP-EF-005E	Total	S16T018836	Mercury	µg/sample	n/a	<0.0500	<0.0500	0.0500
16-001-AP-EF-005E	Resin	S16T018837	Mercury	µg/sample	89.4	<0.0500	<0.0500	0.0500
16-001-AP-EF-005E	Glass Wool	S16T018838	Mercury	µg/sample	89.4	<0.0500	<0.0500	0.0500
16-001-AP-EF-005F	Total	S16T018839	Mercury	µg/sample	n/a	<0.0500	<0.0500	0.0500
16-001-AP-EF-005F	Resin	S16T018840	Mercury	µg/sample	89.4	<0.0500	<0.0500	0.0500
16-001-AP-EF-005F	Glass Wool	S16T018841	Mercury	µg/sample	89.4	<0.0500	<0.0500	0.0500
16-001-AP-EF-005G	Total	S16T018842	Mercury	µg/sample	n/a	<0.0500	<0.0500	0.0500
16-001-AP-EF-005G	Resin	S16T018843	Mercury	µg/sample	97.9	<0.0500	<0.0500	0.0500
16-001-AP-EF-005G	Glass Wool	S16T018844	Mercury	µg/sample	97.9	<0.0500	<0.0500	0.0500
16-001-AP-EF-005H	Total	S16T018845	Mercury	µg/sample	n/a	<0.0500	<0.0500	0.0500
16-001-AP-EF-005H	Resin	S16T018846	Mercury	µg/sample	97.9	<0.0500	<0.0500	0.0500
16-001-AP-EF-005H	Glass Wool	S16T018847	Mercury	µg/sample	97.9	<0.0500	<0.0500	0.0500
16-001-AP-IN-005H	Total	S16T018874	Mercury	µg/sample	n/a	<0.0500	0.414	0.0500
16-001-AP-IN-005H	Resin	S16T018875	Mercury	µg/sample	97.9	<0.0500	0.409	0.0500
16-001-AP-IN-005H	Glass Wool	S16T018876	Mercury	µg/sample	97.9	<0.0500	<0.0500	0.0500
16-002-AP-EF-005BASE	Total	S16T018877	Mercury	µg/sample	n/a	<0.0500	<0.0500	0.0500
16-002-AP-EF-005BASE	Resin	S16T018878	Mercury	µg/sample	97.9	<0.0500	<0.0500	0.0500
16-002-AP-EF-005BASE	Glass Wool	S16T018879	Mercury	µg/sample	97.9	<0.0500	<0.0500	0.0500
16-002-AP-IN-005BASE	Total	S16T018904	Mercury	µg/sample	n/a	<0.0500	<0.0500	0.0500
16-002-AP-IN-005BASE	Resin	S16T018905	Mercury	µg/sample	97.9	<0.0500	<0.0500	0.0500
16-002-AP-IN-005BASE	Glass Wool	S16T018906	Mercury	µg/sample	97.9	<0.0500	<0.0500	0.0500

DATA SUMMARY REPORT FOR SAMPLE GROUP 20161908

Customer Sample ID	Vapor Tube Portion	Laboratory Sample ID	Analyte	Result Unit	Standard % Recovery	Blank	Result	Reporting Limit
16-002-AP-BK-005BASE	Total	S16T018907	Mercury	µg/sample	n/a	<0.0500	<0.0500	0.0500
16-002-AP-BK-005BASE	Resin	S16T018908	Mercury	µg/sample	97.9	<0.0500	<0.0500	0.0500
16-002-AP-BK-005BASE	Glass Wool	S16T018909	Mercury	µg/sample	97.9	<0.0500	<0.0500	0.0500
16-002-AP-EF-005A	Total	S16T018910	Mercury	µg/sample	n/a	<0.0500	0.328	0.0500
16-002-AP-EF-005A	Resin	S16T018911	Mercury	µg/sample	97.9	<0.0500	0.323	0.0500
16-002-AP-EF-005A	Glass Wool	S16T018912	Mercury	µg/sample	97.9	<0.0500	<0.0500	0.0500
16-002-AP-IN-005A	Total	S16T018913	Mercury	µg/sample	n/a	<0.0500	<0.0500	0.0500
16-002-AP-IN-005A	Resin	S16T018914	Mercury	µg/sample	97.9	<0.0500	<0.0500	0.0500
16-002-AP-IN-005A	Glass Wool	S16T018915	Mercury	µg/sample	97.9	<0.0500	<0.0500	0.0500
16-002-AP-EF-005B	Total	S16T018916	Mercury	µg/sample	n/a	<0.0500	<0.0500	0.0500
16-002-AP-EF-005B	Resin	S16T018917	Mercury	µg/sample	97.9	<0.0500	<0.0500	0.0500
16-002-AP-EF-005B	Glass Wool	S16T018918	Mercury	µg/sample	97.9	<0.0500	<0.0500	0.0500
16-002-AP-EF-005C	Total	S16T018919	Mercury	µg/sample	n/a	<0.0500	<0.0500	0.0500
16-002-AP-EF-005C	Resin	S16T018920	Mercury	µg/sample	97.9	<0.0500	<0.0500	0.0500
16-002-AP-EF-005C	Glass Wool	S16T018921	Mercury	µg/sample	97.9	<0.0500	<0.0500	0.0500
16-002-AP-EF-005D	Total	S16T018922	Mercury	µg/sample	n/a	<0.0500	<0.0500	0.0500
16-002-AP-EF-005D	Resin	S16T018923	Mercury	µg/sample	97.3	<0.0500	<0.0500	0.0500
16-002-AP-EF-005D	Glass Wool	S16T018924	Mercury	µg/sample	97.3	<0.0500	<0.0500	0.0500
16-002-AP-EF-005E	Total	S16T018926	Mercury	µg/sample	n/a	<0.0500	<0.0500	0.0500
16-002-AP-EF-005E	Resin	S16T018927	Mercury	µg/sample	97.3	<0.0500	<0.0500	0.0500
16-002-AP-EF-005E	Glass Wool	S16T018930	Mercury	µg/sample	97.3	<0.0500	<0.0500	0.0500
16-002-AP-EF-005F	Total	S16T018935	Mercury	µg/sample	n/a	<0.0500	<0.0500	0.0500
16-002-AP-EF-005F	Resin	S16T018965	Mercury	µg/sample	97.3	<0.0500	<0.0500	0.0500
16-002-AP-EF-005F	Glass Wool	S16T018967	Mercury	µg/sample	97.3	<0.0500	<0.0500	0.0500
16-002-AP-EF-005G	Total	S16T018969	Mercury	µg/sample	n/a	<0.0500	<0.0500	0.0500
16-002-AP-EF-005G	Resin	S16T018970	Mercury	µg/sample	97.3	<0.0500	<0.0500	0.0500
16-002-AP-EF-005G	Glass Wool	S16T018971	Mercury	µg/sample	97.3	<0.0500	<0.0500	0.0500
16-002-AP-EF-005H	Total	S16T018972	Mercury	µg/sample	n/a	<0.0500	<0.0500	0.0500
16-002-AP-EF-005H	Resin	S16T018974	Mercury	µg/sample	97.3	<0.0500	<0.0500	0.0500
16-002-AP-EF-005H	Glass Wool	S16T018975	Mercury	µg/sample	97.3	<0.0500	<0.0500	0.0500
16-002-AP-IN-005H	Total	S16T018978	Mercury	µg/sample	n/a	<0.0500	0.358	0.0500
16-002-AP-IN-005H	Resin	S16T018979	Mercury	µg/sample	97.3	<0.0500	0.353	0.0500
16-002-AP-IN-005H	Glass Wool	S16T018980	Mercury	µg/sample	97.3	<0.0500	<0.0500	0.0500

Attachment 2

ANALYSIS DATE REPORT

ANALYSIS DATE REPORT FOR SAMPLE GROUP 20161908

Laboratory Sample ID	Customer Sample ID	Method	Preparation Date	Analysis Date
S16T018813	16-001-AP-EF-005BASE	Mercury	06/29/2016 07:45	06/29/2016 11:46
S16T018814	16-001-AP-EF-005BASE	Mercury	06/29/2016 07:45	06/29/2016 11:48
S16T018816	16-001-AP-IN-005BASE	Mercury	06/29/2016 07:45	06/29/2016 11:53
S16T018817	16-001-AP-IN-005BASE	Mercury	06/29/2016 07:45	06/29/2016 11:55
S16T018819	16-001-AP-BK-005BASE	Mercury	06/29/2016 07:45	06/29/2016 11:56
S16T018820	16-001-AP-BK-005BASE	Mercury	06/29/2016 07:45	06/29/2016 11:58
S16T018822	16-001-AP-EF-005A	Mercury	06/29/2016 07:45	06/29/2016 12:00
S16T018823	16-001-AP-EF-005A	Mercury	06/29/2016 07:45	06/29/2016 12:02
S16T018825	16-001-AP-IN-005A	Mercury	06/29/2016 07:45	06/29/2016 12:03
S16T018826	16-001-AP-IN-005A	Mercury	06/29/2016 07:45	06/29/2016 12:05
S16T018828	16-001-AP-EF-005B	Mercury	06/29/2016 07:45	06/29/2016 12:06
S16T018829	16-001-AP-EF-005B	Mercury	06/29/2016 07:45	06/29/2016 12:08
S16T018831	16-001-AP-EF-005C	Mercury	06/29/2016 07:45	06/29/2016 12:13
S16T018832	16-001-AP-EF-005C	Mercury	06/29/2016 07:45	06/29/2016 12:15
S16T018834	16-001-AP-EF-005D	Mercury	06/29/2016 07:45	06/29/2016 12:17
S16T018835	16-001-AP-EF-005D	Mercury	06/29/2016 07:45	06/29/2016 12:18
S16T018837	16-001-AP-EF-005E	Mercury	06/29/2016 07:45	06/29/2016 12:20
S16T018838	16-001-AP-EF-005E	Mercury	06/29/2016 07:45	06/29/2016 12:22
S16T018840	16-001-AP-EF-005F	Mercury	06/29/2016 07:45	06/29/2016 12:23
S16T018841	16-001-AP-EF-005F	Mercury	06/29/2016 07:45	06/29/2016 12:25
S16T018843	16-001-AP-EF-005G	Mercury	06/30/2016 07:40	06/30/2016 10:20
S16T018844	16-001-AP-EF-005G	Mercury	06/30/2016 07:40	06/30/2016 10:22
S16T018846	16-001-AP-EF-005H	Mercury	06/30/2016 07:40	06/30/2016 10:24
S16T018847	16-001-AP-EF-005H	Mercury	06/30/2016 07:40	06/30/2016 10:26
S16T018875	16-001-AP-IN-005H	Mercury	06/30/2016 07:40	06/30/2016 10:28
S16T018876	16-001-AP-IN-005H	Mercury	06/30/2016 07:40	06/30/2016 10:29
S16T018878	16-002-AP-EF-005BASE	Mercury	06/30/2016 07:40	06/30/2016 10:34
S16T018879	16-002-AP-EF-005BASE	Mercury	06/30/2016 07:40	06/30/2016 10:36
S16T018905	16-002-AP-IN-005BASE	Mercury	06/30/2016 07:40	06/30/2016 10:37
S16T018906	16-002-AP-IN-005BASE	Mercury	06/30/2016 07:40	06/30/2016 10:39
S16T018908	16-002-AP-BK-005BASE	Mercury	06/30/2016 07:40	06/30/2016 10:41
S16T018909	16-002-AP-BK-005BASE	Mercury	06/30/2016 07:40	06/30/2016 10:42
S16T018911	16-002-AP-EF-005A	Mercury	06/30/2016 07:40	06/30/2016 10:44
S16T018912	16-002-AP-EF-005A	Mercury	06/30/2016 07:40	06/30/2016 10:46
S16T018914	16-002-AP-IN-005A	Mercury	06/30/2016 07:40	06/30/2016 10:47
S16T018915	16-002-AP-IN-005A	Mercury	06/30/2016 07:40	06/30/2016 10:49
S16T018917	16-002-AP-EF-005B	Mercury	06/30/2016 07:40	06/30/2016 10:54
S16T018918	16-002-AP-EF-005B	Mercury	06/30/2016 07:40	06/30/2016 10:55
S16T018920	16-002-AP-EF-005C	Mercury	06/30/2016 07:40	06/30/2016 10:57
S16T018921	16-002-AP-EF-005C	Mercury	06/30/2016 07:40	06/30/2016 10:58
S16T018923	16-002-AP-EF-005D	Mercury	06/30/2016 07:40	06/30/2016 11:05
S16T018924	16-002-AP-EF-005D	Mercury	06/30/2016 07:40	06/30/2016 11:07
S16T018927	16-002-AP-EF-005E	Mercury	06/30/2016 07:40	06/30/2016 11:12
S16T018930	16-002-AP-EF-005E	Mercury	06/30/2016 07:40	06/30/2016 11:13
S16T018965	16-002-AP-EF-005F	Mercury	06/30/2016 07:40	06/30/2016 11:15
S16T018967	16-002-AP-EF-005F	Mercury	06/30/2016 07:40	06/30/2016 11:17

ANALYSIS DATE REPORT FOR SAMPLE GROUP 20161908

Laboratory Sample ID	Customer Sample ID	Method	Preparation Date	Analysis Date
S16T018970	16-002-AP-EF-005G	Mercury	06/30/2016 07:40	06/30/2016 11:18
S16T018971	16-002-AP-EF-005G	Mercury	06/30/2016 07:40	06/30/2016 11:20
S16T018974	16-002-AP-EF-005H	Mercury	06/30/2016 07:40	06/30/2016 11:22
S16T018975	16-002-AP-EF-005H	Mercury	06/30/2016 07:40	06/30/2016 11:24
S16T018979	16-002-AP-IN-005H	Mercury	06/30/2016 07:40	06/30/2016 11:25
S16T018980	16-002-AP-IN-005H	Mercury	06/30/2016 07:40	06/30/2016 11:27

Attachment 3

RECEIPT PAPERWORK

222-S	SAMPLE RECEIPT AND CHAIN OF CUSTODY VERIFICATION CHECKLIST	ATS-LO-090-101 Rev DG-1

Date Samples Received: 6-27-16 Total Number of Samples: 310 Group #: 20161908 Hg

Sample Custodian: Sharon L Holder IH Technician: [signature]

Sample Custodian to Complete:

Action	Yes	No	N/A	Comments
RSR provided?			✓	
Verify GKI is complete			✓	☐ In Project File
Received from an alpha facility?		✓		☐ Contact PC for approval to release
Check that outer custody seal is intact, if present			✓	
Record cooler temperature in centigrade, as appropriate	✓ 8.0			☐ Check if no cooler and/or no ice
Samples are intact and in good condition		✓		If No, provide comments below: Broken SVOA Tube
RSA/COC provided and complete containing the following information?				
• Client name and client sample number	✓			
• Date and time of sampling	✓			
• Sampling location or origin	✓			
• Container type, size, and number	✓			
• Preservatives (if used) noted on the COC/RSA and sample bottles			✓	
• Analysis request is clear	✓			
• Signature of persons relinquishing and receiving samples	✓			
• Date and/or time of sample custody exchange	✓			
Verify that sample numbers on containers match the COC and/or RSA	✓			
Samples stored properly (e.g., refrigeration)	✓			

Notify the PC immediately if any problems are noted. Any "No" checked boxes require PC resolution. For WRPS samples, the initials block below is completed by the responsible WRPS PC.

Samples acceptable for release? Yes PC/SC Initials RLM Date 6-27-16

If No, comment on communication and resolution:

WRPS: Ship - 180
Run - 78
WHL - NH_3 - 26
Hg - 26

Number of IH Samples Received:

Aldehyde Screen:	26	Amines:	26	Ammonia:	26	Aromatic HC:		Asbestos:	
Beryllium:		Be-Bulk:		Be-Filter:		Be-Wipe		1,3-Butadiene:	52
Formaldehyde:		Furans:	26	Mercury:	26	Methanol:		Nitrosamines:	26
Nitrous Oxide:		Pyridines:	24	SVOA:	26	VOA:	26	Other-IH:	26

A-6005-302 (REV 4)

INDUSTRIAL HYGIENE CHAIN OF CUSTODY AND LABORATORY REQUEST

Page 1 of 12

Contractor: Washington River Protection Services (WRPS)			Date Sampled: 06/24/2016
COA: CB20	CACN: 202003	Survey No.: 16-9999-A	
Contact Name: Parker Jones		Phone: (509) 942-9494	Date Needed: N/A
Return Report To: Joyce Caldwell		MSIN: R1-06	Phone: (509) 376-0737

Laboratory Log No.	Sample ID/Type/Description	Required Analysis/Method
	16-001-AP-EF-001BASE ~~Carbotrap 300 TDU Tube~~, SKC 226-09 (6/24/16 @)	Acetonitrile
	16-001-AP-EF-002BASE Anasorb 747 / Tenax TA	Furans 2044852
	16-001-AP-EF-003BASE Carbotrap 150 TDU	SVOC 2045293
	16-001-AP-EF-004BASE Carbotrap 300 TDU	VOC 2046071
SILT018812	16-001-AP-EF-005BASE Anasorb C300, SKC-226-17-1A SILT018813 8814	Mercury
	16-001-AP-EF-006BASE Anasorb 747, SKC-226-29	Ammonia
	16-001-AP-EF-007BASE SKC-226-37 (Part A)	1,3-Butadiene

Special Instructions: N/A

	Signature	Printed Name	Location	Date	Time
Delivered to Storage:	[signature]	Eric Harries	2704HV/H-104	06/24/2016	12:30
Retrieved from Storage:	[signature]	BRETT GARNER	[redacted]	6-27-16	1040

	Signature	Printed Name	Date	Time
Relinquished By:	[signature]	BRETT GARNER	6-27-16	1345
Received By:	[signature]	TERESA FORRESTER	6-27-16	1345
Relinquished By:				
Received By:				
Relinquished By:				
Received By:				

Additional Comments: N/A

A-6004-114 (REV 4)

INDUSTRIAL HYGIENE CHAIN OF CUSTODY AND LABORATORY REQUEST

Page 5 of 12

Contractor: Washington River Protection Services (WRPS)			Date Sampled: 06/24/2016
COA: CB20	CACN: 202003	Survey No.: 16-9999-A	
Contact Name: Parker Jones		Phone: (509) 942-9494	Date Needed: N/A
Return Report To: Joyce Caldwell		MSIN: R1-06	Phone: (509) 376-0737

Laboratory Log No.	Sample ID/Type/Description	Required Analysis/Method
	16-001-AP-IN-001BASE ~~Carbotrap 300 TDU Tube~~, SKC 226-09	Acetonitrile
	16-001-AP-IN-002BASE Anasorb 747 / Tenax TA	Furans 2044287
	16-001-AP-IN-003BASE Carbotrap 150 TDU	SVOC 2045294
	16-001-AP-IN-004BASE Carbotrap 300 TDU	VOC A007655
S16T018815	16-001-AP-IN-005BASE Anasorb C300, SKC-226-17-1A S16T018816 8817	Mercury
	16-001-AP-IN-006BASE Anasorb 747, SKC-226-29	Ammonia
	16-001-AP-IN-007BASE SKC-226-37 (Part A)	1,3-Butadiene

Special Instructions: N/A

	Signature	Printed Name	Location	Date	Time
Delivered to Storage:		Eric Harries	2704HV/H-104	06/24/2016	12:30
Retrieved from Storage:		BRETT GARNER	[redacted]	6-27-16	1055

	Signature	Printed Name	Date	Time
Relinquished By:		BRETT GARNER	6-27-16	1345
Received By:		TERESA FORRESTER	6-27-16	1345
Relinquished By:				
Received By:				
Relinquished By:				
Received By:				

Additional Comments: N/A

A-6004-114 (REV 4)

INDUSTRIAL HYGIENE CHAIN OF CUSTODY AND LABORATORY REQUEST

Page 9 of 12

Contractor: Washington River Protection Services (WRPS)			Date Sampled: 06/24/2016
COA: CB20	CACN: 202003	Survey No.: 16-9999-A	
Contact Name: Parker Jones		Phone: (509) 942-9494	Date Needed: N/A
Return Report To: Joyce Caldwell		MSIN: R1-06	Phone: (509) 376-0737

Laboratory Log No.	Sample ID/Type/Description	Required Analysis/Method
	16-001-AP-BK-001BASE ~~Carbotrap 300 TDU Tube~~, SKC 226-09 6/24/16 1400	Acetonitrile
	16-001-AP-BK-002BASE Anasorb 747 / Tenax TA	Furans 2047413
	16-001-AP-BK-003BASE Carbotrap 150 TDU	SVOC A022448
	16-001-AP-BK-004BASE Carbotrap 300 TDU	VOC A017577
SILT018818	16-001-AP-BK-005BASE Anasorb C300, SKC-226-17-1A SILT018819 8820	Mercury
	16-001-AP-BK-006BASE Anasorb 747, SKC-226-29	Ammonia
	16-001-AP-BK-007BASE SKC-226-37 (Part A)	1,3-Butadiene

Special Instructions: N/A

	Signature	Printed Name	Location	Date	Time
Delivered to Storage:		Eric Harries	2704HV/H-104	06/24/2016	12:30
Retrieved from Storage:		BRETT GARNER	[redacted]	6-27-16	1100

	Signature	Printed Name	Date	Time
Relinquished By:		BRETT GARNER	6-27-16	1345
Received By:		TERESA FORRESTER	6-27-16	1345
Relinquished By:				
Received By:				
Relinquished By:				
Received By:				

Additional Comments: N/A

A-6004-114 (REV 4)

INDUSTRIAL HYGIENE CHAIN OF CUSTODY AND LABORATORY REQUEST

Page 1 of 8

Contractor: Washington River Protection Services (WRPS)			Date Sampled: 06/24/2016
COA: CB20	CACN: 202003	Survey No.: 16-9999-A	
Contact Name: Parker Jones		Phone: (509) 942-9494	Date Needed: N/A
Return Report To: Joyce Caldwell		MSIN: R1-06	Phone: (509) 376-0737

Laboratory Log No.	Sample ID/Type/Description	Required Analysis/Method
	16-001-AP-EF-001A ~~Carbotrap 300 TDU Tube~~, SKC 226-09 6/29/16	Acetonitrile
	16-001-AP-EF-002A Anasorb 747 / Tenax TA	Furans A006376
	16-001-AP-EF-003A Carbotrap 150 TDU	SVOC 2045078
	16-001-AP-EF-004A Carbotrap 300 TDU	VOC 2046092
SIGTOI 8821	16-001-AP-EF-005A Anasorb C300, SKC-226-17-1A SIGTC18822 8823	Mercury
	16-001-AP-EF-006A Anasorb 747, SKC-226-29	Ammonia
	16-001-AP-EF-007A SKC-226-37 (Part A)	1,3-Butadiene

Special Instructions: N/A

	Signature	Printed Name	Location	Date	Time
Delivered to Storage:	[signature]	Eric Harries	2704HV/H-104	06/24/2016	15:30
Retrieved from Storage:	[signature]	BRET GARNER	[redacted]	6-27-16	1625

	Signature	Printed Name	Date	Time
Relinquished By:	[signature]	BRET GARNER	6-27-16	1345
Received By:	[signature]	Sharon L Holder	6-27-16	1345
Relinquished By:				
Received By:				
Relinquished By:				
Received By:				

Additional Comments:

A-6004-114 (REV 4)

INDUSTRIAL HYGIENE CHAIN OF CUSTODY AND LABORATORY REQUEST

Page 5 of 8

Contractor: Washington River Protection Services (WRPS)			Date Sampled: 06/24/2016
COA: CB20	CACN: 202003	Survey No.: 16-9999-A	
Contact Name: Parker Jones		Phone: (509) 942-9494	Date Needed: N/A
Return Report To: Joyce Caldwell		MSIN: R1-06	Phone: (509) 376-0737

Laboratory Log No.	Sample ID/Type/Description	Required Analysis/Method
	16-001-AP-IN-001A 6/24/16 Carbotrap 300 TDU ~~Tube~~, SKC 226-09	Acetonitrile
	16-001-AP-IN-002A Anasorb 747 / Tenax TA	Furans 2044250
	16-001-AP-IN-003A Carbotrap 150 TDU	SVOC A022215
	16-001-AP-IN-004A Carbotrap 300 TDU	VOC 2045546
S16T018824	16-001-AP-IN-005A Anasorb C300, SKC-226-17-1A S16T018825 8826	Mercury
	16-001-AP-IN-006A Anasorb 747, SKC-226-29	Ammonia
	16-001-AP-IN-007A SKC-226-37 (Part A)	1,3-Butadiene

Special Instructions: N/A

	Signature	Printed Name	Location	Date	Time
Delivered to Storage:		Eric Harries	2704HV/H-104	06/24/2016	15:30
Retrieved from Storage:		BRETT GARNER		6-27-16	1126

	Signature	Printed Name	Date	Time
Relinquished By:		BRETT GARNER	6-27-16	1345
Received By:		Sharon L Holder	6-27-16	1345
Relinquished By:				
Received By:				
Relinquished By:				
Received By:				

Additional Comments:

A-6004-114 (REV 4)

INDUSTRIAL HYGIENE CHAIN OF CUSTODY AND LABORATORY REQUEST

Page 1 of 4

Contractor: Washington River Protection Services (WRPS)			Date Sampled: 06/24/2016
COA: CB20	CACN: 202003	Survey No.: 16-9999-A	
Contact Name: Parker Jones		Phone: (509) 942-9494	Date Needed: N/A
Return Report To: Joyce Caldwell		MSIN: R1-06	Phone: (509) 376-0737

Laboratory Log No.	Sample ID/Type/Description	Required Analysis/Method
	16-001-AP-EF-001B ~~Carbotrap 300 TDU Tube~~, SKC 226-09 (6/24/14 BD)	Acetonitrile
	16-001-AP-EF-002B Anasorb 747 / Tenax TA	Furans A006423
	16-001-AP-EF-003B Carbotrap 150 TDU	SVOC A022214
	16-001-AP-EF-004B Carbotrap 300 TDU	VOC A017486
SILT018827	16-001-AP-EF-005B Anasorb C300, SKC-226-17-1A SILT018828 8829	Mercury
	16-001-AP-EF-006B Anasorb 747, SKC-226-29	Ammonia
	16-001-AP-EF-007B SKC-226-37 (Part A)	1,3-Butadiene

Special Instructions: NA

	Signature	Printed Name	Location	Date	Time
Delivered to Storage:		Eric Harries	2704HV/H-104	06/24/2016	17:30
Retrieved from Storage:		BRETT GARNER	[redacted]	6-27-16	1037

	Signature	Printed Name	Date	Time
Relinquished By:		BRETT GARNER	6-27-16	1345
Received By:		TERESA FORRESTER	6-27-16	1345
Relinquished By:				
Received By:				
Relinquished By:				
Received By:				

Additional Comments:

A-6004-114 (REV 4)

INDUSTRIAL HYGIENE CHAIN OF CUSTODY AND LABORATORY REQUEST

Page 1 of 4

Contractor: Washington River Protection Services (WRPS)			Date Sampled: 06/24/2016
COA: CB20	CACN: 202003	Survey No.: 16-9999-A	
Contact Name: Parker Jones		Phone: (509) 942-9494	Date Needed: N/A
Return Report To: Joyce Caldwell		MSIN: R1-06	Phone: (509) 376-0737

Laboratory Log No.	Sample ID/Type/Description	Required Analysis/Method
	16-001-AP-EF-001C ~~Carbotrap 300 TDU Tube~~, SKC 226-09	Acetonitrile
	16-001-AP-EF-002C Anasorb 747 / Tenax TA	Furans A006499
	16-001-AP-EF-003C Carbotrap 150 TDU	SVOC A023713
	16-001-AP-EF-004C Carbotrap 300 TDU	VOC A017598
S16T018830	16-001-AP-EF-005C Anasorb C300, SKC-226-17-1A S16T018831 8832	Mercury
	16-001-AP-EF-006C Anasorb 747, SKC-226-29	Ammonia
	16-001-AP-EF-007C SKC-226-37 (Part A)	1,3-Butadiene

Special Instructions: N/A

	Signature	Printed Name	Location	Date	Time
Delivered to Storage:		Ryan Burns	2704HV/H-104	06/24/2016	19:30
Retrieved from Storage:		BRETT GARNER	[redacted]	6-27-16	1028

	Signature	Printed Name	Date	Time
Relinquished By:		BRETT GARNER	6-27-16	1345
Received By:		Leslie Diaz	6/27/16	1345
Relinquished By:				
Received By:				
Relinquished By:				
Received By:				

Additional Comments: N/A

A-6004-114 (REV 4)

INDUSTRIAL HYGIENE CHAIN OF CUSTODY AND LABORATORY REQUEST

Page 1 of 4

Contractor: Washington River Protection Services (WRPS)			Date Sampled: 06/24/2016
COA: CB20	CACN: 202003	Survey No.: 16-9999-A	
Contact Name: Parker Jones		Phone: (509) 942-9494	Date Needed:
Return Report To: Joyce Caldwell		MSIN: R1-06	Phone: (509) 376-0737

Laboratory Log No.	Sample ID/Type/Description	Required Analysis/Method
	16-001-AP-EF-001D ~~Carbotrap 300 TDU Tube~~, SKC 226-09 (6/24/16 BB)	Acetonitrile
	16-001-AP-EF-002D Anasorb 747 / Tenax TA	Furans A006718
	16-001-AP-EF-003D Carbotrap 150 TDU	SVOC A022172
	16-001-AP-EF-004D Carbotrap 300 TDU	VOC 2045394
S16T018833	16-001-AP-EF-005D Anasorb C300, SKC-226-17-1A S16T018834 8835	Mercury
	16-001-AP-EF-006D Anasorb 747, SKC-226-29	Ammonia
	16-001-AP-EF-007D SKC-226-37 (Part A)	1,3-Butadiene

Special Instructions: N/A

	Signature	Printed Name	Location	Date	Time
Delivered to Storage:	Brett Garner for Ryan Burns	Ryan Burns	2704HV/H-104	06/24/2016	21:40
Retrieved from Storage:	Brett Garner	BRETT GARNER	[redacted]	6-27-16	1016

	Signature	Printed Name	Date	Time
Relinquished By:	Brett Garner	BRETT GARNER	6-27-16	1345
Received By:	Leslie Diaz	Leslie DIAZ	6/27/16	1345
Relinquished By:				
Received By:				
Relinquished By:				
Received By:				

Additional Comments:
~~N/A~~ 6/24/16 tech not available to sign

A-6004-114 (REV 4)

INDUSTRIAL HYGIENE CHAIN OF CUSTODY AND LABORATORY REQUEST

Page 1 of 4

Contractor: Washington River Protection Services (WRPS)			Date Sampled: 06/24/2016
COA: CB20	CACN: 202003	Survey No.: 16-9999-A	
Contact Name: Parker Jones		Phone: (509) 942-9494	Date Needed: N/A
Return Report To: Joyce Caldwell		MSIN: R1-06	Phone: (509) 376-0737

Laboratory Log No.	Sample ID/Type/Description	Required Analysis/Method
	16-001-AP-EF-001E ~~Carbotrap 300 TDU Tube~~, SKC 226-09	Acetonitrile
	16-001-AP-EF-002E Anasorb 747 / Tenax TA	Furans 2044774
	16-001-AP-EF-003E Carbotrap 150 TDU	SVOC 2045144
	16-001-AP-EF-004E Carbotrap 300 TDU	VOC 2045924
SILTO18836	16-001-AP-EF-005E Anasorb C300, SKC-226-17-1A SILTO18837 8838	Mercury
	16-001-AP-EF-006E Anasorb 747, SKC-226-29	Ammonia
	16-001-AP-EF-007E SKC-226-37 (Part A)	1,3-Butadiene

Special Instructions: N/A

	Signature	Printed Name	Location	Date	Time
Delivered to Storage:	Brett Garner for Ryan Burns	Ryan Burns	2704HV/H-104	06/24/2016	23:15
Retrieved from Storage:	Brett Garner	BRETT GARNER	[redacted]	6-27-16	1006

	Signature	Printed Name	Date	Time
Relinquished By:	Brett Garner	BRETT GARNER	6-27-16	1345
Received By:	Teresa Forrester	TERESA FORRESTER	6-27-16	1345
Relinquished By:				
Received By:				
Relinquished By:				
Received By:				

Additional Comments:
~~N/A~~ 6-27-16 Tech Not available to sign

A-6004-114 (REV 4)

INDUSTRIAL HYGIENE CHAIN OF CUSTODY AND LABORATORY REQUEST

Page 1 of 4

Contractor: Washington River Protection Services (WRPS)			Date Sampled: 06/25/2016
COA: CB20	CACN: 202003	Survey No.: 16-9999-A	
Contact Name: Parker Jones		Phone: (509) 942-9494	Date Needed: N/A
Return Report To: Joyce Caldwell		MSIN: R1-06	Phone: (509) 376-0737

Laboratory Log No.	Sample ID/Type/Description	Required Analysis/Method
	16-001-AP-EF-001F ~~Carbotrap 300 TDU Tube~~, SKC 226-09	Acetonitrile
	16-001-AP-EF-002F Anasorb 747 / Tenax TA	Furans 2046256
	16-001-AP-EF-003F Carbotrap 150 TDU	SVOC A020783
	16-001-AP-EF-004F Carbotrap 300 TDU	VOC 2044244
S16T018839	16-001-AP-EF-005F Anasorb C300, SKC-226-17-1A	S16T018840 8841 Mercury
	16-001-AP-EF-006F Anasorb 747, SKC-226-29	Ammonia
	16-001-AP-EF-007F SKC-226-37 (Part A)	1,3-Butadiene

Special Instructions: N/A

	Signature	Printed Name	Location	Date	Time
Delivered to Storage:	Brett Garner for Ryan Burns	Ryan Burns	2704HV/H-104	06/25/2016	01:20
Retrieved from Storage:	Brett Garner	BRETT GARNER	[redacted]	6-27-16	0956

	Signature	Printed Name	Date	Time
Relinquished By:	Brett Garner	BRETT GARNER	6-27-16	1345
Received By:	Leslie Diaz	LESLIE DIAZ	6/27/16	1345
Relinquished By:				
Received By:				
Relinquished By:				
Received By:				

Additional Comments: ~~N/A~~ 6-27-16 Tech not available to sign

A-6004-114 (REV 4)

INDUSTRIAL HYGIENE CHAIN OF CUSTODY AND LABORATORY REQUEST

Page 1 of 4

Contractor: Washington River Protection Services (WRPS)			Date Sampled: 06/25/2016
COA: CB20	CACN: 202003	Survey No.: 16-9999-A	
Contact Name: Parker Jones		Phone: (509) 942-9494	Date Needed: N/A
Return Report To: Joyce Caldwell		MSIN: R1-06	Phone: (509) 376-0737

Laboratory Log No.	Sample ID/Type/Description	Required Analysis/Method
	16-001-AP-EF-001G ~~Carbotrap 300 TDU Tube~~, SKC 226-09	Acetonitrile
	16-001-AP-EF-002G Anasorb 747 / Tenax TA	Furans A019149
	16-001-AP-EF-003G Carbotrap 150 TDU	SVOC A023695
	16-001-AP-EF-004G Carbotrap 300 TDU	VOC A015608
S16T018842	16-001-AP-EF-005G Anasorb C300, SKC-226-17-1A S16T018843 8844	Mercury
	16-001-AP-EF-006G Anasorb 747, SKC-226-29	Ammonia
	16-001-AP-EF-007G SKC-226-37 (Part A)	1,3-Butadiene

Special Instructions: N/A

	Signature	Printed Name	Location	Date	Time
Delivered to Storage:	~~BRETT GARNER~~ Ryan Burns	Ryan Burns	2704HV/H-104	06/25/2016	03:40
Retrieved from Storage:	Brett Garner	BRETT GARNER	[redacted]	6-27-16	0941

	Signature	Printed Name	Date	Time
Relinquished By:	Brett Garner	BRETT GARNER	6-27-16	1340
Received By:	Leslie Diaz	LESLIE DIAZ	6/27/16	1345
Relinquished By:				
Received By:				
Relinquished By:				
Received By:				

Additional Comments: ~~N/A~~ 6/27/16 tech not available to sign

A-6004-114 (REV 4)

INDUSTRIAL HYGIENE CHAIN OF CUSTODY AND LABORATORY REQUEST

Page 1 of 128

Contractor: Washington River Protection Services (WRPS)			Date Sampled: 06/25/2016
COA: CB20	CACN: 202003	Survey No.: 16-9999-A	
Contact Name: Parker Jones		Phone: (509) 942-9494	Date Needed: ASAP
Return Report To: Joyce Caldwell		MSIN: R1-06	Phone: (509) 376-0737

Laboratory Log No.	Sample ID/Type/Description	Required Analysis/Method
X	16-001-AP-EF-001H ~~Carbotrap 300 TDU Tube~~, SKC 226-09	Acetonitrile
X	16-001-AP-EF-002H Anasorb 747 / Tenax TA	Furans 2044465
X	16-001-AP-EF-003H Carbotrap 150 TDU	SVOC see special instructions
X	16-001-AP-EF-004H Carbotrap 300 TDU	VOC 2045367
X SILT018845	16-001-AP-EF-005H SILT018846 8847 Anasorb C300, SKC-226-17-1A	Mercury
X	16-001-AP-EF-006H Anasorb 747, SKC-226-29	Ammonia
X	16-001-AP-EF-007H SKC-226-37 (Part A)	1,3-Butadiene

Special Instructions: N/A
Received Broken Tube - 16-001-AP-EF-002H, (SVOC)

	Signature	Printed Name	Location	Date	Time
Delivered to Storage:	~~Brett Garner~~ FOR Ryan Burns	Ryan Burns	2704HV/H-104	06/25/2016	06:30
Retrieved from Storage:	Brett Garner	BRETT GARNER	[redacted]	6-27-16	0906

	Signature	Printed Name	Date	Time
Relinquished By:	Brett Garner	BRETT GARNER	6-27-16	1345
Received By:	Sharon L Holden	Sharon L Holden	6.27.16	1345
Relinquished By:				
Received By:				
Relinquished By:				
Received By:				

Additional Comments: ~~N/A~~ 6.27.16 Tech unavailable to Sign

A-6004-114 (REV 4)

INDUSTRIAL HYGIENE CHAIN OF CUSTODY AND LABORATORY REQUEST

Page 5 of 12 8

Contractor: Washington River Protection Services (WRPS)			Date Sampled: 06/25/2016
COA: CB20	CACN: 202003	Survey No.: 16-9999-A	
Contact Name: Parker Jones		Phone: (509) 942-9494	Date Needed: NA
Return Report To: Joyce Caldwell		MSIN: R1-06	Phone: (509) 376-0737

Laboratory Log No.	Sample ID/Type/Description	Required Analysis/Method
X	16-001-AP-IN-001H ~~Carbotrap 300 TDU Tube~~, SKC 226-09	Acetonitrile
X	16-001-AP-IN-002H Anasorb 747 / Tenax TA	Furans 2045734
X	16-001-AP-IN-003H Carbotrap 150 TDU	SVOC 2045265
X	16-001-AP-IN-004H Carbotrap 300 TDU	VOC A016516
X S16T018874	16-001-AP-IN-005H Anasorb C300, SKC-226-17-1A	S16T018875 8876 Mercury
X	16-001-AP-IN-006H Anasorb 747, SKC-226-29	Ammonia
X	16-001-AP-IN-007H SKC-226-37 (Part A)	1,3-Butadiene

Special Instructions: NA

	Signature	Printed Name	Location	Date	Time
Delivered to Storage:	Butt Burns / BRETT GARNER FOR RYAN BURNS	Ryan Burns	2704HV/H-104	06/25/2016	06:30
Retrieved from Storage:	Butt Burns	BRETT GARNER	[redacted]	6-27-16	0900

	Signature	Printed Name	Date	Time
Relinquished By:	Butt Burns	BRETT GARNER	6-27-16	1345
Received By:	Sharon L Holder	Sharon L Holder	6-27-16	1345
Relinquished By:				
Received By:				
Relinquished By:				
Received By:				

Additional Comments: NA 6-22-16 Tech unavailable to Sign

A-6004-114 (REV 4)

INDUSTRIAL HYGIENE CHAIN OF CUSTODY AND LABORATORY REQUEST

Page 1 of 12

Contractor: Washington River Protection Services (WRPS)			Date Sampled: 06/25/2016
COA: CB20	CACN: 202003	Survey No.: 16-9999-B	
Contact Name: Parker Jones		Phone: (509) 942-9494	Date Needed: N/A
Return Report To: Joyce Caldwell		MSIN: R1-06	Phone: (509) 376-0737

Laboratory Log No.	Sample ID/Type/Description	Required Analysis/Method
	16-002-AP-EF-001BASE ~~Carbotrap 300 TDU Tube~~, SKC 226-09 (06-27-16)	Acetonitrile
	16-002-AP-EF-002BASE Anasorb 747 / Tenax TA	Furans 2047396 ~~2047396~~
	16-002-AP-EF-003BASE Carbotrap 150 TDU	SVOC 2045149 ~~A023648~~
	16-001-AP-EF-004BASE Carbotrap 300 TDU	VOC 2046056 ~~2046197~~
S16T018877	16-002-AP-EF-005BASE Anasorb C300, SKC-226-17-1A, S16T018878 8879	Mercury
19 44	16-002-AP-EF-006BASE Anasorb 747, SKC-226-29	Ammonia
	16-002-AP-EF-007BASE SKC-226-37 (Part A)	1,3-Butadiene

LAD 6/29/16

Special Instructions: N/A

	Signature	Printed Name	Location	Date	Time
Delivered to Storage:		Patrick B Louderback	2704HV/H-104	06/25/2016	12:15
Retrieved from Storage:		BRETT GARNER	[redacted]	6-27-16	0834

	Signature	Printed Name	Date	Time
Relinquished By:		BRETT GARNER	6-27-16	1345
Received By:		Leslie DIAZ	6/27/16	1345
Relinquished By:				
Received By:				
Relinquished By:				
Received By:				

Additional Comments: N/A

A-6004-114 (REV 4)

INDUSTRIAL HYGIENE CHAIN OF CUSTODY AND LABORATORY REQUEST

Page 5 of 12

Contractor: Washington River Protection Services (WRPS)			Date Sampled: 06/25/2016
COA: CB20	CACN: 202003	Survey No.: 16-9999-B	
Contact Name: Parker Jones		Phone: (509) 942-9494	Date Needed: N/A
Return Report To: Joyce Caldwell		MSIN: R1-06	Phone: (509) 376-0737

Laboratory Log No.	Sample ID/Type/Description	Required Analysis/Method
	16-002-AP-IN-001BASE ~~Carbotrap 300 TDU Tube~~, SKC 226-09	Acetonitrile
	16-002-AP-IN-002BASE Anasorb 747 / Tenax TA	Furans 2047405
	16-002-AP-IN-003BASE Carbotrap 150 TDU	SVOC A023648
	16-002-AP-IN-004BASE Carbotrap 300 TDU	VOC 2046158
S16T018904	16-002-AP-IN-005BASE Anasorb C300, SKC-226-17-1A S16T018905 8906	Mercury
1914A	16-002-AP-IN-006BASE Anasorb 747, SKC-226-29	Ammonia
	16-002-AP-IN-007BASE SKC-226-37 (Part A)	1,3-Butadiene

Special Instructions: N/A

	Signature	Printed Name	Location	Date	Time
Delivered to Storage:		Patrick B Louderback	2704HV/H-104	06/25/2016	12:15
Retrieved from Storage:		BRETT GARNER	[redacted]	6-27-16	0844

	Signature	Printed Name	Date	Time
Relinquished By:		BRETT GARNER	6-27-16	1345
Received By:		LESLIE DIAZ	6/27/16	1345
Relinquished By:				
Received By:				
Relinquished By:				
Received By:				

Additional Comments: N A

A-6004-114 (REV 4)

INDUSTRIAL HYGIENE CHAIN OF CUSTODY AND LABORATORY REQUEST

Page 9 of 12

Contractor: Washington River Protection Services (WRPS)			Date Sampled: 06/25/2016
COA: CB20	CACN: 202003	Survey No.: 16-9999-B	
Contact Name: Parker Jones		Phone: (509) 942-9494	Date Needed: N/A
Return Report To: Joyce Caldwell		MSIN: R1-06	Phone: (509) 376-0737

Laboratory Log No.	Sample ID/Type/Description	Required Analysis/Method
	16-002-AP-BK-001BASE BL 6-27-16 ~~Carbotrap 300 TDU Tube~~, SKC 226-09	Acetonitrile
	16-002-AP-BK-002BASE Anasorb 747 / Tenax TA	Furans 2047136
	16-002-AP-BK-003BASE Carbotrap 150 TDU	SVOC 2045084
	16-002-AP-BK-004BASE Carbotrap 300 TDU	VOC 2046191
S16T018907	16-002-AP-BK-005BASE Anasorb C300, SKC-226-17-1A, S16T018908 8909	Mercury
19150	16-002-AP-BK-006BASE Anasorb 747, SKC-226-29	Ammonia
	16-002-AP-BK-007BASE SKC-226-37 (Part A)	1,3-Butadiene

Special Instructions: N/A

	Signature	Printed Name	Location	Date	Time
Delivered to Storage:		Patrick B Louderback	2704HV/H-104	06/25/2016	12:15
Retrieved from Storage:		BRETT GARNER	[redacted]	6-27-16	0852

	Signature	Printed Name	Date	Time
Relinquished By:		BRETT GARNER	6-27-16	1345
Received By:		Leslie Diaz	6/27/16	1345
Relinquished By:				
Received By:				
Relinquished By:				
Received By:				

Additional Comments: N/A

A-6004-114 (REV 4)

INDUSTRIAL HYGIENE CHAIN OF CUSTODY AND LABORATORY REQUEST

Page 1 of 8

Contractor: Washington River Protection Services (WRPS)			Date Sampled: 06/25/2016
COA: CB20	CACN: 202003	Survey No.: 16-9999-B	
Contact Name: Parker Jones		Phone: (509) 942-9494	Date Needed: N/A
Return Report To: Joyce Caldwell		MSIN: R1-06	Phone: (509) 376-0737

Laboratory Log No.	Sample ID/Type/Description	Required Analysis/Method
	16-002-AP-EF-001A ✓ PG 6-27-16 ~~Carbotrap 300 TDU Tube~~, SKC 226-09	Acetonitrile
	16-002-AP-EF-002A ✓ Anasorb 747 / Tenax TA	Furans 2047166
	16-002-AP-EF-003A ✓ Carbotrap 150 TDU	SVOC 4023653
	16-002-AP-EF-004A ✓ Carbotrap 300 TDU	VOC 2046010
S16T018910	16-002-AP-EF-005A ✓ Anasorb C300, SKC-226-17-1A S16T018911 8912	Mercury
19153	16-002-AP-EF-006A ✓ Anasorb 747, SKC-226-29	Ammonia
	16-002-AP-EF-007A ✓ SKC-226-37 (Part A)	1,3-Butadiene

Special Instructions:
N/A

	Signature	Printed Name	Location	Date	Time
Delivered to Storage:		Patrick B Louderback	2704HV/H-104	06/25/2016	14:30
Retrieved from Storage:		BRETT GARNER	[redacted]	6-27-16	0812

	Signature	Printed Name	Date	Time
Relinquished By:		BRETT GARNER	6-27-16	1345
Received By:		Sharon L Holden	6-27-16	1345
Relinquished By:				
Received By:				
Relinquished By:				
Received By:				

Additional Comments:
N/A

A-6004-114 (REV 4)

INDUSTRIAL HYGIENE CHAIN OF CUSTODY AND LABORATORY REQUEST

Page 5 of 8

Contractor: Washington River Protection Services (WRPS)			Date Sampled: 06/25/2016
COA: CB20	CACN: 202003	Survey No.: 16-9999-B	
Contact Name: Parker Jones		Phone: (509) 942-9494	Date Needed: N/A
Return Report To: Joyce Caldwell		MSIN: R1-06	Phone: (509) 376-0737

Laboratory Log No.	Sample ID/Type/Description	Required Analysis/Method
	16-002-AP-IN-001A BG 6-27-16 ~~Carbotrap 300 TDU Tube~~, SKC 226-09	Acetonitrile
	16-002-AP-IN-002A Anasorb 747 / Tenax TA	Furans 2046145
	16-002-AP-IN-003A Carbotrap 150 TDU	SVOC A023722
	16-002-AP-IN-004A Carbotrap 300 TDU	VOC 2046186
S16T018913	16-002-AP-IN-005A Anasorb C300, SKC-226-17-1A S16T018914 8915	Mercury
19156	16-002-AP-IN-006A Anasorb 747, SKC-226-29	Ammonia
	16-002-AP-IN-007A SKC-226-37 (Part A)	1,3-Butadiene

Special Instructions:
N/A

	Signature	Printed Name	Location	Date	Time
Delivered to Storage:		Patrick B Louderback	2704HV/H-104	06/25/2016	14:30
Retrieved from Storage:		BRETT GARNER	[redacted]	6-27-16	0818

	Signature	Printed Name	Date	Time
Relinquished By:		BRETT GARNER	6-27-16	1345
Received By:		SharonLHolden	6-27-16	1345
Relinquished By:				
Received By:				
Relinquished By:				
Received By:				

Additional Comments:
N/A

A-6004-114 (REV 4)

INDUSTRIAL HYGIENE CHAIN OF CUSTODY AND LABORATORY REQUEST

Page 1 of 4

Contractor: Washington River Protection Services (WRPS)			Date Sampled: 06/25/2016
COA: CB20	CACN: 202003	Survey No.: 16-9999-B	
Contact Name: Parker Jones		Phone: (509) 942-9494	Date Needed: N/A
Return Report To: Joyce Caldwell		MSIN: R1-06	Phone: (509) 376-0737

Laboratory Log No.	Sample ID/Type/Description	Required Analysis/Method
	16-002-AP-EF-001B ✓ BG 6-27-16 ~~Carbotrap 300 TDU Tube~~, SKC 226-09	Acetonitrile
	16-002-AP-EF-002B ✓ Anasorb 747 / Tenax TA	Furans 2047550
	16-002-AP-EF-003B ✓ Carbotrap 150 TDU	SVOC A023713
	16-002-AP-EF-004B ✓ Carbotrap 300 TDU	VOC 2046206
S16T018916	16-002-AP-EF-005B ✓ Anasorb C300, SKC-226-17-1A S16T018917 8918	Mercury
19159	16-002-AP-EF-006B ✓ Anasorb 747, SKC-226-29	Ammonia
	16-002-AP-EF-007B ✓ SKC-226-37 (Part A)	1,3-Butadiene

Special Instructions: N/A

	Signature	Printed Name	Location	Date	Time
Delivered to Storage:	[signature]	Eric Harries	2704HV/H-104	06/25/2016	16:15
Retrieved from Storage:	[signature]	BRETT GARNER	[redacted]	6-27-16	0728

	Signature	Printed Name	Date	Time
Relinquished By:	[signature]	BRETT GARNER	6-27-16	1345
Received By:	[signature]	LESLIE DIAZ	6/27/16	1345
Relinquished By:				
Received By:				
Relinquished By:				
Received By:				

Additional Comments:

Sample No.: 16-002-AP-EF-005B, came undone from the sample tubing.

A-6004-114 (REV 4)

INDUSTRIAL HYGIENE CHAIN OF CUSTODY AND LABORATORY REQUEST

Page 1 of 4

Contractor: Washington River Protection Services (WRPS)			Date Sampled: 06/25/2016
COA: CB20	CACN: 202003	Survey No.: 16-9999-B	
Contact Name: Parker Jones		Phone: (509) 942-9494	Date Needed: N/A
Return Report To: Joyce Caldwell		MSIN: R1-06	Phone: (509) 376-0737

Laboratory Log No.	Sample ID/Type/Description	Required Analysis/Method
	16-002-AP-EF-001C ~~Carbotrap 300 TDU Tube~~, SKC 226-09 (BK 6-27-16)	Acetonitrile
	16-002-AP-EF-002C Anasorb 747 / Tenax TA	Furans 2046649
	16-002-AP-EF-003C Carbotrap 150 TDU	SVOC A023704
	16-002-AP-EF-004C Carbotrap 300 TDU	VOC 2044087
S16T018919	16-002-AP-EF-005C Anasorb C300, SKC-226-17-1A (S16T018920 8921)	Mercury
19167	16-002-AP-EF-006C Anasorb 747, SKC-226-29	Ammonia
	16-002-AP-EF-007C SKC-226-37 (Part A)	1,3-Butadiene

Special Instructions:
N/A

	Signature	Printed Name	Location	Date	Time
Delivered to Storage:		Patrick Louderback	2704HV/H-104	06/25/2016	18:25
Retrieved from Storage:		BRETT GARNER	[redacted]	6-27-16	0776

	Signature	Printed Name	Date	Time
Relinquished By:		BRETT GARNER	6-27-16	1345
Received By:		TERESA FORRESTER	6-27-16	1345
Relinquished By:				
Received By:				
Relinquished By:				
Received By:				

Additional Comments:
N/A

A-6004-114 (REV 4)

INDUSTRIAL HYGIENE CHAIN OF CUSTODY AND LABORATORY REQUEST

Page 1 of 4

Contractor: Washington River Protection Services (WRPS)			Date Sampled: 06/25/2016
COA: CB20	CACN: 202003	Survey No.: 16-9999-B	
Contact Name: Parker Jones		Phone: (509) 942-9494	Date Needed: ~~06/24/2016~~ N/A 6-27-16
Return Report To: Joyce Caldwell		MSIN: R1-06	Phone: (509) 376-0737

Laboratory Log No.	Sample ID/Type/Description	Required Analysis/Method
	16-002-AP-EF-001D ✓ ~~Carbotrap 300 TDU Tube~~, SKC 226-09 (BG 6-27-16)	Acetonitrile
	16-002-AP-EF-002D ✓ Anasorb 747 / Tenax TA	Furans 2046208
	16-002-AP-EF-003D ✓ Carbotrap 150 TDU	SVOC A023721
	16-002-AP-EF-004D ✓ Carbotrap 300 TDU	VOC 2044374
S16T018922	16-002-AP-EF-005D ✓ Anasorb C300, SKC-226-17-1A S16T018923 8924	Mercury
19165	16-002-AP-EF-006D ✓ Anasorb 747, SKC-226-29	Ammonia
	16-002-AP-EF-007D ✓ SKC-226-37 (Part A)	1,3-Butadiene

Special Instructions: NA

	Signature	Printed Name	Location	Date	Time
Delivered to Storage:		RYAN BURNS	2704HV/H-104	06/25/2016	2035
Retrieved from Storage:	Brett Garner	BRETT GARNER	[redacted]	6-27-16	0744

	Signature	Printed Name	Date	Time
Relinquished By:	Brett Garner	BRETT GARNER	6-27-16	1345
Received By:	Leslie Diaz	Leslie Diaz	6/27/16	1345
Relinquished By:				
Received By:				
Relinquished By:				
Received By:				

Additional Comments:

A-6004-114 (REV 4)

INDUSTRIAL HYGIENE CHAIN OF CUSTODY AND LABORATORY REQUEST

Page 1 of 4

Contractor: Washington River Protection Services (WRPS)			Date Sampled: 06/25/2016
COA: CB20	CACN: 202003	Survey No.: 16-9999-B	
Contact Name: Parker Jones		Phone: (509) 942-9494	Date Needed: N/A
Return Report To: Joyce Caldwell		MSIN: R1-06	Phone: (509) 376-0737

Laboratory Log No.	Sample ID/Type/Description	Required Analysis/Method
	16-002-AP-EF-001E ~~Carbotrap 300 TDU~~ Tube, SKC 226-09	Acetonitrile
	16-002-AP-EF-002E Anasorb 747 / Tenax TA	Furans Z046291
	16-002-AP-EF-003E Carbotrap 150 TDU	SVOC A0Z3711
	16-002-AP-EF-004E Carbotrap 300 TDU	VOC Z044230
S16T018926	16-002-AP-EF-005E Anasorb C300, SKC-226-17-1A	Mercury S16T018927 8930
19168	16-002-AP-EF-006E Anasorb 747, SKC-226-29	Ammonia
	16-002-AP-EF-007E SKC-226-37 (Part A)	1,3-Butadiene

Special Instructions: N/A

	Signature	Printed Name	Location	Date	Time
Delivered to Storage:		JASON RENO	2704HV/H-104	06/25/2016	2237
Retrieved from Storage:		BRETT GARNER	[redacted]	6-27-16	0753

	Signature	Printed Name	Date	Time
Relinquished By:		BRETT GARNER	6-27-16	1745
Received By:		LESLIE DIAZ	6/27/16	1345
Relinquished By:				
Received By:				
Relinquished By:				
Received By:				

Additional Comments:

A-6004-114 (REV 4)

INDUSTRIAL HYGIENE CHAIN OF CUSTODY AND LABORATORY REQUEST

Page 1 of 4

RB 6-25-16

Contractor: Washington River Protection Services (WRPS) B			Date Sampled: 06/25/2016
COA: CB20	CACN: 202003	Survey No.: 16-9999-~~BA~~ ~~RB 6-25-16~~	
Contact Name: Parker Jones		Phone: (509) 942-9494	Date Needed: NA
Return Report To: Joyce Caldwell		MSIN: R1-06	Phone: (509) 376-0737

Laboratory Log No.	Sample ID/Type/Description	Required Analysis/Method
E	16-002-AP-EF-001F SKC 226-09	Acetonitrile
C	16-002-AP-EF-002F Anasorb 747 / Tenax TA	Furans 2046197
A	16-002-AP-EF-003F Carbotrap 150 TDU	SVOC A023646
B	16-002-AP-EF-004F Carbotrap 300 TDU	VOC 2044090
F	16-002-AP-EF-005F S16T018935 S16T018965 8967 Anasorb C300, SKC-226-17-1A	Mercury
G	16-002-AP-EF-006F Anasorb 747, SKC-226-29 S16C19171	Ammonia
I	16-002-AP-EF-007F SKC-226-37 (Part A)	1,3-Butadiene

Special Instructions: NA

	Signature	Printed Name	Location	Date	Time
Delivered to Storage:		RYAN BURNS	2704HV/H-104	6/26/16	0050
Retrieved from Storage:		BRETT GARNER	[redacted]	6-27-16	0801

	Signature	Printed Name	Date	Time
Relinquished By:		BRETT GARNER	6-27-16	1345
Received By:		TERESA FORRESTER	6-27-16	1345
Relinquished By:				
Received By:				
Relinquished By:				
Received By:				

Additional Comments:

A-6004-114 (REV 4)

INDUSTRIAL HYGIENE CHAIN OF CUSTODY AND LABORATORY REQUEST

Page 1 of 4

Contractor: Washington River Protection Services (WRPS)			Date Sampled: ~~06/25/2016~~ 6/26/16
COA: CB20	CACN: 202003	Survey No.: 16-9999-B	
Contact Name: Parker Jones		Phone: (509) 942-9494	Date Needed: NA
Return Report To: Joyce Caldwell		MSIN: R1-06	Phone: (509) 376-0737

Laboratory Log No.	Sample ID/Type/Description	Required Analysis/Method
E	16-002-AP-EF-001G 6/25/16 ~~Carbotrap 300 TDU Tube~~, SKC 226-09	Acetonitrile
C	16-002-AP-EF-002G Anasorb 747 / Tenax TA	Furans Z047Z78
A	16-002-AP-EF-003G Carbotrap 150 TDU	SVOC A023707
B	16-002-AP-EF-004G Carbotrap 300 TDU	VOC Z044357
F	16-002-AP-EF-005G S16T018969 S16T018970 8971 Anasorb C300, SKC-226-17-1A	Mercury
G	16-002-AP-EF-006G Anasorb 747, SKC-226-29 S16T019174	Ammonia
I	16-002-AP-EF-007G SKC-226-37 (Part A)	1,3-Butadiene

Special Instructions:

NA

	Signature	Printed Name	Location	Date	Time
Delivered to Storage:	[signature]	JASON KENG	2704HV/H-104	6/26/15	0715
Retrieved from Storage:	[signature]	BRETT GARNER	[redacted]	6-27-16	0634

	Signature	Printed Name	Date	Time
Relinquished By:	[signature]	BRETT GARNER	6-27-16	1345
Received By:	[signature]	Leslie Diaz	6/27/16	13.45
Relinquished By:				
Received By:				
Relinquished By:				
Received By:				

Additional Comments:

A-6004-114 (REV 4)

6/27/16

INDUSTRIAL HYGIENE CHAIN OF CUSTODY AND LABORATORY REQUEST

Page 1 of 12/8

Contractor: Washington River Protection Services (WRPS)			Date Sampled: 6/26/16
COA: CB20	CACN: 202003	Survey No.: 16-9999-B	
Contact Name: Parker Jones		Phone: (509) 942-9494	Date Needed: 7/4
Return Report To: Joyce Caldwell		MSIN: R1-06	Phone: (509) 376-0737

Laboratory Log No.	Sample ID/Type/Description	Required Analysis/Method
	16-002-AP-EF-001H ✓ RB 6-25-16 ~~Carbotrap 300 TDU~~ Tube, SKC 226-09	Acetonitrile
	16-002-AP-EF-002H ✓ Anasorb 747 / Tenax TA	Furans 2046740
	16-002-AP-EF-003H ✓ Carbotrap 150 TDU	SVOC A023645
	16-002-AP-EF-004H ✓ Carbotrap 300 TDU	VOC 2044255
S16T018972	16-002-AP-EF-005H ✓ Anasorb C300, SKC-226-17-1A S16T018974 8975	Mercury
19177	16-002-AP-EF-006H ✓ Anasorb 747, SKC-226-29	Ammonia
	16-002-AP-EF-007H ✓ SKC-226-37 (Part A)	1,3-Butadiene

Special Instructions:

	Signature	Printed Name	Location	Date	Time
Delivered to Storage:		JASON REVO	2704HV/H-104	6/26/16	0535
Retrieved from Storage:		BRETT GARNER	[redacted]	6-27-16	0652

	Signature	Printed Name	Date	Time
Relinquished By:		BRETT GARNER	6-27-16	1345
Received By:		TERESA FORRESTER	6-27-16	1345
Relinquished By:				
Received By:				
Relinquished By:				
Received By:				

Additional Comments:

A-6004-114 (REV 4)

INDUSTRIAL HYGIENE CHAIN OF CUSTODY AND LABORATORY REQUEST

Page 5 of 12/8 — Jr 6/27/16

Contractor: Washington River Protection Services (WRPS)			Date Sampled: 6/22/16
COA: CB20	CACN: 202003	Survey No.: 16-9999-B	
Contact Name: Parker Jones		Phone: (509) 942-9494	Date Needed: N/A
Return Report To: Joyce Caldwell		MSIN: R1-06	Phone: (509) 376-0737

Laboratory Log No.	Sample ID/Type/Description	Required Analysis/Method
	16-002-AP-IN-001H ✓ KS 6-25-16 ~~Carbotrap 300 TDU~~ Tube, SKC 226-09	Acetonitrile
	16-002-AP-IN-002H ✓ Anasorb 747 / Tenax TA	Furans A006713
	16-002-AP-IN-003H ✓ Carbotrap 150 TDU	SVOC A023657
	16-002-AP-IN-004H ✓ Carbotrap 300 TDU	VOC 2044121
SILT018978	16-002-AP-IN-005H ✓ Anasorb C300, SKC-226-17-1A S16T018979 8980	Mercury
19181	16-002-AP-IN-006H ✓ Anasorb 747, SKC-226-29	Ammonia
	16-002-AP-IN-007H ✓ SKC-226-37 (Part A)	1,3-Butadiene

Special Instructions:

	Signature	Printed Name	Location	Date	Time
Delivered to Storage:	[signature]	JASON PENIO	2704HV/H-104	6/26/16	0535
Retrieved from Storage:	[signature]	BRETT GARNER	[redacted]	6-27-16	0701

	Signature	Printed Name	Date	Time
Relinquished By:	[signature]	BRETT GARNER	6-27-16	1345
Received By:	[signature]	TERESA FORRESTER	6-27-16	1345
Relinquished By:				
Received By:				
Relinquished By:				
Received By:				

Additional Comments:

A-6004-114 (REV 4)

C.3.7 Ammonia

FINAL REPORT ON AMMONIA VAPOR TUBES FOR CARTRIDGE EVALUATION COLLECTED JUNE 24 – 26, 2016

Document No.: 20161907 Rev. 0

Michael A. Purcell
WAI Hanford Laboratory

Date Published
July 22, 2016

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Prepared for:

washington river protection solutions

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Prepared by:

WAI HANFORD LABORATORY

WAI Hanford Laboratory
1955 Jadwin Ave, Suite 330
Richland, WA 99354
509-373-3240

July 22, 2016
Michael A. Purcell, WHL Project Coordinator

NARRATIVE

FINAL REPORT ON AMMONIA VAPOR TUBES FOR CARTRIDGE EVALUATION COLLECTED JUNE 24 - 26, 2016

This final report presents the results of twenty-six ammonia vapor tubes received at the 222-S Laboratory on June 27, 2016, in good condition and with adequate paperwork. The samples were logged into sample delivery group 20161907.

DISCLAIMERS

- The information contained in this report is intended only for the use of the addressee and should be considered confidential.
- This report shall not be reproduced, except in full, without written approval of the laboratory.
- The results shown in this report pertain only to the actual samples tested.
- These results conform to the requirements specified in the referenced methods/procedures and specifications provided verbally or electronically by the customer. Any deviations or modifications are discussed in the following narrative.
- This report only addresses laboratory activities related to the listed surveys. Requirements or anomalies concerning field sampling are not addressed in this report.

PROCEDURES

Method	Preparation Procedure	Analysis Procedure
Ammonia by OSHA ID-188	LA-533-117, Rev. 3-1	LA-503-157, Rev. 2-5

ANALYTICAL SUMMARY

The vapor tubes were tested for ammonia, as specified on the chain of custody. Standard laboratory procedures for ion chromatography were followed as well as the requirements in WHL-MP-1029, *WHL Industrial Hygiene Quality Assurance Project Plan for 222-S Laboratory* (QAPP). Program specific work authorization instructions have been provided for WRPS IH sample analysis through verbal and electronic communication with the customer point of contact, and are kept as a record by the laboratory. When applicable, any client communication specific to the samples in this report will be included herein. All quality control criteria in the QAPP were met.

The measurement uncertainty was estimated based on the historical behavior of laboratory control samples (LCS). The results of 373 LCS determinations indicate a mean recovery of 100% with a standard deviation of 4%. Statistical process control limits for the LCS are 88 - 107%, with no significant bias. The overall estimate of uncertainty is 8%, with coverage factor (k) = 2.

Due to background levels of ammonium (or interfering compounds) that are typically present in the media used in the sorbent tubes for collecting the vapor samples, positive results are obtained for the preparation blank. Laboratories typically correct the LCS and all field samples for these background levels, when detected. However, per agreement with the customer, no blank subtraction was performed. The client-requested reporting limit is 10 µg per sample, which makes the analysis of additional blanks and subsequent blank subtraction unnecessary. It is the

laboratory's opinion that including the media contribution, which is well below the client's requested reporting limit, provides results that are more conservative than when blank subtractions are performed. Group 20161907 samples with results that exceeded the reporting limit were: 16-001-AP-IN-006A, 16-001-AP-EF-006C, 16-001-AP-EF-006D, 16-001-AP-EF-006E, 16-001-AP-EF-006F, 16-001-AP-EF-006G, 16-001-AP-EF-006H, 16-001-AP-IN-006H, 16-002-AP-EF-006A, 16-002-AP-EF-006D, 16-002-AP-EF-006E, 16-002-AP-EF-006F, 16-002-AP-EF-006G, 16-002-AP-EF-006H, and 16-002-AP-IN-006H. For these samples, the total result includes the contribution from the glass wool portion even though the glass wool portion result is lower than the reporting limit (see Attachment 1). All other sample results were below the reporting limit.

Attachment 1

DATA SUMMARY REPORT

DATA SUMMARY REPORT FOR SAMPLE GROUP 20161907

Customer Sample ID	Vapor Tube Portion	Laboratory Sample ID	Analyte	Result Unit	Standard % Recovery	Blank	Result	Reporting Limit
16-001-AP-EF-006BASE	Total	S16T018973	Ammonia	µg/sample	n/a	<10.0	<10.0	10.0
16-001-AP-EF-006BASE	Front Resin	S16T018976	Ammonia	µg/sample	97.4	<10.0	<10.0	10.0
16-001-AP-EF-006BASE	Back Resin	S16T018977	Ammonia	µg/sample	97.4	<10.0	<10.0	10.0
16-001-AP-IN-006BASE	Total	S16T018981	Ammonia	µg/sample	n/a	<10.0	<10.0	10.0
16-001-AP-IN-006BASE	Front Resin	S16T018982	Ammonia	µg/sample	97.4	<10.0	<10.0	10.0
16-001-AP-IN-006BASE	Back Resin	S16T018983	Ammonia	µg/sample	97.4	<10.0	<10.0	10.0
16-001-AP-BK-006BASE	Total	S16T018984	Ammonia	µg/sample	n/a	<10.0	<10.0	10.0
16-001-AP-BK-006BASE	Front Resin	S16T018985	Ammonia	µg/sample	97.4	<10.0	<10.0	10.0
16-001-AP-BK-006BASE	Back Resin	S16T018986	Ammonia	µg/sample	97.4	<10.0	<10.0	10.0
16-001-AP-EF-006A	Total	S16T018987	Ammonia	µg/sample	n/a	<10.0	<10.0	10.0
16-001-AP-EF-006A	Front Resin	S16T018988	Ammonia	µg/sample	97.4	<10.0	<10.0	10.0
16-001-AP-EF-006A	Back Resin	S16T018989	Ammonia	µg/sample	97.4	<10.0	<10.0	10.0
16-001-AP-IN-006A	Total	S16T018990	Ammonia	µg/sample	n/a	<10.0	1.01E+03	200
16-001-AP-IN-006A	Front Resin	S16T018991	Ammonia	µg/sample	97.4	<10.0	1.01E+03	200
16-001-AP-IN-006A	Back Resin	S16T018992	Ammonia	µg/sample	97.4	<10.0	<10.0	10.0
16-001-AP-EF-006B	Total	S16T018993	Ammonia	µg/sample	n/a	<10.0	<10.0	10.0
16-001-AP-EF-006B	Front Resin	S16T018994	Ammonia	µg/sample	97.4	<10.0	<10.0	10.0
16-001-AP-EF-006B	Back Resin	S16T018995	Ammonia	µg/sample	97.4	<10.0	<10.0	10.0
16-001-AP-EF-006C	Total	S16T018996	Ammonia	µg/sample	n/a	<10.0	108	20.0
16-001-AP-EF-006C	Front Resin	S16T018997	Ammonia	µg/sample	97.4	<10.0	107	20.0
16-001-AP-EF-006C	Back Resin	S16T018998	Ammonia	µg/sample	97.4	<10.0	<10.0	10.0
16-001-AP-EF-006D	Total	S16T018999	Ammonia	µg/sample	n/a	<10.0	173	90.0
16-001-AP-EF-006D	Front Resin	S16T019000	Ammonia	µg/sample	97.4	<10.0	172	90.0
16-001-AP-EF-006D	Back Resin	S16T019001	Ammonia	µg/sample	97.4	<10.0	<10.0	10.0
16-001-AP-EF-006E	Total	S16T019002	Ammonia	µg/sample	n/a	<10.0	57.1	50.0
16-001-AP-EF-006E	Front Resin	S16T019003	Ammonia	µg/sample	97.4	<10.0	56.4	50.0
16-001-AP-EF-006E	Back Resin	S16T019004	Ammonia	µg/sample	97.4	<10.0	<10.0	10.0
16-001-AP-EF-006F	Total	S16T019005	Ammonia	µg/sample	n/a	<10.0	622	100
16-001-AP-EF-006F	Front Resin	S16T019006	Ammonia	µg/sample	101	<10.0	621	100
16-001-AP-EF-006F	Back Resin	S16T019007	Ammonia	µg/sample	101	<10.0	<10.0	10.0
16-001-AP-EF-006G	Total	S16T019008	Ammonia	µg/sample	n/a	<10.0	728	100
16-001-AP-EF-006G	Front Resin	S16T019009	Ammonia	µg/sample	101	<10.0	727	100
16-001-AP-EF-006G	Back Resin	S16T019010	Ammonia	µg/sample	101	<10.0	<10.0	10.0
16-001-AP-EF-006H	Total	S16T019011	Ammonia	µg/sample	n/a	<10.0	878	200
16-001-AP-EF-006H	Front Resin	S16T019012	Ammonia	µg/sample	101	<10.0	878	200
16-001-AP-EF-006H	Back Resin	S16T019013	Ammonia	µg/sample	101	<10.0	<10.0	10.0
16-001-AP-IN-006H	Total	S16T019021	Ammonia	µg/sample	n/a	<10.0	1.15E+03	200
16-001-AP-IN-006H	Front Resin	S16T019067	Ammonia	µg/sample	101	<10.0	1.14E+03	200
16-001-AP-IN-006H	Back Resin	S16T019068	Ammonia	µg/sample	101	<10.0	<10.0	10.0
16-002-AP-EF-006BASE	Total	S16T019144	Ammonia	µg/sample	n/a	<10.0	<10.0	10.0
16-002-AP-EF-006BASE	Front Resin	S16T019145	Ammonia	µg/sample	101	<10.0	<10.0	10.0
16-002-AP-EF-006BASE	Back Resin	S16T019146	Ammonia	µg/sample	101	<10.0	<10.0	10.0
16-002-AP-IN-006BASE	Total	S16T019147	Ammonia	µg/sample	n/a	<10.0	<10.0	10.0
16-002-AP-IN-006BASE	Front Resin	S16T019148	Ammonia	µg/sample	101	<10.0	<10.0	10.0
16-002-AP-IN-006BASE	Back Resin	S16T019149	Ammonia	µg/sample	101	<10.0	<10.0	10.0
16-002-AP-BK-006BASE	Total	S16T019150	Ammonia	µg/sample	n/a	<10.0	<10.0	10.0
16-002-AP-BK-006BASE	Front Resin	S16T019151	Ammonia	µg/sample	101	<10.0	<10.0	10.0
16-002-AP-BK-006BASE	Back Resin	S16T019152	Ammonia	µg/sample	101	<10.0	<10.0	10.0

DATA SUMMARY REPORT FOR SAMPLE GROUP 20161907

Customer Sample ID	Vapor Tube Portion	Laboratory Sample ID	Analyte	Result Unit	Standard % Recovery	Blank	Result	Reporting Limit
16-002-AP-EF-006A	Total	S16T019153	Ammonia	µg/sample	n/a	<10.0	972	200
16-002-AP-EF-006A	Front Resin	S16T019154	Ammonia	µg/sample	101	<10.0	972	200
16-002-AP-EF-006A	Back Resin	S16T019155	Ammonia	µg/sample	101	<10.0	<10.0	10.0
16-002-AP-IN-006A	Total	S16T019156	Ammonia	µg/sample	n/a	<10.0	<10.0	10.0
16-002-AP-IN-006A	Front Resin	S16T019157	Ammonia	µg/sample	101	<10.0	<10.0	10.0
16-002-AP-IN-006A	Back Resin	S16T019158	Ammonia	µg/sample	101	<10.0	<10.0	10.0
16-002-AP-EF-006B	Total	S16T019159	Ammonia	µg/sample	n/a	<10.0	<10.0	10.0
16-002-AP-EF-006B	Front Resin	S16T019160	Ammonia	µg/sample	101	<10.0	<10.0	10.0
16-002-AP-EF-006B	Back Resin	S16T019161	Ammonia	µg/sample	101	<10.0	<10.0	10.0
16-002-AP-EF-006C	Total	S16T019162	Ammonia	µg/sample	n/a	<10.0	<10.0	10.0
16-002-AP-EF-006C	Front Resin	S16T019163	Ammonia	µg/sample	104	<10.0	<10.0	10.0
16-002-AP-EF-006C	Back Resin	S16T019164	Ammonia	µg/sample	104	<10.0	<10.0	10.0
16-002-AP-EF-006D	Total	S16T019165	Ammonia	µg/sample	n/a	<10.0	26.3	10.0
16-002-AP-EF-006D	Front Resin	S16T019166	Ammonia	µg/sample	104	<10.0	25.2	10.0
16-002-AP-EF-006D	Back Resin	S16T019167	Ammonia	µg/sample	104	<10.0	<10.0	10.0
16-002-AP-EF-006E	Total	S16T019168	Ammonia	µg/sample	n/a	<10.0	84.7	10.0
16-002-AP-EF-006E	Front Resin	S16T019169	Ammonia	µg/sample	104	<10.0	84.1	10.0
16-002-AP-EF-006E	Back Resin	S16T019170	Ammonia	µg/sample	104	<10.0	<10.0	10.0
16-002-AP-EF-006F	Total	S16T019171	Ammonia	µg/sample	n/a	<10.0	158	20.0
16-002-AP-EF-006F	Front Resin	S16T019172	Ammonia	µg/sample	104	<10.0	157	20.0
16-002-AP-EF-006F	Back Resin	S16T019173	Ammonia	µg/sample	104	<10.0	<10.0	10.0
16-002-AP-EF-006G	Total	S16T019174	Ammonia	µg/sample	n/a	<10.0	261	50.0
16-002-AP-EF-006G	Front Resin	S16T019175	Ammonia	µg/sample	104	<10.0	260	50.0
16-002-AP-EF-006G	Back Resin	S16T019176	Ammonia	µg/sample	104	<10.0	<10.0	10.0
16-002-AP-EF-006H	Total	S16T019177	Ammonia	µg/sample	n/a	<10.0	392	50.0
16-002-AP-EF-006H	Front Resin	S16T019178	Ammonia	µg/sample	104	<10.0	391	50.0
16-002-AP-EF-006H	Back Resin	S16T019179	Ammonia	µg/sample	104	<10.0	<10.0	10.0
16-002-AP-IN-006H	Total	S16T019180	Ammonia	µg/sample	n/a	<10.0	998	200
16-002-AP-IN-006H	Front Resin	S16T019181	Ammonia	µg/sample	104	<10.0	997	200
16-002-AP-IN-006H	Back Resin	S16T019182	Ammonia	µg/sample	104	<10.0	<10.0	10.0

Attachment 2

ANALYSIS DATE REPORT

ANALYSIS DATE REPORT FOR SAMPLE GROUP 20161907

Laboratory Sample ID	Customer Sample ID	Method	Preparation Date	Analysis Date
S16T018976	16-001-AP-EF-006BASE	Ammonia	06/30/2016 08:20	07/01/2016 00:55
S16T018977	16-001-AP-EF-006BASE	Ammonia	06/30/2016 08:20	07/01/2016 01:12
S16T018982	16-001-AP-IN-006BASE	Ammonia	06/30/2016 08:20	07/01/2016 01:29
S16T018983	16-001-AP-IN-006BASE	Ammonia	06/30/2016 08:20	07/01/2016 01:45
S16T018985	16-001-AP-BK-006BASE	Ammonia	06/30/2016 08:20	07/01/2016 02:02
S16T018986	16-001-AP-BK-006BASE	Ammonia	06/30/2016 08:20	07/01/2016 02:19
S16T018988	16-001-AP-EF-006A	Ammonia	06/30/2016 08:20	07/01/2016 03:27
S16T018989	16-001-AP-EF-006A	Ammonia	06/30/2016 08:20	07/01/2016 03:44
S16T018991	16-001-AP-IN-006A	Ammonia	06/30/2016 08:20	07/06/2016 11:44
S16T018992	16-001-AP-IN-006A	Ammonia	06/30/2016 08:20	07/01/2016 04:17
S16T018994	16-001-AP-EF-006B	Ammonia	06/30/2016 08:20	07/01/2016 04:34
S16T018995	16-001-AP-EF-006B	Ammonia	06/30/2016 08:20	07/01/2016 04:51
S16T018997	16-001-AP-EF-006C	Ammonia	06/30/2016 08:20	07/06/2016 12:07
S16T018998	16-001-AP-EF-006C	Ammonia	06/30/2016 08:20	07/01/2016 05:25
S16T019000	16-001-AP-EF-006D	Ammonia	06/30/2016 08:20	07/06/2016 12:30
S16T019001	16-001-AP-EF-006D	Ammonia	06/30/2016 08:20	07/01/2016 05:58
S16T019003	16-001-AP-EF-006E	Ammonia	06/30/2016 08:20	07/06/2016 12:53
S16T019004	16-001-AP-EF-006E	Ammonia	06/30/2016 08:20	07/01/2016 07:23
S16T019006	16-001-AP-EF-006F	Ammonia	07/07/2016 08:55	07/08/2016 14:41
S16T019007	16-001-AP-EF-006F	Ammonia	07/07/2016 08:55	07/07/2016 18:34
S16T019009	16-001-AP-EF-006G	Ammonia	07/07/2016 08:55	07/08/2016 15:24
S16T019010	16-001-AP-EF-006G	Ammonia	07/07/2016 08:55	07/07/2016 20:00
S16T019012	16-001-AP-EF-006H	Ammonia	07/07/2016 08:55	07/08/2016 16:07
S16T019013	16-001-AP-EF-006H	Ammonia	07/07/2016 08:55	07/07/2016 21:26
S16T019067	16-001-AP-IN-006H	Ammonia	07/07/2016 08:55	07/08/2016 16:50
S16T019068	16-001-AP-IN-006H	Ammonia	07/07/2016 08:55	07/08/2016 01:02
S16T019145	16-002-AP-EF-006BASE	Ammonia	07/07/2016 08:55	07/08/2016 01:45
S16T019146	16-002-AP-EF-006BASE	Ammonia	07/07/2016 08:55	07/08/2016 02:28
S16T019148	16-002-AP-IN-006BASE	Ammonia	07/07/2016 08:55	07/08/2016 03:11
S16T019149	16-002-AP-IN-006BASE	Ammonia	07/07/2016 08:55	07/08/2016 03:54
S16T019151	16-002-AP-BK-006BASE	Ammonia	07/07/2016 08:55	07/08/2016 04:37
S16T019152	16-002-AP-BK-006BASE	Ammonia	07/07/2016 08:55	07/08/2016 05:20
S16T019154	16-002-AP-EF-006A	Ammonia	07/07/2016 08:55	07/08/2016 17:33
S16T019155	16-002-AP-EF-006A	Ammonia	07/07/2016 08:55	07/08/2016 06:47
S16T019157	16-002-AP-IN-006A	Ammonia	07/07/2016 08:55	07/08/2016 09:39
S16T019158	16-002-AP-IN-006A	Ammonia	07/07/2016 08:55	07/08/2016 10:22
S16T019160	16-002-AP-EF-006B	Ammonia	07/07/2016 08:55	07/08/2016 11:05
S16T019161	16-002-AP-EF-006B	Ammonia	07/07/2016 08:55	07/08/2016 11:48
S16T019163	16-002-AP-EF-006C	Ammonia	07/07/2016 08:55	07/08/2016 15:50
S16T019164	16-002-AP-EF-006C	Ammonia	07/07/2016 08:55	07/08/2016 16:13
S16T019166	16-002-AP-EF-006D	Ammonia	07/07/2016 08:55	07/08/2016 16:36
S16T019167	16-002-AP-EF-006D	Ammonia	07/07/2016 08:55	07/08/2016 17:00
S16T019169	16-002-AP-EF-006E	Ammonia	07/07/2016 08:55	07/08/2016 17:23
S16T019170	16-002-AP-EF-006E	Ammonia	07/07/2016 08:55	07/08/2016 17:46
S16T019172	16-002-AP-EF-006F	Ammonia	07/07/2016 08:55	07/13/2016 11:05
S16T019173	16-002-AP-EF-006F	Ammonia	07/07/2016 08:55	07/08/2016 19:42

ANALYSIS DATE REPORT FOR SAMPLE GROUP 20161907

Laboratory Sample ID	Customer Sample ID	Method	Preparation Date	Analysis Date
S16T019175	16-002-AP-EF-006G	Ammonia	07/07/2016 08:55	07/13/2016 11:28
S16T019176	16-002-AP-EF-006G	Ammonia	07/07/2016 08:55	07/08/2016 20:05
S16T019178	16-002-AP-EF-006H	Ammonia	07/07/2016 08:55	07/13/2016 11:52
S16T019179	16-002-AP-EF-006H	Ammonia	07/07/2016 08:55	07/08/2016 21:14
S16T019181	16-002-AP-IN-006H	Ammonia	07/07/2016 08:55	07/13/2016 12:15
S16T019182	16-002-AP-IN-006H	Ammonia	07/07/2016 08:55	07/08/2016 22:00

Attachment 3

RECEIPT PAPERWORK

222-S	SAMPLE RECEIPT AND CHAIN OF CUSTODY VERIFICATION CHECKLIST	ATS-LO-090-101 Rev DG-1

Date Samples Received: 6-27-16 Total Number of Samples: 310 Group #: 20161907 NH3

Sample Custodian: Sharon L Holder IH Technician: [signature]

Sample Custodian to Complete:

Action	Yes	No	N/A	Comments
RSR provided?			✓	
Verify GKI is complete			✓	☐ In Project File
Received from an alpha facility?		✓		☐ Contact PC for approval to release
Check that outer custody seal is intact, if present			✓	
Record cooler temperature in centigrade, as appropriate	✓ 8.0			☐ Check if no cooler and/or no ice
Samples are intact and in good condition		✓		If No, provide comments below: Broken SVOA Tube
RSA/COC provided and complete containing the following information?				
• Client name and client sample number	✓			
• Date and time of sampling	✓			
• Sampling location or origin	✓			
• Container type, size, and number	✓			
• Preservatives (if used) noted on the COC/RSA and sample bottles			✓	
• Analysis request is clear	✓			
• Signature of persons relinquishing and receiving samples	✓			
• Date and/or time of sample custody exchange	✓			
Verify that sample numbers on containers match the COC and/or RSA	✓			
Samples stored properly (e.g., refrigeration)	✓			

Notify the PC immediately if any problems are noted. Any "No" checked boxes require PC resolution. For WRPS samples, the initials block below is completed by the responsible WRPS PC.

Samples acceptable for release? Yes PC/SC Initials RLM Date 6-27-16

If No, comment on communication and resolution:

WRPS: Ship - 180
Run - 78
WHL - NH3 - 26
Hg - 26

Number of IH Samples Received:

Aldehyde Screen:	26	Amines:	26	Ammonia:	26	Aromatic HC:		Asbestos:	
Beryllium:		Be-Bulk:		Be-Filter:		Be-Wipe		1,3-Butadiene:	52
Formaldehyde:		Furans:	26	Mercury:	26	Methanol:		Nitrosamines:	26
Nitrous Oxide:		Pyridines:	24	SVOA:	26	VOA:	26	Other-IH:	26

A-6005-302 (REV 4)

INDUSTRIAL HYGIENE CHAIN OF CUSTODY AND LABORATORY REQUEST

Page 1 of 12

Contractor: Washington River Protection Services (WRPS)			Date Sampled: 06/24/2016
COA: CB20	CACN: 202003	Survey No.: 16-9999-A	
Contact Name: Parker Jones		Phone: (509) 942-9494	Date Needed: N/A
Return Report To: Joyce Caldwell		MSIN: R1-06	Phone: (509) 376-0737

Laboratory Log No.	Sample ID/Type/Description	Required Analysis/Method
	16-001-AP-EF-001BASE ~~Carbotrap 300 TDU Tube~~, SKC 226-09 (6/24/16 ✓)	Acetonitrile
	16-001-AP-EF-002BASE Anasorb 747 / Tenax TA	Furans 2044852
	16-001-AP-EF-003BASE Carbotrap 150 TDU	SVOC 2045293
	16-001-AP-EF-004BASE Carbotrap 300 TDU	VOC 2046071
	16-001-AP-EF-005BASE Anasorb C300, SKC-226-17-1A	Mercury
S16T018973	16-001-AP-EF-006BASE S16T018976 8977 Anasorb 747, SKC-226-29	Ammonia
	16-001-AP-EF-007BASE SKC-226-37 (Part A)	1,3-Butadiene

Special Instructions: N/A

	Signature	Printed Name	Location	Date	Time
Delivered to Storage:	[signature]	Eric Harries	2704HV/H-104	06/24/2016	12:30
Retrieved from Storage:	[signature]	BRETT GARNER	[redacted]	6-27-16	1040

	Signature	Printed Name	Date	Time
Relinquished By:	[signature]	BRETT GARNER	6-27-16	1345
Received By:	[signature]	TERESA FORRESTER	6-27-16	1345
Relinquished By:				
Received By:				
Relinquished By:				
Received By:				

Additional Comments: N/A

A-6004-114 (REV 4)

INDUSTRIAL HYGIENE CHAIN OF CUSTODY AND LABORATORY REQUEST

Page 5 of 12

Contractor: Washington River Protection Services (WRPS)			Date Sampled: 06/24/2016
COA: CB20	CACN: 202003	Survey No.: 16-9999-A	
Contact Name: Parker Jones		Phone: (509) 942-9494	Date Needed: N/A
Return Report To: Joyce Caldwell		MSIN: R1-06	Phone: (509) 376-0737

Laboratory Log No.	Sample ID/Type/Description	Required Analysis/Method
	16-001-AP-IN-001BASE ~~Carbotrap 300 TDU Tube~~, SKC 226-09 (6/24/16 AD)	Acetonitrile
	16-001-AP-IN-002BASE Anasorb 747 / Tenax TA	Furans 2044287
	16-001-AP-IN-003BASE Carbotrap 150 TDU	SVOC 2045294
	16-001-AP-IN-004BASE Carbotrap 300 TDU	VOC ~~A006~~ A007655 6-27-16
	16-001-AP-IN-005BASE Anasorb C300, SKC-226-17-1A	Mercury
S16T018981	16-001-AP-IN-006BASE Anasorb 747, SKC-226-29 S16T018982 8983	Ammonia
	16-001-AP-IN-007BASE SKC-226-37 (Part A)	1,3-Butadiene

Special Instructions: N/A

	Signature	Printed Name	Location	Date	Time
Delivered to Storage:		Eric Harries	2704HV/H-104	06/24/2016	12:30
Retrieved from Storage:		BRETT GARNER	[redacted]	6-27-16	1055

	Signature	Printed Name	Date	Time
Relinquished By:		BRETT GARNER	6-27-16	1345
Received By:		TERESA FORRESTER	6-27-16	1345
Relinquished By:				
Received By:				
Relinquished By:				
Received By:				

Additional Comments: N/A

A-6004-114 (REV 4)

INDUSTRIAL HYGIENE CHAIN OF CUSTODY AND LABORATORY REQUEST

Page 9 of 12

Contractor: Washington River Protection Services (WRPS)			Date Sampled: 06/24/2016
COA: CB20	CACN: 202003	Survey No.: 16-9999-A	
Contact Name: Parker Jones		Phone: (509) 942-9494	Date Needed: N/A
Return Report To: Joyce Caldwell		MSIN: R1-06	Phone: (509) 376-0737

Laboratory Log No.	Sample ID/Type/Description	Required Analysis/Method
	16-001-AP-BK-001BASE ~~Carbotrap 300 TDU Tube~~, SKC 226-09 (6/24/16 LRD)	Acetonitrile
	16-001-AP-BK-002BASE Anasorb 747 / Tenax TA	Furans 2047413
	16-001-AP-BK-003BASE Carbotrap 150 TDU	SVOC A022448
	16-001-AP-BK-004BASE Carbotrap 300 TDU	VOC A017577
	16-001-AP-BK-005BASE Anasorb C300, SKC-226-17-1A	Mercury
S16T018984	16-001-AP-BK-006BASE Anasorb 747, SKC-226-29 S16T018985 89846	Ammonia
	16-001-AP-BK-007BASE SKC-226-37 (Part A)	1,3-Butadiene

Special Instructions: N/A

	Signature	Printed Name	Location	Date	Time
Delivered to Storage:	[signature]	Eric Harries	2704HV/H-104	06/24/2016	12:30
Retrieved from Storage:	[signature]	BRETT GARNER	[redacted]	6-27-16	1100

	Signature	Printed Name	Date	Time
Relinquished By:	[signature]	BRETT GARNER	6-27-16	1345
Received By:	[signature]	TERESA FORRESTER	6-27-16	1345
Relinquished By:				
Received By:				
Relinquished By:				
Received By:				

Additional Comments: N/A

A-6004-114 (REV 4)

INDUSTRIAL HYGIENE CHAIN OF CUSTODY AND LABORATORY REQUEST

Page 1 of 8

Contractor: Washington River Protection Services (WRPS)			Date Sampled: 06/24/2016
COA: CB20	CACN: 202003	Survey No.: 16-9999-A	
Contact Name: Parker Jones		Phone: (509) 942-9494	Date Needed: N/A
Return Report To: Joyce Caldwell		MSIN: R1-06	Phone: (509) 376-0737

Laboratory Log No.	Sample ID/Type/Description	Required Analysis/Method
	16-001-AP-EF-001A 6/24/16 BR ~~Carbotrap 300 TDU Tube~~, SKC 226-09	Acetonitrile
	16-001-AP-EF-002A Anasorb 747 / Tenax TA	Furans A006376
	16-001-AP-EF-003A Carbotrap 150 TDU	SVOC 2045078
	16-001-AP-EF-004A Carbotrap 300 TDU	VOC 2046092
	16-001-AP-EF-005A Anasorb C300, SKC-226-17-1A	Mercury
S16T018987	16-001-AP-EF-006A S16T018988 8989 Anasorb 747, SKC-226-29	Ammonia
	16-001-AP-EF-007A SKC-226-37 (Part A)	1,3-Butadiene

Special Instructions: N/A

	Signature	Printed Name	Location	Date	Time
Delivered to Storage:	[signature]	Eric Harries	2704HV/H-104	06/24/2016	15:30
Retrieved from Storage:	[signature]	BRETT GARNER	[redacted]	6-27-16	1625

	Signature	Printed Name	Date	Time
Relinquished By:	[signature]	BRETT GARNER	6-27-16	1345
Received By:	[signature]	Sharon L Holder	6-27-16	1345
Relinquished By:				
Received By:				
Relinquished By:				
Received By:				

Additional Comments:

A-6004-114 (REV 4)

INDUSTRIAL HYGIENE CHAIN OF CUSTODY AND LABORATORY REQUEST

Page 5 of 8

Contractor: Washington River Protection Services (WRPS)			Date Sampled: 06/24/2016
COA: CB20	CACN: 202003	Survey No.: 16-9998-A	
Contact Name: Parker Jones		Phone: (509) 942-9494	Date Needed: N/A
Return Report To: Joyce Caldwell		MSIN: R1-06	Phone: (509) 376-0737

Laboratory Log No.	Sample ID/Type/Description	Required Analysis/Method
	16-001-AP-IN-001A Carbotrap 300 TDU Tube, SKC 226-09	Acetonitrile
	16-001-AP-IN-002A Anasorb 747 / Tenax TA	Furans 2049250
	16-001-AP-IN-003A Carbotrap 150 TDU	SVOC A022215
	16-001-AP-IN-004A Carbotrap 300 TDU	VOC 2045546
	16-001-AP-IN-005A Anasorb C300, SKC-226-17-1A	Mercury
S16T018990	16-001-AP-IN-006A S16T01 8991 8992 Anasorb 747, SKC-226-29	Ammonia
	16-001-AP-IN-007A SKC-226-37 (Part A)	1,3-Butadiene

Special Instructions: N/A

	Signature	Printed Name	Location	Date	Time
Delivered to Storage:		Eric Harries	2704HV/H-104	06/24/2016	15:30
Retrieved from Storage:		BRET GARNER		6-27-16	1126

	Signature	Printed Name	Date	Time
Relinquished By:		BRET GARNER	6-27-16	1345
Received By:		Sharon L Holder	6-27-16	1345
Relinquished By:			16	
Received By:				
Relinquished By:				
Received By:				

Additional Comments:

A-6004-114 (REV 4)

INDUSTRIAL HYGIENE CHAIN OF CUSTODY AND LABORATORY REQUEST

Page 1 of 4

Contractor: Washington River Protection Services (WRPS)			Date Sampled: 06/24/2016
COA: CB20	CACN: 202003	Survey No.: 16-9999-A	
Contact Name: Parker Jones		Phone: (509) 942-9494	Date Needed: N/A
Return Report To: Joyce Caldwell		MSIN: R1-06	Phone: (509) 376-0737

Laboratory Log No.	Sample ID/Type/Description	Required Analysis/Method
	16-001-AP-EF-001B (6/24/14 BD) ~~Carbotrap 300 TDU Tube~~, SKC 226-09	Acetonitrile
	16-001-AP-EF-002B Anasorb 747 / Tenax TA	Furans A006423
	16-001-AP-EF-003B Carbotrap 150 TDU	SVOC A022214
	16-001-AP-EF-004B Carbotrap 300 TDU	VOC A017486
	16-001-AP-EF-005B Anasorb C300, SKC-226-17-1A	Mercury
S16T018993	16-001-AP-EF-006B Anasorb 747, SKC-226-29 S16T018994 8995	Ammonia
	16-001-AP-EF-007B SKC-226-37 (Part A)	1,3-Butadiene

Special Instructions: NA

	Signature	Printed Name	Location	Date	Time
Delivered to Storage:	[signature]	Eric Harries	2704HV/H-104	06/24/2016	17:30
Retrieved from Storage:	[signature]	BRETT GARNER	[redacted]	6-27-16	1037

	Signature	Printed Name	Date	Time
Relinquished By:	[signature]	BRETT GARNER	6-27-16	1345
Received By:	[signature]	TERESA FORRESTER	6-27-16	1345
Relinquished By:				
Received By:				
Relinquished By:				
Received By:				

Additional Comments:

A-6004-114 (REV 4)

INDUSTRIAL HYGIENE CHAIN OF CUSTODY AND LABORATORY REQUEST

Page 1 of 4

Contractor: Washington River Protection Services (WRPS)			Date Sampled: 06/24/2016
COA: CB20	CACN: 202003	Survey No.: 16-9999-A	
Contact Name: Parker Jones		Phone: (509) 942-9494	Date Needed: N/A
Return Report To: Joyce Caldwell		MSIN: R1-06	Phone: (509) 376-0737

Laboratory Log No.	Sample ID/Type/Description	Required Analysis/Method
	16-001-AP-EF-001C 6/24/16 RD ~~Carbotrap 300 TDU Tube~~, SKC 226-09	Acetonitrile
	16-001-AP-EF-002C Anasorb 747 / Tenax TA	Furans A006499
	16-001-AP-EF-003C Carbotrap 150 TDU	SVOC A023713
	16-001-AP-EF-004C Carbotrap 300 TDU	VOC A017598
	16-001-AP-EF-005C Anasorb C300, SKC-226-17-1A	Mercury
S16T018996	16-001-AP-EF-006C S16T018997 8998 Anasorb 747, SKC-226-29	Ammonia
	16-001-AP-EF-007C SKC-226-37 (Part A)	1,3-Butadiene

Special Instructions: N/A

	Signature	Printed Name	Location	Date	Time
Delivered to Storage:	Brett Garner	Ryan Burns	2704HV/H-104	06/24/2016	19:30
Retrieved from Storage:	Brett Garner	BRETT GARNER	[redacted]	6-27-16	1028

	Signature	Printed Name	Date	Time
Relinquished By:	Brett Garner	BRETT GARNER	6-27-16	1345
Received By:	Leslie Diaz	Leslie Diaz	6/27/16	1345
Relinquished By:				
Received By:				
Relinquished By:				
Received By:				

Additional Comments: N/A

A-6004-114 (REV 4)

INDUSTRIAL HYGIENE CHAIN OF CUSTODY AND LABORATORY REQUEST

Page 1 of 4

Contractor: Washington River Protection Services (WRPS)			Date Sampled: 06/24/2016
COA: CB20	CACN: 202003	Survey No.: 16-9999-A	
Contact Name: Parker Jones		Phone: (509) 942-9494	Date Needed:
Return Report To: Joyce Caldwell		MSIN: R1-06	Phone: (509) 376-0737

Laboratory Log No.	Sample ID/Type/Description	Required Analysis/Method
	16-001-AP-EF-001D ~~Carbotrap 300 TDU Tube~~, SKC 226-09 (6/24/16 BE)	Acetonitrile
	16-001-AP-EF-002D Anasorb 747 / Tenax TA	Furans A006718
	16-001-AP-EF-003D Carbotrap 150 TDU	SVOC A022172
	16-001-AP-EF-004D Carbotrap 300 TDU	VOC 2045394
	16-001-AP-EF-005D Anasorb C300, SKC-226-17-1A	Mercury
S16T018999	16-001-AP-EF-006D Anasorb 747, SKC-226-29 S16T019000 9001	Ammonia
	16-001-AP-EF-007D SKC-226-37 (Part A)	1,3-Butadiene

Special Instructions: N/A

	Signature	Printed Name	Location	Date	Time
Delivered to Storage:	Brett Garner for Ryan Burns	Ryan Burns	2704HV/H-104	06/24/2016	21:40
Retrieved from Storage:	[signature]	BRETT GARNER	[redacted]	6-27-16	1016

	Signature	Printed Name	Date	Time
Relinquished By:	[signature]	BRETT GARNER	6-27-16	1345
Received By:	[signature]	Leslie DIAZ	6/27/16	1345
Relinquished By:				
Received By:				
Relinquished By:				
Received By:				

Additional Comments: ~~N/A~~ 6/27/16 tech not available to sign

A-6004-114 (REV 4)

INDUSTRIAL HYGIENE CHAIN OF CUSTODY AND LABORATORY REQUEST

Page 1 of 4

Contractor: Washington River Protection Services (WRPS)			Date Sampled: 06/24/2016
COA: CB20	CACN: 202003	Survey No.: 16-9999-A	
Contact Name: Parker Jones		Phone: (509) 942-9494	Date Needed: N/A
Return Report To: Joyce Caldwell		MSIN: R1-06	Phone: (509) 376-0737

Laboratory Log No.	Sample ID/Type/Description	Required Analysis/Method
	16-001-AP-EF-001E ~~Carbotrap 300 TDU Tube~~, SKC 226-09	Acetonitrile
	16-001-AP-EF-002E Anasorb 747 / Tenax TA	Furans 2044774
	16-001-AP-EF-003E Carbotrap 150 TDU	SVOC 2045144
	16-001-AP-EF-004E Carbotrap 300 TDU	VOC 2045924
	16-001-AP-EF-005E Anasorb C300, SKC-226-17-1A	Mercury
S16T019002	16-001-AP-EF-006E Anasorb 747, SKC-226-29 S16T019003 9004	Ammonia
	16-001-AP-EF-007E SKC-226-37 (Part A)	1,3-Butadiene

Special Instructions: N/A

	Signature	Printed Name	Location	Date	Time
Delivered to Storage:	Brett Garner for Ryan Burns	Ryan Burns	2704HV/H-104	06/24/2016	23:15
Retrieved from Storage:	Brett Garner	BRETT GARNER	[redacted]	6-27-16	1606

	Signature	Printed Name	Date	Time
Relinquished By:	Brett Garner	BRETT GARNER	6-27-16	1345
Received By:	Teresa Forrester	TERESA FORRESTER	6-27-16	1345
Relinquished By:				
Received By:				
Relinquished By:				
Received By:				

Additional Comments:
N/A 6-27-16 Tech NA available to sign

A-6004-114 (REV 4)

INDUSTRIAL HYGIENE CHAIN OF CUSTODY AND LABORATORY REQUEST

Page 1 of 4

Contractor: Washington River Protection Services (WRPS)			Date Sampled: 06/25/2016
COA: CB20	CACN: 202003	Survey No.: 16-9999-A	
Contact Name: Parker Jones		Phone: (509) 942-9494	Date Needed: N/A
Return Report To: Joyce Caldwell		MSIN: R1-06	Phone: (509) 376-0737

Laboratory Log No.	Sample ID/Type/Description	Required Analysis/Method
	16-001-AP-EF-001F ~~Carbotrap 300 TDU Tube~~, SKC 226-09 (6/25/16)	Acetonitrile
	16-001-AP-EF-002F Anasorb 747 / Tenax TA	Furans 2046256
	16-001-AP-EF-003F Carbotrap 150 TDU	SVOC A020783
	16-001-AP-EF-004F Carbotrap 300 TDU	VOC 2044244
	16-001-AP-EF-005F Anasorb C300, SKC-226-17-1A	Mercury
S16T019005	16-001-AP-EF-006F Anasorb 747, SKC-226-29 S16T019006 9007	Ammonia
	16-001-AP-EF-007F SKC-226-37 (Part A)	1,3-Butadiene

Special Instructions: N/A

	Signature	Printed Name	Location	Date	Time
Delivered to Storage:	Ryan Burns/BRETT GARNER FOR Ryan Burns	Ryan Burns	2704HV/H-104	06/25/2016	01:20
Retrieved from Storage:	Brett Garner	BRETT GARNER	[redacted]	6-27-16	0956

	Signature	Printed Name	Date	Time
Relinquished By:	Brett Garner	BRETT GARNER	6-27-16	1345
Received By:	Leslie Diaz	LESLIE DIAZ	6/27/16	1345
Relinquished By:				
Received By:				
Relinquished By:				
Received By:				

Additional Comments: ~~N/A 6-27-16~~ Tech not available to sign

A-6004-114 (REV 4)

INDUSTRIAL HYGIENE CHAIN OF CUSTODY AND LABORATORY REQUEST

Page 1 of 4

Contractor: Washington River Protection Services (WRPS)			Date Sampled: 06/25/2016
COA: CB20	CACN: 202003	Survey No.: 16-9999-A	
Contact Name: Parker Jones		Phone: (509) 942-9494	Date Needed: N/A
Return Report To: Joyce Caldwell		MSIN: R1-06	Phone: (509) 376-0737

Laboratory Log No.	Sample ID/Type/Description	Required Analysis/Method
	16-001-AP-EF-001G ~~Carbotrap 300 TDU Tube~~, SKC 226-09	Acetonitrile
	16-001-AP-EF-002G Anasorb 747 / Tenax TA	Furans A019149
	16-001-AP-EF-003G Carbotrap 150 TDU	SVOC A023695
	16-001-AP-EF-004G Carbotrap 300 TDU	VOC A015608
	16-001-AP-EF-005G Anasorb C300, SKC-226-17-1A	Mercury
S16T019008	16-001-AP-EF-006G Anasorb 747, SKC-226-29 S16T019009 9010	Ammonia
	16-001-AP-EF-007G SKC-226-37 (Part A)	1,3-Butadiene

Special Instructions: N/A

	Signature	Printed Name	Location	Date	Time
Delivered to Storage:	~~Brett Garber~~ ~~AGENCY~~ for Ryan Burns	Ryan Burns	2704HV/H-104	06/25/2016	03:40
Retrieved from Storage:	Brett Garber	BRETT GARBER	[redacted]	6-27-16	0941

	Signature	Printed Name	Date	Time
Relinquished By:	Brett Garber	BRETT GARBER	6-27-16	1345
Received By:	Leslie Diaz	LESLIE DIAZ	6/27/16	1345
Relinquished By:				
Received By:				
Relinquished By:				
Received By:				

Additional Comments: N/A 6/27/16 tech not available to sign

A-6004-114 (REV 4)

INDUSTRIAL HYGIENE CHAIN OF CUSTODY AND LABORATORY REQUEST

Page 1 of 2

Contractor: Washington River Protection Services (WRPS)			Date Sampled: 06/25/2016
COA: CB20	CACN: 202003	Survey No.: 16-9999-A	
Contact Name: Parker Jones		Phone: (509) 942-9494	Date Needed: N/A
Return Report To: Joyce Caldwell		MSIN: R1-06	Phone: (509) 376-0737

Laboratory Log No.	Sample ID/Type/Description	Required Analysis/Method
X	16-001-AP-EF-001H 6/25/16 ~~Carbotrap 300 TDU Tube~~, SKC 226-09	Acetonitrile
X	16-001-AP-EF-002H Anasorb 747 / Tenax TA	Furans 2044465
X	16-001-AP-EF-003H Carbotrap 150 TDU	SVOC see special instructions
X	16-001-AP-EF-004H Carbotrap 300 TDU	VOC 2045367
X	16-001-AP-EF-005H Anasorb C300, SKC-226-17-1A	Mercury
X S16T019011	16-001-AP-EF-006H S16T019012 9013 Anasorb 747, SKC-226-29	Ammonia
X	16-001-AP-EF-007H SKC-226-37 (Part A)	1,3-Butadiene

Special Instructions: N/A
Received Broken Tube - 16-001-AP-EF-002H, (SVOC)

	Signature	Printed Name	Location	Date	Time
Delivered to Storage:	~~Brett Garner~~ FOR Ryan Burns	Ryan Burns	2704HV/H-104	06/25/2016	06:30
Retrieved from Storage:	Brett Garner	BRETT GARNER	[redacted]	6-27-16	0906

	Signature	Printed Name	Date	Time
Relinquished By:	Brett Garner	BRETT GARNER	6-27-16	1345
Received By:	Sharon L Holden	Sharon L Holden	6-27-16	1345
Relinquished By:				
Received By:				
Relinquished By:				
Received By:				

Additional Comments: ~~N/A~~ 6-27-16 Tech unavailable to Sign

A-6004-114 (REV 4)

INDUSTRIAL HYGIENE CHAIN OF CUSTODY AND LABORATORY REQUEST

Page 5 of 12 8

Contractor: Washington River Protection Services (WRPS)			Date Sampled: 06/25/2016
COA: CB20	CACN: 202003	Survey No.: 16-9999-A	
Contact Name: Parker Jones		Phone: (509) 942-9494	Date Needed: ASAP
Return Report To: Joyce Caldwell		MSIN: R1-06	Phone: (509) 376-0737

Laboratory Log No.	Sample ID/Type/Description	Required Analysis/Method
X	16-001-AP-IN-001H ~~Carbotrap 300 TDU Tube~~, SKC 226-09	Acetonitrile
X	16-001-AP-IN-002H Anasorb 747 / Tenax TA	Furans 2045734
X	16-001-AP-IN-003H Carbotrap 150 TDU	SVOC 2045265
X	16-001-AP-IN-004H Carbotrap 300 TDU	VOC A016516
X	16-001-AP-IN-005H Anasorb C300, SKC-226-17-1A	Mercury
SLT019021 X	16-001-AP-IN-006H Anasorb 747, SKC-226-29 SLT019067 9068	Ammonia
X	16-001-AP-IN-007H SKC-226-37 (Part A)	1,3-Butadiene

Special Instructions: N/A

	Signature	Printed Name	Location	Date	Time
Delivered to Storage:	Brett Garner for Ryan Burns	Ryan Burns	2704HV/H-104	06/25/2016	06:30
Retrieved from Storage:	Brett Garner	BRETT GARNER	[redacted]	6-27-16	0900

	Signature	Printed Name	Date	Time
Relinquished By:	Brett Garner	BRETT GARNER	6-27-16	1345
Received By:	Sharon L Holder	Sharon L Holder	6-27-16	1345
Relinquished By:				
Received By:				
Relinquished By:				
Received By:				

Additional Comments: N/A 6-27-16 Tech unavailable to Sign

A-6004-114 (REV 4)

INDUSTRIAL HYGIENE CHAIN OF CUSTODY AND LABORATORY REQUEST

Page 1 of 12

Contractor: Washington River Protection Services (WRPS)			Date Sampled: 06/25/2016
COA: CB20	CACN: 202003	Survey No.: 16-9999-B	
Contact Name: Parker Jones		Phone: (509) 942-9494	Date Needed: N/A
Return Report To: Joyce Caldwell		MSIN: R1-06	Phone: (509) 376-0737

Laboratory Log No.	Sample ID/Type/Description	Required Analysis/Method
	16-002-AP-EF-001BASE ~~Carbotrap 300 TDU Tube~~, SKC 226-09 (6-27-16)	Acetonitrile
	16-002-AP-EF-002BASE Anasorb 747 / Tenax TA	Furans 2047396 ~~2047396~~
	16-002-AP-EF-003BASE Carbotrap 150 TDU	SVOC 2045149 ~~A023[illegible]~~
	16-001-AP-EF-004BASE Carbotrap 300 TDU	VOC 2046056 ~~2046194~~
	16-002-AP-EF-005BASE Anasorb C300, SKC-226-17-1A	Mercury
SIW-T019144	16-002-AP-EF-006BASE Anasorb 747, SKC-226-29 SIW-T019145 9146	Ammonia
	16-002-AP-EF-007BASE SKC-226-37 (Part A)	1,3-Butadiene

LD 6/29/16

Special Instructions: N/A

	Signature	Printed Name	Location	Date	Time
Delivered to Storage:		Patrick B Louderback	2704HV/H-104	06/25/2016	12:15
Retrieved from Storage:		BRETT GARNER	[redacted]	6-27-16	0834

	Signature	Printed Name	Date	Time
Relinquished By:		BRETT GARNER	6-27-16	1345
Received By:		Leslie DIAZ	6/27/16	1345
Relinquished By:				
Received By:				
Relinquished By:				
Received By:				

Additional Comments: N/A

A-6004-114 (REV 4)

INDUSTRIAL HYGIENE CHAIN OF CUSTODY AND LABORATORY REQUEST

Page 5 of 12

Contractor: Washington River Protection Services (WRPS)			Date Sampled: 06/25/2016
COA: CB20	CACN: 202003	Survey No.: 16-9999-B	
Contact Name: Parker Jones		Phone: (509) 942-9494	Date Needed: N/A
Return Report To: Joyce Caldwell		MSIN: R1-06	Phone: (509) 376-0737

Laboratory Log No.	Sample ID/Type/Description	Required Analysis/Method
	16-002-AP-IN-001BASE BG 6-27-16 ~~Carbotrap 300 TDU Tube~~, SKC 226-09	Acetonitrile
	16-002-AP-IN-002BASE Anasorb 747 / Tenax TA	Furans 2047405
	16-002-AP-IN-003BASE Carbotrap 150 TDU	SVOC A023648
	16-002-AP-IN-004BASE Carbotrap 300 TDU	VOC 2046158
	16-002-AP-IN-005BASE Anasorb C300, SKC-226-17-1A	Mercury
SI6TO 19147	16-002-AP-IN-006BASE Anasorb 747, SKC-226-29 ; SI6T019148 9149	Ammonia
	16-002-AP-IN-007BASE SKC-226-37 (Part A)	1,3-Butadiene

Special Instructions: N/A

	Signature	Printed Name	Location	Date	Time
Delivered to Storage:		Patrick B Louderback	2704HV/H-104	06/25/2016	12:15
Retrieved from Storage:		BRETT GARNER	[redacted]	6-27-16	0844

	Signature	Printed Name	Date	Time
Relinquished By:		BRETT GARNER	6-27-16	1345
Received By:		LESLIE DIAZ	6/27/16	1345
Relinquished By:				
Received By:				
Relinquished By:				
Received By:				

Additional Comments: N A

A-6004-114 (REV 4)

INDUSTRIAL HYGIENE CHAIN OF CUSTODY AND LABORATORY REQUEST

Page 9 of 12

Contractor: Washington River Protection Services (WRPS)			Date Sampled: 06/25/2016
COA: CB20	CACN: 202003	Survey No.: 16-9999-B	
Contact Name: Parker Jones		Phone: (509) 942-9494	Date Needed: N/A
Return Report To: Joyce Caldwell		MSIN: R1-06	Phone: (509) 376-0737

Laboratory Log No.	Sample ID/Type/Description	Required Analysis/Method
	16-002-AP-BK-001BASE BL 6-27-16 ~~Carbotrap 300 TDU Tube~~, SKC 226-09	Acetonitrile
	16-002-AP-BK-002BASE Anasorb 747 / Tenax TA	Furans 2047136
	16-002-AP-BK-003BASE Carbotrap 150 TDU	SVOC 2045084
	16-002-AP-BK-004BASE Carbotrap 300 TDU	VOC 2046191
	16-002-AP-BK-005BASE Anasorb C300, SKC-226-17-1A	Mercury
SIGT019150	16-002-AP-BK-006BASE SIGT019151 9152 Anasorb 747, SKC-226-29	Ammonia
	16-002-AP-BK-007BASE SKC-226-37 (Part A)	1,3-Butadiene

Special Instructions: N/A

	Signature	Printed Name	Location	Date	Time
Delivered to Storage:		Patrick B Louderback	2704HV/H-104	06/25/2016	12:15
Retrieved from Storage:		BRETT GARNER	[redacted]	6-27-16	0852

	Signature	Printed Name	Date	Time
Relinquished By:		BRETT GARNER	6-27-16	1345
Received By:		LESLIE DIAZ	6/27/16	1345
Relinquished By:				
Received By:				
Relinquished By:				
Received By:				

Additional Comments: N/A

A-6004-114 (REV 4)

INDUSTRIAL HYGIENE CHAIN OF CUSTODY AND LABORATORY REQUEST

Page 1 of 8

Contractor: Washington River Protection Services (WRPS)			Date Sampled: 06/25/2016
COA: CB20	CACN: 202003	Survey No.: 16-9999-B	
Contact Name: Parker Jones		Phone: (509) 942-9494	Date Needed: N/A
Return Report To: Joyce Caldwell		MSIN: R1-06	Phone: (509) 376-0737

Laboratory Log No.	Sample ID/Type/Description	Required Analysis/Method
	16-002-AP-EF-001A RG 6-27-16 ~~Carbotrap 300 TDU Tube~~, SKC 226-09	Acetonitrile
	16-002-AP-EF-002A Anasorb 747 / Tenax TA	Furans 2047166
	16-002-AP-EF-003A Carbotrap 150 TDU	SVOC 4023653
	16-002-AP-EF-004A Carbotrap 300 TDU	VOC 2046010
	16-002-AP-EF-005A Anasorb C300, SKC-226-17-1A	Mercury
S16T0 19153	16-002-AP-EF-006A Anasorb 747, SKC-226-29 S16T019154 9155	Ammonia
	16-002-AP-EF-007A SKC-226-37 (Part A)	1,3-Butadiene

Special Instructions:
N/A

	Signature	Printed Name	Location	Date	Time
Delivered to Storage:		Patrick B Louderback	2704HV/H-104	06/25/2016	14:30
Retrieved from Storage:		BRETT GARNER	[redacted]	6-27-16	0812

	Signature	Printed Name	Date	Time
Relinquished By:		BRETT GARNER	6-27-16	1345
Received By:		Sharon L Holden	6-27-16	1345
Relinquished By:				
Received By:				
Relinquished By:				
Received By:				

Additional Comments:
N/A

A-6004-114 (REV 4)

INDUSTRIAL HYGIENE CHAIN OF CUSTODY AND LABORATORY REQUEST

Page 5 of 8

Contractor: Washington River Protection Services (WRPS)			Date Sampled: 06/25/2016
COA: CB20	CACN: 202003	Survey No.: 16-9999-B	
Contact Name: Parker Jones		Phone: (509) 942-9494	Date Needed: N/A
Return Report To: Joyce Caldwell		MSIN: R1-06	Phone: (509) 376-0737

Laboratory Log No.	Sample ID/Type/Description	Required Analysis/Method
	16-002-AP-IN-001A BG 6-27-16 ~~Carbotrap 300 TDU Tube~~, SKC 226-09	Acetonitrile
	16-002-AP-IN-002A Anasorb 747 / Tenax TA	Furans 2046145
	16-002-AP-IN-003A Carbotrap 150 TDU	SVOC A023722
	16-002-AP-IN-004A Carbotrap 300 TDU	VOC 2046186
	16-002-AP-IN-005A Anasorb C300, SKC-226-17-1A	Mercury
SILTD 19156	16-002-AP-IN-006A Anasorb 747, SKC-226-29 SILT019157 9158	Ammonia
	16-002-AP-IN-007A SKC-226-37 (Part A)	1,3-Butadiene

Special Instructions:
N/A

	Signature	Printed Name	Location	Date	Time
Delivered to Storage:		Patrick B Louderback	2704HV/H-104	06/25/2016	14:30
Retrieved from Storage:		BRETT GARNER	[redacted]	6-27-16	0818

	Signature	Printed Name	Date	Time
Relinquished By:		BRETT GARNER	6-27-16	1345
Received By:		SharonLHolden	6-27-16	1345
Relinquished By:				
Received By:				
Relinquished By:				
Received By:				

Additional Comments:
N/A

A-6004-114 (REV 4)

INDUSTRIAL HYGIENE CHAIN OF CUSTODY AND LABORATORY REQUEST

Page 1 of 4

Contractor: Washington River Protection Services (WRPS)			Date Sampled: 06/25/2016
COA: CB20	CACN: 202003	Survey No.: 16-9999-B	
Contact Name: Parker Jones		Phone: (509) 942-9494	Date Needed: N/A
Return Report To: Joyce Caldwell		MSIN: R1-06	Phone: (509) 376-0737

Laboratory Log No.	Sample ID/Type/Description	Required Analysis/Method
	16-002-AP-EF-001B ✓ BG 6-27-16 ~~Carbotrap 300 TDU Tube~~, SKC 226-09	Acetonitrile
	16-002-AP-EF-002B ✓ Anasorb 747 / Tenax TA	Furans 2047550
	16-002-AP-EF-003B ✓ Carbotrap 150 TDU	SVOC A023713
	16-002-AP-EF-004B ✓ Carbotrap 300 TDU	VOC 2046206
	16-002-AP-EF-005B ✓ Anasorb C300, SKC-226-17-1A	Mercury
SI 6 TO 19159	16-002-AP-EF-006B ✓ SI 6 TO 9160 9161 Anasorb 747, SKC-226-29	Ammonia
	16-002-AP-EF-007B ✓ SKC-226-37 (Part A)	1,3-Butadiene

Special Instructions: N/A

	Signature	Printed Name	Location	Date	Time
Delivered to Storage:	[signature]	Eric Harries	2704HV/H-104	06/25/2016	16:15
Retrieved from Storage:	[signature]	BRETT GARNER	[redacted]	6-27-16	0728

	Signature	Printed Name	Date	Time
Relinquished By:	[signature]	BRETT GARNER GARNER	6-27-16	1345
Received By:	[signature]	LESLIE DIAZ	6/27/16	1345
Relinquished By:				
Received By:				
Relinquished By:				
Received By:				

Additional Comments:

Sample No.: 16-002-AP-EF-005B, came undone from the sample tubing.

A-6004-114 (REV 4)

INDUSTRIAL HYGIENE CHAIN OF CUSTODY AND LABORATORY REQUEST

Page 1 of 4

Contractor: Washington River Protection Services (WRPS)			Date Sampled: 06/25/2016
COA: CB20	CACN: 202003	Survey No.: 16-9999-B	
Contact Name: Parker Jones		Phone: (509) 942-9494	Date Needed: N/A
Return Report To: Joyce Caldwell		MSIN: R1-06	Phone: (509) 376-0737

Laboratory Log No.	Sample ID/Type/Description	Required Analysis/Method
	16-002-AP-EF-001C ~~Carbotrap 300 TDU Tube~~, SKC 226-09	Acetonitrile
	16-002-AP-EF-002C Anasorb 747 / Tenax TA	Furans 2046649
	16-002-AP-EF-003C Carbotrap 150 TDU	SVOC A023704
	16-002-AP-EF-004C Carbotrap 300 TDU	VOC 2044087
	16-002-AP-EF-005C Anasorb C300, SKC-226-17-1A	Mercury
S16T019162	16-002-AP-EF-006C Anasorb 747, SKC-226-29 S16T019163 9164	Ammonia
	16-002-AP-EF-007C SKC-226-37 (Part A)	1,3-Butadiene

Special Instructions:
N/A

	Signature	Printed Name	Location	Date	Time
Delivered to Storage:		Patrick Louderback	2704HV/H-104	06/25/2016	18:25
Retrieved from Storage:		BRETT GARNER	[redacted]	6-27-16	0776

	Signature	Printed Name	Date	Time
Relinquished By:		BRETT GARNER	6-27-16	1345
Received By:		TERESA FORRESTER	6-27-16	1345
Relinquished By:				
Received By:				
Relinquished By:				
Received By:				

Additional Comments:
N/A

A-6004-114 (REV 4)

INDUSTRIAL HYGIENE CHAIN OF CUSTODY AND LABORATORY REQUEST

Page 1 of 4

Contractor: Washington River Protection Services (WRPS)			Date Sampled: 06/25/2016
COA: CB20	CACN: 202003	Survey No.: 16-9999-B	
Contact Name: Parker Jones		Phone: (509) 942-9494	Date Needed: ~~06/24/2016~~ NA 6-25-16
Return Report To: Joyce Caldwell		MSIN: R1-06	Phone: (509) 376-0737

Laboratory Log No.	Sample ID/Type/Description	Required Analysis/Method
	16-002-AP-EF-001D ✓ BG 6-27-16 ~~Carbotrap 300 TDU Tube~~, SKC 226-09	Acetonitrile
	16-002-AP-EF-002D ✓ Anasorb 747 / Tenax TA	Furans 2046208
	16-002-AP-EF-003D ✓ Carbotrap 150 TDU	SVOC A013721
	16-002-AP-EF-004D ✓ Carbotrap 300 TDU	VOC 2044374
	16-002-AP-EF-005D ✓ Anasorb C300, SKC-226-17-1A	Mercury
S16T019165	16-002-AP-EF-006D ✓ Anasorb 747, SKC-226-29 S16T019166 91667	Ammonia
	16-002-AP-EF-007D ✓ SKC-226-37 (Part A)	1,3-Butadiene

Special Instructions: NA

	Signature	Printed Name	Location	Date	Time
Delivered to Storage:		RYAN BURNS	2704HV/H-104	06/25/2016	2035
Retrieved from Storage:	Brett Garner	BRETT GARNER	[redacted]	6-27-16	0744

	Signature	Printed Name	Date	Time
Relinquished By:	Brett Garner	BRETT GARNER	6-27-16	1345
Received By:	Leslie Diaz	LESLIE DIAZ	6/27/16	1345
Relinquished By:				
Received By:				
Relinquished By:				
Received By:				

Additional Comments:

A-6004-114 (REV 4)

INDUSTRIAL HYGIENE CHAIN OF CUSTODY AND LABORATORY REQUEST

Page 1 of 4

Contractor: Washington River Protection Services (WRPS)			Date Sampled: 06/25/2016
COA: CB20	CACN: 202003	Survey No.: 16-9999-B	
Contact Name: Parker Jones		Phone: (509) 942-9494	Date Needed: N/A
Return Report To: Joyce Caldwell		MSIN: R1-06	Phone: (509) 376-0737

Laboratory Log No.	Sample ID/Type/Description	Required Analysis/Method
	16-002-AP-EF-001E ~~Carbotrap 300 TDU~~ Tube, SKC 226-09	Acetonitrile
	16-002-AP-EF-002E Anasorb 747 / Tenax TA	Furans Z046291
	16-002-AP-EF-003E Carbotrap 150 TDU	SVOC A023711
	16-002-AP-EF-004E Carbotrap 300 TDU	VOC Z044230
	16-002-AP-EF-005E Anasorb C300, SKC-226-17-1A	Mercury
S16T019168	16-002-AP-EF-006E S16T019169 9170 Anasorb 747, SKC-226-29	Ammonia
	16-002-AP-EF-007E SKC-226-37 (Part A)	1,3-Butadiene

Special Instructions: N/A

	Signature	Printed Name	Location	Date	Time
Delivered to Storage:		JASON RENO	2704HV/H-104	06/25/2016	2237
Retrieved from Storage:		BRETT GARNER	[redacted]	6-27-16	0753

	Signature	Printed Name	Date	Time
Relinquished By:		BRETT GARNER	6-27-16	1345
Received By:		Leslie Diaz	6/27/16	1345
Relinquished By:				
Received By:				
Relinquished By:				
Received By:				

Additional Comments:

A-6004-114 (REV 4)

INDUSTRIAL HYGIENE CHAIN OF CUSTODY AND LABORATORY REQUEST

Page 1 of 4

RB 6-25-16

Contractor: Washington River Protection Services (WRPS) B/			Date Sampled: 06/25/2016
COA: CB20	CACN: 202003	Survey No.: 16-9999-~~BA RB 6-25-16~~	
Contact Name: Parker Jones		Phone: (509) 942-9494	Date Needed: NA
Return Report To: Joyce Caldwell		MSIN: R1-06	Phone: (509) 376-0737

Laboratory Log No.	Sample ID/Type/Description	Required Analysis/Method
E	16-002-AP-EF-001F SKC 226-09	Acetonitrile
C	16-002-AP-EF-002F Anasorb 747 / Tenax TA	Furans 2046197
A	16-002-AP-EF-003F Carbotrap 150 TDU	SVOC A023646
B	16-002-AP-EF-004F Carbotrap 300 TDU	VOC 2044090
F	16-002-AP-EF-005F Anasorb C300, SKC-226-17-1A	Mercury
G	16-002-AP-EF-006F Anasorb 747, SKC-226-29 S16T019171	Ammonia S16T019172 9173
I	16-002-AP-EF-007F SKC-226-37 (Part A)	1,3-Butadiene

Special Instructions: NA

	Signature	Printed Name	Location	Date	Time
Delivered to Storage:		RYAN BURNS	2704HV/H-104	6/26/16	0050
Retrieved from Storage:		BRETT GARNER	[redacted]	6-27-16	0801

	Signature	Printed Name	Date	Time
Relinquished By:		BRETT GARNER	6-27-16	1345
Received By:		TERESA FORRESTER	6-27-16	1345
Relinquished By:				
Received By:				
Relinquished By:				
Received By:				

Additional Comments:

A-6004-114 (REV 4)

INDUSTRIAL HYGIENE CHAIN OF CUSTODY AND LABORATORY REQUEST

Page 1 of 4

Contractor: Washington River Protection Services (WRPS)			Date Sampled: ~~06/25/2016~~ 6/26/16
COA: CB20	CACN: 202003	Survey No.: 16-9999-B	
Contact Name: Parker Jones		Phone: (509) 942-9494	Date Needed: NA
Return Report To: Joyce Caldwell		MSIN: R1-06	Phone: (509) 376-0737

Laboratory Log No.	Sample ID/Type/Description	Required Analysis/Method
E	16-002-AP-EF-001G 6/25/16 ~~Carbotrap 300 TDU Tube~~, SKC 226-09	Acetonitrile
C	16-002-AP-EF-002G Anasorb 747 / Tenax TA	Furans 2047278
A	16-002-AP-EF-003G Carbotrap 150 TDU	SVOC A023707
B	16-002-AP-EF-004G Carbotrap 300 TDU	VOC 2044357
F	16-002-AP-EF-005G Anasorb C300, SKC-226-17-1A	Mercury
G	16-002-AP-EF-006G Anasorb 747, SKC-226-29 S16T019174	Ammonia S16T019175 9176
I	16-002-AP-EF-007G SKC-226-37 (Part A)	1,3-Butadiene

Special Instructions: NA

	Signature	Printed Name	Location	Date	Time
Delivered to Storage:		JASON KENG	2704HV/H-104	6/26/15	0715
Retrieved from Storage:		BRETT GARNER	[redacted]	6-27-16	0634

	Signature	Printed Name	Date	Time
Relinquished By:		BRETT GARNER	6-27-16	1345
Received By:		Leslie Diaz	6/27/16	13:45
Relinquished By:				
Received By:				
Relinquished By:				
Received By:				

Additional Comments:

A-6004-114 (REV 4)

6/27/16

INDUSTRIAL HYGIENE CHAIN OF CUSTODY AND LABORATORY REQUEST

Page 1 of 2 (6/28)

Contractor: Washington River Protection Services (WRPS)			Date Sampled: 6/26/16
COA: CB20	CACN: 202003	Survey No.: 16-9999-B	
Contact Name: Parker Jones		Phone: (509) 942-9494	Date Needed: 7/1
Return Report To: Joyce Caldwell		MSIN: R1-06	Phone: (509) 376-0737

Laboratory Log No.	Sample ID/Type/Description	Required Analysis/Method
	16-002-AP-EF-001H ✓ RB 6-25-16 ~~Carbotrap 300 TDU~~ Tube, SKC 226-09	Acetonitrile
	16-002-AP-EF-002H ✓ Anasorb 747 / Tenax TA	Furans 2046740
	16-002-AP-EF-003H ✓ Carbotrap 150 TDU	SVOC A023645
	16-002-AP-EF-004H ✓ Carbotrap 300 TDU	VOC 2044255
	16-002-AP-EF-005H ✓ Anasorb C300, SKC-226-17-1A	Mercury
S16T019177	16-002-AP-EF-006H ✓ Anasorb 747, SKC-226-29 S16T019178 9179	Ammonia
	16-002-AP-EF-007H ✓ SKC-226-37 (Part A)	1,3-Butadiene

Special Instructions:

	Signature	Printed Name	Location	Date	Time
Delivered to Storage:		JASON REYNO	2704HV/H-104	6/26/16	0535
Retrieved from Storage:		BRETT GARNER	[redacted]	6-27-16	0652

	Signature	Printed Name	Date	Time
Relinquished By:		BRETT GARNER	6-27-16	1345
Received By:		TERESA FORRESTER	6-27-16	1345
Relinquished By:				
Received By:				
Relinquished By:				
Received By:				

Additional Comments:

A-6004-114 (REV 4)

INDUSTRIAL HYGIENE CHAIN OF CUSTODY AND LABORATORY REQUEST

Page 5 of 12/8 (5e 6/22/16)

Contractor: Washington River Protection Services (WRPS)			Date Sampled: 6/22/16
COA: CB20	CACN: 202003	Survey No.: 16-9999-B	
Contact Name: Parker Jones		Phone: (509) 942-9494	Date Needed: N/A
Return Report To: Joyce Caldwell		MSIN: R1-06	Phone: (509) 376-0737

Laboratory Log No.	Sample ID/Type/Description	Required Analysis/Method
	16-002-AP-IN-001H ✓ KS 6-25-16 ~~Carbotrap 300 TDU~~ Tube, SKC 226-09	Acetonitrile
	16-002-AP-IN-002H ✓ Anasorb 747 / Tenax TA	Furans A006713
	16-002-AP-IN-003H ✓ Carbotrap 150 TDU	SVOC A023657
	16-002-AP-IN-004H ✓ Carbotrap 300 TDU	VOC 2044121
	16-002-AP-IN-005H ✓ Anasorb C300, SKC-226-17-1A	Mercury
SI6T019180	16-002-AP-IN-006H ✓ Anasorb 747, SKC-226-29 SI6T019181 9182	Ammonia
	16-002-AP-IN-007H ✓ SKC-226-37 (Part A)	1,3-Butadiene

Special Instructions:

	Signature	Printed Name	Location	Date	Time
Delivered to Storage:	[signature]	JASON RENIO	2704HV/H-104	6/10/16	0535
Retrieved from Storage:	[signature]	BRETT GARNER	[redacted]	6-27-16	0701

	Signature	Printed Name	Date	Time
Relinquished By:	[signature]	BRETT GARNER	6-27-16	1345
Received By:	[signature]	TERESA FORRESTER	6-27-16	1345
Relinquished By:				
Received By:				
Relinquished By:				
Received By:				

Additional Comments:

A-6004-114 (REV 4)

C.3.8 Aldehydes

ANALYTICAL REPORT

Report Date: July 08, 2016

Robert (Buddy) Sosa
Washington River Protection So
PO Box 850, MSIN T6-02
Richland, WA 99352

Phone: (509) 373-1262

E-mail: robert_w_sosa@rl.gov

Workorder: 34-1618256
Client Project ID: CARTRIDGE EVALUATION
Purchase Order: 55502 Rel9
Project Manager: Rand Potter

Analytical Results

Sample ID: S16T018936 — Collected: 06/25/2016
Lab ID: 1618256001 — Sampling Location: CARTRIDGE EVALUATION — Received: 06/30/2016
Method: **EPA TO-11A** — Media: SKC 226-119, Silica Gel (2,4-Dinitrophenylhydrazine) — Analyzed: 07/07/2016
Sampling Parameter: **Air Volume Not Provided**

Analyte	Result (ug/sample)	Result (mg/m³)	Result (ppm)	RL (ug/sample)
Formaldehyde	<0.050	NA	NA	0.050
Acetaldehyde	**0.36**	NA	NA	0.050
Acetone	**2.6**	NA	NA	0.050
Acrolein	<0.050	NA	NA	0.050
Propionaldehyde	<0.050	NA	NA	0.050
Crotonaldehyde	<0.050	NA	NA	0.050
Butyraldehyde	<0.050	NA	NA	0.050
Benzaldehyde	<0.050	NA	NA	0.050
Isovaleraldehyde	<0.050	NA	NA	0.050
Valeraldehyde	<0.050	NA	NA	0.050
m-Tolualdehyde	<0.050	NA	NA	0.050
p-Tolualdehyde	<0.050	NA	NA	0.050
o-Tolualdehyde	<0.050	NA	NA	0.050
Hexanal	<0.050	NA	NA	0.050
2,5-Dimethylbenzaldehyde	<0.050	NA	NA	0.050

Sample ID: S16T018937 — Collected: 06/25/2016
Lab ID: 1618256002 — Sampling Location: CARTRIDGE EVALUATION — Received: 06/30/2016
Method: **EPA TO-11A** — Media: SKC 226-119, Silica Gel (2,4-Dinitrophenylhydrazine) — Analyzed: 07/07/2016
Sampling Parameter: **Air Volume Not Provided**

Analyte	Result (ug/sample)	Result (mg/m³)	Result (ppm)	RL (ug/sample)
Formaldehyde	**0.081**	NA	NA	0.050
Acetaldehyde	**1.1**	NA	NA	0.050

Results Continued on Next Page

ANALYTICAL REPORT

Workorder: 34-1618256
Client Project ID: CARTRIDGE EVALUATION
Purchase Order: 55502 Rel9
Project Manager: Rand Potter

Analytical Results

Sample ID: **S16T018937** Collected: 06/25/2016
Lab ID: 1618256002 Sampling Location: CARTRIDGE EVALUATION Received: 06/30/2016
Method: **EPA TO-11A** Media: SKC 226-119, Silica Gel (2,4-Dinitrophenylhydrazine) Analyzed: 07/07/2016
Sampling Parameter: **Air Volume Not Provided**

Analyte	Result (ug/sample)	Result (mg/m³)	Result (ppm)	RL (ug/sample)
Acetone	**9.3**	NA	NA	0.050
Acrolein	<0.050	NA	NA	0.050
Propionaldehyde	**0.18**	NA	NA	0.050
Crotonaldehyde	<0.050	NA	NA	0.050
Butyraldehyde	**0.33**	NA	NA	0.050
Benzaldehyde	<0.050	NA	NA	0.050
Isovaleraldehyde	<0.050	NA	NA	0.050
Valeraldehyde	<0.050	NA	NA	0.050
m-Tolualdehyde	<0.050	NA	NA	0.050
p-Tolualdehyde	<0.050	NA	NA	0.050
o-Tolualdehyde	<0.050	NA	NA	0.050
Hexanal	**0.17**	NA	NA	0.050
2,5-Dimethylbenzaldehyde	<0.050	NA	NA	0.050

Sample ID: **S16T018938** Collected: 06/25/2016
Lab ID: 1618256003 Sampling Location: CARTRIDGE EVALUATION Received: 06/30/2016
Method: **EPA TO-11A** Media: SKC 226-119, Silica Gel (2,4-Dinitrophenylhydrazine) Analyzed: 07/07/2016
Sampling Parameter: **Air Volume Not Provided**

Analyte	Result (ug/sample)	Result (mg/m³)	Result (ppm)	RL (ug/sample)
Formaldehyde	<0.050	NA	NA	0.050
Acetaldehyde	**0.41**	NA	NA	0.050
Acetone	**2.7**	NA	NA	0.050
Acrolein	<0.050	NA	NA	0.050
Propionaldehyde	<0.050	NA	NA	0.050
Crotonaldehyde	<0.050	NA	NA	0.050
Butyraldehyde	<0.050	NA	NA	0.050
Benzaldehyde	<0.050	NA	NA	0.050
Isovaleraldehyde	<0.050	NA	NA	0.050
Valeraldehyde	<0.050	NA	NA	0.050
m-Tolualdehyde	<0.050	NA	NA	0.050
p-Tolualdehyde	<0.050	NA	NA	0.050
o-Tolualdehyde	<0.050	NA	NA	0.050
Hexanal	<0.050	NA	NA	0.050
2,5-Dimethylbenzaldehyde	<0.050	NA	NA	0.050

ALS

ANALYTICAL REPORT

Workorder: 34-1618256
Client Project ID: CARTRIDGE EVALUATION
Purchase Order: 55502 Rel9
Project Manager: Rand Potter

Analytical Results

Sample ID: **S16T018939** Collected: 06/25/2016
Lab ID: 1618256004 Sampling Location: CARTRIDGE EVALUATION Received: 06/30/2016

Method: **EPA TO-11A** Media: SKC 226-119, Silica Gel (2,4-Dinitrophenylhydrazine) Analyzed: 07/07/2016
Sampling Parameter: **Air Volume Not Provided**

Analyte	Result (ug/sample)	Result (mg/m^3)	Result (ppm)	RL (ug/sample)
Formaldehyde	<0.050	NA	NA	0.050
Acetaldehyde	**0.35**	NA	NA	0.050
Acetone	**1.8**	NA	NA	0.050
Acrolein	<0.050	NA	NA	0.050
Propionaldehyde	<0.050	NA	NA	0.050
Crotonaldehyde	<0.050	NA	NA	0.050
Butyraldehyde	<0.050	NA	NA	0.050
Benzaldehyde	<0.050	NA	NA	0.050
Isovaleraldehyde	<0.050	NA	NA	0.050
Valeraldehyde	<0.050	NA	NA	0.050
m-Tolualdehyde	<0.050	NA	NA	0.050
p-Tolualdehyde	<0.050	NA	NA	0.050
o-Tolualdehyde	<0.050	NA	NA	0.050
Hexanal	<0.050	NA	NA	0.050
2,5-Dimethylbenzaldehyde	<0.050	NA	NA	0.050

Sample ID: **S16T018940** Collected: 06/24/2016
Lab ID: 1618256005 Sampling Location: CARTRIDGE EVALUATION Received: 06/30/2016

Method: **EPA TO-11A** Media: SKC 226-119, Silica Gel (2,4-Dinitrophenylhydrazine) Analyzed: 07/07/2016
Sampling Parameter: **Air Volume Not Provided**

Analyte	Result (ug/sample)	Result (mg/m^3)	Result (ppm)	RL (ug/sample)
Formaldehyde	**0.11**	NA	NA	0.050
Acetaldehyde	**0.52**	NA	NA	0.050
Acetone	**0.10**	NA	NA	0.050
Acrolein	<0.050	NA	NA	0.050
Propionaldehyde	<0.050	NA	NA	0.050
Crotonaldehyde	<0.050	NA	NA	0.050
Butyraldehyde	<0.050	NA	NA	0.050
Benzaldehyde	<0.050	NA	NA	0.050
Isovaleraldehyde	<0.050	NA	NA	0.050
Valeraldehyde	<0.050	NA	NA	0.050
m-Tolualdehyde	<0.050	NA	NA	0.050
p-Tolualdehyde	<0.050	NA	NA	0.050
o-Tolualdehyde	<0.050	NA	NA	0.050
Hexanal	<0.050	NA	NA	0.050

Results Continued on Next Page

ANALYTICAL REPORT

Workorder: 34-1618256
Client Project ID: CARTRIDGE EVALUATION
Purchase Order: 55502 Rel9
Project Manager: Rand Potter

Analytical Results

Sample ID: **S16T018940** Collected: 06/24/2016
Lab ID: 1618256005 Sampling Location: CARTRIDGE EVALUATION Received: 06/30/2016
Method: **EPA TO-11A** Media: SKC 226-119, Silica Gel (2,4-Dinitrophenylhydrazine) Analyzed: 07/07/2016
Sampling Parameter: **Air Volume Not Provided**

Analyte	Result (ug/sample)	Result (mg/m³)	Result (ppm)	RL (ug/sample)
2,5-Dimethylbenzaldehyde	<0.050	NA	NA	0.050

Sample ID: **S16T018941** Collected: 06/24/2016
Lab ID: 1618256006 Sampling Location: CARTRIDGE EVALUATION Received: 06/30/2016
Method: **EPA TO-11A** Media: SKC 226-119, Silica Gel (2,4-Dinitrophenylhydrazine) Analyzed: 07/07/2016
Sampling Parameter: **Air Volume Not Provided**

Analyte	Result (ug/sample)	Result (mg/m³)	Result (ppm)	RL (ug/sample)
Formaldehyde	<0.050	NA	NA	0.050
Acetaldehyde	**0.23**	NA	NA	0.050
Acetone	**0.64**	NA	NA	0.050
Acrolein	<0.050	NA	NA	0.050
Propionaldehyde	<0.050	NA	NA	0.050
Crotonaldehyde	<0.050	NA	NA	0.050
Butyraldehyde	<0.050	NA	NA	0.050
Benzaldehyde	<0.050	NA	NA	0.050
Isovaleraldehyde	<0.050	NA	NA	0.050
Valeraldehyde	<0.050	NA	NA	0.050
m-Tolualdehyde	<0.050	NA	NA	0.050
p-Tolualdehyde	<0.050	NA	NA	0.050
o-Tolualdehyde	<0.050	NA	NA	0.050
Hexanal	<0.050	NA	NA	0.050
2,5-Dimethylbenzaldehyde	<0.050	NA	NA	0.050

Sample ID: **S16T018942** Collected: 06/24/2016
Lab ID: 1618256007 Sampling Location: CARTRIDGE EVALUATION Received: 06/30/2016
Method: **EPA TO-11A** Media: SKC 226-119, Silica Gel (2,4-Dinitrophenylhydrazine) Analyzed: 07/07/2016
Sampling Parameter: **Air Volume Not Provided**

Analyte	Result (ug/sample)	Result (mg/m³)	Result (ppm)	RL (ug/sample)
Formaldehyde	**0.11**	NA	NA	0.050
Acetaldehyde	**0.67**	NA	NA	0.050
Acetone	**0.44**	NA	NA	0.050
Acrolein	<0.050	NA	NA	0.050
Propionaldehyde	<0.050	NA	NA	0.050

Results Continued on Next Page

ANALYTICAL REPORT

Workorder: 34-1618256
Client Project ID: CARTRIDGE EVALUATION
Purchase Order: 55502 Rel9
Project Manager: Rand Potter

Analytical Results

Sample ID: **S16T018942** Collected: 06/24/2016
Lab ID: 1618256007 Sampling Location: CARTRIDGE EVALUATION Received: 06/30/2016
Method: **EPA TO-11A** Media: SKC 226-119, Silica Gel (2,4-Dinitrophenylhydrazine) Analyzed: 07/07/2016
Sampling Parameter: **Air Volume Not Provided**

Analyte	Result (ug/sample)	Result (mg/m^3)	Result (ppm)	RL (ug/sample)
Crotonaldehyde	<0.050	NA	NA	0.050
Butyraldehyde	<0.050	NA	NA	0.050
Benzaldehyde	<0.050	NA	NA	0.050
Isovaleraldehyde	<0.050	NA	NA	0.050
Valeraldehyde	<0.050	NA	NA	0.050
m-Tolualdehyde	<0.050	NA	NA	0.050
p-Tolualdehyde	<0.050	NA	NA	0.050
o-Tolualdehyde	<0.050	NA	NA	0.050
Hexanal	<0.050	NA	NA	0.050
2,5-Dimethylbenzaldehyde	<0.050	NA	NA	0.050

Sample ID: **S16T018943** Collected: 06/24/2016
Lab ID: 1618256008 Sampling Location: CARTRIDGE EVALUATION Received: 06/30/2016
Method: **EPA TO-11A** Media: SKC 226-119, Silica Gel (2,4-Dinitrophenylhydrazine) Analyzed: 07/07/2016
Sampling Parameter: **Air Volume Not Provided**

Analyte	Result (ug/sample)	Result (mg/m^3)	Result (ppm)	RL (ug/sample)
Formaldehyde	**0.12**	NA	NA	0.050
Acetaldehyde	**0.57**	NA	NA	0.050
Acetone	**0.15**	NA	NA	0.050
Acrolein	<0.050	NA	NA	0.050
Propionaldehyde	<0.050	NA	NA	0.050
Crotonaldehyde	<0.050	NA	NA	0.050
Butyraldehyde	<0.050	NA	NA	0.050
Benzaldehyde	<0.050	NA	NA	0.050
Isovaleraldehyde	<0.050	NA	NA	0.050
Valeraldehyde	<0.050	NA	NA	0.050
m-Tolualdehyde	<0.050	NA	NA	0.050
p-Tolualdehyde	<0.050	NA	NA	0.050
o-Tolualdehyde	<0.050	NA	NA	0.050
Hexanal	<0.050	NA	NA	0.050
2,5-Dimethylbenzaldehyde	<0.050	NA	NA	0.050

ANALYTICAL REPORT

Workorder: 34-1618256
Client Project ID: CARTRIDGE EVALUATION
Purchase Order: 55502 Rel9
Project Manager: Rand Potter

Analytical Results

Sample ID: **S16T018944** Collected: 06/24/2016
Lab ID: 1618256009 Sampling Location: CARTRIDGE EVALUATION Received: 06/30/2016

Method: **EPA TO-11A** Media: SKC 226-119, Silica Gel (2,4-Dinitrophenylhydrazine) Analyzed: 07/07/2016
Sampling Parameter: **Air Volume Not Provided**

Analyte	Result (ug/sample)	Result (mg/m^3)	Result (ppm)	RL (ug/sample)
Formaldehyde	**0.14**	NA	NA	0.050
Acetaldehyde	**0.56**	NA	NA	0.050
Acetone	**0.34**	NA	NA	0.050
Acrolein	<0.050	NA	NA	0.050
Propionaldehyde	<0.050	NA	NA	0.050
Crotonaldehyde	<0.050	NA	NA	0.050
Butyraldehyde	<0.050	NA	NA	0.050
Benzaldehyde	<0.050	NA	NA	0.050
Isovaleraldehyde	<0.050	NA	NA	0.050
Valeraldehyde	<0.050	NA	NA	0.050
m-Tolualdehyde	<0.050	NA	NA	0.050
p-Tolualdehyde	<0.050	NA	NA	0.050
o-Tolualdehyde	<0.050	NA	NA	0.050
Hexanal	<0.050	NA	NA	0.050
2,5-Dimethylbenzaldehyde	<0.050	NA	NA	0.050

Sample ID: **S16T018945** Collected: 06/24/2016
Lab ID: 1618256010 Sampling Location: CARTRIDGE EVALUATION Received: 06/30/2016

Method: **EPA TO-11A** Media: SKC 226-119, Silica Gel (2,4-Dinitrophenylhydrazine) Analyzed: 07/07/2016
Sampling Parameter: **Air Volume Not Provided**

Analyte	Result (ug/sample)	Result (mg/m^3)	Result (ppm)	RL (ug/sample)
Formaldehyde	**0.33**	NA	NA	0.050
Acetaldehyde	**1.0**	NA	NA	0.050
Acetone	**5.9**	NA	NA	0.050
Acrolein	<0.050	NA	NA	0.050
Propionaldehyde	**0.16**	NA	NA	0.050
Crotonaldehyde	<0.050	NA	NA	0.050
Butyraldehyde	**0.21**	NA	NA	0.050
Benzaldehyde	<0.050	NA	NA	0.050
Isovaleraldehyde	<0.050	NA	NA	0.050
Valeraldehyde	<0.050	NA	NA	0.050
m-Tolualdehyde	<0.050	NA	NA	0.050
p-Tolualdehyde	<0.050	NA	NA	0.050
o-Tolualdehyde	<0.050	NA	NA	0.050
Hexanal	**0.24**	NA	NA	0.050

Results Continued on Next Page

ANALYTICAL REPORT

Workorder: 34-1618256
Client Project ID: CARTRIDGE EVALUATION
Purchase Order: 55502 Rel9
Project Manager: Rand Potter

Analytical Results

Sample ID: **S16T018945** Collected: 06/24/2016
Lab ID: 1618256010 Sampling Location: CARTRIDGE EVALUATION Received: 06/30/2016
Method: **EPA TO-11A** Media: SKC 226-119, Silica Gel (2,4-Dinitrophenylhydrazine) Analyzed: 07/07/2016
Sampling Parameter: **Air Volume Not Provided**

Analyte	Result (ug/sample)	Result (mg/m³)	Result (ppm)	RL (ug/sample)
2,5-Dimethylbenzaldehyde	<0.050	NA	NA	0.050

Sample ID: **S16T018946** Collected: 06/24/2016
Lab ID: 1618256011 Sampling Location: CARTRIDGE EVALUATION Received: 06/30/2016
Method: **EPA TO-11A** Media: SKC 226-119, Silica Gel (2,4-Dinitrophenylhydrazine) Analyzed: 07/07/2016
Sampling Parameter: **Air Volume Not Provided**

Analyte	Result (ug/sample)	Result (mg/m³)	Result (ppm)	RL (ug/sample)
Formaldehyde	<0.050	NA	NA	0.050
Acetaldehyde	**0.090**	NA	NA	0.050
Acetone	**0.46**	NA	NA	0.050
Acrolein	<0.050	NA	NA	0.050
Propionaldehyde	<0.050	NA	NA	0.050
Crotonaldehyde	<0.050	NA	NA	0.050
Butyraldehyde	<0.050	NA	NA	0.050
Benzaldehyde	<0.050	NA	NA	0.050
Isovaleraldehyde	<0.050	NA	NA	0.050
Valeraldehyde	<0.050	NA	NA	0.050
m-Tolualdehyde	<0.050	NA	NA	0.050
p-Tolualdehyde	<0.050	NA	NA	0.050
o-Tolualdehyde	<0.050	NA	NA	0.050
Hexanal	<0.050	NA	NA	0.050
2,5-Dimethylbenzaldehyde	<0.050	NA	NA	0.050

Sample ID: **S16T018947** Collected: 06/24/2016
Lab ID: 1618256012 Sampling Location: CARTRIDGE EVALUATION Received: 06/30/2016
Method: **EPA TO-11A** Media: SKC 226-119, Silica Gel (2,4-Dinitrophenylhydrazine) Analyzed: 07/07/2016
Sampling Parameter: **Air Volume Not Provided**

Analyte	Result (ug/sample)	Result (mg/m³)	Result (ppm)	RL (ug/sample)
Formaldehyde	**0.11**	NA	NA	0.050
Acetaldehyde	**0.11**	NA	NA	0.050
Acetone	**0.66**	NA	NA	0.050
Acrolein	<0.050	NA	NA	0.050
Propionaldehyde	<0.050	NA	NA	0.050

Results Continued on Next Page

ANALYTICAL REPORT

Workorder: 34-1618256
Client Project ID: CARTRIDGE EVALUATION
Purchase Order: 55502 Rel9
Project Manager: Rand Potter

Analytical Results

Sample ID: **S16T018947** Collected: 06/24/2016
Lab ID: 1618256012 Sampling Location: CARTRIDGE EVALUATION Received: 06/30/2016
Method: **EPA TO-11A** Media: SKC 226-119, Silica Gel (2,4-Dinitrophenylhydrazine) Analyzed: 07/07/2016
Sampling Parameter: **Air Volume Not Provided**

Analyte	Result (ug/sample)	Result (mg/m³)	Result (ppm)	RL (ug/sample)
Crotonaldehyde	<0.050	NA	NA	0.050
Butyraldehyde	<0.050	NA	NA	0.050
Benzaldehyde	<0.050	NA	NA	0.050
Isovaleraldehyde	<0.050	NA	NA	0.050
Valeraldehyde	<0.050	NA	NA	0.050
m-Tolualdehyde	<0.050	NA	NA	0.050
p-Tolualdehyde	<0.050	NA	NA	0.050
o-Tolualdehyde	<0.050	NA	NA	0.050
Hexanal	**0.50**	NA	NA	0.050
2,5-Dimethylbenzaldehyde	<0.050	NA	NA	0.050

Sample ID: **S16T018948** Collected: 06/24/2016
Lab ID: 1618256013 Sampling Location: CARTRIDGE EVALUATION Received: 06/30/2016
Method: **EPA TO-11A** Media: SKC 226-119, Silica Gel (2,4-Dinitrophenylhydrazine) Analyzed: 07/07/2016
Sampling Parameter: **Air Volume Not Provided**

Analyte	Result (ug/sample)	Result (mg/m³)	Result (ppm)	RL (ug/sample)
Formaldehyde	<0.050	NA	NA	0.050
Acetaldehyde	<0.050	NA	NA	0.050
Acetone	<0.050	NA	NA	0.050
Acrolein	<0.050	NA	NA	0.050
Propionaldehyde	<0.050	NA	NA	0.050
Crotonaldehyde	<0.050	NA	NA	0.050
Butyraldehyde	<0.050	NA	NA	0.050
Benzaldehyde	<0.050	NA	NA	0.050
Isovaleraldehyde	<0.050	NA	NA	0.050
Valeraldehyde	<0.050	NA	NA	0.050
m-Tolualdehyde	<0.050	NA	NA	0.050
p-Tolualdehyde	<0.050	NA	NA	0.050
o-Tolualdehyde	<0.050	NA	NA	0.050
Hexanal	<0.050	NA	NA	0.050
2,5-Dimethylbenzaldehyde	<0.050	NA	NA	0.050

ANALYTICAL REPORT

Workorder: 34-1618256
Client Project ID: CARTRIDGE EVALUATION
Purchase Order: 55502 Rel9
Project Manager: Rand Potter

Analytical Results

Sample ID: **S16T018949** Collected: 06/26/2016
Lab ID: 1618256014 Sampling Location: CARTRIDGE EVALUATION Received: 06/30/2016
Method: **EPA TO-11A** Media: SKC 226-119, Silica Gel (2,4-Dinitrophenylhydrazine) Analyzed: 07/07/2016
Sampling Parameter: **Air Volume Not Provided**

Analyte	Result (ug/sample)	Result (mg/m^3)	Result (ppm)	RL (ug/sample)
Formaldehyde	**0.096**	NA	NA	0.050
Acetaldehyde	**0.41**	NA	NA	0.050
Acetone	**1.3**	NA	NA	0.050
Acrolein	<0.050	NA	NA	0.050
Propionaldehyde	<0.050	NA	NA	0.050
Crotonaldehyde	<0.050	NA	NA	0.050
Butyraldehyde	<0.050	NA	NA	0.050
Benzaldehyde	<0.050	NA	NA	0.050
Isovaleraldehyde	<0.050	NA	NA	0.050
Valeraldehyde	<0.050	NA	NA	0.050
m-Tolualdehyde	<0.050	NA	NA	0.050
p-Tolualdehyde	<0.050	NA	NA	0.050
o-Tolualdehyde	<0.050	NA	NA	0.050
Hexanal	<0.050	NA	NA	0.050
2,5-Dimethylbenzaldehyde	<0.050	NA	NA	0.050

Sample ID: **S16T018950** Collected: 06/26/2016
Lab ID: 1618256015 Sampling Location: CARTRIDGE EVALUATION Received: 06/30/2016
Method: **EPA TO-11A** Media: SKC 226-119, Silica Gel (2,4-Dinitrophenylhydrazine) Analyzed: 07/07/2016
Sampling Parameter: **Air Volume Not Provided**

Analyte	Result (ug/sample)	Result (mg/m^3)	Result (ppm)	RL (ug/sample)
Formaldehyde	**0.13**	NA	NA	0.050
Acetaldehyde	**0.97**	NA	NA	0.050
Acetone	**6.1**	NA	NA	0.050
Acrolein	<0.050	NA	NA	0.050
Propionaldehyde	**0.16**	NA	NA	0.050
Crotonaldehyde	<0.050	NA	NA	0.050
Butyraldehyde	**0.23**	NA	NA	0.050
Benzaldehyde	<0.050	NA	NA	0.050
Isovaleraldehyde	<0.050	NA	NA	0.050
Valeraldehyde	<0.050	NA	NA	0.050
m-Tolualdehyde	<0.050	NA	NA	0.050
p-Tolualdehyde	<0.050	NA	NA	0.050
o-Tolualdehyde	<0.050	NA	NA	0.050
Hexanal	**0.20**	NA	NA	0.050

Results Continued on Next Page

ANALYTICAL REPORT

Workorder: 34-1618256
Client Project ID: CARTRIDGE EVALUATION
Purchase Order: 55502 Rel9
Project Manager: Rand Potter

Analytical Results

Sample ID: **S16T018950** Collected: 06/26/2016
Lab ID: 1618256015 Sampling Location: CARTRIDGE EVALUATION Received: 06/30/2016
Method: **EPA TO-11A** Media: SKC 226-119, Silica Gel (2,4-Dinitrophenylhydrazine) Analyzed: 07/07/2016
Sampling Parameter: **Air Volume Not Provided**

Analyte	Result (ug/sample)	Result (mg/m³)	Result (ppm)	RL (ug/sample)
2,5-Dimethylbenzaldehyde	<0.050	NA	NA	0.050

Sample ID: **S16T018951** Collected: 06/26/2016
Lab ID: 1618256016 Sampling Location: CARTRIDGE EVALUATION Received: 06/30/2016
Method: **EPA TO-11A** Media: SKC 226-119, Silica Gel (2,4-Dinitrophenylhydrazine) Analyzed: 07/07/2016
Sampling Parameter: **Air Volume Not Provided**

Analyte	Result (ug/sample)	Result (mg/m³)	Result (ppm)	RL (ug/sample)
Formaldehyde	<0.050	NA	NA	0.050
Acetaldehyde	**0.46**	NA	NA	0.050
Acetone	**0.62**	NA	NA	0.050
Acrolein	<0.050	NA	NA	0.050
Propionaldehyde	<0.050	NA	NA	0.050
Crotonaldehyde	<0.050	NA	NA	0.050
Butyraldehyde	<0.050	NA	NA	0.050
Benzaldehyde	<0.050	NA	NA	0.050
Isovaleraldehyde	<0.050	NA	NA	0.050
Valeraldehyde	<0.050	NA	NA	0.050
m-Tolualdehyde	<0.050	NA	NA	0.050
p-Tolualdehyde	<0.050	NA	NA	0.050
o-Tolualdehyde	<0.050	NA	NA	0.050
Hexanal	<0.050	NA	NA	0.050
2,5-Dimethylbenzaldehyde	<0.050	NA	NA	0.050

Sample ID: **S16T018952** Collected: 06/25/2016
Lab ID: 1618256017 Sampling Location: CARTRIDGE EVALUATION Received: 06/30/2016
Method: **EPA TO-11A** Media: SKC 226-119, Silica Gel (2,4-Dinitrophenylhydrazine) Analyzed: 07/07/2016
Sampling Parameter: **Air Volume Not Provided**

Analyte	Result (ug/sample)	Result (mg/m³)	Result (ppm)	RL (ug/sample)
Formaldehyde	**0.092**	NA	NA	0.050
Acetaldehyde	**0.40**	NA	NA	0.050
Acetone	**0.25**	NA	NA	0.050
Acrolein	<0.050	NA	NA	0.050
Propionaldehyde	<0.050	NA	NA	0.050

Results Continued on Next Page

ANALYTICAL REPORT

Workorder: 34-1618256
Client Project ID: CARTRIDGE EVALUATION
Purchase Order: 55502 Rel9
Project Manager: Rand Potter

Analytical Results

Sample ID: S16T018952 — Collected: 06/25/2016
Lab ID: 1618256017 — Sampling Location: CARTRIDGE EVALUATION — Received: 06/30/2016
Method: **EPA TO-11A** — Media: SKC 226-119, Silica Gel (2,4-Dinitrophenylhydrazine) — Analyzed: 07/07/2016
Sampling Parameter: **Air Volume Not Provided**

Analyte	Result (ug/sample)	Result (mg/m³)	Result (ppm)	RL (ug/sample)
Crotonaldehyde	<0.050	NA	NA	0.050
Butyraldehyde	<0.050	NA	NA	0.050
Benzaldehyde	<0.050	NA	NA	0.050
Isovaleraldehyde	<0.050	NA	NA	0.050
Valeraldehyde	<0.050	NA	NA	0.050
m-Tolualdehyde	<0.050	NA	NA	0.050
p-Tolualdehyde	<0.050	NA	NA	0.050
o-Tolualdehyde	<0.050	NA	NA	0.050
Hexanal	<0.050	NA	NA	0.050
2,5-Dimethylbenzaldehyde	<0.050	NA	NA	0.050

Sample ID: S16T018953 — Collected: 06/25/2016
Lab ID: 1618256018 — Sampling Location: CARTRIDGE EVALUATION — Received: 06/30/2016
Method: **EPA TO-11A** — Media: SKC 226-119, Silica Gel (2,4-Dinitrophenylhydrazine) — Analyzed: 07/07/2016
Sampling Parameter: **Air Volume Not Provided**

Analyte	Result (ug/sample)	Result (mg/m³)	Result (ppm)	RL (ug/sample)
Formaldehyde	**0.061**	NA	NA	0.050
Acetaldehyde	**0.45**	NA	NA	0.050
Acetone	**1.4**	NA	NA	0.050
Acrolein	<0.050	NA	NA	0.050
Propionaldehyde	<0.050	NA	NA	0.050
Crotonaldehyde	<0.050	NA	NA	0.050
Butyraldehyde	<0.050	NA	NA	0.050
Benzaldehyde	<0.050	NA	NA	0.050
Isovaleraldehyde	<0.050	NA	NA	0.050
Valeraldehyde	<0.050	NA	NA	0.050
m-Tolualdehyde	<0.050	NA	NA	0.050
p-Tolualdehyde	<0.050	NA	NA	0.050
o-Tolualdehyde	<0.050	NA	NA	0.050
Hexanal	<0.050	NA	NA	0.050
2,5-Dimethylbenzaldehyde	<0.050	NA	NA	0.050

ANALYTICAL REPORT

Workorder: 34-1618256
Client Project ID: CARTRIDGE EVALUATION
Purchase Order: 55502 Rel9
Project Manager: Rand Potter

Analytical Results

Sample ID: **S16T018954** Collected: 06/25/2016
Lab ID: 1618256019 Sampling Location: CARTRIDGE EVALUATION Received: 06/30/2016

Method: **EPA TO-11A** Media: SKC 226-119, Silica Gel (2,4-Dinitrophenylhydrazine) Analyzed: 07/07/2016
Sampling Parameter: **Air Volume Not Provided**

Analyte	Result (ug/sample)	Result (mg/m^3)	Result (ppm)	RL (ug/sample)
Formaldehyde	**0.11**	NA	NA	0.050
Acetaldehyde	**0.54**	NA	NA	0.050
Acetone	**0.57**	NA	NA	0.050
Acrolein	<0.050	NA	NA	0.050
Propionaldehyde	<0.050	NA	NA	0.050
Crotonaldehyde	<0.050	NA	NA	0.050
Butyraldehyde	<0.050	NA	NA	0.050
Benzaldehyde	<0.050	NA	NA	0.050
Isovaleraldehyde	<0.050	NA	NA	0.050
Valeraldehyde	<0.050	NA	NA	0.050
m-Tolualdehyde	<0.050	NA	NA	0.050
p-Tolualdehyde	<0.050	NA	NA	0.050
o-Tolualdehyde	<0.050	NA	NA	0.050
Hexanal	<0.050	NA	NA	0.050
2,5-Dimethylbenzaldehyde	<0.050	NA	NA	0.050

Sample ID: **S16T018955** Collected: 06/25/2016
Lab ID: 1618256020 Sampling Location: CARTRIDGE EVALUATION Received: 06/30/2016

Method: **EPA TO-11A** Media: SKC 226-119, Silica Gel (2,4-Dinitrophenylhydrazine) Analyzed: 07/07/2016
Sampling Parameter: **Air Volume Not Provided**

Analyte	Result (ug/sample)	Result (mg/m^3)	Result (ppm)	RL (ug/sample)
Formaldehyde	**0.13**	NA	NA	0.050
Acetaldehyde	**0.51**	NA	NA	0.050
Acetone	**0.28**	NA	NA	0.050
Acrolein	<0.050	NA	NA	0.050
Propionaldehyde	<0.050	NA	NA	0.050
Crotonaldehyde	<0.050	NA	NA	0.050
Butyraldehyde	<0.050	NA	NA	0.050
Benzaldehyde	<0.050	NA	NA	0.050
Isovaleraldehyde	<0.050	NA	NA	0.050
Valeraldehyde	<0.050	NA	NA	0.050
m-Tolualdehyde	<0.050	NA	NA	0.050
p-Tolualdehyde	<0.050	NA	NA	0.050
o-Tolualdehyde	<0.050	NA	NA	0.050
Hexanal	<0.050	NA	NA	0.050

Results Continued on Next Page

ANALYTICAL REPORT

Workorder: 34-1618256
Client Project ID: CARTRIDGE EVALUATION
Purchase Order: 55502 Rel9
Project Manager: Rand Potter

Analytical Results

Sample ID: **S16T018955** Collected: 06/25/2016
Lab ID: 1618256020 Sampling Location: CARTRIDGE EVALUATION Received: 06/30/2016
Method: **EPA TO-11A** Media: SKC 226-119, Silica Gel (2,4-Dinitrophenylhydrazine) Analyzed: 07/07/2016
Sampling Parameter: **Air Volume Not Provided**

Analyte	Result (ug/sample)	Result (mg/m³)	Result (ppm)	RL (ug/sample)
2,5-Dimethylbenzaldehyde	<0.050	NA	NA	0.050

Sample ID: **S16T018956** Collected: 06/25/2016
Lab ID: 1618256021 Sampling Location: CARTRIDGE EVALUATION Received: 06/30/2016
Method: **EPA TO-11A** Media: SKC 226-119, Silica Gel (2,4-Dinitrophenylhydrazine) Analyzed: 07/06/2016
Sampling Parameter: **Air Volume Not Provided**

Analyte	Result (ug/sample)	Result (mg/m³)	Result (ppm)	RL (ug/sample)
Formaldehyde	**0.10**	NA	NA	0.050
Acetaldehyde	**0.31**	NA	NA	0.050
Acetone	**0.064**	NA	NA	0.050
Acrolein	<0.050	NA	NA	0.050
Propionaldehyde	<0.050	NA	NA	0.050
Crotonaldehyde	<0.050	NA	NA	0.050
Butyraldehyde	<0.050	NA	NA	0.050
Benzaldehyde	<0.050	NA	NA	0.050
Isovaleraldehyde	<0.050	NA	NA	0.050
Valeraldehyde	<0.050	NA	NA	0.050
m-Tolualdehyde	<0.050	NA	NA	0.050
p-Tolualdehyde	<0.050	NA	NA	0.050
o-Tolualdehyde	<0.050	NA	NA	0.050
Hexanal	<0.050	NA	NA	0.050
2,5-Dimethylbenzaldehyde	<0.050	NA	NA	0.050

Sample ID: **S16T018957** Collected: 06/25/2016
Lab ID: 1618256022 Sampling Location: CARTRIDGE EVALUATION Received: 06/30/2016
Method: **EPA TO-11A** Media: SKC 226-119, Silica Gel (2,4-Dinitrophenylhydrazine) Analyzed: 07/06/2016
Sampling Parameter: **Air Volume Not Provided**

Analyte	Result (ug/sample)	Result (mg/m³)	Result (ppm)	RL (ug/sample)
Formaldehyde	**0.50**	NA	NA	0.050
Acetaldehyde	**1.1**	NA	NA	0.050
Acetone	**2.8**	NA	NA	0.050
Acrolein	<0.050	NA	NA	0.050
Propionaldehyde	**0.20**	NA	NA	0.050

Results Continued on Next Page

ANALYTICAL REPORT

Workorder: 34-1618256
Client Project ID: CARTRIDGE EVALUATION
Purchase Order: 55502 Rel9
Project Manager: Rand Potter

Analytical Results

Sample ID: **S16T018957** Collected: 06/25/2016
Lab ID: 1618256022 Sampling Location: CARTRIDGE EVALUATION Received: 06/30/2016
Method: **EPA TO-11A** Media: SKC 226-119, Silica Gel (2,4-Dinitrophenylhydrazine) Analyzed: 07/06/2016
Sampling Parameter: **Air Volume Not Provided**

Analyte	Result (ug/sample)	Result (mg/m^3)	Result (ppm)	RL (ug/sample)
Crotonaldehyde	<0.050	NA	NA	0.050
Butyraldehyde	**0.25**	NA	NA	0.050
Benzaldehyde	<0.050	NA	NA	0.050
Isovaleraldehyde	<0.050	NA	NA	0.050
Valeraldehyde	**0.066**	NA	NA	0.050
m-Tolualdehyde	<0.050	NA	NA	0.050
p-Tolualdehyde	<0.050	NA	NA	0.050
o-Tolualdehyde	<0.050	NA	NA	0.050
Hexanal	**0.50**	NA	NA	0.050
2,5-Dimethylbenzaldehyde	<0.050	NA	NA	0.050

Sample ID: **S16T018958** Collected: 06/25/2016
Lab ID: 1618256023 Sampling Location: CARTRIDGE EVALUATION Received: 06/30/2016
Method: **EPA TO-11A** Media: SKC 226-119, Silica Gel (2,4-Dinitrophenylhydrazine) Analyzed: 07/06/2016
Sampling Parameter: **Air Volume Not Provided**

Analyte	Result (ug/sample)	Result (mg/m^3)	Result (ppm)	RL (ug/sample)
Formaldehyde	**0.29**	NA	NA	0.050
Acetaldehyde	**0.46**	NA	NA	0.050
Acetone	**0.64**	NA	NA	0.050
Acrolein	<0.050	NA	NA	0.050
Propionaldehyde	**0.20**	NA	NA	0.050
Crotonaldehyde	<0.050	NA	NA	0.050
Butyraldehyde	**0.080**	NA	NA	0.050
Benzaldehyde	<0.050	NA	NA	0.050
Isovaleraldehyde	<0.050	NA	NA	0.050
Valeraldehyde	**0.092**	NA	NA	0.050
m-Tolualdehyde	<0.050	NA	NA	0.050
p-Tolualdehyde	<0.050	NA	NA	0.050
o-Tolualdehyde	<0.050	NA	NA	0.050
Hexanal	**0.13**	NA	NA	0.050
2,5-Dimethylbenzaldehyde	<0.050	NA	NA	0.050

ANALYTICAL REPORT

Workorder: 34-1618256
Client Project ID: CARTRIDGE EVALUATION
Purchase Order: 55502 Rel9
Project Manager: Rand Potter

Analytical Results

Sample ID: **S16T018959** Collected: 06/25/2016
Lab ID: 1618256024 Sampling Location: CARTRIDGE EVALUATION Received: 06/30/2016

Method: **EPA TO-11A** Media: SKC 226-119, Silica Gel (2,4-Dinitrophenylhydrazine) Analyzed: 07/06/2016
Sampling Parameter: **Air Volume Not Provided**

Analyte	Result (ug/sample)	Result (mg/m^3)	Result (ppm)	RL (ug/sample)
Formaldehyde	<0.050	NA	NA	0.050
Acetaldehyde	**0.12**	NA	NA	0.050
Acetone	**0.064**	NA	NA	0.050
Acrolein	<0.050	NA	NA	0.050
Propionaldehyde	<0.050	NA	NA	0.050
Crotonaldehyde	<0.050	NA	NA	0.050
Butyraldehyde	<0.050	NA	NA	0.050
Benzaldehyde	<0.050	NA	NA	0.050
Isovaleraldehyde	<0.050	NA	NA	0.050
Valeraldehyde	<0.050	NA	NA	0.050
m-Tolualdehyde	<0.050	NA	NA	0.050
p-Tolualdehyde	<0.050	NA	NA	0.050
o-Tolualdehyde	<0.050	NA	NA	0.050
Hexanal	<0.050	NA	NA	0.050
2,5-Dimethylbenzaldehyde	<0.050	NA	NA	0.050

Sample ID: **S16T018960** Collected: 06/25/2016
Lab ID: 1618256025 Sampling Location: CARTRIDGE EVALUATION Received: 06/30/2016

Method: **EPA TO-11A** Media: SKC 226-119, Silica Gel (2,4-Dinitrophenylhydrazine) Analyzed: 07/06/2016
Sampling Parameter: **Air Volume Not Provided**

Analyte	Result (ug/sample)	Result (mg/m^3)	Result (ppm)	RL (ug/sample)
Formaldehyde	**0.11**	NA	NA	0.050
Acetaldehyde	**0.16**	NA	NA	0.050
Acetone	**0.45**	NA	NA	0.050
Acrolein	<0.050	NA	NA	0.050
Propionaldehyde	<0.050	NA	NA	0.050
Crotonaldehyde	<0.050	NA	NA	0.050
Butyraldehyde	<0.050	NA	NA	0.050
Benzaldehyde	<0.050	NA	NA	0.050
Isovaleraldehyde	<0.050	NA	NA	0.050
Valeraldehyde	<0.050	NA	NA	0.050
m-Tolualdehyde	<0.050	NA	NA	0.050
p-Tolualdehyde	<0.050	NA	NA	0.050
o-Tolualdehyde	<0.050	NA	NA	0.050
Hexanal	**0.36**	NA	NA	0.050

Results Continued on Next Page

ANALYTICAL REPORT

Workorder: 34-1618256
Client Project ID: CARTRIDGE EVALUATION
Purchase Order: 55502 Rel9
Project Manager: Rand Potter

Analytical Results

Sample ID: **S16T018960**			Collected: 06/25/2016
Lab ID: 1618256025	Sampling Location: CARTRIDGE EVALUATION		Received: 06/30/2016
Method: **EPA TO-11A**	Media: SKC 226-119, Silica Gel (2,4-Dinitrophenylhydrazine)		Analyzed: 07/06/2016
	Sampling Parameter: **Air Volume Not Provided**		

Analyte	Result (ug/sample)	Result (mg/m³)	Result (ppm)	RL (ug/sample)
2,5-Dimethylbenzaldehyde	<0.050	NA	NA	0.050

Sample ID: **S16T018961**			Collected: 06/25/2016
Lab ID: 1618256026	Sampling Location: CARTRIDGE EVALUATION		Received: 06/30/2016
Method: **EPA TO-11A**	Media: SKC 226-119, Silica Gel (2,4-Dinitrophenylhydrazine)		Analyzed: 07/06/2016
	Sampling Parameter: **Air Volume Not Provided**		

Analyte	Result (ug/sample)	Result (mg/m³)	Result (ppm)	RL (ug/sample)
Formaldehyde	<0.050	NA	NA	0.050
Acetaldehyde	<0.050	NA	NA	0.050
Acetone	<0.050	NA	NA	0.050
Acrolein	<0.050	NA	NA	0.050
Propionaldehyde	<0.050	NA	NA	0.050
Crotonaldehyde	<0.050	NA	NA	0.050
Butyraldehyde	<0.050	NA	NA	0.050
Benzaldehyde	<0.050	NA	NA	0.050
Isovaleraldehyde	<0.050	NA	NA	0.050
Valeraldehyde	<0.050	NA	NA	0.050
m-Tolualdehyde	<0.050	NA	NA	0.050
p-Tolualdehyde	<0.050	NA	NA	0.050
o-Tolualdehyde	<0.050	NA	NA	0.050
Hexanal	<0.050	NA	NA	0.050
2,5-Dimethylbenzaldehyde	<0.050	NA	NA	0.050

Comments

Quality Control: **EPA TO-11A - (HBN: 172200)**

LMB used to media correct LCS/LCSD and field samples for Acetone only.

Quality Control: **EPA TO-11A - (HBN: 172268)**

LMB used to media correct LCS/LCSD and field samples for Acetone only.

Report Authorization (/S/ is an electronic signature that complies with 21 CFR Part 11)

Method	Analyst	Peer Review
EPA TO-11A	/S/ David Teynor 07/08/2016 09:57	/S/ Christopher Winter 07/08/2016 16:37

ANALYTICAL REPORT

Workorder: 34-1618256
Client Project ID: CARTRIDGE EVALUATION
Purchase Order: 55502 Rel9
Project Manager: Rand Potter

Laboratory Contact Information

ALS Environmental
960 W Levoy Drive
Salt Lake City, Utah 84123

Phone: (801) 266-7700
Email: alslt.lab@ALSGlobal.com
Web: www.alsslc.com

General Lab Comments

The results provided in this report relate only to the items tested.
Samples were received in acceptable condition unless otherwise noted.
Samples have not been blank corrected unless otherwise noted.
This test report shall not be reproduced, except in full, without written approval of ALS.

ALS provides professional analytical services for all samples submitted. ALS is not in a position to interpret the data and assumes no responsibility for the quality of the samples submitted.

All quality control samples processed with the samples in this report yielded acceptable results unless otherwise noted.

ALS is accredited for specific fields of testing (scopes) in the following testing sectors. The quality system implemented at ALS conforms to accreditation requirements and is applied to all analytical testing performed by ALS. The following table lists testing sector, accreditation body, accreditation number and website. Please contact these accrediting bodies or your ALS project manager for the current scope of accreditation that applies to your analytical testing.

Testing Sector	Accreditation Body (Standard)	Certificate Number	Website
Environmental	ACLASS (DoD ELAP)	ADE-1420	http://www.aclasscorp.com
	Utah (NELAC)	DATA1	http://health.utah.gov/lab/labimp/
	Nevada	UT00009	http://ndep.nv.gov/bsdw/labservice.htm
	Oklahoma	UT00009	http://www.deq.state.ok.us/CSDnew/
	Iowa	IA# 376	http://www.iowadnr.gov/InsideDNR/RegulatoryWater.aspx
	Florida (TNI)	E871067	http://www.dep.state.fl.us/labs/bars/sas/qa/
	Texas (TNI)	T104704456-11-1	http://www.tceq.texas.gov/field/qa/lab_accred_certif.html
Industrial Hygiene	AIHA-LAP, LLC (ISO 17025 and AIHA-LAP, LLC IHLAP/ELLAP)	101574	http://www.aihaaccreditedlabs.org
Lead Testing:			
CPSC	ACLASS (ISO 17025, CPSC)	ADE-1420	http://www.aclasscorp.com
Soil, Dust, Paint ,Air	AIHA-LAP, LLC (ISO 17025, AIHA-LAP, LLC ELLAP and NLLAP)	101574	http://www.aihaaccreditedlabs.org
Dietary Supplements	ACLASS (ISO 17025)	ADE-1420	http://www.aclasscorp.com

Definitions

LOD = Limit of Detection = MDL = Method Detection Limit, A statistical estimate of method/media/instrument sensitivity.
LOQ = Limit of Quantitation = RL = Reporting Limit, A verified value of method/media/instrument sensitivity.
ND = Not Detected, Testing result not detected above the LOD or LOQ.
NA = Not Applicable.
** No result could be reported, see sample comments for details.
< This testing result is less than the numerical value.
( ) This testing result is between the LOD and LOQ and has higher analytical uncertainty than values at or above the LOQ.

ANALYTICAL REPORT

Workorder: 34-1618256
Client Project ID: CARTRIDGE EVALUATION
Purchase Order: 55502 Rel9
Project Manager: Rand Potter

ALS Envrionmental certifies this analytical report is in compliance with the Hanford SOW, both technically and for completeness. Release of the data contained in this report has been electronically authorized by the following laboratory representative:

Rand Potter, Project Manager, ALS Environmental

Quality Control Sample
Batch Report

Analysis Information

Workorder: 1618256

Limits: Historical/Performance
Basis: ALS Laboratory Group

Preparation: NA
Batch: NA
Prepared By: NA

Analysis: EPA TO-11A
Batch: ILC/12184 (HBN: 172200)
Analyzed By: David Teynor

Blank

LMB: 506868
Analyzed: 07/07/2016 00:00
Units: ug/sample

Analyte	Result	MDL	RL
Formaldehyde	ND	NA	0.0500
Acetaldehyde	ND	NA	0.0500
Acetone	0.251	NA	0.0500
Acrolein	ND	NA	0.0500
Propionaldehyde	ND	NA	0.0500
Crotonaldehyde	ND	NA	0.0500
Butyraldehyde	ND	NA	0.0500
Benzaldehyde	ND	NA	0.0500
Isovaleraldehyde	ND	NA	0.0500
Valeraldehyde	ND	NA	0.0500
m-Tolualdehyde	ND	NA	0.0500
p-Tolualdehyde	ND	NA	0.0500
o-Tolualdehyde	ND	NA	0.0500
Hexanal	ND	NA	0.0500
2,5-Dimethylbenzaldehyde	ND	NA	0.0500

Laboratory Control Sample - Laboratory Control Sample Duplicate

LCS: 506869
Analyzed: 07/07/2016 00:00
Dilution: 1
Units: ug/sample

LCSD: 506870
Analyzed: 07/07/2016 00:00
Dilution: 1
Units: ug/sample

Analyte	Result	Target	% Rec	QC Limits		Result	% Rec	RPD	QC Limits	
Formaldehyde	3.09	3.00	103	87.8	116.8	3.15	105	1.92	0.0	20.0
Acetaldehyde	3.13	3.00	104	94.7	110.5	3.17	106	1.27	0.0	20.0
Acetone	2.76	3.00	92.0	69.2	119.9	2.77	92.3	0.362	0.0	20.0
Acrolein	3.00	3.00	100	83.5	120.2	3.06	102	1.98	0.0	20.0
Propionaldehyde	3.26	3.00	109	92.2	117.2	3.30	110	1.22	0.0	20.0
Crotonaldehyde	3.13	3.00	104	93.1	114.8	3.18	106	1.58	0.0	20.0
Butyraldehyde	3.27	3.00	109	86.6	120.8	3.31	110	1.22	0.0	20.0
Benzaldehyde	3.16	3.00	105	96.0	112.3	3.21	107	1.57	0.0	20.0
Isovaleraldehyde	3.60	3.00	120	95.4	121.6	3.21	107	11.5	0.0	20.0
Valeraldehyde	3.20	3.00	107	85.3	120.4	3.23	108	0.933	0.0	20.0
m-Tolualdehyde	3.09	3.00	103	80.9	118.6	3.18	106	2.87	0.0	20.0
p-Tolualdehyde	3.03	3.00	101	83.5	122.2	3.30	110	8.53	0.0	20.0
o-Tolualdehyde	3.11	3.00	104	91.6	111.4	3.20	107	2.85	0.0	20.0
Hexanal	3.21	3.00	107	85.4	127.6	3.20	107	0.312	0.0	20.0
2,5-Dimethylbenzaldehyde	3.39	3.00	113	99.6	118.7	3.42	114	0.881	0.0	20.0

Quality Control Sample
Batch Report

Analysis Information

Workorder: 1618256

Limits: Historical/Performance	**Preparation:** NA	**Analysis:** EPA TO-11A
Basis: ALS Laboratory Group	**Batch:** NA	**Batch:** ILC/12184 (HBN: 172200)
	Prepared By: NA	**Analyzed By:** David Teynor

Comments

LMB used to media correct LCS/LCSD and field samples for Acetone only.

QC Report Authorization (/S/ is an electronic signature that complies with 21 CFR Part 11)

Analyst	Peer Review
/S/ David Teynor	/S/ Christopher Winter
07/08/2016 09:57	07/08/2016 16:37

Symbols and Definitions

* - Analyte above reporting limit or outside of control limits
▲ - Sample result is greater than 4 times the spike added
◓ - Sample and Matrix Duplicate less than 5 times the reporting limit
● - Result is above the calibration range

RPD - Relative % Difference (Spike / Spike Duplicate)
ND - Not Detected (U - Qualifier also flags analyte as not detected)
NA - Not Applicable
QC results are not adjusted for moisture correction, where applicable

Quality Control Sample
Batch Report

Analysis Information

Workorder: 1618256

Limits: Historical/Performance
Basis: ALS Laboratory Group

Preparation: NA
Batch: NA
Prepared By: NA

Analysis: EPA TO-11A
Batch: ILC/12191 (HBN: 172268)
Analyzed By: David Teynor

Blank

LMB: 506984
Analyzed: 07/06/2016 00:00
Units: ug/sample

Analyte	Result	MDL	RL
Formaldehyde	ND	NA	0.0500
Acetaldehyde	ND	NA	0.0500
Acetone	0.271	NA	0.0500
Acrolein	ND	NA	0.0500
Propionaldehyde	ND	NA	0.0500
Crotonaldehyde	ND	NA	0.0500
Butyraldehyde	ND	NA	0.0500
Benzaldehyde	ND	NA	0.0500
Isovaleraldehyde	ND	NA	0.0500
Valeraldehyde	ND	NA	0.0500
m-Tolualdehyde	ND	NA	0.0500
p-Tolualdehyde	ND	NA	0.0500
o-Tolualdehyde	ND	NA	0.0500
Hexanal	ND	NA	0.0500
2,5-Dimethylbenzaldehyde	ND	NA	0.0500

Laboratory Control Sample - Laboratory Control Sample Duplicate

LCS: 506985
Analyzed: 07/06/2016 00:00
Dilution: 1
Units: ug/sample

LCSD: 506986
Analyzed: 07/06/2016 00:00
Dilution: 1
Units: ug/sample

Analyte	Result	Target	% Rec	QC Limits		Result	% Rec	RPD	QC Limits	
Formaldehyde	3.08	3.00	103	87.8	116.8	3.08	103	0.00	0.0	20.0
Acetaldehyde	3.10	3.00	103	94.7	110.5	3.13	104	0.963	0.0	20.0
Acetone	2.66	3.00	88.6	69.2	119.9	2.70	90.0	1.49	0.0	20.0
Acrolein	3.05	3.00	102	83.5	120.2	3.02	101	0.988	0.0	20.0
Propionaldehyde	3.22	3.00	107	92.2	117.2	3.25	108	0.927	0.0	20.0
Crotonaldehyde	3.10	3.00	103	93.1	114.8	3.14	105	1.28	0.0	20.0
Butyraldehyde	3.25	3.00	108	86.6	120.8	3.25	108	0.00	0.0	20.0
Benzaldehyde	3.17	3.00	106	96.0	112.3	3.26	109	2.80	0.0	20.0
Isovaleraldehyde	3.20	3.00	107	95.4	121.6	3.28	109	2.47	0.0	20.0
Valeraldehyde	3.21	3.00	107	85.3	120.4	3.23	108	0.621	0.0	20.0
m-Tolualdehyde	3.20	3.00	107	80.9	118.6	3.35	112	4.58	0.0	20.0
p-Tolualdehyde	3.01	3.00	100	83.5	122.2	2.83	94.3	6.16	0.0	20.0
o-Tolualdehyde	3.04	3.00	101	91.6	111.4	3.05	102	0.328	0.0	20.0
Hexanal	3.42	3.00	114	85.4	127.6	3.50	117	2.31	0.0	20.0
2,5-Dimethylbenzaldehyde	3.31	3.00	110	99.6	118.7	3.37	112	1.80	0.0	20.0

Quality Control Sample
Batch Report

Analysis Information

Workorder: 1618256

Limits: Historical/Performance	**Preparation:** NA	**Analysis:** EPA TO-11A
Basis: ALS Laboratory Group	**Batch:** NA	**Batch:** ILC/12191 (HBN: 172268)
	Prepared By: NA	**Analyzed By:** David Teynor

Comments

LMB used to media correct LCS/LCSD and field samples for Acetone only.

QC Report Authorization (/S/ is an electronic signature that complies with 21 CFR Part 11)

Analyst	Peer Review
/S/ David Teynor	/S/ Christopher Winter
07/08/2016 08:31	07/08/2016 10:29

Symbols and Definitions

* - Analyte above reporting limit or outside of control limits
▲ - Sample result is greater than 4 times the spike added
◓ - Sample and Matrix Duplicate less than 5 times the reporting limit
● - Result is above the calibration range

RPD - Relative % Difference (Spike / Spike Duplicate)
ND - Not Detected (U - Qualifier also flags analyte as not detected)
NA - Not Applicable
QC results are not adjusted for moisture correction, where applicable

F26

1618256

Assembler	CHAIN OF CUSTODY/SAMPLE ANALYSIS REQUEST	C.O.C. No.
N/A		20161911
		Page 1 of 3

Collector: JONES	Contact/Requestor: CARL HOWALD IV	Telephone No. 373-6861 MSIN T6-05 FAX 372-1878
SAF No.: N/A	Sample Origin: CARTRIDGE EVALUATION	Purchase Order/Charge Code: 202003/CB20
Project Title: CARTRIDGE EVALUATION	Logbook/ Work Package No.: N/A	Ice Chest No.: WTS-055 Temp.: ON Ice.
Shipped To (Lab): ALS	Method of Shipment	Bill of Lading/Air Bill No.: 776637232822
Protocol: N/A	Data Turnaround: 10 DAYS	Parts and Return No.: 40958

Sample No.	Lab ID	*	Date	Time	No./Type Container	Sample Analysis	Preservative
	S16T018936	VA	6/25/16		SILICA GEL	Aldehyde 16-001-AP-EF-009H	25C or low
	S16T018937	VA	6/25/16		SILICA GEL	Aldehyde 16-001-AP-IN-009H	25C or low
	S16T018938	VA	6/25/16		SILICA GEL	Aldehyde 16-001-AP-EF-009G	25C or low
	S16T018939	VA	6/25/16		SILICA GEL	Aldehyde 16-001-AP-EF-009F	25C or low
	S16T018940	VA	6/24/16		SILICA GEL	Aldehyde 16-001-AP-EF-009E	25C or low
	S16T018941	VA	6/24/16		SILICA GEL	Aldehyde 16-001-AP-EF-009D	25C or low
	S16T018942	VA	6/24/16		SILICA GEL	Aldehyde 16-001-AP-EF-009C	25C or low
	S16T018943	VA	6/24/16		SILICA GEL	Aldehyde 16-001-AP-EF-009B	25C or low
	S16T018944	VA	6/24/16		SILICA GEL	Aldehyde 16-001-AP-EF-009A	25C or low
	S16T018945	VA	6/24/16		SILICA GEL	Aldehyde 16-001-AP-IN-009A	25C or low

POSSIBLE SAMPLE HAZARDS/REMARKS (List all known wastes) MSDS ○ Yes ◉ No

SPECIAL INSTRUCTIONS — Hold Time

Send Results to Robert Sosa @ Greg Moore
Robert_W_Sosa@rl.gov and
Gregory_S_Moore@rl.gov see SOW for email

Release 9
Reference Contract # 55502
NIOSH 2016 MOD EPA TO-11A

Relinquished By (Print / Sign)	Date/Time	Received By (Print / Sign)	Date/Time
Leslie DIAZ Leslie Diaz	6/29/16 10:00	Julie Godish Julie Godish	6/29/16 1000
Julie Godish Julie Godish	6/29/16 1400	FEDEX	
Relinquished By		Received By	
Relinquished By		Received By	

Matrix*

S = Soil	DL = Drum Liquids		
SE = Sediment	T = Tissue		
SO = Solid	WI = Wipe		
SL = Sludge	L = Liquid		
W = Water	V = Vegetation		
O = Oil	VA = Vapor		
A = Air	X = Other		
DS = Drum Solids			

FINAL SAMPLE DISPOSITION	Disposal Method (e.g., Return to customer, per lab procedure)	Disposed By	Date/Time
	DJT used in process	CONSUMED	07/05/16 13:30

All samples containing hazardous materials shall be picked up by requestor and returned to parent container or site of origin.

A-6003-962 (03/05)

Assembler	CHAIN OF CUSTODY/SAMPLE ANALYSIS REQUEST	C.O.C. No.
N/A		20161911
		Page 2 of 3

Collector: JONES	Contact/Requestor: CARL HOWALD IV	Telephone No.: 373-6861	MSIN: T6-05 FAX: 372-1878
SAF No.: N/A	Sample Origin: CARTRIDGE EVALUATION	Purchase Order/Charge Code: 202003/CB20	
Project Title: CARTRIDGE EVALUATION	Logbook/ Work Package No.: N/A	Ice Chest No.: WTS-055	Temp.: ON Ice
Shipped To (Lab): ALS	Method of Shipment	Bill of Lading/Air Bill No.: 7766 3723 2822	
Protocol: N/A	Data Turnaround: 10 DAYS	Parts and Return No.: 40958	

Sample No.	Lab ID	*	Date	Time	No./Type Container	Sample Analysis	Preservative
	S16T018946	VA	6/24/16		SILICA GEL	Aldehyde 16-001-AP-EF-009BASE	25C or low
	S16T018947	VA	6/24/16		SILICA GEL	Aldehyde 16-001-AP-IN-009BASE	25C or low
	S16T018948	VA	6/24/16		SILICA GEL	Aldehyde 16-001-AP-BK-009BASE	25C or low
	S16T018949	VA	6/26/16		SILICA GEL	Aldehyde 16-002-AP-EF-009H	25C or low
	S16T018950	VA	6/26/16		SILICA GEL	Aldehyde 16-002-AP-IN-009H	25C or low
	S16T018951	VA	6/26/16		SILICA GEL	Aldehyde 16-002-AP-EF-009G	25C or low
	S16T018952	VA	6/25/16		SILICA GEL	Aldehyde 16-002-AP-EF-009F	25C or low
	S16T018953	VA	6/25/16		SILICA GEL	Aldehyde 16-002-AP-EF-009E	25C or low
	S16T018954	VA	6/25/16		SILICA GEL	Aldehyde 16-002-AP-EF-009D	25C or low
	S16T018955	VA	6/25/16		SILICA GEL	Aldehyde 16-002-AP-EF-009C	25C or low

POSSIBLE SAMPLE HAZARDS/REMARKS (List all known wastes) MSDS ○ Yes ◉ No

SPECIAL INSTRUCTIONS — Hold Time

Send Results to Robert Sosa @ Greg Moore
Robert_W_Sosa@rl.gov and
Gregory_S_Moore@rl.gov see SOW for email

Release 9
Reference Contract # 55502
NICSH 2016 MOD EPA TO-11A

Relinquished By	Print	Sign	Date/Time	Received By	Print	Sign	Date/Time
	Leslie Diaz		6/29/16 0100		Julie Gadson	Julie Gadson	6/29/16 0100
Relinquished By	JA Gradsner WRPS	Julie Gadson	6/29/16 1400	Received By	FEDEX		Date/Time
Relinquished By			Date/Time	Received By			Date/Time
Relinquished By			Date/Time	Received By			Date/Time

Matrix*

S = Soil	DL = Drum Liquids		
SE = Sediment	T = Tissue		
SO = Solid	WI = Wipe		
SL = Sludge	L = Liquid		
W = Water	V = Vegetation		
O = Oil	VA = Vapor		
A = Air	X = Other		
DS = Drum Solids			

FINAL SAMPLE DISPOSITION	Disposal Method (e.g., Return to customer, per lab procedure, used in process)	Disposed By	Date/Time
	DJT	CONSUMED	07/05/16 13:30

All samples containing hazardous materials shall be picked up by requestor and returned to parent container or site of origin.

A-6003-962 (03/05)

1618256

Assembler	CHAIN OF CUSTODY/SAMPLE ANALYSIS REQUEST	C.O.C. No.
N/A		20161911
		Page 3 of 3

Collector: JONES	Contact/Requestor: CARL HOWALD IV	Telephone No.: 373-6861	MSIN: T6-05 FAX: 372-1878
SAF No.: N/A	Sample Origin: CARTRIDGE EVALUATION	Purchase Order/Charge Code: 202003/CB20	
Project Title: CARTRIDGE EVALUATION	Logbook/ Work Package No.: N/A	Ice Chest No.: WTS-055	Temp.: ON Ice
Shipped To (Lab): ALS	Method of Shipment	Bill of Lading/Air Bill No.: 776637232822	
Protocol: N/A	Data Turnaround: 10 DAYS	Parts and Return No.: 40958	

Sample No.	Lab ID	*	Date	Time	No./Type Container	Sample Analysis	Preservative
	S16T018956	VA	6/25/16		SILICA GEL	Aldehyde 16-002-AP-EF-009B	25C or low
	S16T018957	VA	6/25/16		SILICA GEL	Aldehyde 16-002-AP-EF-009A	25C or low
	S16T018958	VA	6/25/16		SILICA GEL	Aldehyde 16-002-AP-IN-009A	25C or low
	S16T018959	VA	6/25/16		SILICA GEL	Aldehyde 16-002-AP-EF-009BASE	25C or low
	S16T018960	VA	6/25/16		SILICA GEL	Aldehyde 16-002-AP-IN-009BASE	25C or low
	S16T018961	VA	6/25/16		SILICA GEL	Aldehyde 16-002-AP-BK-009BASE	25C or low

POSSIBLE SAMPLE HAZARDS/REMARKS (List all known wastes) MSDS ○ Yes ◉ No

SPECIAL INSTRUCTIONS

Send Results to Robert Sosa @ Greg Moore
Robert_W_Sosa@rl.gov and
Gregory_S_Moore@rl.gov see SOW for email

Release 9
Reference Contract # 55502
NIOSH 2016 MOD EPA TO-11A

Hold Time

Relinquished By	Print	Sign	Date/Time	Received By	Print	Sign	Date/Time
	Leslie Diaz	Leslie Diaz	6/29/16 10:00	Julie Godshalk	Julie Godshalk	Julie Godshalk	6/29/16 1000
Relinquished By			Date/Time	Received By			Date/Time
Julie Godshalk	Julie Godshalk	Julie Godshalk	6/29/16 1400	FEDEX			
Relinquished By			Date/Time	Received By			Date/Time
Fedex				Alexander Edwards			6/30/16 0900
Relinquished By			Date/Time	Received By			Date/Time

Matrix*

S = Soil		DL = Drum Liquids	
SE = Sediment		T = Tissue	
SO = Solid		WI = Wipe	
SL = Sludge		L = Liquid	
W = Water		V = Vegetation	
O = Oil		VA = Vapor	
A = Air		X = Other	
DS = Drum Solids			

FINAL SAMPLE DISPOSITION	Disposal Method (e.g., Return to customer, per lab procedure, used in process)	Disposed By	Date/Time
	DJT	CONSUMED	07/06/16 10:00

All samples containing hazardous materials shall be picked up by requestor and returned to parent container or site of origin.

A-6003-962 (03/05)

C.3.9 1,3-Butadiene

ANALYTICAL REPORT

Report Date: July 08, 2016

Robert (Buddy) Sosa
Washington River Protection So
PO Box 850, MSIN T6-02
Richland, WA 99352

Phone: (509) 373-1262

E-mail: robert_w_sosa@rl.gov

20161912

Workorder: 34-1618257
Client Project ID: CARTRIDGE EVALUATION
Purchase Order: 55502 Rel9
Project Manager: Rand Potter

Analytical Results

Sample ID: S16T019014 — Collected: 06/25/2016
Lab ID: 1618257001 — Sampling Location: CARTRIDGE EVALUATION — Received: 06/30/2016
Method: NIOSH 1024 — Media: SKC 226-37 Sorbent Tube — Analyzed: 07/07/2016
Sampling Parameter: Air Volume Not Provided

Analyte	Result (mg/sample)	Result (mg/m³)	Result (ppm)	RL (mg/sample)
1,3-Butadiene	<0.0010	NA	NA	0.0010

Sample ID: S16T019015 — Collected: 06/25/2016
Lab ID: 1618257002 — Sampling Location: CARTRIDGE EVALUATION — Received: 06/30/2016
Method: NIOSH 1024 — Media: SKC 226-37 Sorbent Tube — Analyzed: 07/07/2016
Sampling Parameter: Air Volume Not Provided

Analyte	Result (mg/sample)	Result (mg/m³)	Result (ppm)	RL (mg/sample)
1,3-Butadiene	<0.0010	NA	NA	0.0010

Sample ID: S16T019016 — Collected: 06/25/2016
Lab ID: 1618257003 — Sampling Location: CARTRIDGE EVALUATION — Received: 06/30/2016
Method: NIOSH 1024 — Media: SKC 226-37 Sorbent Tube — Analyzed: 07/07/2016
Sampling Parameter: Air Volume Not Provided

Analyte	Result (mg/sample)	Result (mg/m³)	Result (ppm)	RL (mg/sample)
1,3-Butadiene	<0.0010	NA	NA	0.0010

Sample ID: S16T019017 — Collected: 06/25/2016
Lab ID: 1618257004 — Sampling Location: CARTRIDGE EVALUATION — Received: 06/30/2016
Method: NIOSH 1024 — Media: SKC 226-37 Sorbent Tube — Analyzed: 07/07/2016
Sampling Parameter: Air Volume Not Provided

Analyte	Result (mg/sample)	Result (mg/m³)	Result (ppm)	RL (mg/sample)
1,3-Butadiene	<0.0010	NA	NA	0.0010

ANALYTICAL REPORT

Workorder: **34-1618257**
Client Project ID: CARTRIDGE EVALUATION
Purchase Order: 55502 Rel9
Project Manager: Rand Potter

Analytical Results

Sample ID: **S16T019018** — Collected: 06/24/2016
Lab ID: 1618257005 — Sampling Location: CARTRIDGE EVALUATION — Received: 06/30/2016
Method: NIOSH 1024 — Media: SKC 226-37 Sorbent Tube — Analyzed: 07/07/2016
Sampling Parameter: **Air Volume Not Provided**

Analyte	Result (mg/sample)	Result (mg/m³)	Result (ppm)	RL (mg/sample)
1,3-Butadiene	<0.0010	NA	NA	0.0010

Sample ID: **S16T019019** — Collected: 06/24/2016
Lab ID: 1618257006 — Sampling Location: CARTRIDGE EVALUATION — Received: 06/30/2016
Method: NIOSH 1024 — Media: SKC 226-37 Sorbent Tube — Analyzed: 07/07/2016
Sampling Parameter: **Air Volume Not Provided**

Analyte	Result (mg/sample)	Result (mg/m³)	Result (ppm)	RL (mg/sample)
1,3-Butadiene	<0.0010	NA	NA	0.0010

Sample ID: **S16T019020** — Collected: 06/24/2016
Lab ID: 1618257007 — Sampling Location: CARTRIDGE EVALUATION — Received: 06/30/2016
Method: NIOSH 1024 — Media: SKC 226-37 Sorbent Tube — Analyzed: 07/07/2016
Sampling Parameter: **Air Volume Not Provided**

Analyte	Result (mg/sample)	Result (mg/m³)	Result (ppm)	RL (mg/sample)
1,3-Butadiene	<0.0010	NA	NA	0.0010

Sample ID: **S16T019022** — Collected: 06/24/2016
Lab ID: 1618257008 — Sampling Location: CARTRIDGE EVALUATION — Received: 06/30/2016
Method: NIOSH 1024 — Media: SKC 226-37 Sorbent Tube — Analyzed: 07/07/2016
Sampling Parameter: **Air Volume Not Provided**

Analyte	Result (mg/sample)	Result (mg/m³)	Result (ppm)	RL (mg/sample)
1,3-Butadiene	<0.0010	NA	NA	0.0010

Sample ID: **S16T019023** — Collected: 06/24/2016
Lab ID: 1618257009 — Sampling Location: CARTRIDGE EVALUATION — Received: 06/30/2016
Method: NIOSH 1024 — Media: SKC 226-37 Sorbent Tube — Analyzed: 07/07/2016
Sampling Parameter: **Air Volume Not Provided**

Analyte	Result (mg/sample)	Result (mg/m³)	Result (ppm)	RL (mg/sample)
1,3-Butadiene	<0.0010	NA	NA	0.0010

ANALYTICAL REPORT

Workorder: **34-1618257**
Client Project ID: CARTRIDGE EVALUATION
Purchase Order: 55502 Rel9
Project Manager: Rand Potter

Analytical Results

Sample ID: **S16T019024** — Collected: 06/24/2016
Lab ID: 1618257010 — Sampling Location: CARTRIDGE EVALUATION — Received: 06/30/2016
Method: NIOSH 1024 — Media: SKC 226-37 Sorbent Tube — Analyzed: 07/07/2016
Sampling Parameter: **Air Volume Not Provided**

Analyte	Result (mg/sample)	Result (mg/m³)	Result (ppm)	RL (mg/sample)
1,3-Butadiene	<0.0010	NA	NA	0.0010

Sample ID: **S16T019025** — Collected: 06/24/2016
Lab ID: 1618257011 — Sampling Location: CARTRIDGE EVALUATION — Received: 06/30/2016
Method: NIOSH 1024 — Media: SKC 226-37 Sorbent Tube — Analyzed: 07/07/2016
Sampling Parameter: **Air Volume Not Provided**

Analyte	Result (mg/sample)	Result (mg/m³)	Result (ppm)	RL (mg/sample)
1,3-Butadiene	<0.0010	NA	NA	0.0010

Sample ID: **S16T019026** — Collected: 06/24/2016
Lab ID: 1618257012 — Sampling Location: CARTRIDGE EVALUATION — Received: 06/30/2016
Method: NIOSH 1024 — Media: SKC 226-37 Sorbent Tube — Analyzed: 07/07/2016
Sampling Parameter: **Air Volume Not Provided**

Analyte	Result (mg/sample)	Result (mg/m³)	Result (ppm)	RL (mg/sample)
1,3-Butadiene	<0.0010	NA	NA	0.0010

Sample ID: **S16T019027** — Collected: 06/24/2016
Lab ID: 1618257013 — Sampling Location: CARTRIDGE EVALUATION — Received: 06/30/2016
Method: NIOSH 1024 — Media: SKC 226-37 Sorbent Tube — Analyzed: 07/07/2016
Sampling Parameter: **Air Volume Not Provided**

Analyte	Result (mg/sample)	Result (mg/m³)	Result (ppm)	RL (mg/sample)
1,3-Butadiene	<0.0010	NA	NA	0.0010

Sample ID: **S16T019028** — Collected: 06/25/2016
Lab ID: 1618257014 — Sampling Location: CARTRIDGE EVALUATION — Received: 06/30/2016
Method: NIOSH 1024 — Media: SKC 226-37 Sorbent Tube — Analyzed: 07/07/2016
Sampling Parameter: **Air Volume Not Provided**

Analyte	Result (mg/sample)	Result (mg/m³)	Result (ppm)	RL (mg/sample)
1,3-Butadiene	<0.0010	NA	NA	0.0010

ANALYTICAL REPORT

Workorder: **34-1618257**
Client Project ID: CARTRIDGE EVALUATION
Purchase Order: 55502 Rel9
Project Manager: Rand Potter

Analytical Results

Sample ID: **S16T019029** — Collected: 06/25/2016
Lab ID: 1618257015 — Sampling Location: CARTRIDGE EVALUATION — Received: 06/30/2016
Method: NIOSH 1024 — Media: SKC 226-37 Sorbent Tube — Analyzed: 07/07/2016
Sampling Parameter: **Air Volume Not Provided**

Analyte	Result (mg/sample)	Result (mg/m³)	Result (ppm)	RL (mg/sample)
1,3-Butadiene	<0.0010	NA	NA	0.0010

Sample ID: **S16T019030** — Collected: 06/25/2016
Lab ID: 1618257016 — Sampling Location: CARTRIDGE EVALUATION — Received: 06/30/2016
Method: NIOSH 1024 — Media: SKC 226-37 Sorbent Tube — Analyzed: 07/07/2016
Sampling Parameter: **Air Volume Not Provided**

Analyte	Result (mg/sample)	Result (mg/m³)	Result (ppm)	RL (mg/sample)
1,3-Butadiene	<0.0010	NA	NA	0.0010

Sample ID: **S16T019031** — Collected: 06/25/2016
Lab ID: 1618257017 — Sampling Location: CARTRIDGE EVALUATION — Received: 06/30/2016
Method: NIOSH 1024 — Media: SKC 226-37 Sorbent Tube — Analyzed: 07/07/2016
Sampling Parameter: **Air Volume Not Provided**

Analyte	Result (mg/sample)	Result (mg/m³)	Result (ppm)	RL (mg/sample)
1,3-Butadiene	<0.0010	NA	NA	0.0010

Sample ID: **S16T019032** — Collected: 06/24/2016
Lab ID: 1618257018 — Sampling Location: CARTRIDGE EVALUATION — Received: 06/30/2016
Method: NIOSH 1024 — Media: SKC 226-37 Sorbent Tube — Analyzed: 07/07/2016
Sampling Parameter: **Air Volume Not Provided**

Analyte	Result (mg/sample)	Result (mg/m³)	Result (ppm)	RL (mg/sample)
1,3-Butadiene	<0.0010	NA	NA	0.0010

Sample ID: **S16T019033** — Collected: 06/24/2016
Lab ID: 1618257019 — Sampling Location: CARTRIDGE EVALUATION — Received: 06/30/2016
Method: NIOSH 1024 — Media: SKC 226-37 Sorbent Tube — Analyzed: 07/07/2016
Sampling Parameter: **Air Volume Not Provided**

Analyte	Result (mg/sample)	Result (mg/m³)	Result (ppm)	RL (mg/sample)
1,3-Butadiene	<0.0010	NA	NA	0.0010

ANALYTICAL REPORT

Workorder: **34-1618257**
Client Project ID: CARTRIDGE EVALUATION
Purchase Order: 55502 Rel9
Project Manager: Rand Potter

Analytical Results

Sample ID: **S16T019034** Collected: 06/24/2016
Lab ID: 1618257020 Sampling Location: CARTRIDGE EVALUATION Received: 06/30/2016
Method: NIOSH 1024 Media: SKC 226-37 Sorbent Tube **Analyzed:** 07/07/2016
Sampling Parameter: **Air Volume Not Provided**

Analyte	Result (mg/sample)	Result (mg/m³)	Result (ppm)	RL (mg/sample)
1,3-Butadiene	<0.0010	NA	NA	0.0010

Sample ID: **S16T019035** Collected: 06/24/2016
Lab ID: 1618257021 Sampling Location: CARTRIDGE EVALUATION Received: 06/30/2016
Method: NIOSH 1024 Media: SKC 226-37 Sorbent Tube **Analyzed:** 07/07/2016
Sampling Parameter: **Air Volume Not Provided**

Analyte	Result (mg/sample)	Result (mg/m³)	Result (ppm)	RL (mg/sample)
1,3-Butadiene	<0.0010	NA	NA	0.0010

Sample ID: **S16T019036** Collected: 06/24/2016
Lab ID: 1618257022 Sampling Location: CARTRIDGE EVALUATION Received: 06/30/2016
Method: NIOSH 1024 Media: SKC 226-37 Sorbent Tube **Analyzed:** 07/07/2016
Sampling Parameter: **Air Volume Not Provided**

Analyte	Result (mg/sample)	Result (mg/m³)	Result (ppm)	RL (mg/sample)
1,3-Butadiene	<0.0010	NA	NA	0.0010

Sample ID: **S16T019037** Collected: 06/24/2016
Lab ID: 1618257023 Sampling Location: CARTRIDGE EVALUATION Received: 06/30/2016
Method: NIOSH 1024 Media: SKC 226-37 Sorbent Tube **Analyzed:** 07/07/2016
Sampling Parameter: **Air Volume Not Provided**

Analyte	Result (mg/sample)	Result (mg/m³)	Result (ppm)	RL (mg/sample)
1,3-Butadiene	<0.0010	NA	NA	0.0010

Sample ID: **S16T019038** Collected: 06/24/2016
Lab ID: 1618257024 Sampling Location: CARTRIDGE EVALUATION Received: 06/30/2016
Method: NIOSH 1024 Media: SKC 226-37 Sorbent Tube **Analyzed:** 07/07/2016
Sampling Parameter: **Air Volume Not Provided**

Analyte	Result (mg/sample)	Result (mg/m³)	Result (ppm)	RL (mg/sample)
1,3-Butadiene	<0.0010	NA	NA	0.0010

ANALYTICAL REPORT

Workorder: 34-1618257
Client Project ID: CARTRIDGE EVALUATION
Purchase Order: 55502 Rel9
Project Manager: Rand Potter

Analytical Results

Sample ID: S16T019039				Collected: 06/24/2016
Lab ID: 1618257025	Sampling Location: CARTRIDGE EVALUATION			Received: 06/30/2016
Method: NIOSH 1024	Media: SKC 226-37 Sorbent Tube Sampling Parameter: Air Volume Not Provided			Analyzed: 07/07/2016
Analyte	Result (mg/sample)	Result (mg/m³)	Result (ppm)	RL (mg/sample)
1,3-Butadiene	<0.0010	NA	NA	0.0010

Sample ID: S16T019040				Collected: 06/24/2016
Lab ID: 1618257026	Sampling Location: CARTRIDGE EVALUATION			Received: 06/30/2016
Method: NIOSH 1024	Media: SKC 226-37 Sorbent Tube Sampling Parameter: Air Volume Not Provided			Analyzed: 07/07/2016
Analyte	Result (mg/sample)	Result (mg/m³)	Result (ppm)	RL (mg/sample)
1,3-Butadiene	<0.0010	NA	NA	0.0010

Sample ID: S16T019041				Collected: 06/26/2016
Lab ID: 1618257027	Sampling Location: CARTRIDGE EVALUATION			Received: 06/30/2016
Method: NIOSH 1024	Media: SKC 226-37 Sorbent Tube Sampling Parameter: Air Volume Not Provided			Analyzed: 07/07/2016
Analyte	Result (mg/sample)	Result (mg/m³)	Result (ppm)	RL (mg/sample)
1,3-Butadiene	<0.0010	NA	NA	0.0010

Sample ID: S16T019042				Collected: 06/26/2016
Lab ID: 1618257028	Sampling Location: CARTRIDGE EVALUATION			Received: 06/30/2016
Method: NIOSH 1024	Media: SKC 226-37 Sorbent Tube Sampling Parameter: Air Volume Not Provided			Analyzed: 07/07/2016
Analyte	Result (mg/sample)	Result (mg/m³)	Result (ppm)	RL (mg/sample)
1,3-Butadiene	<0.0010	NA	NA	0.0010

Sample ID: S16T019043				Collected: 06/26/2016
Lab ID: 1618257029	Sampling Location: CARTRIDGE EVALUATION			Received: 06/30/2016
Method: NIOSH 1024	Media: SKC 226-37 Sorbent Tube Sampling Parameter: Air Volume Not Provided			Analyzed: 07/07/2016
Analyte	Result (mg/sample)	Result (mg/m³)	Result (ppm)	RL (mg/sample)
1,3-Butadiene	<0.0010	NA	NA	0.0010

ANALYTICAL REPORT

Workorder: **34-1618257**
Client Project ID: CARTRIDGE EVALUATION
Purchase Order: 55502 Rel9
Project Manager: Rand Potter

Analytical Results

Sample ID: S16T019044				Collected: 06/25/2016
Lab ID: 1618257030	Sampling Location: CARTRIDGE EVALUATION			Received: 06/30/2016
Method: NIOSH 1024	**Media: SKC 226-37 Sorbent Tube**			**Analyzed: 07/07/2016**
	Sampling Parameter: Air Volume Not Provided			
Analyte	**Result (mg/sample)**	**Result (mg/m³)**	**Result (ppm)**	**RL (mg/sample)**
1,3-Butadiene	<0.0010	NA	NA	0.0010

Sample ID: S16T019045				Collected: 06/25/2016
Lab ID: 1618257031	Sampling Location: CARTRIDGE EVALUATION			Received: 06/30/2016
Method: NIOSH 1024	**Media: SKC 226-37 Sorbent Tube**			**Analyzed: 07/07/2016**
	Sampling Parameter: Air Volume Not Provided			
Analyte	**Result (mg/sample)**	**Result (mg/m³)**	**Result (ppm)**	**RL (mg/sample)**
1,3-Butadiene	<0.0010	NA	NA	0.0010

Sample ID: S16T019046				Collected: 06/25/2016
Lab ID: 1618257032	Sampling Location: CARTRIDGE EVALUATION			Received: 06/30/2016
Method: NIOSH 1024	**Media: SKC 226-37 Sorbent Tube**			**Analyzed: 07/07/2016**
	Sampling Parameter: Air Volume Not Provided			
Analyte	**Result (mg/sample)**	**Result (mg/m³)**	**Result (ppm)**	**RL (mg/sample)**
1,3-Butadiene	<0.0010	NA	NA	0.0010

Sample ID: S16T019047				Collected: 06/25/2016
Lab ID: 1618257033	Sampling Location: CARTRIDGE EVALUATION			Received: 06/30/2016
Method: NIOSH 1024	**Media: SKC 226-37 Sorbent Tube**			**Analyzed: 07/07/2016**
	Sampling Parameter: Air Volume Not Provided			
Analyte	**Result (mg/sample)**	**Result (mg/m³)**	**Result (ppm)**	**RL (mg/sample)**
1,3-Butadiene	<0.0010	NA	NA	0.0010

Sample ID: S16T019048				Collected: 06/25/2016
Lab ID: 1618257034	Sampling Location: CARTRIDGE EVALUATION			Received: 06/30/2016
Method: NIOSH 1024	**Media: SKC 226-37 Sorbent Tube**			**Analyzed: 07/07/2016**
	Sampling Parameter: Air Volume Not Provided			
Analyte	**Result (mg/sample)**	**Result (mg/m³)**	**Result (ppm)**	**RL (mg/sample)**
1,3-Butadiene	<0.0010	NA	NA	0.0010

ANALYTICAL REPORT

Workorder: 34-1618257
Client Project ID: CARTRIDGE EVALUATION
Purchase Order: 55502 Rel9
Project Manager: Rand Potter

Analytical Results

Sample ID: S16T019049				Collected: 06/25/2016
Lab ID: 1618257035	Sampling Location: CARTRIDGE EVALUATION			Received: 06/30/2016
Method: NIOSH 1024	Media: SKC 226-37 Sorbent Tube Sampling Parameter: Air Volume Not Provided			Analyzed: 07/07/2016
Analyte	Result (mg/sample)	Result (mg/m³)	Result (ppm)	RL (mg/sample)
1,3-Butadiene	<0.0010	NA	NA	0.0010

Sample ID: S16T019050				Collected: 06/25/2016
Lab ID: 1618257036	Sampling Location: CARTRIDGE EVALUATION			Received: 06/30/2016
Method: NIOSH 1024	Media: SKC 226-37 Sorbent Tube Sampling Parameter: Air Volume Not Provided			Analyzed: 07/07/2016
Analyte	Result (mg/sample)	Result (mg/m³)	Result (ppm)	RL (mg/sample)
1,3-Butadiene	<0.0010	NA	NA	0.0010

Sample ID: S16T019051				Collected: 06/25/2016
Lab ID: 1618257037	Sampling Location: CARTRIDGE EVALUATION			Received: 06/30/2016
Method: NIOSH 1024	Media: SKC 226-37 Sorbent Tube Sampling Parameter: Air Volume Not Provided			Analyzed: 07/07/2016
Analyte	Result (mg/sample)	Result (mg/m³)	Result (ppm)	RL (mg/sample)
1,3-Butadiene	<0.0010	NA	NA	0.0010

Sample ID: S16T019052				Collected: 06/25/2016
Lab ID: 1618257038	Sampling Location: CARTRIDGE EVALUATION			Received: 06/30/2016
Method: NIOSH 1024	Media: SKC 226-37 Sorbent Tube Sampling Parameter: Air Volume Not Provided			Analyzed: 07/07/2016
Analyte	Result (mg/sample)	Result (mg/m³)	Result (ppm)	RL (mg/sample)
1,3-Butadiene	<0.0010	NA	NA	0.0010

Sample ID: S16T019053				Collected: 06/25/2016
Lab ID: 1618257039	Sampling Location: CARTRIDGE EVALUATION			Received: 06/30/2016
Method: NIOSH 1024	Media: SKC 226-37 Sorbent Tube Sampling Parameter: Air Volume Not Provided			Analyzed: 07/07/2016
Analyte	Result (mg/sample)	Result (mg/m³)	Result (ppm)	RL (mg/sample)
1,3-Butadiene	<0.0010	NA	NA	0.0010

ANALYTICAL REPORT

Workorder: 34-1618257
Client Project ID: CARTRIDGE EVALUATION
Purchase Order: 55502 Rel9
Project Manager: Rand Potter

Analytical Results

Sample ID: S16T019054				Collected: 06/26/2016
Lab ID: 1618257040	Sampling Location: CARTRIDGE EVALUATION			Received: 06/30/2016
Method: NIOSH 1024	Media: SKC 226-37 Sorbent Tube Sampling Parameter: Air Volume Not Provided			Analyzed: 07/07/2016
Analyte	Result (mg/sample)	Result (mg/m³)	Result (ppm)	RL (mg/sample)
1,3-Butadiene	<0.0010	NA	NA	0.0010

Sample ID: S16T019055				Collected: 06/26/2016
Lab ID: 1618257041	Sampling Location: CARTRIDGE EVALUATION			Received: 06/30/2016
Method: NIOSH 1024	Media: SKC 226-37 Sorbent Tube Sampling Parameter: Air Volume Not Provided			Analyzed: 07/07/2016
Analyte	Result (mg/sample)	Result (mg/m³)	Result (ppm)	RL (mg/sample)
1,3-Butadiene	<0.0010	NA	NA	0.0010

Sample ID: S16T019056				Collected: 06/26/2016
Lab ID: 1618257042	Sampling Location: CARTRIDGE EVALUATION			Received: 06/30/2016
Method: NIOSH 1024	Media: SKC 226-37 Sorbent Tube Sampling Parameter: Air Volume Not Provided			Analyzed: 07/07/2016
Analyte	Result (mg/sample)	Result (mg/m³)	Result (ppm)	RL (mg/sample)
1,3-Butadiene	<0.0010	NA	NA	0.0010

Sample ID: S16T019057				Collected: 06/25/2016
Lab ID: 1618257043	Sampling Location: CARTRIDGE EVALUATION			Received: 06/30/2016
Method: NIOSH 1024	Media: SKC 226-37 Sorbent Tube Sampling Parameter: Air Volume Not Provided			Analyzed: 07/07/2016
Analyte	Result (mg/sample)	Result (mg/m³)	Result (ppm)	RL (mg/sample)
1,3-Butadiene	<0.0010	NA	NA	0.0010

Sample ID: S16T019058				Collected: 06/25/2016
Lab ID: 1618257044	Sampling Location: CARTRIDGE EVALUATION			Received: 06/30/2016
Method: NIOSH 1024	Media: SKC 226-37 Sorbent Tube Sampling Parameter: Air Volume Not Provided			Analyzed: 07/07/2016
Analyte	Result (mg/sample)	Result (mg/m³)	Result (ppm)	RL (mg/sample)
1,3-Butadiene	<0.0010	NA	NA	0.0010

ANALYTICAL REPORT

Workorder: **34-1618257**
Client Project ID: CARTRIDGE EVALUATION
Purchase Order: 55502 Rel9
Project Manager: Rand Potter

Analytical Results

Sample ID: **S16T019059** Collected: 06/25/2016
Lab ID: 1618257045 Sampling Location: CARTRIDGE EVALUATION Received: 06/30/2016
Method: NIOSH 1024 Media: SKC 226-37 Sorbent Tube **Analyzed:** 07/07/2016
Sampling Parameter: **Air Volume Not Provided**

Analyte	Result (mg/sample)	Result (mg/m³)	Result (ppm)	RL (mg/sample)
1,3-Butadiene	<0.0010	NA	NA	0.0010

Sample ID: **S16T019060** Collected: 06/25/2016
Lab ID: 1618257046 Sampling Location: CARTRIDGE EVALUATION Received: 06/30/2016
Method: NIOSH 1024 Media: SKC 226-37 Sorbent Tube **Analyzed:** 07/07/2016
Sampling Parameter: **Air Volume Not Provided**

Analyte	Result (mg/sample)	Result (mg/m³)	Result (ppm)	RL (mg/sample)
1,3-Butadiene	<0.0010	NA	NA	0.0010

Sample ID: **S16T019061** Collected: 06/25/2016
Lab ID: 1618257047 Sampling Location: CARTRIDGE EVALUATION Received: 06/30/2016
Method: NIOSH 1024 Media: SKC 226-37 Sorbent Tube **Analyzed:** 07/07/2016
Sampling Parameter: **Air Volume Not Provided**

Analyte	Result (mg/sample)	Result (mg/m³)	Result (ppm)	RL (mg/sample)
1,3-Butadiene	<0.0010	NA	NA	0.0010

Sample ID: **S16T019062** Collected: 06/25/2016
Lab ID: 1618257048 Sampling Location: CARTRIDGE EVALUATION Received: 06/30/2016
Method: NIOSH 1024 Media: SKC 226-37 Sorbent Tube **Analyzed:** 07/07/2016
Sampling Parameter: **Air Volume Not Provided**

Analyte	Result (mg/sample)	Result (mg/m³)	Result (ppm)	RL (mg/sample)
1,3-Butadiene	<0.0010	NA	NA	0.0010

Sample ID: **S16T019063** Collected: 06/25/2016
Lab ID: 1618257049 Sampling Location: CARTRIDGE EVALUATION Received: 06/30/2016
Method: NIOSH 1024 Media: SKC 226-37 Sorbent Tube **Analyzed:** 07/07/2016
Sampling Parameter: **Air Volume Not Provided**

Analyte	Result (mg/sample)	Result (mg/m³)	Result (ppm)	RL (mg/sample)
1,3-Butadiene	<0.0010	NA	NA	0.0010

ANALYTICAL REPORT

Workorder: **34-1618257**
Client Project ID: CARTRIDGE EVALUATION
Purchase Order: 55502 Rel9
Project Manager: Rand Potter

Analytical Results

Sample ID: S16T019064				Collected: 06/25/2016
Lab ID: 1618257050	Sampling Location: CARTRIDGE EVALUATION			Received: 06/30/2016
Method: NIOSH 1024	**Media: SKC 226-37 Sorbent Tube** **Sampling Parameter: Air Volume Not Provided**			**Analyzed: 07/07/2016**
Analyte	**Result (mg/sample)**	**Result (mg/m³)**	**Result (ppm)**	**RL (mg/sample)**
1,3-Butadiene	<0.0010	NA	NA	0.0010

Sample ID: S16T019065				Collected: 06/25/2016
Lab ID: 1618257051	Sampling Location: CARTRIDGE EVALUATION			Received: 06/30/2016
Method: NIOSH 1024	**Media: SKC 226-37 Sorbent Tube** **Sampling Parameter: Air Volume Not Provided**			**Analyzed: 07/07/2016**
Analyte	**Result (mg/sample)**	**Result (mg/m³)**	**Result (ppm)**	**RL (mg/sample)**
1,3-Butadiene	<0.0010	NA	NA	0.0010

Sample ID: S16T019066				Collected: 06/25/2016
Lab ID: 1618257052	Sampling Location: CARTRIDGE EVALUATION			Received: 06/30/2016
Method: NIOSH 1024	**Media: SKC 226-37 Sorbent Tube** **Sampling Parameter: Air Volume Not Provided**			**Analyzed: 07/07/2016**
Analyte	**Result (mg/sample)**	**Result (mg/m³)**	**Result (ppm)**	**RL (mg/sample)**
1,3-Butadiene	<0.0010	NA	NA	0.0010

Report Authorization (/S/ is an electronic signature that complies with 21 CFR Part 11)

Method	Analyst	Peer Review
NIOSH 1024	/S/ Fred Rejali 07/08/2016 00:58	/S/ Thomas J. Masoian 07/08/2016 09:19

Laboratory Contact Information

ALS Environmental
960 W Levoy Drive
Salt Lake City, Utah 84123

Phone: (801) 266-7700
Email: alslt.lab@ALSGlobal.com
Web: www.alsslc.com

ANALYTICAL REPORT

Workorder: 34-1618257
Client Project ID: CARTRIDGE EVALUATION
Purchase Order: 55502 Rel9
Project Manager: Rand Potter

General Lab Comments

The results provided in this report relate only to the items tested.
Samples were received in acceptable condition unless otherwise noted.
Samples have not been blank corrected unless otherwise noted.
This test report shall not be reproduced, except in full, without written approval of ALS.

ALS provides professional analytical services for all samples submitted. ALS is not in a position to interpret the data and assumes no responsibility for the quality of the samples submitted.

All quality control samples processed with the samples in this report yielded acceptable results unless otherwise noted.

ALS is accredited for specific fields of testing (scopes) in the following testing sectors. The quality system implemented at ALS conforms to accreditation requirements and is applied to all analytical testing performed by ALS. The following table lists testing sector, accreditation body, accreditation number and website. Please contact these accrediting bodies or your ALS project manager for the current scope of accreditation that applies to your analytical testing.

Testing Sector	Accreditation Body (Standard)	Certificate Number	Website
Environmental	ACLASS (DoD ELAP)	ADE-1420	http://www.aclasscorp.com
	Utah (NELAC)	DATA1	http://health.utah.gov/lab/labimp/
	Nevada	UT00009	http://ndep.nv.gov/bsdw/labservice.htm
	Oklahoma	UT00009	http://www.deq.state.ok.us/CSDnew/
	Iowa	IA# 376	http://www.iowadnr.gov/InsideDNR/RegulatoryWater.aspx
	Florida (TNI)	E871067	http://www.dep.state.fl.us/labs/bars/sas/qa/
	Texas (TNI)	T104704456-11-1	http://www.tceq.texas.gov/field/qa/lab_accred_certif.html
Industrial Hygiene	AIHA-LAP, LLC (ISO 17025 and AIHA-LAP, LLC IHLAP/ELLAP)	101574	http://www.aihaaccreditedlabs.org
Lead Testing:			
CPSC	ACLASS (ISO 17025, CPSC)	ADE-1420	http://www.aclasscorp.com
Soil, Dust, Paint ,Air	AIHA-LAP, LLC (ISO 17025, AIHA-LAP, LLC ELLAP and NLLAP)	101574	http://www.aihaaccreditedlabs.org
Dietary Supplements	ACLASS (ISO 17025)	ADE-1420	http://www.aclasscorp.com

Definitions

LOD = Limit of Detection = MDL = Method Detection Limit, A statistical estimate of method/media/instrument sensitivity.
LOQ = Limit of Quantitation = RL = Reporting Limit, A verified value of method/media/instrument sensitivity.
ND = Not Detected, Testing result not detected above the LOD or LOQ.
NA = Not Applicable.
** No result could be reported, see sample comments for details.
< This testing result is less than the numerical value.
( ) This testing result is between the LOD and LOQ and has higher analytical uncertainty than values at or above the LOQ.

ALS Envrionmental certifies this analytical report is in compliance with the Hanford SOW, both technically and for completeness. Release of the data contained in this report has been electronically authorized by the following laboratory representative:

Rand Potter, Project Manager, ALS Environmental

Quality Control Sample
Batch Report

Analysis Information

Workorder: 1618257

Limits: Historical/Performance	**Preparation:** NA	**Analysis:** NIOSH 1024
Basis: ALS Laboratory Group	**Batch:** NA	**Batch:** IFID/7563 (HBN: 172343)
	Prepared By: NA	**Analyzed By:** Fred Rejali

Blank

MB: 507118
Analyzed: 07/07/2016 00:00
Units: mg/sample

Analyte	Result	MDL	RL
1,3-Butadiene	ND	NA	0.00100

MB: 507325
Analyzed: 07/07/2016 00:00
Units: mg/sample

Analyte	Result	MDL	RL
1,3-Butadiene	ND	NA	0.00100

MB: 507328
Analyzed: 07/07/2016 00:00
Units: mg/sample

Analyte	Result	MDL	RL
1,3-Butadiene	ND	NA	0.00100

MB: 507331
Analyzed: 07/07/2016 00:00
Units: mg/sample

Analyte	Result	MDL	RL
1,3-Butadiene	ND	NA	0.00100

Laboratory Control Sample - Laboratory Control Sample Duplicate

LCS: 507119
Analyzed: 07/07/2016 00:00
Dilution: 1
Units: mg/sample

LCSD: 507120
Analyzed: 07/07/2016 00:00
Dilution: 1
Units: mg/sample

Analyte	Result	Target	% Rec	QC Limits		Result	% Rec	RPD	QC Limits	
1,3-Butadiene	0.0327	0.0342	95.6	78.0	117.6	0.0323	94.4	1.23	0.0	20.0

LCS: 507326
Analyzed: 07/07/2016 00:00
Dilution: 1
Units: mg/sample

LCSD: 507327
Analyzed: 07/07/2016 00:00
Dilution: 1
Units: mg/sample

Analyte	Result	Target	% Rec	QC Limits		Result	% Rec	RPD	QC Limits	
1,3-Butadiene	0.0302	0.0342	88.4	78.0	117.6	0.0314	91.8	3.83	0.0	20.0

LCS: 507329
Analyzed: 07/07/2016 00:00
Dilution: 1
Units: mg/sample

LCSD: 507330
Analyzed: 07/07/2016 00:00
Dilution: 1
Units: mg/sample

Analyte	Result	Target	% Rec	QC Limits		Result	% Rec	RPD	QC Limits	
1,3-Butadiene	0.0325	0.0342	95.0	78.0	117.6	0.0323	94.4	0.617	0.0	20.0

Quality Control Sample
Batch Report

Analysis Information

Workorder: 1618257

Limits: Historical/Performance	**Preparation:** NA	**Analysis:** NIOSH 1024
Basis: ALS Laboratory Group	**Batch:** NA	**Batch:** IFID/7563 (HBN: 172343)
	Prepared By: NA	**Analyzed By:** Fred Rejali

Laboratory Control Sample - Laboratory Control Sample Duplicate

LCS: 507332 Analyzed: 07/07/2016 00:00 Dilution: 1 Units: mg/sample						LCSD: 507333 Analyzed: 07/07/2016 00:00 Dilution: 1 Units: mg/sample				
Analyte	Result	Target	% Rec	QC Limits		Result	% Rec	RPD	QC Limits	
1,3-Butadiene	0.0316	0.0342	92.4	78.0	117.6	0.0300	87.7	5.19	0.0	20.0

QC Report Authorization (/S/ is an electronic signature that complies with 21 CFR Part 11)

Analyst	Peer Review
/S/ Fred Rejali 07/08/2016 00:58	/S/ Thomas J. Masoian 07/08/2016 09:19

Symbols and Definitions

* - Analyte above reporting limit or outside of control limits
▲ - Sample result is greater than 4 times the spike added
◓ - Sample and Matrix Duplicate less than 5 times the reporting limit
● - Result is above the calibration range

RPD - Relative % Difference (Spike / Spike Duplicate)
ND - Not Detected (U - Qualifier also flags analyte as not detected)
NA - Not Applicable
QC results are not adjusted for moisture correction, where applicable

1618257

1618257

Assembler	CHAIN OF CUSTODY/SAMPLE ANALYSIS REQUEST	C.O.C. No.
N/A		20161912
		Page 1 of 6

Collector: JONES	Contact/Requestor: CARL ROWALD IV	Telephone No.: 373-6861	MSIN: T6-05 FAX: 372-1878
SAF No.: N/A	Sample Origin: CARTRIDGE EVALUATION	Purchase Order/Charge Code: 202003/CB20	
Project Title: CARTRIDGE EVALUATION	Logbook/ Work Package No.: N/A	Ice Chest No.: WTS-05.5	Temp.: ON ICE
Shipped To (Lab): ALS	Method of Shipment	Bill of Lading/Air Bill No.: 7766 3723 2822	
Protocol: N/A	Data Turnaround: 10 DAYS	Parts and Return No.: 40958	

Sample No.	Lab ID	*	Date	Time	No./Type Container	Sample Analysis	Preservative
	S16T019014	VA	6/25/16		CHARCOAL TUBE	1,3-Butadiene 16-001-AP-EF-008H	CHILL -4C
	S16T019015	VA	6/25/16		CHARCOAL TUBE	1,3-Butadiene 16-001-AP-IN-008H	CHILL -4C
	S16T019016	VA	6/25/16		CHARCOAL TUBE	1,3-Butadiene 16-001-AP-EF-008G	CHILL -4C
	S16T019017	VA	6/25/16		CHARCOAL TUBE	1,3-Butadiene 16-001-AP-EF-008F	CHILL -4C
	S16T019018	VA	6/24/16		CHARCOAL TUBE	1,3-Butadiene 16-001-AP-EF-008E	CHILL -4C
	S16T019019	VA	6/24/16		CHARCOAL TUBE	1,3-Butadiene 16-001-AP-EF-008D	CHILL -4C
	S16T019020	VA	6/24/16		CHARCOAL TUBE	1,3-Butadiene 16-001-AP-EF-008C	CHILL -4C
	S16T019022	VA	6/24/16		CHARCOAL TUBE	1,3-Butadiene 16-001-AP-EF-008B	CHILL -4C
	S16T019023	VA	6/24/16		CHARCOAL TUBE	1,3-Butadiene 16-001-AP-EF-008A	CHILL -4C
	S16T019024	VA	6/24/16		CHARCOAL TUBE	1,3-Butadiene 16-001-AP-IN-008A	CHILL -4C

POSSIBLE SAMPLE HAZARDS/REMARKS (List all known wastes) MSDS ○ Yes ◉ No

SPECIAL INSTRUCTIONS — Hold Time

Send Results to Robert Sosa @ Greg Moore
Robert_W_Sosa@rl.gov and
Gregory_S_Moore@rl.gov see SOW for email

Reference Contract # 55502
RELEASE 9
NIOSH 1024 CHILL BELOW -4 C

Relinquished By	Print	Sign	Date/Time	Received By	Print	Sign	Date/Time
	Leslie Diaz	Leslie Diaz	6/24/16 0800	Julie Gradon	Julie Gradon	Julie Gradon	6/29/16 1000
Relinquished By			Date/Time	Received By			Date/Time
Julie Gradon	Julie Gradon	Julie Gradon	6/29/16 1400	FEDEX			
Relinquished By			Date/Time	Received By			Date/Time
Fedex							6/30/2016 1920
Relinquished By			Date/Time	Received By			Date/Time

Matrix*

S = Soil	DL = Drum Liquids		
SE = Sediment	T = Tissue		
SO = Solid	WI = Wipe		
SL = Sludge	L = Liquid		
W = Water	V = Vegetation		
O = Oil	VA = Vapor		
A = Air	X = Other		
DS = Drum Solids			

FINAL SAMPLE DISPOSITION	Disposal Method (e.g., Return to customer, per lab procedure, used in process)	Disposed By	Date/Time
		Fred Rejali	07107/16 2300

All samples containing hazardous materials shall be picked up by requestor and returned to parent container or site of origin.

A-6003-962 (03/05)

Assembler	CHAIN OF CUSTODY/SAMPLE ANALYSIS REQUEST	C.O.C. No.
N/A		20161912
		Page 2 of 6

Collector: JONES	Contact/Requestor: CARL HOWALD IV	Telephone No. 373-6861 MSIN T6-05 FAX 372-1878
SAF No.: N/A	Sample Origin: CARTRIDGE EVALUATION	Purchase Order/Charge Code: 202003/CD20
Project Title: CARTRIDGE EVALUATION	Logbook/ Work Package No.: N/A	Ice Chest No. WTS-055 Temp. ON ICE
Shipped To (Lab): ALS	Method of Shipment	Bill of Lading/Air Bill No. 7766 3723 2827
Protocol: N/A	Data Turnaround: 10 DAYS	Parts and Return No. 40958

Sample No.	Lab ID	*	Date	Time	No./Type Container	Sample Analysis	Preservative
	S16T019025	VA	6/24/16		CHARCOAL TUBE	1,3-Butadiene 16-001-AP-EF-008BASE	CHILL -4C
	S16T019026	VA	6/24/16		CHARCOAL TUBE	1,3-Butadiene 16-001-AP-IN-008BASE	CHILL -4C
	S16T019027	VA	6/24/16		CHARCOAL TUBE	1,3-Butadiene 16-001-AP-BK-008BASE	CHILL -4C
	S16T019028	VA	6/25/16		CHARCOAL TUBE	1,3-Butadiene 16-001-AP-EF-007H	CHILL -4C
	S16T019029	VA	6/25/16		CHARCOAL TUBE	1,3-Butadiene 16-001-AP-IN-007H	CHILL -4C
	S16T019030	VA	6/25/16		CHARCOAL TUBE	1,3-Butadiene 16-001-AP-EF-007G	CHILL -4C
	S16T019031	VA	6/25/16		CHARCOAL TUBE	1,3-Butadiene 16-001-AP-EF-007F	CHILL -4C
	S16T019032	VA	6/24/16		CHARCOAL TUBE	1,3-Butadiene 16-001-AP-EF-007E	CHILL -4C
	S16T019033	VA	6/24/16		CHARCOAL TUBE	1,3-Butadiene 16-001-AP-EF-007D	CHILL -4C
	S16T019034	VA	6/24/16		CHARCOAL TUBE	1,3-Butadiene 16-001-AP-EF-007C	CHILL -4C

POSSIBLE SAMPLE HAZARDS/REMARKS (List all known wastes) MSDS ○ Yes ◉ No

SPECIAL INSTRUCTIONS — Hold Time

Send Results to Robert Sosa @ Greg Moore
Robert_W_Sosa@rl.gov and
Gregory_S_Moore@rl.gov see SOW for email

Reference Contract # 55502
RELEASE 9
NIOSH 1024 CHILL BELOW -4 C

Relinquished By (Print / Sign)	Date/Time	Received By (Print / Sign)	Date/Time
TERESA FORRESTER Teresa Forrester	6-29-16 1000	Julie Gradisher Julie Gradisher	6/29/16 1000
JA Gradisher WRPS Julie Gradisher	6/29/16 1400	JA Gradisher WRPS	6/29/16 FEDEX

Matrix*

S = Soil		DL = Drum Liquids	
SE = Sediment		T = Tissue	
SO = Solid		WI = Wipe	
SL = Sludge		L = Liquid	
W = Water		V = Vegetation	
O = Oil		VA = Vapor	
A = Air		X = Other	
DS = Drum Solids			

FINAL SAMPLE DISPOSITION — Disposal Method (e.g., Return to customer, per lab procedure, used in process): Disposed By: Fred Rejahi Date/Time: 07/07/16 2300

All samples containing hazardous materials shall be picked up by requestor and returned to parent container or site of origin.

A-6003-962 (03/05)

Assembler	CHAIN OF CUSTODY/SAMPLE ANALYSIS REQUEST	C.O.C. No. 20161912
N/A		Page 3 of 6

Collector: JONES	Contact/Requestor: CARL HOWALD IV	Telephone No. 373-6861 MSIN T6-05 FAX 372-1878
SAF No.: N/A	Sample Origin: CARTRIDGE EVALUATION	Purchase Order/Charge Code: 202003/CB20
Project Title: CARTRIDGE EVALUATION	Logbook/ Work Package No.: N/A	Ice Chest No. WTS-055 Temp. ON ICE
Shipped To (Lab): ALS	Method of Shipment	Bill of Lading/Air Bill No. 7786 3723 2822
Protocol: N/A	Data Turnaround: 10 DAYS	Parts and Return No. 40958

Sample No.	Lab ID	*	Date	Time	No./Type Container	Sample Analysis	Preservative
	S16T019035	VA	6/24/16		CHARCOAL TUBE	1,3-Butadiene 16-001-AP-EF-007B	CHILL -4C
	S16T019036	VA	6/24/16		CHARCOAL TUBE	1,3-Butadiene 16-001-AP-EF-007A	CHILL -4C
	S16T019037	VA	6/24/16		CHARCOAL TUBE	1,3-Butadiene 16-001-AP-IN-007A	CHILL -4C
	S16T019038	VA	6/24/16		CHARCOAL TUBE	1,3-Butadiene 16-001-AP-EF-007BASE	CHILL -4C
	S16T019039	VA	6/24/16		CHARCOAL TUBE	1,3-Butadiene 16-001-AP-IN-007BASE	CHILL -4C
	S16T019040	VA	6/24/16		CHARCOAL TUBE	1,3-Butadiene 16-001-AP-BK-007BASE	CHILL -4C
	S16T019041	VA	6/26/16		CHARCOAL TUBE	1,3-Butadiene 16-002-AP-EF-008H	CHILL -4C
	S16T019042	VA	6/26/16		CHARCOAL TUBE	1,3-Butadiene 16-002-AP-IN-008H	CHILL -4C
	S16T019043	VA	6/26/16		CHARCOAL TUBE	1,3-Butadiene 16-002-AP-EF-008G	CHILL -4C
	S16T019044	VA	6/25/16		CHARCOAL TUBE	1,3-Butadiene 16-002-AP-EF-008F	CHILL -4C

POSSIBLE SAMPLE HAZARDS/REMARKS (List all known wastes) MSDS ○ Yes ◉ No

SPECIAL INSTRUCTIONS Hold Time

Send Results to Robert Sosa @ Greg Moore
Robert_W_Sosa@rl.gov and
Gregory_S_Moore@rl.gov see SOW for email

Reference Contract # 55502
RELEASE 9
NIOSH 1024 CHILL BELOW -4 C

Relinquished By (Print / Sign)	Date/Time	Received By (Print / Sign)	Date/Time
TERESA FORRESTER Teresa Forrester	6-29-16 1000	Julie Gradisher Julie Gradisher	6/29/16 1000
JA Gradisher WRPS Julie Gradisher	6-29-16 1400	FEDEX	
		Mildred Klevins Mildred Klevins	6/30/2016 920

Matrix*

S = Soil	DL = Drum Liquids		
SE = Sediment	T = Tissue		
SO = Solid	WI = Wipe		
SL = Sludge	L = Liquid		
W = Water	V = Vegetation		
O = Oil	VA = Vapor		
A = Air	X = Other		
DS = Drum Solids			

FINAL SAMPLE DISPOSITION — Disposal Method (e.g., Return to customer, per lab procedure, used in process): used in process — Disposed By: Fred Reial — Date/Time: 07/07/16 2300

All samples containing hazardous materials shall be picked up by requestor and returned to parent container or site of origin.

A-6003-962 (03/05)

Assembler	CHAIN OF CUSTODY/SAMPLE ANALYSIS REQUEST	C.O.C. No.
N/A		20161912
		Page 4 of 6

Collector: JONES	Contact/Requestor: CARL ROWALD IV	Telephone No. 373-6861 MSIN T6-05 FAX 372-1878
SAF No.: N/A	Sample Origin: CARTRIDGE EVALUATION	Purchase Order/Charge Code: 202003/CB20
Project Title: CARTRIDGE EVALUATION	Logbook/ Work Package No.: N/A	Ice Chest No. WTS-055 Temp. ON ICE
Shipped To (Lab): ALS	Method of Shipment	Bill of Lading/Air Bill No. 77666 3723 2822
Protocol: N/A	Data Turnaround: 10 DAYS	Parts and Return No. 40958

Sample No.	Lab ID	*	Date	Time	No./Type Container	Sample Analysis	Preservative
	S16T019045	VA	6/25/16		CHARCOAL TUBE	1,3-Butadiene 16-002-AP-EF-008E	CHILL -4C
	S16T019046	VA	6/25/16		CHARCOAL TUBE	1,3-Butadiene 16-002-AP-EF-008D	CHILL -4C
	S16T019047	VA	6/25/16		CHARCOAL TUBE	1,3-Butadiene 16-002-AP-EF-008C	CHILL -4C
	S16T019048	VA	6/25/16		CHARCOAL TUBE	1,3-Butadiene 16-002-AP-EF-008B	CHILL -4C
	S16T019049	VA	6/25/16		CHARCOAL TUBE	1,3-Butadiene 16-002-AP-EF-008A	CHILL -4C
	S16T019050	VA	6/25/16		CHARCOAL TUBE	1,3-Butadiene 16-002-AP-IN-008A	CHILL -4C
	S16T019051	VA	6/25/16		CHARCOAL TUBE	1,3-Butadiene 16-002-AP-EF-008BASE	CHILL -4C
	S16T019052	VA	6/25/16		CHARCOAL TUBE	1,3-Butadiene 16-002-AP-IN-008BASE	CHILL -4C
	S16T019053	VA	6/25/16		CHARCOAL TUBE	1,3-Butadiene 16-002-AP-BK-008BASE	CHILL -4C
	S16T019054	VA	6/26/16		CHARCOAL TUBE	1,3-Butadiene 16-002-AP-EF-007H	CHILL -4C

POSSIBLE SAMPLE HAZARDS/REMARKS (List all known wastes) MSDS ○ Yes ◉ No

SPECIAL INSTRUCTIONS — Hold Time

Send Results to Robert Sosa @ Greg Moore
Robert_W_Sosa@rl.gov and
Gregory_S_Moore@rl.gov see SOW for email

Reference Contract # 55502
RELEASE 9
NIOSH 1024 CHILL BELOW -4 C

Relinquished By	Print	Sign	Date/Time	Received By	Print	Sign	Date/Time
	Leslie DIAZ	Leslie Diaz	6/29/16 1000		Julie Gradisher	Julie Gradisher	6/29/16 1000
Relinquished By: JA Gradisher WRPS		Julie Gradisher	6/29/16 1400	Received By: FEDEX			
Relinquished By				Received By			
Relinquished By				Received By			

Matrix*

S = Soil	DL = Drum Liquids		
SE = Sediment	T = Tissue		
SO = Solid	WI = Wipe		
SL = Sludge	L = Liquid		
W = Water	V = Vegetation		
O = Oil	VA = Vapor		
A = Air	X = Other		
DS = Drum Solids			

FINAL SAMPLE DISPOSITION	Disposal Method (e.g., Return to customer, per lab procedure, used in process)	Disposed By	Date/Time
		Fred Rajab	07107116 2300

All samples containing hazardous materials shall be picked up by requestor and returned to parent container or site of origin.

A-6003-962 (03/05)

Assembler	CHAIN OF CUSTODY/SAMPLE ANALYSIS REQUEST	C.O.C. No. 20161912
N/A		Page 5 of 6

Collector: JONES	Contact/Requestor: CARL HOWALD IV	Telephone No. 373-6861 MSIN T6-05 FAX 372-1878
SAF No.: N/A	Sample Origin: CARTRIDGE EVALUATION	Purchase Order/Charge Code: 202003/CB20
Project Title: CARTRIDGE EVALUATION	Logbook/ Work Package No.: N/A	Ice Chest No. W.S-055 Temp. ON ICE
Shipped To (Lab): ALS	Method of Shipment	Bill of Lading/Air Bill No. 7766 3723 2822
Protocol: N/A	Data Turnaround: 10 DAYS	Parts and Return No. 40958

Sample No.	Lab ID	*	Date	Time	No./Type Container	Sample Analysis	Preservative
	S16T019055	VA	6/26/16		CHARCOAL TUBE	1,3-Butadiene 16-002-AP-IN-007H	CHILL -4C
	S16T019056	VA	6/26/16		CHARCOAL TUBE	1,3-Butadiene 16-002-AP-EF-007G	CHILL -4C
	S16T019057	VA	6/25/16		CHARCOAL TUBE	1,3-Butadiene 16-002-AP-EF-007F	CHILL -4C
	S16T019058	VA	6/25/16		CHARCOAL TUBE	1,3-Butadiene 16-002-AP-EF-007E	CHILL -4C
	S16T019059	VA	6/25/16		CHARCOAL TUBE	1,3-Butadiene 16-002-AP-EF-007D	CHILL -4C
	S16T019060	VA	6/25/16		CHARCOAL TUBE	1,3-Butadiene 16-002-AP-EF-007C	CHILL -4C
	S16T019061	VA	6/25/16		CHARCOAL TUBE	1,3-Butadiene 16-002-AP-EF-007B	CHILL -4C
	S16T019062	VA	6/25/16		CHARCOAL TUBE	1,3-Butadiene 16-002-AP-EF-007A	CHILL -4C
	S16T019063	VA	6/25/16		CHARCOAL TUBE	1,3-Butadiene 16-002-AP-IN-007A	CHILL -4C
	S16T019064	VA	6/25/16		CHARCOAL TUBE	1,3-Butadiene 16-002-AP-EF-007BASE	CHILL -4C

POSSIBLE SAMPLE HAZARDS/REMARKS (List all known wastes) MSDS ○ Yes ◉ No

SPECIAL INSTRUCTIONS — Hold Time

Send Results to Robert Sosa @ Greg Moore
Robert_W_Sosa@rl.gov and
Gregory_S_Moore@rl.gov see SOW for email

Reference Contract # 55502
RELEASE 9
NIOSH 1024 CHILL BELOW -4 C

Relinquished By (Print / Sign)	Date/Time	Received By (Print / Sign)	Date/Time
Leslie Diaz / Leslie Diaz	6/29/16 10:00	Julie Gradisher / Julie Gradisher	6/29/16 1000
JA Gradisher WRPS / Julie Gradisher	6/29/16 1400	FEDEX	
			6/30/2016 930

Matrix*

S = Soil		DL = Drum Liquids	
SE = Sediment		T = Tissue	
SO = Solid		WI = Wipe	
SL = Sludge		L = Liquid	
W = Water		V = Vegetation	
O = Oil		VA = Vapor	
A = Air		X = Other	
DS = Drum Solids			

FINAL SAMPLE DISPOSITION	Disposal Method (e.g., Return to customer, per lab procedure, used in process)	Disposed By	Date/Time
		Fred Rejahl	07/07/16 2300

All samples containing hazardous materials shall be picked up by requestor and returned to parent container or site of origin.

A-6003-962 (03/05)

Assembler	CHAIN OF CUSTODY/SAMPLE ANALYSIS REQUEST	C.O.C. No. 20161912
N/A		Page 6 of 6

Collector: JONES	Contact/Requestor: CARL HOWALD IV	Telephone No. 373-6861 MSIN T6-05 FAX 372-1878
SAF No.: N/A	Sample Origin: CARTRIDGE EVALUATION	Purchase Order/Charge Code: 202003/CB20
Project Title: CARTRIDGE EVALUATION	Logbook/ Work Package No.: N/A	Ice Chest No.: WTS-055 Temp.: on Ice
Shipped To (Lab): ALS	Method of Shipment	Bill of Lading/Air Bill No.: 7756 3723 2822
Protocol: N/A	Data Turnaround: 10 DAYS	Parts and Return No.: 40958

Sample No.	Lab ID	*	Date	Time	No./Type Container	Sample Analysis	Preservative
	S16T019065	VA	6/25/16		CHARCOAL TUBE	1,3-Butadiene 16-002-AP-IN-007BASE	CHILL -4C
	S16T019066	VA	6/25/16		CHARCOAL TUBE	1,3-Butadiene 16-002-AP-BK-007BASE	CHILL -4C

POSSIBLE SAMPLE HAZARDS/REMARKS (List all known wastes) MSDS ○ Yes ◉ No

SPECIAL INSTRUCTIONS — Hold Time

Send Results to Robert Sosa @ Greg Moore
Robert_W_Sosa@rl.gov and
Gregory_S_Moore@rl.gov see SOW for email

Reference Contract # 55502
RELEASE 9
NIOSH 1024 CHILL BELOW -4 C

Relinquished By (Print / Sign)	Date/Time	Received By (Print / Sign)	Date/Time
Fred Rajab	6/29/16 10:00	Julie Gadsby	6/29/16 1000
Julie Gadsby	6/29/16 1400	FEDEX	

Matrix*

S = Soil		DL = Drum Liquids	
SE = Sediment		T = Tissue	
SO = Solid		WI = Wipe	
SL = Sludge		L = Liquid	
W = Water		V = Vegetation	
O = Oil		VA = Vapor	
A = Air		X = Other	
DS = Drum Solids			

FINAL SAMPLE DISPOSITION — Disposal Method (e.g., Return to customer, per lab procedure, used in process): used in process — Disposed By: Fred Rajab — Date/Time: 07/07/16 2300

All samples containing hazardous materials shall be picked up by requestor and returned to parent container or site of origin.

A-6003-962 (03/05)

C.3.10 Pyridines

ANALYTICAL REPORT

Report Date: July 11, 2016

Robert (Buddy) Sosa
Washington River Protection So
PO Box 850, MSIN T6-02
Richland, WA 99352

Phone: (509) 373-1262

E-mail: robert_w_sosa@rl.gov

20161910

Workorder: 34-1618255
Client Project ID: CARTRIDGE EVALUATION
Purchase Order: 55502 Rel9
Project Manager: Rand Potter

Analytical Results

Sample ID: S16T018880 — Collected: 06/25/2016
Lab ID: 1618255001 — Sampling Location: CARTRIDGE EVALUATION — Received: 06/30/2016
Method: NIOSH 1613 Mod. — Media: SKC 226-01, Charcoal Tube 100/50mg — Analyzed: 07/08/2016
Sampling Parameter: Air Volume Not Provided

Analyte	Result (ug/sample)	Result (mg/m³)	Result (ppm)	RL (ug/sample)
Pyridine	<0.20	NA	NA	0.20
2,4-Dimethylpyridine	<0.20	NA	NA	0.20

Sample ID: S16T018881 — Collected: 06/25/2016
Lab ID: 1618255002 — Sampling Location: CARTRIDGE EVALUATION — Received: 06/30/2016
Method: NIOSH 1613 Mod. — Media: SKC 226-01, Charcoal Tube 100/50mg — Analyzed: 07/08/2016
Sampling Parameter: Air Volume Not Provided

Analyte	Result (ug/sample)	Result (mg/m³)	Result (ppm)	RL (ug/sample)
Pyridine	<0.20	NA	NA	0.20
2,4-Dimethylpyridine	<0.20	NA	NA	0.20

Sample ID: S16T018882 — Collected: 06/25/2016
Lab ID: 1618255003 — Sampling Location: CARTRIDGE EVALUATION — Received: 06/30/2016
Method: NIOSH 1613 Mod. — Media: SKC 226-01, Charcoal Tube 100/50mg — Analyzed: 07/08/2016
Sampling Parameter: Air Volume Not Provided

Analyte	Result (ug/sample)	Result (mg/m³)	Result (ppm)	RL (ug/sample)
Pyridine	<0.20	NA	NA	0.20
2,4-Dimethylpyridine	<0.20	NA	NA	0.20

ANALYTICAL REPORT

Workorder: **34-1618255**
Client Project ID: CARTRIDGE EVALUATION
Purchase Order: 55502 Rel9
Project Manager: Rand Potter

Analytical Results

Sample ID: **S16T018883** Collected: 06/25/2016
Lab ID: 1618255004 Sampling Location: CARTRIDGE EVALUATION Received: 06/30/2016
Method: **NIOSH 1613 Mod.** Media: SKC 226-01, Charcoal Tube 100/50mg Analyzed: 07/08/2016
Sampling Parameter: **Air Volume Not Provided**

Analyte	Result (ug/sample)	Result (mg/m³)	Result (ppm)	RL (ug/sample)
Pyridine	<0.20	NA	NA	0.20
2,4-Dimethylpyridine	<0.20	NA	NA	0.20

Sample ID: **S16T018884** Collected: 06/24/2016
Lab ID: 1618255005 Sampling Location: CARTRIDGE EVALUATION Received: 06/30/2016
Method: **NIOSH 1613 Mod.** Media: SKC 226-01, Charcoal Tube 100/50mg Analyzed: 07/08/2016
Sampling Parameter: **Air Volume Not Provided**

Analyte	Result (ug/sample)	Result (mg/m³)	Result (ppm)	RL (ug/sample)
Pyridine	<0.20	NA	NA	0.20
2,4-Dimethylpyridine	<0.20	NA	NA	0.20

Sample ID: **S16T018885** Collected: 06/24/2016
Lab ID: 1618255006 Sampling Location: CARTRIDGE EVALUATION Received: 06/30/2016
Method: **NIOSH 1613 Mod.** Media: SKC 226-01, Charcoal Tube 100/50mg Analyzed: 07/08/2016
Sampling Parameter: **Air Volume Not Provided**

Analyte	Result (ug/sample)	Result (mg/m³)	Result (ppm)	RL (ug/sample)
Pyridine	<0.20	NA	NA	0.20
2,4-Dimethylpyridine	<0.20	NA	NA	0.20

Sample ID: **S16T018886** Collected: 06/24/2016
Lab ID: 1618255007 Sampling Location: CARTRIDGE EVALUATION Received: 06/30/2016
Method: **NIOSH 1613 Mod.** Media: SKC 226-01, Charcoal Tube 100/50mg Analyzed: 07/08/2016
Sampling Parameter: **Air Volume Not Provided**

Analyte	Result (ug/sample)	Result (mg/m³)	Result (ppm)	RL (ug/sample)
Pyridine	<0.20	NA	NA	0.20
2,4-Dimethylpyridine	<0.20	NA	NA	0.20

ANALYTICAL REPORT

Workorder: **34-1618255**
Client Project ID: CARTRIDGE EVALUATION
Purchase Order: 55502 Rel9
Project Manager: Rand Potter

Analytical Results

Sample ID: **S16T018887** Collected: 06/24/2016
Lab ID: 1618255008 Sampling Location: CARTRIDGE EVALUATION Received: 06/30/2016
Method: **NIOSH 1613 Mod.** Media: SKC 226-01, Charcoal Tube 100/50mg Analyzed: 07/08/2016
Sampling Parameter: **Air Volume Not Provided**

Analyte	Result (ug/sample)	Result (mg/m³)	Result (ppm)	RL (ug/sample)
Pyridine	<0.20	NA	NA	0.20
2,4-Dimethylpyridine	<0.20	NA	NA	0.20

Sample ID: **S16T018888** Collected: 06/24/2016
Lab ID: 1618255009 Sampling Location: CARTRIDGE EVALUATION Received: 06/30/2016
Method: **NIOSH 1613 Mod.** Media: SKC 226-01, Charcoal Tube 100/50mg Analyzed: 07/08/2016
Sampling Parameter: **Air Volume Not Provided**

Analyte	Result (ug/sample)	Result (mg/m³)	Result (ppm)	RL (ug/sample)
Pyridine	<0.20	NA	NA	0.20
2,4-Dimethylpyridine	<0.20	NA	NA	0.20

Sample ID: **S16T018889** Collected: 06/24/2016
Lab ID: 1618255010 Sampling Location: CARTRIDGE EVALUATION Received: 06/30/2016
Method: **NIOSH 1613 Mod.** Media: SKC 226-01, Charcoal Tube 100/50mg Analyzed: 07/08/2016
Sampling Parameter: **Air Volume Not Provided**

Analyte	Result (ug/sample)	Result (mg/m³)	Result (ppm)	RL (ug/sample)
Pyridine	<0.20	NA	NA	0.20
2,4-Dimethylpyridine	<0.20	NA	NA	0.20

Sample ID: **S16T018890** Collected: 06/24/2016
Lab ID: 1618255011 Sampling Location: CARTRIDGE EVALUATION Received: 06/30/2016
Method: **NIOSH 1613 Mod.** Media: SKC 226-01, Charcoal Tube 100/50mg Analyzed: 07/08/2016
Sampling Parameter: **Air Volume Not Provided**

Analyte	Result (ug/sample)	Result (mg/m³)	Result (ppm)	RL (ug/sample)
Pyridine	<0.20	NA	NA	0.20
2,4-Dimethylpyridine	<0.20	NA	NA	0.20

ANALYTICAL REPORT

Workorder: **34-1618255**
Client Project ID: CARTRIDGE EVALUATION
Purchase Order: 55502 Rel9
Project Manager: Rand Potter

Analytical Results

Sample ID: **S16T018891** Collected: 06/24/2016
Lab ID: 1618255012 Sampling Location: CARTRIDGE EVALUATION Received: 06/30/2016
Method: **NIOSH 1613 Mod.** Media: SKC 226-01, Charcoal Tube 100/50mg Analyzed: 07/08/2016
Sampling Parameter: **Air Volume Not Provided**

Analyte	Result (ug/sample)	Result (mg/m³)	Result (ppm)	RL (ug/sample)
Pyridine	<0.20	NA	NA	0.20
2,4-Dimethylpyridine	<0.20	NA	NA	0.20

Sample ID: **S16T018892** Collected: 06/24/2016
Lab ID: 1618255013 Sampling Location: CARTRIDGE EVALUATION Received: 06/30/2016
Method: **NIOSH 1613 Mod.** Media: SKC 226-01, Charcoal Tube 100/50mg Analyzed: 07/08/2016
Sampling Parameter: **Air Volume Not Provided**

Analyte	Result (ug/sample)	Result (mg/m³)	Result (ppm)	RL (ug/sample)
Pyridine	<0.20	NA	NA	0.20
2,4-Dimethylpyridine	<0.20	NA	NA	0.20

Sample ID: **S16T018893** Collected: 06/26/2016
Lab ID: 1618255014 Sampling Location: CARTRIDGE EVALUATION Received: 06/30/2016
Method: **NIOSH 1613 Mod.** Media: SKC 226-01, Charcoal Tube 100/50mg Analyzed: 07/08/2016
Sampling Parameter: **Air Volume Not Provided**

Analyte	Result (ug/sample)	Result (mg/m³)	Result (ppm)	RL (ug/sample)
Pyridine	<0.20	NA	NA	0.20
2,4-Dimethylpyridine	<0.20	NA	NA	0.20

Sample ID: **S16T018894** Collected: 06/26/2016
Lab ID: 1618255015 Sampling Location: CARTRIDGE EVALUATION Received: 06/30/2016
Method: **NIOSH 1613 Mod.** Media: SKC 226-01, Charcoal Tube 100/50mg Analyzed: 07/08/2016
Sampling Parameter: **Air Volume Not Provided**

Analyte	Result (ug/sample)	Result (mg/m³)	Result (ppm)	RL (ug/sample)
Pyridine	<0.20	NA	NA	0.20
2,4-Dimethylpyridine	<0.20	NA	NA	0.20

ANALYTICAL REPORT

Workorder: **34-1618255**
Client Project ID: CARTRIDGE EVALUATION
Purchase Order: 55502 Rel9
Project Manager: Rand Potter

Analytical Results

Sample ID: **S16T018895** Collected: 06/26/2016
Lab ID: 1618255016 Sampling Location: CARTRIDGE EVALUATION Received: 06/30/2016
Method: **NIOSH 1613 Mod.** Media: SKC 226-01, Charcoal Tube 100/50mg Analyzed: 07/08/2016
Sampling Parameter: **Air Volume Not Provided**

Analyte	Result (ug/sample)	Result (mg/m³)	Result (ppm)	RL (ug/sample)
Pyridine	<0.20	NA	NA	0.20
2,4-Dimethylpyridine	<0.20	NA	NA	0.20

Sample ID: **S16T018896** Collected: 06/25/2016
Lab ID: 1618255017 Sampling Location: CARTRIDGE EVALUATION Received: 06/30/2016
Method: **NIOSH 1613 Mod.** Media: SKC 226-01, Charcoal Tube 100/50mg Analyzed: 07/08/2016
Sampling Parameter: **Air Volume Not Provided**

Analyte	Result (ug/sample)	Result (mg/m³)	Result (ppm)	RL (ug/sample)
Pyridine	<0.20	NA	NA	0.20
2,4-Dimethylpyridine	<0.20	NA	NA	0.20

Sample ID: **S16T018897** Collected: 06/25/2016
Lab ID: 1618255018 Sampling Location: CARTRIDGE EVALUATION Received: 06/30/2016
Method: **NIOSH 1613 Mod.** Media: SKC 226-01, Charcoal Tube 100/50mg Analyzed: 07/09/2016
Sampling Parameter: **Air Volume Not Provided**

Analyte	Result (ug/sample)	Result (mg/m³)	Result (ppm)	RL (ug/sample)
Pyridine	<0.20	NA	NA	0.20
2,4-Dimethylpyridine	<0.20	NA	NA	0.20

Sample ID: **S16T018898** Collected: 06/25/2016
Lab ID: 1618255019 Sampling Location: CARTRIDGE EVALUATION Received: 06/30/2016
Method: **NIOSH 1613 Mod.** Media: SKC 226-01, Charcoal Tube 100/50mg Analyzed: 07/09/2016
Sampling Parameter: **Air Volume Not Provided**

Analyte	Result (ug/sample)	Result (mg/m³)	Result (ppm)	RL (ug/sample)
Pyridine	<0.20	NA	NA	0.20
2,4-Dimethylpyridine	<0.20	NA	NA	0.20

ANALYTICAL REPORT

Workorder: **34-1618255**
Client Project ID: CARTRIDGE EVALUATION
Purchase Order: 55502 Rel9
Project Manager: Rand Potter

Analytical Results

Sample ID: **S16T018899** — Collected: 06/25/2016
Lab ID: 1618255020 — Sampling Location: CARTRIDGE EVALUATION — Received: 06/30/2016
Method: **NIOSH 1613 Mod.** — Media: SKC 226-01, Charcoal Tube 100/50mg — Analyzed: 07/08/2016
Sampling Parameter: **Air Volume Not Provided**

Analyte	Result (ug/sample)	Result (mg/m³)	Result (ppm)	RL (ug/sample)
Pyridine	<0.20	NA	NA	0.20
2,4-Dimethylpyridine	<0.20	NA	NA	0.20

Sample ID: **S16T018900** — Collected: 06/25/2016
Lab ID: 1618255021 — Sampling Location: CARTRIDGE EVALUATION — Received: 06/30/2016
Method: **NIOSH 1613 Mod.** — Media: SKC 226-01, Charcoal Tube 100/50mg — Analyzed: 07/09/2016
Sampling Parameter: **Air Volume Not Provided**

Analyte	Result (ug/sample)	Result (mg/m³)	Result (ppm)	RL (ug/sample)
Pyridine	<0.20	NA	NA	0.20
2,4-Dimethylpyridine	<0.20	NA	NA	0.20

Sample ID: **S16T018901** — Collected: 06/25/2016
Lab ID: 1618255022 — Sampling Location: CARTRIDGE EVALUATION — Received: 06/30/2016
Method: **NIOSH 1613 Mod.** — Media: SKC 226-01, Charcoal Tube 100/50mg — Analyzed: 07/09/2016
Sampling Parameter: **Air Volume Not Provided**

Analyte	Result (ug/sample)	Result (mg/m³)	Result (ppm)	RL (ug/sample)
Pyridine	<0.20	NA	NA	0.20
2,4-Dimethylpyridine	<0.20	NA	NA	0.20

Sample ID: **S16T018902** — Collected: 06/25/2016
Lab ID: 1618255023 — Sampling Location: CARTRIDGE EVALUATION — Received: 06/30/2016
Method: **NIOSH 1613 Mod.** — Media: SKC 226-01, Charcoal Tube 100/50mg — Analyzed: 07/09/2016
Sampling Parameter: **Air Volume Not Provided**

Analyte	Result (ug/sample)	Result (mg/m³)	Result (ppm)	RL (ug/sample)
Pyridine	<0.20	NA	NA	0.20
2,4-Dimethylpyridine	<0.20	NA	NA	0.20

ANALYTICAL REPORT

Workorder: **34-1618255**
Client Project ID: CARTRIDGE EVALUATION
Purchase Order: 55502 Rel9
Project Manager: Rand Potter

Analytical Results

Sample ID: **S16T018903** Collected: 06/25/2016
Lab ID: 1618255024 Sampling Location: CARTRIDGE EVALUATION Received: 06/30/2016
Method: **NIOSH 1613 Mod.** Media: SKC 226-01, Charcoal Tube 100/50mg Analyzed: 07/09/2016
Sampling Parameter: **Air Volume Not Provided**

Analyte	Result (ug/sample)	Result (mg/m^3)	Result (ppm)	RL (ug/sample)
Pyridine	<0.20	NA	NA	0.20
2,4-Dimethylpyridine	<0.20	NA	NA	0.20

Comments

Quality Control: **NIOSH 1613 Mod. - (HBN: 172094)**

The referenced method has not been validated for 2,4-dimethylpyridine. Additionally, studies regarding media collection efficiency, sample storage stability, analyte retention capability, and/or analyte desorption efficiency have not been performed.

LCSD 506677 fails RPD for 2,4-dimethyl pyridine at 28.1%, but passes percent recovery.

Report Authorization (/S/ is an electronic signature that complies with 21 CFR Part 11)

Method	Analyst	Peer Review
NIOSH 1613 Mod.	/S/ Steven Yourstone 07/07/2016 10:23	/S/ Thomas J. Masoian 07/11/2016 08:47

Laboratory Contact Information

ALS Environmental
960 W Levoy Drive
Salt Lake City, Utah 84123

Phone: (801) 266-7700
Email: alslt.lab@ALSGlobal.com
Web: www.alsslc.com

ANALYTICAL REPORT

Workorder: **34-1618255**
Client Project ID: CARTRIDGE EVALUATION
Purchase Order: 55502 Rel9
Project Manager: Rand Potter

General Lab Comments

The results provided in this report relate only to the items tested.
Samples were received in acceptable condition unless otherwise noted.
Samples have not been blank corrected unless otherwise noted.
This test report shall not be reproduced, except in full, without written approval of ALS.

ALS provides professional analytical services for all samples submitted. ALS is not in a position to interpret the data and assumes no responsibility for the quality of the samples submitted.

All quality control samples processed with the samples in this report yielded acceptable results unless otherwise noted.

ALS is accredited for specific fields of testing (scopes) in the following testing sectors. The quality system implemented at ALS conforms to accreditation requirements and is applied to all analytical testing performed by ALS. The following table lists testing sector, accreditation body, accreditation number and website. Please contact these accrediting bodies or your ALS project manager for the current scope of accreditation that applies to your analytical testing.

Testing Sector	Accreditation Body (Standard)	Certificate Number	Website
Environmental	ACLASS (DoD ELAP)	ADE-1420	http://www.aclasscorp.com
	Utah (NELAC)	DATA1	http://health.utah.gov/lab/labimp/
	Nevada	UT00009	http://ndep.nv.gov/bsdw/labservice.htm
	Oklahoma	UT00009	http://www.deq.state.ok.us/CSDnew/
	Iowa	IA# 376	http://www.iowadnr.gov/InsideDNR/RegulatoryWater.aspx
	Florida (TNI)	E871067	http://www.dep.state.fl.us/labs/bars/sas/qa/
	Texas (TNI)	T104704456-11-1	http://www.tceq.texas.gov/field/qa/lab_accred_certif.html
Industrial Hygiene	AIHA-LAP, LLC (ISO 17025 and AIHA-LAP, LLC IHLAP/ELLAP)	101574	http://www.aihaaccreditedlabs.org
Lead Testing:			
CPSC	ACLASS (ISO 17025, CPSC)	ADE-1420	http://www.aclasscorp.com
Soil, Dust, Paint ,Air	AIHA-LAP, LLC (ISO 17025, AIHA-LAP, LLC ELLAP and NLLAP)	101574	http://www.aihaaccreditedlabs.org
Dietary Supplements	ACLASS (ISO 17025)	ADE-1420	http://www.aclasscorp.com

Definitions

LOD = Limit of Detection = MDL = Method Detection Limit, A statistical estimate of method/media/instrument sensitivity.
LOQ = Limit of Quantitation = RL = Reporting Limit, A verified value of method/media/instrument sensitivity.
ND = Not Detected, Testing result not detected above the LOD or LOQ.
NA = Not Applicable.
** No result could be reported, see sample comments for details.
< This testing result is less than the numerical value.
( ) This testing result is between the LOD and LOQ and has higher analytical uncertainty than values at or above the LOQ.

ALS Envrionmental certifies this analytical report is in compliance with the Hanford SOW, both technically and for completeness. Release of the data contained in this report has been electronically authorized by the following laboratory representative:

Rand Potter, Project Manager, ALS Environmental

Quality Control Sample
Batch Report

Analysis Information

Workorder: 1618255

Limits: Historical/Performance	**Preparation:** NA	**Analysis:** NIOSH 1613 Mod.
Basis: ALS Laboratory Group	**Batch:** NA	**Batch:** ISVO/3041 (HBN: 172094)
	Prepared By: NA	**Analyzed By:** Steven Yourstone

Blank

LMB: 506672
Analyzed: 07/08/2016 06:44
Units: ug/sample

Analyte	Result	MDL	RL
Pyridine	ND	NA	0.200
2,4-Dimethylpyridine	ND	NA	0.200

LMB: 506675
Analyzed: 07/08/2016 07:05
Units: ug/sample

Analyte	Result	MDL	RL
Pyridine	ND	NA	0.200
2,4-Dimethylpyridine	ND	NA	0.200

Laboratory Control Sample - Laboratory Control Sample Duplicate

LCS: 506673
Analyzed: 07/08/2016 14:36
Dilution: 1
Units: ug/sample

LCSD: 506674
Analyzed: 07/08/2016 14:56
Dilution: 1
Units: ug/sample

Analyte	Result	Target	% Rec	QC Limits		Result	% Rec	RPD	QC Limits	
Pyridine	1.36	2.00	68.1	61.8	141.1	1.48	73.9	8.10	0.0	22.1
2,4-Dimethylpyridine	1.03	1.98	52.2	51.7	130.6	1.26	63.7	19.9	0.0	22.2

LCS: 506676
Analyzed: 07/08/2016 15:16
Dilution: 1
Units: ug/sample

LCSD: 506677
Analyzed: 07/08/2016 15:35
Dilution: 1
Units: ug/sample

Analyte	Result	Target	% Rec	QC Limits		Result	% Rec	RPD	QC Limits	
Pyridine	1.51	2.00	75.4	61.8	141.1	1.75	87.5	14.9	0.0	22.1
2,4-Dimethylpyridine	1.13	1.98	56.9	51.7	130.6	1.50	75.6	* 28.1	0.0	22.2

Comments

The referenced method has not been validated for 2,4-dimethylpyridine. Additionally, studies regarding media collection efficiency, sample storage stability, analyte retention capability, and/or analyte desorption efficiency have not been performed.

LCSD 506677 fails RPD for 2,4-dimethyl pyridine at 28.1%, but passes percent recovery.

QC Report Authorization (/S/ is an electronic signature that complies with 21 CFR Part 11)

Analyst	Peer Review
/S/ Steven Yourstone	/S/ Thomas J. Masoian
07/07/2016 10:23	07/11/2016 08:47

Symbols and Definitions

* - Analyte above reporting limit or outside of control limits
▲ - Sample result is greater than 4 times the spike added
◓ - Sample and Matrix Duplicate less than 5 times the reporting limit
◆ - Result is above the calibration range

RPD - Relative % Difference (Spike / Spike Duplicate)
ND - Not Detected (U - Qualifier also flags analyte as not detected)
NA - Not Applicable
QC results are not adjusted for moisture correction, where applicable

H 1618255

1618255

Assembler	CHAIN OF CUSTODY/SAMPLE ANALYSIS REQUEST	C.O.C. No.
N/A		20161910
		Page 1 of 3

Collector: JONES	Contact/Requestor: CARL HOWALD IV	Telephone No.: 373-6861	MSIN: T6-05 FAX: 372-1878
SAF No.: N/A	Sample Origin: CARTRIDGE EVALUATION	Purchase Order/Charge Code: 202003/CB20	
Project Title: CARTRIDGE EVALUATION	Logbook/ Work Package No.: N/A	Ice Chest No.: WTS-055	Temp.: ONICE
Shipped To (Lab): ALS	Method of Shipment	Bill of Lading/Air Bill No.: 7766 3723 2822	
Protocol: N/A	Data Turnaround: 10 DAYS	Parts and Return No.: 40958	

Sample No.	Lab ID	*	Date	Time	No./Type Container	Sample Analysis	Preservative
1	S16T018880	VA	6/25/16		CHARCOAL TUBE	Pyridines 16-001-AP-EF-010H	N/A
2	S16T018881	VA	6/25/16		CHARCOAL TUBE	Pyridines 16-001-AP-IN-010H	N/A
3	S16T018882	VA	6/25/16		CHARCOAL TUBE	Pyridines 16-001-AP-EF-010G	N/A
4	S16T018883	VA	6/25/16		CHARCOAL TUBE	Pyridines 16-001-AP-EF-010F	N/A
5	S16T018884	VA	6/24/16		CHARCOAL TUBE	Pyridines 16-001-AP-EF-010E	N/A
6	S16T018885	VA	6/24/16		CHARCOAL TUBE	Pyridines 16-001-AP-EF-010D	N/A
7	S16T018886	VA	6/24/16		CHARCOAL TUBE	Pyridines 16-001-AP-EF-010C	N/A
8	S16T018887	VA	6/24/16		CHARCOAL TUBE	Pyridines 16-001-AP-EF-010B	N/A
9	S16T018888	VA	6/24/16		CHARCOAL TUBE	Pyridines 16-001-AP-EF-010A	N/A
10	S16T018889	VA	6/24/16		CHARCOAL TUBE	Pyridines 16-001-AP-IN-010A	N/A

POSSIBLE SAMPLE HAZARDS/REMARKS (List all known wastes) MSDS ○ Yes ◉ No

SPECIAL INSTRUCTIONS — Hold Time

Send Results to Robert Sosa @ Greg Moore
Robert_N_Sosa@rl.gov and
Gregory_S_Moore@rl.gov see SOW for email

RELEASE 9
Reference Contract # 55502

Relinquished By (Print / Sign)	Date/Time	Received By (Print / Sign)	Date/Time
TERESA FORRESTER / Teresa Forrester	6-29-16 1000	RE ROGERS / RE Rogers	6-29-16 10:00
RE ROGERS / RE Rogers	6-29-16 1400	FEDEX	
FEDEX		Alexander Edwards / Alexander Edwards	6/30/16 900

Matrix*

S = Soil		DL = Drum Liquids	
SE = Sediment		T = Tissue	
SO = Solid		WI = Wipe	
SL = Sludge		L = Liquid	
W = Water		V = Vegetation	
O = Oil		VA = Vapor	
A = Air		X = Other	
DS = Drum Solids			

FINAL SAMPLE DISPOSITION	Disposal Method (e.g., Return to customer, per lab procedure, used in process)	Disposed By	Date/Time
		Eunice R Pratt	7/1/16 14:20

All samples containing hazardous materials shall be picked up by requestor and returned to parent container or site of origin.

A-6003-962 (03/05)

Assembler	CHAIN OF CUSTODY/SAMPLE ANALYSIS REQUEST	C.O.C. No.
N/A		20161910
		Page 2 of 3

Collector: JONES	Contact/Requestor: CARL HOWALD IV	Telephone No. 373-6861 MSIN T6-05 FAX 372-1878
SAF No.: N/A	Sample Origin: CARTRIDGE EVALUATION	Purchase Order/Charge Code: 202003/CB20
Project Title: CARTRIDGE EVALUATION	Logbook/ Work Package No.: N/A	Ice Chest No. Wt5-055 Temp. ON ICE
Shipped To (Lab): ALS	Method of Shipment	Bill of Lading/Air Bill No. 7766 3783 2822
Protocol: N/A	Data Turnaround: 10 DAYS	Parts and Return No. 40958

Sample No.	Lab ID	*	Date	Time	No./Type Container	Sample Analysis	Preservative
11	S16T018890	VA	6/24/16		CHARCOAL TUBE	Pyridines 16-001-AP-EF-010BASE	N/A
12	S16T018891	VA	6/24/16		CHARCOAL TUBE	Pyridines 16-001-AP-IN-010BASE	N/A
13	S16T018892	VA	6/24/16		CHARCOAL TUBE	Pyridines 16-001-AP-BK-010BASE.	N/A
14	S16T018893	VA	6/26/16		CHARCOAL TUBE	Pyridines 16-002-AP-EF-010H	N/A
15	S16T018894	VA	6/26/16		CHARCOAL TUBE	Pyridines 16-002-AP-IN-010H	N/A
16	S16T018895	VA	6/26/16		CHARCOAL TUBE	Pyridines 16-002-AP-EF-010G	N/A
17	S16T018896	VA	6/25/16		CHARCOAL TUBE	Pyridines 16-002-AP-EF-010F	N/A
18	S16T018897	VA	6/25/16		CHARCOAL TUBE	Pyridines 16-002-AP-EF-010D	N/A
19	S16T018898	VA	6/25/16		CHARCOAL TUBE	Pyridines 16-002-AP-EF-010C	N/A
20	S16T018899	VA	6/25/16		CHARCOAL TUBE	Pyridines 16-002-AP-EF-010B	N/A

POSSIBLE SAMPLE HAZARDS/REMARKS (List all known wastes) MSDS ○ Yes ◉ No

SPECIAL INSTRUCTIONS — Hold Time

Send Results to Robert Sosa @ Greg Moore
Robert_W_Sosa@rl.gov and
Gregory_S_Moore@rl.gov see SOW for email

RELEASE 9
Reference Contract # 55502

Relinquished By (Print / Sign)	Date/Time	Received By (Print / Sign)	Date/Time
TERESA FORRESTER	6-29-16 1000	RE Rogers	6-29-16 10:00
RE Rogers	6-29-16 1400		
		FEDEX	
		Meredith Edwards	6/29/2016 920

Matrix*

S = Soil		DL = Drum Liquids	
SE = Sediment		T = Tissue	
SO = Solid		WI = Wipe	
SL = Sludge		L = Liquid	
W = Water		V = Vegetation	
O = Oil		VA = Vapor	
A = Air		X = Other	
DS = Drum Solids			

FINAL SAMPLE DISPOSITION — Disposal Method (e.g., Return to customer, per lab procedure, used in process) — Disposed By: Eric R Pratt — Date/Time: 7/1/16 14:20

All samples containing hazardous materials shall be picked up by requestor and returned to parent container or site of origin.

A-6003-962 (03/05)

Assembler	CHAIN OF CUSTODY/SAMPLE ANALYSIS REQUEST	C.O.C. No. 20161910
N/A		Page 3 of 3

Collector: JONES	Contact/Requestor: CARL HOWALD IV	Telephone No. 373-6861	MSIN T6-05 FAX 372-1878
SAF No.: N/A	Sample Origin: CARTRIDGE EVALUATION	Purchase Order/Charge Code: 202003/CB20	
Project Title: CARTRIDGE EVALUATION	Logbook/ Work Package No.: N/A	Ice Chest No. W75-055	Temp. ON ICE
Shipped To (Lab): ALS	Method of Shipment	Bill of Lading/Air Bill No. 7766 3723 2822	
Protocol: N/A	Data Turnaround: 10 DAYS	Parts and Return No. 40958	

Sample No.	Lab ID	*	Date	Time	No./Type Container	Sample Analysis	Preservative
21	S16T018900	VA	6/25/16		CHARCOAL TUBE	Pyridines 16-002-AP-IN-010A	N/A
22	S16T018901	VA	6/25/16		CHARCOAL TUBE	Pyridines 16-002-AP-EF-010BASE	N/A
23	S16T018902	VA	6/25/16		CHARCOAL TUBE	Pyridines 16-002-AP-IN-010BASE	N/A
24	S16T018903	VA	6/25/16		CHARCOAL TUBE	Pyridines 16-002-AP-BK-010BASE	N/A

POSSIBLE SAMPLE HAZARDS/REMARKS (List all known wastes) MSDS ○ Yes ◉ No

SPECIAL INSTRUCTIONS — Hold Time

Send Results to Robert Sosa @ Greg Moore
Robert_W_Sosa@rl.gov and
Gregory_S_Moore@rl.gov see SOW for email

RELEASE 9
Reference Contract # 55502

Relinquished By	Print	Sign	Date/Time	Received By	Print	Sign	Date/Time
	TERESA FORRESTER		6-29-16 1000		RE Rogers		6/29/16 10:00
Relinquished By			Date/Time	Received By			Date/Time
RE Rogers			6/29/16/1400		FEDEX		
Relinquished By			Date/Time	Received By			Date/Time
							1/30/16/920
Relinquished By			Date/Time	Received By			Date/Time

Matrix*

S = Soil	DL = Drum Liquids		
SE = Sediment	T = Tissue		
SO = Solid	WI = Wipe		
SL = Sludge	L = Liquid		
W = Water	V = Vegetation		
O = Oil	VA = Vapor		
A = Air	X = Other		
DS = Drum Solids			

FINAL SAMPLE DISPOSITION — Disposal Method (e.g., Return to customer, per lab procedure, used in process) — Disposed By — Date/Time

Emilie R Pratt — 7/1/16 14:20

All samples containing hazardous materials shall be picked up by requestor and returned to parent container or site of origin.

A-6003-962 (03/05)

ERP

C.3.11 Nitrosamines

RJ LEE GROUP

RJ Lee*Group*, Inc. | Columbia Basin Analytical Laboratories
2710 North 20th Avenue, Pasco WA 99301
Tel: (509) 545-4989 | Fax: (509) 544-6010

Carl Howald IV

07/26/16

Washington River Protection Solutions, LLC
P.O. Box 850 MSIN H6-16
Richland, WA 99352

Contract No.: 55503 R5

Project: Cartridge Evaluation

Subject: Nitrosamines Analysis Report, Group Number 20161909, Revision 1.

Enclosed is the final report for group 20161909 number analyzed for Nitrosamines using NIOSH 2522-Modified. This group number 20161909 has been assigned a Columbia Basin Analytical Laboratories login order number of W607016. This report consists of a summary report of the samples, a laboratory report of each nitrosamine, a single quality control report for the analysis batch, and a copy of the chain of custody.

General Set Comments

Columbia Basin Analytical Laboratories received 26 samples on 07/07/16 to be tested for Nitrosamines. The samples were analyzed in accordance with NIOSH 2522-Modified for N-Nitrosodimethylamine, N-Nitrosomethylethylamine, N-Nitrosodiethylamine, N-Nitrosodi-n-propylamine, N-Nitrosodi-n-butylamine, N-Nitrosopiperidine, N-Nitrosopyrrolidine,and N-Nitrosomorpholine. All results have been corrected for desorption efficiency and measurable levels in the blanks.

This revision is being issued per client request for the presentation of summed totals for samples that required re-extraction due to unexpectedly high analyte concentrations. The original version of this report does not include a summed total for all extractions/re-extractions for each sample.

** Original analysis results below reportable limit. Confirmation column results above reportable limit.*

Positive Results

There were detectable nitrosamines concentrations above the reporting limit in the samples.

16-001-AP-IN-011H	W607016-02	N-Nitrosodimethylamine	5.234	µg/tube
16-001-AP-IN-011H	W607016-02	N-Nitrosodi-n-butylamine	0.061	µg/tube
16-001-AP-IN-011H	W607016-02	N-Nitrosomethylethylamine	0.075	µg/tube
16-001-AP-IN-011A	W607016-10	N-Nitrosodimethylamine	7.552	µg/tube
16-001-AP-IN-011A	W607016-10	N-Nitrosodi-n-butylamine	0.079	µg/tube
16-001-AP-IN-011A	W607016-10	N-Nitrosomethylethylamine	0.111	µg/tube
16-001-AP-IN-011A	W607016-10	N-Nitrosomorpholine	0.148	µg/tube
16-002-AP-IN-012H	W607016-15	N-Nitrosodimethylamine	5.511	µg/tube
16-002-AP-IN-012H	W607016-15	N-Nitrosodi-n-butylamine	0.095	µg/tube
16-002-AP-IN-012H	W607016-15	N-Nitrosomorpholine	0.040	µg/tube

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16-002-AP-EF-011A	W607016-22	N-Nitrosodimethylamine	2.692	µg/tube
16-002-AP-EF-011A	W607016-22	N-Nitrosodi-n-butylamine	0.097	µg/tube
16-002-AP-EF-011A	W607016-22	N-Nitrosomethylethylamine	0.061	µg/tube

Recovery Failures in the ICV, CCV's, LCS, RL and MRL

There were no recovery failures in the: ICV, CCV, LCS, LCSD, RL and MRL .

RSD Failures in the LCS and LCSD's

There were no RSD failures between the laboratory control samples.

Measurable Blank Values

There were no measurable analytes in the blank samples.

Calibration Curves

The calibration curves for the Nitrosamines had an R-value that was 0.997 or better, over a range of 5.0 ng/mL to 200 ng/mL.

General Lab Comments

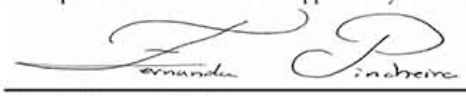
The results provided in this report relate only to the items tested. Samples were received in acceptable conditions unless otherwise noted in the comments above. Samples have not been field blank corrected unless otherwise noted in the general set comments above. This test report shall not be reproduced, except in full, without written approval of Columbia Basin Analytical Laboratories.

I certify that this analytical report is in compliance with the Hanford SOW, both technically and for completeness. Release of the data contained in this hard copy report has been authorized by the Laboratory Director or a designee as verified by the following signature.

07/22/16

Scientist II DeNomy Dage

This report has been reviewed and approved by the following individual:



07/26/16

Scientist I Fernanda Pincheira

If you have any questions, please feel free to contact DeNomy Dage at ddage@rjlg.com or at 509-545-4989.

RJ LEE GROUP

Carl Howald IV
Washington River Protection Solutions, LLC
P.O. Box 850 MSIN H6-16
Richland, WA 99352
Client Project:
Cartridge Evaluation

Laboratory Report

NIOSH 2522
Air/Emissions on GC/TEA Analyzer
Summary Table

RJ Lee Group No.: W607016
Samples Received: 07/07/16
Report Date: 07/26/16
COC No.: 20161909
Extraction Date: 7/12/2016

Sample Identification		Sampling	Analysis	Analyte	Concentration	Qualifiers
Client Sample ID	RJLG ID	Date	Date		µg/tube	
16-001-AP-EF-011H | S16T018848	| W607016-01	06/25/16	07/12/16	N-Nitrosodimethylamine	<0.022	
		06/25/16	07/12/16	N-Nitrosomethylethylamine	<0.022	
		06/25/16	07/12/16	N-Nitrosodiethylamine	<0.021	
		06/25/16	07/12/16	N-Nitrosodi-n-propylamine	<0.021	
		06/25/16	07/12/16	N-Nitrosodi-n-butylamine	<0.021	
		06/25/16	07/12/16	N-Nitrosopiperidine	<0.022	
		06/25/16	07/12/16	N-Nitrosopyrrolidine	<0.022	
		06/25/16	07/12/16	N-Nitrosomorpholine	<0.022	
16-001-AP-IN-011H | S16T018849	| W607016-02	06/25/16	07/15/16	N-Nitrosodimethylamine	0.045	
		06/25/16	07/14/16	N-Nitrosodimethylamine	0.299	
		06/25/16	07/13/16	N-Nitrosodimethylamine	4.89	E
		06/25/16	07/14/16	N-Nitrosomethylethylamine	<0.022	
		06/25/16	07/13/16	N-Nitrosomethylethylamine	0.075	
		06/25/16	07/15/16	N-Nitrosomethylethylamine	<0.022	
		06/25/16	07/15/16	N-Nitrosodiethylamine	<0.021	
		06/25/16	07/14/16	N-Nitrosodiethylamine	<0.022	
		06/25/16	07/13/16	N-Nitrosodiethylamine	<0.021	
		06/25/16	07/15/16	N-Nitrosodi-n-propylamine	<0.021	
		06/25/16	07/14/16	N-Nitrosodi-n-propylamine	<0.022	
		06/25/16	07/13/16	N-Nitrosodi-n-propylamine	<0.021	
		06/25/16	07/13/16	N-Nitrosodi-n-butylamine	0.061	
		06/25/16	07/15/16	N-Nitrosodi-n-butylamine	<0.021	
		06/25/16	07/14/16	N-Nitrosodi-n-butylamine	<0.021	
		06/25/16	07/13/16	N-Nitrosopiperidine	<0.022	

Report Qualifiers:
A = Target Analyte media breakthrough suspect, see analytical report
B = Analyte detected in the associated blank
D = Analyte analyzed in a dilution
d = Data that exceeds the RSD criteria set by the SOP
E = Report concentration was above the instrument calibration range
H = Holding times for preparation or analysis exceeded
I = Analyte detected below quantitation limits, concentration is estimated
L = Sample condition at receipt out of compliance with method defined conditions
P = Library spectrum match, rsd >90% w RT match
Q = Result out of method specific acceptance QC criteria
R = RPD (relative percent difference) outside accepted recovery limits
S = Spike Recovery outside accepted recovery limits
U = Analyte analyzed for but not detected
Z = Not ELAP accredited analyte
N/A = Not Applicable
ND = Not Detected

RJ LEE GROUP

Sample Identification Client Sample ID	RJLG ID	Sampling Date	Analysis Date	Analyte	Concentration µg/tube	Qualifiers
16-001-AP-IN-011H	S16T018849	W607016-02	06/25/16	07/14/16	N-Nitrosopiperidine	<0.021	
			06/25/16	07/15/16	N-Nitrosopiperidine	<0.021	
			06/25/16	07/15/16	N-Nitrosopyrrolidine	<0.021	
			06/25/16	07/13/16	N-Nitrosopyrrolidine	<0.022	
			06/25/16	07/14/16	N-Nitrosopyrrolidine	<0.022	
			06/25/16	07/15/16	N-Nitrosomorpholine	<0.021	
			06/25/16	07/14/16	N-Nitrosomorpholine	<0.022	
			06/25/16	07/13/16	N-Nitrosomorpholine	<0.022	
16-001-AP-EF-011G	S16T018850	W607016-03	06/25/16	07/12/16	N-Nitrosodimethylamine	<0.022	
			06/25/16	07/12/16	N-Nitrosomethylethylamine	<0.022	
			06/25/16	07/12/16	N-Nitrosodiethylamine	<0.021	
			06/25/16	07/12/16	N-Nitrosodi-n-propylamine	<0.021	
			06/25/16	07/12/16	N-Nitrosodi-n-butylamine	<0.021	
			06/25/16	07/12/16	N-Nitrosopiperidine	<0.022	
			06/25/16	07/12/16	N-Nitrosopyrrolidine	<0.022	
			06/25/16	07/12/16	N-Nitrosomorpholine	<0.022	
16-001-AP-EF-011F	S16T018851	W607016-04	06/25/16	07/12/16	N-Nitrosodimethylamine	<0.022	
			06/25/16	07/12/16	N-Nitrosomethylethylamine	<0.022	
			06/25/16	07/12/16	N-Nitrosodiethylamine	<0.021	
			06/25/16	07/12/16	N-Nitrosodi-n-propylamine	<0.021	
			06/25/16	07/12/16	N-Nitrosodi-n-butylamine	<0.021	
			06/25/16	07/12/16	N-Nitrosopiperidine	<0.022	
			06/25/16	07/12/16	N-Nitrosopyrrolidine	<0.022	
			06/25/16	07/12/16	N-Nitrosomorpholine	<0.022	
16-001-AP-EF-011E	S16T018852	W607016-05	06/24/16	07/12/16	N-Nitrosodimethylamine	<0.022	
			06/24/16	07/12/16	N-Nitrosomethylethylamine	<0.022	
			06/24/16	07/12/16	N-Nitrosodiethylamine	<0.021	
			06/24/16	07/12/16	N-Nitrosodi-n-propylamine	<0.021	
			06/24/16	07/12/16	N-Nitrosodi-n-butylamine	<0.021	
			06/24/16	07/12/16	N-Nitrosopiperidine	<0.022	
			06/24/16	07/12/16	N-Nitrosopyrrolidine	<0.022	
			06/24/16	07/12/16	N-Nitrosomorpholine	<0.022	

Report Qualifiers:

A = Target Analyte media breakthrough suspect, see analytical report
B = Analyte detected in the associated blank
D = Analyte analyzed in a dilution
d = Data that exceeds the RSD criteria set by the SOP
E = Report concentration was above the instrument calibration range
H = Holding times for preparation or analysis exceeded
J = Analyte detected below quantitation limits, concentration is estimated
L = Sample condition at receipt out of compliance with method defined conditions
P = Library spectrum match, rsd >90% w RT match
Q = Result out of method specific acceptance QC criteria
R = RPD (relative percent difference) outside accepted recovery limits
S = Spike Recovery outside accepted recovery limits
U = Analyte analyzed for but not detected
Z = Not ELAP accredited analyte
N/A = Not Applicable
ND = Not Detected

RJ LEE GROUP

Sample Identification Client Sample ID	RJLG ID	Sampling Date	Analysis Date	Analyte	Concentration µg/tube	Qualifiers
16-001-AP-EF-011D | S16T018853	| W607016-06	06/24/16	07/12/16	N-Nitrosodimethylamine	<0.022	
		06/24/16	07/12/16	N-Nitrosomethylethylamine	<0.022	
		06/24/16	07/12/16	N-Nitrosodiethylamine	<0.021	
		06/24/16	07/12/16	N-Nitrosodi-n-propylamine	<0.021	
		06/24/16	07/12/16	N-Nitrosodi-n-butylamine	<0.021	
		06/24/16	07/12/16	N-Nitrosopiperidine	<0.022	
		06/24/16	07/12/16	N-Nitrosopyrrolidine	<0.022	
		06/24/16	07/12/16	N-Nitrosomorpholine	<0.022	
16-001-AP-EF-011C | S16T018854	| W607016-07	06/24/16	07/12/16	N-Nitrosodimethylamine	<0.022	
		06/24/16	07/12/16	N-Nitrosomethylethylamine	<0.022	
		06/24/16	07/12/16	N-Nitrosodiethylamine	<0.021	
		06/24/16	07/12/16	N-Nitrosodi-n-propylamine	<0.021	
		06/24/16	07/12/16	N-Nitrosodi-n-butylamine	<0.021	
		06/24/16	07/12/16	N-Nitrosopiperidine	<0.022	
		06/24/16	07/12/16	N-Nitrosopyrrolidine	<0.022	
		06/24/16	07/12/16	N-Nitrosomorpholine	<0.022	
16-001-AP-EF-011B | S16T018855	| W607016-08	06/24/16	07/12/16	N-Nitrosodimethylamine	<0.022	
		06/24/16	07/12/16	N-Nitrosomethylethylamine	<0.022	
		06/24/16	07/12/16	N-Nitrosodiethylamine	<0.021	
		06/24/16	07/12/16	N-Nitrosodi-n-propylamine	<0.021	
		06/24/16	07/12/16	N-Nitrosodi-n-butylamine	<0.021	
		06/24/16	07/12/16	N-Nitrosopiperidine	<0.022	
		06/24/16	07/12/16	N-Nitrosopyrrolidine	<0.022	
		06/24/16	07/12/16	N-Nitrosomorpholine	<0.022	
16-001-AP-EF-011A | S16T018856	| W607016-09	06/24/16	07/12/16	N-Nitrosodimethylamine	<0.022	
		06/24/16	07/12/16	N-Nitrosomethylethylamine	<0.022	
		06/24/16	07/12/16	N-Nitrosodiethylamine	<0.021	
		06/24/16	07/12/16	N-Nitrosodi-n-propylamine	<0.021	
		06/24/16	07/12/16	N-Nitrosodi-n-butylamine	<0.021	
		06/24/16	07/12/16	N-Nitrosopiperidine	<0.022	
		06/24/16	07/12/16	N-Nitrosopyrrolidine	<0.022	
		06/24/16	07/12/16	N-Nitrosomorpholine	<0.022	

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RJ LEE GROUP

Sample Identification Client Sample ID	RJLG ID	Sampling Date	Analysis Date	Analyte	Concentration µg/tube	Qualifiers
16-001-AP-IN-011A | S16T018857	| W607016-10	06/24/16	07/15/16	N-Nitrosodimethylamine	0.051	
		06/24/16	07/13/16	N-Nitrosodimethylamine	7.10	E
		06/24/16	07/14/16	N-Nitrosodimethylamine	0.401	
		06/24/16	07/15/16	N-Nitrosomethylethylamine	<0.022	
		06/24/16	07/13/16	N-Nitrosomethylethylamine	0.111	
		06/24/16	07/14/16	N-Nitrosomethylethylamine	<0.022	
		06/24/16	07/14/16	N-Nitrosodiethylamine	<0.022	
		06/24/16	07/15/16	N-Nitrosodiethylamine	<0.021	
		06/24/16	07/13/16	N-Nitrosodiethylamine	<0.021	
		06/24/16	07/13/16	N-Nitrosodi-n-propylamine	<0.021	
		06/24/16	07/14/16	N-Nitrosodi-n-propylamine	<0.022	
		06/24/16	07/15/16	N-Nitrosodi-n-propylamine	<0.021	
		06/24/16	07/13/16	N-Nitrosodi-n-butylamine	0.079	
		06/24/16	07/14/16	N-Nitrosodi-n-butylamine	<0.021	
		06/24/16	07/15/16	N-Nitrosodi-n-butylamine	<0.021	
		06/24/16	07/14/16	N-Nitrosopiperidine	<0.021	
		06/24/16	07/13/16	N-Nitrosopiperidine	<0.022	
		06/24/16	07/15/16	N-Nitrosopiperidine	<0.021	
		06/24/16	07/14/16	N-Nitrosopyrrolidine	<0.022	
		06/24/16	07/13/16	N-Nitrosopyrrolidine	<0.022	
		06/24/16	07/15/16	N-Nitrosopyrrolidine	<0.021	
		06/24/16	07/13/16	N-Nitrosomorpholine	0.148	
		06/24/16	07/14/16	N-Nitrosomorpholine	<0.022	
		06/24/16	07/15/16	N-Nitrosomorpholine	<0.021	
16-001-AP-EF-011BASE | S16T018858	| W607016-11	06/24/16	07/12/16	N-Nitrosodimethylamine	<0.022	
		06/24/16	07/12/16	N-Nitrosomethylethylamine	<0.022	
		06/24/16	07/12/16	N-Nitrosodiethylamine	<0.021	
		06/24/16	07/12/16	N-Nitrosodi-n-propylamine	<0.021	
		06/24/16	07/12/16	N-Nitrosodi-n-butylamine	<0.021	
		06/24/16	07/12/16	N-Nitrosopiperidine	<0.022	
		06/24/16	07/12/16	N-Nitrosopyrrolidine	<0.022	
		06/24/16	07/12/16	N-Nitrosomorpholine	<0.022	

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RJ LEE GROUP

Sample Identification Client Sample ID	RJLG ID	Sampling Date	Analysis Date	Analyte	Concentration µg/tube	Qualifiers
16-001-AP-IN-011BASE | S16T018859	| W607016-12	06/24/16	07/12/16	N-Nitrosodimethylamine	<0.022	
		06/24/16	07/12/16	N-Nitrosomethylethylamine	<0.022	
		06/24/16	07/12/16	N-Nitrosodiethylamine	<0.021	
		06/24/16	07/12/16	N-Nitrosodi-n-propylamine	<0.021	
		06/24/16	07/12/16	N-Nitrosodi-n-butylamine	<0.021	
		06/24/16	07/12/16	N-Nitrosopiperidine	<0.022	
		06/24/16	07/12/16	N-Nitrosopyrrolidine	<0.022	
		06/24/16	07/12/16	N-Nitrosomorpholine	<0.022	
16-001-AP-BK-011BASE | S16T018860	| W607016-13	06/24/16	07/12/16	N-Nitrosodimethylamine	<0.022	
		06/24/16	07/12/16	N-Nitrosomethylethylamine	<0.022	
		06/24/16	07/12/16	N-Nitrosodiethylamine	<0.021	
		06/24/16	07/12/16	N-Nitrosodi-n-propylamine	<0.021	
		06/24/16	07/12/16	N-Nitrosodi-n-butylamine	<0.021	
		06/24/16	07/12/16	N-Nitrosopiperidine	<0.022	
		06/24/16	07/12/16	N-Nitrosopyrrolidine	<0.022	
		06/24/16	07/12/16	N-Nitrosomorpholine	<0.022	
16-002-AP-EF-012H | S16T018861	| W607016-14	06/26/16	07/12/16	N-Nitrosodimethylamine	<0.022	
		06/26/16	07/12/16	N-Nitrosomethylethylamine	<0.022	
		06/26/16	07/12/16	N-Nitrosodiethylamine	<0.021	
		06/26/16	07/12/16	N-Nitrosodi-n-propylamine	<0.021	
		06/26/16	07/12/16	N-Nitrosodi-n-butylamine	<0.021	
		06/26/16	07/12/16	N-Nitrosopiperidine	<0.022	
		06/26/16	07/12/16	N-Nitrosopyrrolidine	<0.022	
		06/26/16	07/12/16	N-Nitrosomorpholine	<0.022	
16-002-AP-IN-012H | S16T018862	| W607016-15	06/26/16	07/13/16	N-Nitrosodimethylamine	5.20	E
		06/26/16	07/15/16	N-Nitrosodimethylamine	0.041	
		06/26/16	07/14/16	N-Nitrosodimethylamine	0.270	
		06/26/16	07/15/16	N-Nitrosomethylethylamine	<0.022	
		06/26/16	07/13/16	N-Nitrosomethylethylamine	<0.022	
		06/26/16	07/14/16	N-Nitrosomethylethylamine	<0.022	
		06/26/16	07/15/16	N-Nitrosodiethylamine	<0.021	
		06/26/16	07/13/16	N-Nitrosodiethylamine	<0.021	

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16-002-AP-IN-012H | S16T018862	| W607016-15	06/26/16	07/14/16	N-Nitrosodiethylamine	<0.022	
		06/26/16	07/14/16	N-Nitrosodi-n-propylamine	<0.022	
		06/26/16	07/13/16	N-Nitrosodi-n-propylamine	<0.021	
		06/26/16	07/15/16	N-Nitrosodi-n-propylamine	<0.021	
		06/26/16	07/14/16	N-Nitrosodi-n-butylamine	<0.021	
		06/26/16	07/13/16	N-Nitrosodi-n-butylamine	0.095	
		06/26/16	07/15/16	N-Nitrosodi-n-butylamine	<0.021	
		06/26/16	07/13/16	N-Nitrosopiperidine	<0.022	
		06/26/16	07/14/16	N-Nitrosopiperidine	<0.021	
		06/26/16	07/15/16	N-Nitrosopiperidine	<0.021	
		06/26/16	07/14/16	N-Nitrosopyrrolidine	<0.022	
		06/26/16	07/13/16	N-Nitrosopyrrolidine	<0.022	
		06/26/16	07/15/16	N-Nitrosopyrrolidine	<0.021	
		06/26/16	07/13/16	N-Nitrosomorpholine	0.040	
		06/26/16	07/14/16	N-Nitrosomorpholine	<0.022	
		06/26/16	07/15/16	N-Nitrosomorpholine	<0.021	
16-002-AP-EF-011G | S16T018863	| W607016-16	06/26/16	07/12/16	N-Nitrosodimethylamine	<0.022	
		06/26/16	07/12/16	N-Nitrosomethylethylamine	<0.022	
		06/26/16	07/12/16	N-Nitrosodiethylamine	<0.021	
		06/26/16	07/12/16	N-Nitrosodi-n-propylamine	<0.021	
		06/26/16	07/12/16	N-Nitrosodi-n-butylamine	<0.021	
		06/26/16	07/12/16	N-Nitrosopiperidine	<0.022	
		06/26/16	07/12/16	N-Nitrosopyrrolidine	<0.022	
		06/26/16	07/12/16	N-Nitrosomorpholine	<0.022	
16-002-AP-EF-012F | S16T018864	| W607016-17	06/25/16	07/12/16	N-Nitrosodimethylamine	<0.022	
		06/25/16	07/12/16	N-Nitrosomethylethylamine	<0.022	
		06/25/16	07/12/16	N-Nitrosodiethylamine	<0.021	
		06/25/16	07/12/16	N-Nitrosodi-n-propylamine	<0.021	
		06/25/16	07/12/16	N-Nitrosodi-n-butylamine	<0.021	
		06/25/16	07/12/16	N-Nitrosopiperidine	<0.022	
		06/25/16	07/12/16	N-Nitrosopyrrolidine	<0.022	
		06/25/16	07/12/16	N-Nitrosomorpholine	<0.022	

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RJ LEE GROUP

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16-002-AP-EF-011E | S16T018865	| W607016-18	06/25/16	07/12/16	N-Nitrosodimethylamine	<0.022	
		06/25/16	07/12/16	N-Nitrosomethylethylamine	<0.022	
		06/25/16	07/12/16	N-Nitrosodiethylamine	<0.021	
		06/25/16	07/12/16	N-Nitrosodi-n-propylamine	<0.021	
		06/25/16	07/12/16	N-Nitrosodi-n-butylamine	<0.021	
		06/25/16	07/12/16	N-Nitrosopiperidine	<0.022	
		06/25/16	07/12/16	N-Nitrosopyrrolidine	<0.022	
		06/25/16	07/12/16	N-Nitrosomorpholine	<0.022	
16-002-AP-EF-011D | S16T018866	| W607016-19	06/25/16	07/12/16	N-Nitrosodimethylamine	<0.022	
		06/25/16	07/12/16	N-Nitrosomethylethylamine	<0.022	
		06/25/16	07/12/16	N-Nitrosodiethylamine	<0.021	
		06/25/16	07/12/16	N-Nitrosodi-n-propylamine	<0.021	
		06/25/16	07/12/16	N-Nitrosodi-n-butylamine	<0.021	
		06/25/16	07/12/16	N-Nitrosopiperidine	<0.022	
		06/25/16	07/12/16	N-Nitrosopyrrolidine	<0.022	
		06/25/16	07/12/16	N-Nitrosomorpholine	<0.022	
16-002-AP-EF-011C | S16T018867	| W607016-20	06/25/16	07/12/16	N-Nitrosodimethylamine	<0.022	
		06/25/16	07/12/16	N-Nitrosomethylethylamine	<0.022	
		06/25/16	07/12/16	N-Nitrosodiethylamine	<0.021	
		06/25/16	07/12/16	N-Nitrosodi-n-propylamine	<0.021	
		06/25/16	07/12/16	N-Nitrosodi-n-butylamine	<0.021	
		06/25/16	07/12/16	N-Nitrosopiperidine	<0.022	
		06/25/16	07/12/16	N-Nitrosopyrrolidine	<0.022	
		06/25/16	07/12/16	N-Nitrosomorpholine	<0.022	
16-002-AP-EF-011B | S16T018868	| W607016-21	06/25/16	07/13/16	N-Nitrosodimethylamine	<0.022	
		06/25/16	07/13/16	N-Nitrosomethylethylamine	<0.022	
		06/25/16	07/13/16	N-Nitrosodiethylamine	<0.021	
		06/25/16	07/13/16	N-Nitrosodi-n-propylamine	<0.021	
		06/25/16	07/13/16	N-Nitrosodi-n-butylamine	<0.020	
		06/25/16	07/13/16	N-Nitrosopiperidine	<0.022	
		06/25/16	07/13/16	N-Nitrosopyrrolidine	<0.021	
		06/25/16	07/13/16	N-Nitrosomorpholine	<0.022	

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RJ LEE GROUP

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16-002-AP-EF-011A | S16T018869	| W607016-22	06/25/16	07/13/16	N-Nitrosodimethylamine	2.52	E
		06/25/16	07/14/16	N-Nitrosodimethylamine	0.172	
		06/25/16	07/13/16	N-Nitrosomethylethylamine	0.061	*
		06/25/16	07/14/16	N-Nitrosomethylethylamine	<0.022	*
		06/25/16	07/13/16	N-Nitrosodiethylamine	<0.021	
		06/25/16	07/14/16	N-Nitrosodiethylamine	<0.022	
		06/25/16	07/13/16	N-Nitrosodi-n-propylamine	<0.021	
		06/25/16	07/14/16	N-Nitrosodi-n-propylamine	<0.022	
		06/25/16	07/13/16	N-Nitrosodi-n-butylamine	0.097	
		06/25/16	07/14/16	N-Nitrosodi-n-butylamine	<0.021	
		06/25/16	07/13/16	N-Nitrosopiperidine	<0.022	
		06/25/16	07/14/16	N-Nitrosopiperidine	<0.021	
		06/25/16	07/14/16	N-Nitrosopyrrolidine	<0.022	
		06/25/16	07/13/16	N-Nitrosopyrrolidine	<0.021	
		06/25/16	07/13/16	N-Nitrosomorpholine	<0.022	
		06/25/16	07/14/16	N-Nitrosomorpholine	<0.022	
16-002-AP-IN-011A | S16T018870	| W607016-23	06/25/16	07/13/16	N-Nitrosodimethylamine	<0.022	
		06/25/16	07/13/16	N-Nitrosomethylethylamine	<0.022	
		06/25/16	07/13/16	N-Nitrosodiethylamine	<0.021	
		06/25/16	07/13/16	N-Nitrosodi-n-propylamine	<0.021	
		06/25/16	07/13/16	N-Nitrosodi-n-butylamine	<0.020	
		06/25/16	07/13/16	N-Nitrosopiperidine	<0.022	
		06/25/16	07/13/16	N-Nitrosopyrrolidine	<0.021	
		06/25/16	07/13/16	N-Nitrosomorpholine	<0.022	
16-002-AP-EF-011BASE | S16T018871	| W607016-24	06/25/16	07/13/16	N-Nitrosodimethylamine	<0.022	
		06/25/16	07/13/16	N-Nitrosomethylethylamine	<0.022	
		06/25/16	07/13/16	N-Nitrosodiethylamine	<0.021	
		06/25/16	07/13/16	N-Nitrosodi-n-propylamine	<0.021	
		06/25/16	07/13/16	N-Nitrosodi-n-butylamine	<0.020	
		06/25/16	07/13/16	N-Nitrosopiperidine	<0.022	
		06/25/16	07/13/16	N-Nitrosopyrrolidine	<0.021	
		06/25/16	07/13/16	N-Nitrosomorpholine	<0.022	

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16-002-AP-IN-011BASE | S16T018872	W607016-25	06/25/16	07/13/16	N-Nitrosodimethylamine	<0.022	
		06/25/16	07/13/16	N-Nitrosomethylethylamine	<0.022	
		06/25/16	07/13/16	N-Nitrosodiethylamine	<0.021	
		06/25/16	07/13/16	N-Nitrosodi-n-propylamine	<0.021	
		06/25/16	07/13/16	N-Nitrosodi-n-butylamine	<0.020	
		06/25/16	07/13/16	N-Nitrosopiperidine	<0.022	
		06/25/16	07/13/16	N-Nitrosopyrrolidine	<0.021	
		06/25/16	07/13/16	N-Nitrosomorpholine	<0.022	
16-002-AP-BK-011BASE | S16T018873	W607016-26	06/25/16	07/13/16	N-Nitrosodimethylamine	<0.022	
		06/25/16	07/13/16	N-Nitrosomethylethylamine	<0.022	
		06/25/16	07/13/16	N-Nitrosodiethylamine	<0.021	
		06/25/16	07/13/16	N-Nitrosodi-n-propylamine	<0.021	
		06/25/16	07/13/16	N-Nitrosodi-n-butylamine	<0.020	
		06/25/16	07/13/16	N-Nitrosopiperidine	<0.022	
		06/25/16	07/13/16	N-Nitrosopyrrolidine	<0.021	
		06/25/16	07/13/16	N-Nitrosomorpholine	<0.022	

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RJ LEE GROUP

Laboratory Report

NIOSH 2522

Carl Howald IV

Washington River Protection
Solutions, LLC
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Richland, WA 99352

RJ Lee Group No.: W607016
Samples Received: 07/07/16
Report Date: 07/26/16
COC No.: 20161909
Extraction Date: 7/12/2016

Client Project:
Cartridge Evaluation

Analyte: **N-Nitrosodimethylamine**

CAS No.: **62-75-9**

Sample Identification		Sampling Date	Analyzed Date	Result µg/tube	RL µg/tube	Qualifiers
Client Sample ID	RJLG ID					
16-001-AP-EF-011H	S16T018848 | W607016-01	06/25/16	07/12/16	<0.022	0.022	
16-001-AP-IN-011H	S16T018849 | W607016-02	06/25/16	07/13/16	4.89	0.439	E
16-001-AP-IN-011H	S16T018849 | W607016-02	06/25/16	07/14/16	0.299	0.022	
16-001-AP-IN-011H	S16T018849 | W607016-02	06/25/16	07/15/16	0.045	0.022	
16-001-AP-EF-011G	S16T018850 | W607016-03	06/25/16	07/12/16	<0.022	0.022	
16-001-AP-EF-011F	S16T018851 | W607016-04	06/25/16	07/12/16	<0.022	0.022	
16-001-AP-EF-011E	S16T018852 | W607016-05	06/24/16	07/12/16	<0.022	0.022	
16-001-AP-EF-011D	S16T018853 | W607016-06	06/24/16	07/12/16	<0.022	0.022	
16-001-AP-EF-011C	S16T018854 | W607016-07	06/24/16	07/12/16	<0.022	0.022	
16-001-AP-EF-011B	S16T018855 | W607016-08	06/24/16	07/12/16	<0.022	0.022	
16-001-AP-EF-011A	S16T018856 | W607016-09	06/24/16	07/12/16	<0.022	0.022	
16-001-AP-IN-011A	S16T018857 | W607016-10	06/24/16	07/15/16	0.051	0.022	
16-001-AP-IN-011A	S16T018857 | W607016-10	06/24/16	07/14/16	0.401	0.022	
16-001-AP-IN-011A	S16T018857 | W607016-10	06/24/16	07/13/16	7.10	0.439	E
16-001-AP-EF-011BASE	S16T018858 | W607016-11	06/24/16	07/12/16	<0.022	0.022	
16-001-AP-IN-011BASE	S16T018859 | W607016-12	06/24/16	07/12/16	<0.022	0.022	
16-001-AP-BK-011BASE	S16T018860 | W607016-13	06/24/16	07/12/16	<0.022	0.022	
16-002-AP-EF-012H	S16T018861 | W607016-14	06/26/16	07/12/16	<0.022	0.022	
16-002-AP-IN-012H	S16T018862 | W607016-15	06/26/16	07/13/16	5.20	0.439	E
16-002-AP-IN-012H	S16T018862 | W607016-15	06/26/16	07/15/16	0.041	0.022	
16-002-AP-IN-012H	S16T018862 | W607016-15	06/26/16	07/14/16	0.270	0.022	
16-002-AP-EF-011G	S16T018863 | W607016-16	06/26/16	07/12/16	<0.022	0.022	
16-002-AP-EF-012F	S16T018864 | W607016-17	06/25/16	07/12/16	<0.022	0.022	
16-002-AP-EF-011E	S16T018865 | W607016-18	06/25/16	07/12/16	<0.022	0.022	
16-002-AP-EF-011D	S16T018866 | W607016-19	06/25/16	07/12/16	<0.022	0.022	
16-002-AP-EF-011C	S16T018867 | W607016-20	06/25/16	07/12/16	<0.022	0.022	
16-002-AP-EF-011B	S16T018868 | W607016-21	06/25/16	07/13/16	<0.022	0.022	
16-002-AP-EF-011A	S16T018869 | W607016-22	06/25/16	07/13/16	2.52	0.220	E
16-002-AP-EF-011A	S16T018869 | W607016-22	06/25/16	07/14/16	0.172	0.022	
16-002-AP-IN-011A	S16T018870 | W607016-23	06/25/16	07/13/16	<0.022	0.022	

Report Qualifiers:

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Q = Result out of method specific acceptance QC criteria
R = RPD (relative percent difference) outside accepted recovery limits
S = Spike Recovery outside accepted recovery limits
U = Analyte analyzed for but not detected
Z = Not ELAP accredited analyte
N/A = Not Applicable
ND = Not Detected

RJ LEE GROUP

Laboratory Report

NIOSH 2522

Carl Howald IV

Washington River Protection Solutions, LLC
P.O. Box 850 MSIN H6-16
Richland, WA 99352

RJ Lee Group No.: W607016
Samples Received: 07/07/16
Report Date: 07/26/16
COC No.: 20161909
Extraction Date: 7/12/2016

Client Project:
Cartridge Evaluation

Analyte: **N-Nitrosodimethylamine**

CAS No.: **62-75-9**

Sample Identification			Sampling Date	Analyzed Date	Result µg/tube	RL µg/tube	Qualifiers
Client Sample ID		RJLG ID					
16-002-AP-EF-011BASE	S16T018871	W607016-24	06/25/16	07/13/16	<0.022	0.022	
16-002-AP-IN-011BASE	S16T018872	W607016-25	06/25/16	07/13/16	<0.022	0.022	
16-002-AP-BK-011BASE	S16T018873	W607016-26	06/25/16	07/13/16	<0.022	0.022	

Report Qualifiers:
A = Target Analyte media breakthrough suspect, see analytical report
B = Analyte detected in the associated blank
D = Analyte analyzed in a dilution
d = Data that exceeds the RSD criteria set by the SOP
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J = Analyte detected below quantitation limits, concentration is estimated
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R = RPD (relative percent difference) outside accepted recovery limits
S = Spike Recovery outside accepted recovery limits
U = Analyte analyzed for but not detected
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Laboratory Report

NIOSH 2522

Carl Howald IV

Washington River Protection
Solutions, LLC
P.O. Box 850 MSIN H6-16
Richland, WA 99352

RJ Lee Group No.: W607016
Samples Received: 07/07/16
Report Date: 07/26/16
COC No.: 20161909
Extraction Date: 7/12/2016

Client Project:
Cartridge Evaluation

Analyte: **N-Nitrosomethylethylamine**

CAS No.: **10595-95-6**

Sample Identification		Sampling	Analyzed	Result	RL	Qualifiers
Client Sample ID	RJLG ID	Date	Date	µg/tube	µg/tube	
16-001-AP-EF-011H	S16T018848	W607016-01	06/25/16	07/12/16	<0.022	0.022	
16-001-AP-IN-011H	S16T018849	W607016-02	06/25/16	07/13/16	0.075	0.022	
16-001-AP-IN-011H	S16T018849	W607016-02	06/25/16	07/15/16	<0.022	0.022	
16-001-AP-IN-011H	S16T018849	W607016-02	06/25/16	07/14/16	<0.022	0.022	
16-001-AP-EF-011G	S16T018850	W607016-03	06/25/16	07/12/16	<0.022	0.022	
16-001-AP-EF-011F	S16T018851	W607016-04	06/25/16	07/12/16	<0.022	0.022	
16-001-AP-EF-011E	S16T018852	W607016-05	06/24/16	07/12/16	<0.022	0.022	
16-001-AP-EF-011D	S16T018853	W607016-06	06/24/16	07/12/16	<0.022	0.022	
16-001-AP-EF-011C	S16T018854	W607016-07	06/24/16	07/12/16	<0.022	0.022	
16-001-AP-EF-011B	S16T018855	W607016-08	06/24/16	07/12/16	<0.022	0.022	
16-001-AP-EF-011A	S16T018856	W607016-09	06/24/16	07/12/16	<0.022	0.022	
16-001-AP-IN-011A	S16T018857	W607016-10	06/24/16	07/15/16	<0.022	0.022	
16-001-AP-IN-011A	S16T018857	W607016-10	06/24/16	07/14/16	<0.022	0.022	
16-001-AP-IN-011A	S16T018857	W607016-10	06/24/16	07/13/16	0.111	0.022	
16-001-AP-EF-011BASE	S16T018858	W607016-11	06/24/16	07/12/16	<0.022	0.022	
16-001-AP-IN-011BASE	S16T018859	W607016-12	06/24/16	07/12/16	<0.022	0.022	
16-001-AP-BK-011BASE	S16T018860	W607016-13	06/24/16	07/12/16	<0.022	0.022	
16-002-AP-EF-012H	S16T018861	W607016-14	06/26/16	07/12/16	<0.022	0.022	
16-002-AP-IN-012H	S16T018862	W607016-15	06/26/16	07/14/16	<0.022	0.022	
16-002-AP-IN-012H	S16T018862	W607016-15	06/26/16	07/15/16	<0.022	0.022	
16-002-AP-IN-012H	S16T018862	W607016-15	06/26/16	07/13/16	<0.022	0.022	
16-002-AP-EF-011G	S16T018863	W607016-16	06/26/16	07/12/16	<0.022	0.022	
16-002-AP-EF-012F	S16T018864	W607016-17	06/25/16	07/12/16	<0.022	0.022	
16-002-AP-EF-011E	S16T018865	W607016-18	06/25/16	07/12/16	<0.022	0.022	
16-002-AP-EF-011D	S16T018866	W607016-19	06/25/16	07/12/16	<0.022	0.022	
16-002-AP-EF-011C	S16T018867	W607016-20	06/25/16	07/12/16	<0.022	0.022	
16-002-AP-EF-011B	S16T018868	W607016-21	06/25/16	07/13/16	<0.022	0.022	
16-002-AP-EF-011A	S16T018869	W607016-22	06/25/16	07/13/16	0.061	0.022	
16-002-AP-EF-011A	S16T018869	W607016-22	06/25/16	07/14/16	<0.022	0.022	
16-002-AP-IN-011A	S16T018870	W607016-23	06/25/16	07/13/16	<0.022	0.022	

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RJ LEE GROUP

Laboratory Report

NIOSH 2522

Carl Howald IV

Washington River Protection Solutions, LLC
P.O. Box 850 MSIN H6-16
Richland, WA 99352

RJ Lee Group No.: W607016
Samples Received: 07/07/16
Report Date: 07/26/16
COC No.: 20161909
Extraction Date: 7/12/2016

Client Project:
Cartridge Evaluation

Analyte: **N-Nitrosomethylethylamine**

CAS No.: **10595-95-6**

Sample Identification			Sampling Date	Analyzed Date	Result µg/tube	RL µg/tube	Qualifiers
Client Sample ID		RJLG ID					
16-002-AP-EF-011BASE	S16T018871	W607016-24	06/25/16	07/13/16	<0.022	0.022	
16-002-AP-IN-011BASE	S16T018872	W607016-25	06/25/16	07/13/16	<0.022	0.022	
16-002-AP-BK-011BASE	S16T018873	W607016-26	06/25/16	07/13/16	<0.022	0.022	

Report Qualifiers:
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Laboratory Report

NIOSH 2522

Carl Howald IV

Washington River Protection
Solutions, LLC
P.O. Box 850 MSIN H6-16
Richland, WA 99352

RJ Lee Group No.: W607016
Samples Received: 07/07/16
Report Date: 07/26/16
COC No.: 20161909
Extraction Date: 7/12/2016

Client Project:
Cartridge Evaluation

Analyte: **N-Nitrosodiethylamine**

CAS No.: **55-18-5**

Sample Identification		Sampling Date	Analyzed Date	Result µg/tube	RL µg/tube	Qualifiers
Client Sample ID	RJLG ID					
16-001-AP-EF-011H	W607016-01	06/25/16	07/12/16	<0.021	0.021	
16-001-AP-IN-011H	W607016-02	06/25/16	07/15/16	<0.021	0.021	
16-001-AP-IN-011H	W607016-02	06/25/16	07/14/16	<0.022	0.022	
16-001-AP-IN-011H	W607016-02	06/25/16	07/13/16	<0.021	0.021	
16-001-AP-EF-011G	W607016-03	06/25/16	07/12/16	<0.021	0.021	
16-001-AP-EF-011F	W607016-04	06/25/16	07/12/16	<0.021	0.021	
16-001-AP-EF-011E	W607016-05	06/24/16	07/12/16	<0.021	0.021	
16-001-AP-EF-011D	W607016-06	06/24/16	07/12/16	<0.021	0.021	
16-001-AP-EF-011C	W607016-07	06/24/16	07/12/16	<0.021	0.021	
16-001-AP-EF-011B	W607016-08	06/24/16	07/12/16	<0.021	0.021	
16-001-AP-EF-011A	W607016-09	06/24/16	07/12/16	<0.021	0.021	
16-001-AP-IN-011A	W607016-10	06/24/16	07/14/16	<0.022	0.022	
16-001-AP-IN-011A	W607016-10	06/24/16	07/15/16	<0.021	0.021	
16-001-AP-IN-011A	W607016-10	06/24/16	07/13/16	<0.021	0.021	
16-001-AP-EF-011BASE	W607016-11	06/24/16	07/12/16	<0.021	0.021	
16-001-AP-IN-011BASE	W607016-12	06/24/16	07/12/16	<0.021	0.021	
16-001-AP-BK-011BASE	W607016-13	06/24/16	07/12/16	<0.021	0.021	
16-002-AP-EF-012H	W607016-14	06/26/16	07/12/16	<0.021	0.021	
16-002-AP-IN-012H	W607016-15	06/26/16	07/14/16	<0.022	0.022	
16-002-AP-IN-012H	W607016-15	06/26/16	07/13/16	<0.021	0.021	
16-002-AP-IN-012H	W607016-15	06/26/16	07/15/16	<0.021	0.021	
16-002-AP-EF-011G	W607016-16	06/26/16	07/12/16	<0.021	0.021	
16-002-AP-EF-012F	W607016-17	06/25/16	07/12/16	<0.021	0.021	
16-002-AP-EF-011E	W607016-18	06/25/16	07/12/16	<0.021	0.021	
16-002-AP-EF-011D	W607016-19	06/25/16	07/12/16	<0.021	0.021	
16-002-AP-EF-011C	W607016-20	06/25/16	07/12/16	<0.021	0.021	
16-002-AP-EF-011B	W607016-21	06/25/16	07/13/16	<0.021	0.021	
16-002-AP-EF-011A	W607016-22	06/25/16	07/14/16	<0.022	0.022	*
16-002-AP-EF-011A	W607016-22	06/25/16	07/13/16	<0.021	0.021	*
16-002-AP-IN-011A	W607016-23	06/25/16	07/13/16	<0.021	0.021	

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RJ LEE GROUP

Laboratory Report

NIOSH 2522

Carl Howald IV

Washington River Protection Solutions, LLC
P.O. Box 850 MSIN H6-16
Richland, WA 99352

RJ Lee Group No.: W607016
Samples Received: 07/07/16
Report Date: 07/26/16
COC No.: 20161909
Extraction Date: 7/12/2016

Client Project:
Cartridge Evaluation

Analyte: **N-Nitrosodiethylamine**

CAS No.: **55-18-5**

Sample Identification		Sampling Date	Analyzed Date	Result µg/tube	RL µg/tube	Qualifiers
Client Sample ID	RJLG ID					
16-002-AP-EF-011BASE	S16T018871 | W607016-24	06/25/16	07/13/16	<0.021	0.021	
16-002-AP-IN-011BASE	S16T018872 | W607016-25	06/25/16	07/13/16	<0.021	0.021	
16-002-AP-BK-011BASE	S16T018873 | W607016-26	06/25/16	07/13/16	<0.021	0.021	

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RJ LEE GROUP

Laboratory Report

NIOSH 2522

Carl Howald IV

Washington River Protection
Solutions, LLC
P.O. Box 850 MSIN H6-16
Richland, WA 99352

RJ Lee Group No.: W607016
Samples Received: 07/07/16
Report Date: 07/26/16
COC No.: 20161909
Extraction Date: 7/12/2016

Client Project:
Cartridge Evaluation

Analyte: **N-Nitrosodi-n-propylamine**

CAS No.: **621-64-7**

Sample Identification		Sampling Date	Analyzed Date	Result µg/tube	RL µg/tube	Qualifiers
Client Sample ID	RJLG ID					
16-001-AP-EF-011H	S16T018848	W607016-01	06/25/16	07/12/16	<0.021	0.021	
16-001-AP-IN-011H	S16T018849	W607016-02	06/25/16	07/13/16	<0.021	0.021	
16-001-AP-IN-011H	S16T018849	W607016-02	06/25/16	07/15/16	<0.021	0.021	
16-001-AP-IN-011H	S16T018849	W607016-02	06/25/16	07/14/16	<0.022	0.022	
16-001-AP-EF-011G	S16T018850	W607016-03	06/25/16	07/12/16	<0.021	0.021	
16-001-AP-EF-011F	S16T018851	W607016-04	06/25/16	07/12/16	<0.021	0.021	
16-001-AP-EF-011E	S16T018852	W607016-05	06/24/16	07/12/16	<0.021	0.021	
16-001-AP-EF-011D	S16T018853	W607016-06	06/24/16	07/12/16	<0.021	0.021	
16-001-AP-EF-011C	S16T018854	W607016-07	06/24/16	07/12/16	<0.021	0.021	
16-001-AP-EF-011B	S16T018855	W607016-08	06/24/16	07/12/16	<0.021	0.021	
16-001-AP-EF-011A	S16T018856	W607016-09	06/24/16	07/12/16	<0.021	0.021	
16-001-AP-IN-011A	S16T018857	W607016-10	06/24/16	07/14/16	<0.022	0.022	
16-001-AP-IN-011A	S16T018857	W607016-10	06/24/16	07/13/16	<0.021	0.021	
16-001-AP-IN-011A	S16T018857	W607016-10	06/24/16	07/15/16	<0.021	0.021	
16-001-AP-EF-011BASE	S16T018858	W607016-11	06/24/16	07/12/16	<0.021	0.021	
16-001-AP-IN-011BASE	S16T018859	W607016-12	06/24/16	07/12/16	<0.021	0.021	
16-001-AP-BK-011BASE	S16T018860	W607016-13	06/24/16	07/12/16	<0.021	0.021	
16-002-AP-EF-012H	S16T018861	W607016-14	06/26/16	07/12/16	<0.021	0.021	
16-002-AP-IN-012H	S16T018862	W607016-15	06/26/16	07/13/16	<0.021	0.021	
16-002-AP-IN-012H	S16T018862	W607016-15	06/26/16	07/14/16	<0.022	0.022	
16-002-AP-IN-012H	S16T018862	W607016-15	06/26/16	07/15/16	<0.021	0.021	
16-002-AP-EF-011G	S16T018863	W607016-16	06/26/16	07/12/16	<0.021	0.021	
16-002-AP-EF-012F	S16T018864	W607016-17	06/25/16	07/12/16	<0.021	0.021	
16-002-AP-EF-011E	S16T018865	W607016-18	06/25/16	07/12/16	<0.021	0.021	
16-002-AP-EF-011D	S16T018866	W607016-19	06/25/16	07/12/16	<0.021	0.021	
16-002-AP-EF-011C	S16T018867	W607016-20	06/25/16	07/12/16	<0.021	0.021	
16-002-AP-EF-011B	S16T018868	W607016-21	06/25/16	07/13/16	<0.021	0.021	
16-002-AP-EF-011A	S16T018869	W607016-22	06/25/16	07/14/16	<0.022	0.022	
16-002-AP-EF-011A	S16T018869	W607016-22	06/25/16	07/13/16	<0.021	0.021	
16-002-AP-IN-011A	S16T018870	W607016-23	06/25/16	07/13/16	<0.021	0.021	

Report Qualifiers:

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Q = Result out of method specific acceptance QC criteria
R = RPD (relative percent difference) outside accepted recovery limits
S = Spike Recovery outside accepted recovery limits
U = Analyte analyzed for but not detected
Z = Not ELAP accredited analyte
N/A = Not Applicable
ND = Not Detected

RJ LEE GROUP

Laboratory Report

NIOSH 2522

Carl Howald IV

Washington River Protection Solutions, LLC
P.O. Box 850 MSIN H6-16
Richland, WA 99352

RJ Lee Group No.: W607016
Samples Received: 07/07/16
Report Date: 07/26/16
COC No.: 20161909
Extraction Date: 7/12/2016

Client Project:
Cartridge Evaluation

Analyte: **N-Nitrosodi-n-propylamine**

CAS No.: **621-64-7**

Sample Identification			Sampling Date	Analyzed Date	Result µg/tube	RL µg/tube	Qualifiers
Client Sample ID		RJLG ID					
16-002-AP-EF-011BASE	S16T018871	W607016-24	06/25/16	07/13/16	<0.021	0.021	
16-002-AP-IN-011BASE	S16T018872	W607016-25	06/25/16	07/13/16	<0.021	0.021	
16-002-AP-BK-011BASE	S16T018873	W607016-26	06/25/16	07/13/16	<0.021	0.021	

Report Qualifiers:
A = Target Analyte media breakthrough suspect, see analytical report
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d = Data that exceeds the RSD criteria set by the SOP
E = Report concentration was above the instrument calibration range
H = Holding times for preparation or analysis exceeded
J = Analyte detected below quantitation limits, concentration is estimated
L = Sample condition at receipt out of compliance with method defined conditions
P = Library spectrum match, rsd >80% w RT match
Q = Result out of method specific acceptance QC criteria
R = RPD (relative percent difference) outside accepted recovery limits
S = Spike Recovery outside accepted recovery limits
U = Analyte analyzed for but not detected
Z = Not ELAP accredited analyte
N/A = Not Applicable
ND = Not Detected

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Laboratory Report

NIOSH 2522

Carl Howald IV

Washington River Protection
Solutions, LLC
P.O. Box 850 MSIN H6-16
Richland, WA 99352

RJ Lee Group No.: W607016
Samples Received: 07/07/16
Report Date: 07/26/16
COC No.: 20161909
Extraction Date: 7/12/2016

Client Project:
Cartridge Evaluation

Analyte: **N-Nitrosodi-n-butylamine**

CAS No.: **924-16-3**

Sample Identification		Sampling	Analyzed	Result	RL	Qualifiers
Client Sample ID	RJLG ID	Date	Date	µg/tube	µg/tube	
16-001-AP-EF-011H	S16T018848	W607016-01	06/25/16	07/12/16	<0.021	0.021	
16-001-AP-IN-011H	S16T018849	W607016-02	06/25/16	07/14/16	<0.021	0.021	
16-001-AP-IN-011H	S16T018849	W607016-02	06/25/16	07/13/16	0.061	0.021	
16-001-AP-IN-011H	S16T018849	W607016-02	06/25/16	07/15/16	<0.021	0.021	
16-001-AP-EF-011G	S16T018850	W607016-03	06/25/16	07/12/16	<0.021	0.021	
16-001-AP-EF-011F	S16T018851	W607016-04	06/25/16	07/12/16	<0.021	0.021	
16-001-AP-EF-011E	S16T018852	W607016-05	06/24/16	07/12/16	<0.021	0.021	
16-001-AP-EF-011D	S16T018853	W607016-06	06/24/16	07/12/16	<0.021	0.021	
16-001-AP-EF-011C	S16T018854	W607016-07	06/24/16	07/12/16	<0.021	0.021	
16-001-AP-EF-011B	S16T018855	W607016-08	06/24/16	07/12/16	<0.021	0.021	
16-001-AP-EF-011A	S16T018856	W607016-09	06/24/16	07/12/16	<0.021	0.021	
16-001-AP-IN-011A	S16T018857	W607016-10	06/24/16	07/14/16	<0.021	0.021	
16-001-AP-IN-011A	S16T018857	W607016-10	06/24/16	07/13/16	0.079	0.021	
16-001-AP-IN-011A	S16T018857	W607016-10	06/24/16	07/15/16	<0.021	0.021	
16-001-AP-EF-011BASE	S16T018858	W607016-11	06/24/16	07/12/16	<0.021	0.021	
16-001-AP-IN-011BASE	S16T018859	W607016-12	06/24/16	07/12/16	<0.021	0.021	
16-001-AP-BK-011BASE	S16T018860	W607016-13	06/24/16	07/12/16	<0.021	0.021	
16-002-AP-EF-012H	S16T018861	W607016-14	06/26/16	07/12/16	<0.021	0.021	
16-002-AP-IN-012H	S16T018862	W607016-15	06/26/16	07/13/16	0.095	0.021	
16-002-AP-IN-012H	S16T018862	W607016-15	06/26/16	07/14/16	<0.021	0.021	
16-002-AP-IN-012H	S16T018862	W607016-15	06/26/16	07/15/16	<0.021	0.021	
16-002-AP-EF-011G	S16T018863	W607016-16	06/26/16	07/12/16	<0.021	0.021	
16-002-AP-EF-012F	S16T018864	W607016-17	06/25/16	07/12/16	<0.021	0.021	
16-002-AP-EF-011E	S16T018865	W607016-18	06/25/16	07/12/16	<0.021	0.021	
16-002-AP-EF-011D	S16T018866	W607016-19	06/25/16	07/12/16	<0.021	0.021	
16-002-AP-EF-011C	S16T018867	W607016-20	06/25/16	07/12/16	<0.021	0.021	
16-002-AP-EF-011B	S16T018868	W607016-21	06/25/16	07/13/16	<0.020	0.020	
16-002-AP-EF-011A	S16T018869	W607016-22	06/25/16	07/13/16	0.097	0.020	
16-002-AP-EF-011A	S16T018869	W607016-22	06/25/16	07/14/16	<0.021	0.021	
16-002-AP-IN-011A	S16T018870	W607016-23	06/25/16	07/13/16	<0.020	0.020	

Report Qualifiers:

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P = Library spectrum match, rsd >90% w RT match
Q = Result out of method specific acceptance QC criteria
R = RPD (relative percent difference) outside accepted recovery limits
S = Spike Recovery outside accepted recovery limits
U = Analyte analyzed for but not detected
Z = Not ELAP accredited analyte
N/A = Not Applicable
ND = Not Detected

RJ LEE GROUP

Laboratory Report

NIOSH 2522

Carl Howald IV

Washington River Protection Solutions, LLC
P.O. Box 850 MSIN H6-16
Richland, WA 99352

RJ Lee Group No.: W607016
Samples Received: 07/07/16
Report Date: 07/26/16
COC No.: 20161909
Extraction Date: 7/12/2016

Client Project:
Cartridge Evaluation

Analyte: **N-Nitrosodi-n-butylamine**

CAS No.: **924-16-3**

Sample Identification			Sampling Date	Analyzed Date	Result µg/tube	RL µg/tube	Qualifiers
Client Sample ID		RJLG ID					
16-002-AP-EF-011BASE	S16T018871	W607016-24	06/25/16	07/13/16	<0.020	0.020	
16-002-AP-IN-011BASE	S16T018872	W607016-25	06/25/16	07/13/16	<0.020	0.020	
16-002-AP-BK-011BASE	S16T018873	W607016-26	06/25/16	07/13/16	<0.020	0.020	

Report Qualifiers:
A = Target Analyte media breakthrough suspect, see analytical report
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S = Spike Recovery outside accepted recovery limits
U = Analyte analyzed for but not detected
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Laboratory Report

NIOSH 2522

Carl Howald IV

Washington River Protection
Solutions, LLC
P.O. Box 850 MSIN H6-16
Richland, WA 99352

RJ Lee Group No.: W607016
Samples Received: 07/07/16
Report Date: 07/26/16
COC No.: 20161909
Extraction Date: 7/12/2016

Client Project:
Cartridge Evaluation

Analyte: **N-Nitrosopiperidine**

CAS No.: **100-75-4**

Sample Identification		Sampling Date	Analyzed Date	Result µg/tube	RL µg/tube	Qualifiers
Client Sample ID	RJLG ID					
16-001-AP-EF-011H	S16T018848	W607016-01	06/25/16	07/12/16	<0.022	0.022	
16-001-AP-IN-011H	S16T018849	W607016-02	06/25/16	07/13/16	<0.022	0.022	
16-001-AP-IN-011H	S16T018849	W607016-02	06/25/16	07/15/16	<0.021	0.021	
16-001-AP-IN-011H	S16T018849	W607016-02	06/25/16	07/14/16	<0.021	0.021	
16-001-AP-EF-011G	S16T018850	W607016-03	06/25/16	07/12/16	<0.022	0.022	
16-001-AP-EF-011F	S16T018851	W607016-04	06/25/16	07/12/16	<0.022	0.022	
16-001-AP-EF-011E	S16T018852	W607016-05	06/24/16	07/12/16	<0.022	0.022	
16-001-AP-EF-011D	S16T018853	W607016-06	06/24/16	07/12/16	<0.022	0.022	
16-001-AP-EF-011C	S16T018854	W607016-07	06/24/16	07/12/16	<0.022	0.022	
16-001-AP-EF-011B	S16T018855	W607016-08	06/24/16	07/12/16	<0.022	0.022	
16-001-AP-EF-011A	S16T018856	W607016-09	06/24/16	07/12/16	<0.022	0.022	
16-001-AP-IN-011A	S16T018857	W607016-10	06/24/16	07/15/16	<0.021	0.021	
16-001-AP-IN-011A	S16T018857	W607016-10	06/24/16	07/14/16	<0.021	0.021	
16-001-AP-IN-011A	S16T018857	W607016-10	06/24/16	07/13/16	<0.022	0.022	
16-001-AP-EF-011BASE	S16T018858	W607016-11	06/24/16	07/12/16	<0.022	0.022	
16-001-AP-IN-011BASE	S16T018859	W607016-12	06/24/16	07/12/16	<0.022	0.022	
16-001-AP-BK-011BASE	S16T018860	W607016-13	06/24/16	07/12/16	<0.022	0.022	
16-002-AP-EF-012H	S16T018861	W607016-14	06/26/16	07/12/16	<0.022	0.022	
16-002-AP-IN-012H	S16T018862	W607016-15	06/26/16	07/14/16	<0.021	0.021	
16-002-AP-IN-012H	S16T018862	W607016-15	06/26/16	07/13/16	<0.022	0.022	
16-002-AP-IN-012H	S16T018862	W607016-15	06/26/16	07/15/16	<0.021	0.021	
16-002-AP-EF-011G	S16T018863	W607016-16	06/26/16	07/12/16	<0.022	0.022	
16-002-AP-EF-012F	S16T018864	W607016-17	06/25/16	07/12/16	<0.022	0.022	
16-002-AP-EF-011E	S16T018865	W607016-18	06/25/16	07/12/16	<0.022	0.022	
16-002-AP-EF-011D	S16T018866	W607016-19	06/25/16	07/12/16	<0.022	0.022	
16-002-AP-EF-011C	S16T018867	W607016-20	06/25/16	07/12/16	<0.022	0.022	
16-002-AP-EF-011B	S16T018868	W607016-21	06/25/16	07/13/16	<0.022	0.022	
16-002-AP-EF-011A	S16T018869	W607016-22	06/25/16	07/14/16	<0.021	0.021	
16-002-AP-EF-011A	S16T018869	W607016-22	06/25/16	07/13/16	<0.022	0.022	
16-002-AP-IN-011A	S16T018870	W607016-23	06/25/16	07/13/16	<0.022	0.022	

Report Qualifiers:

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Z = Not ELAP accredited analyte
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ND = Not Detected

RJ LEE GROUP

Laboratory Report

NIOSH 2522

Carl Howald IV

Washington River Protection Solutions, LLC
P.O. Box 850 MSIN H6-16
Richland, WA 99352

RJ Lee Group No.: W607016
Samples Received: 07/07/16
Report Date: 07/26/16
COC No.: 20161909
Extraction Date: 7/12/2016

Client Project:
Cartridge Evaluation

Analyte: **N-Nitrosopiperidine**

CAS No.: **100-75-4**

Sample Identification			Sampling Date	Analyzed Date	Result µg/tube	RL µg/tube	Qualifiers
Client Sample ID		RJLG ID					
16-002-AP-EF-011BASE	S16T018871	W607016-24	06/25/16	07/13/16	<0.022	0.022	
16-002-AP-IN-011BASE	S16T018872	W607016-25	06/25/16	07/13/16	<0.022	0.022	
16-002-AP-BK-011BASE	S16T018873	W607016-26	06/25/16	07/13/16	<0.022	0.022	

Report Qualifiers:
A = Target Analyte media breakthrough suspect, see analytical report
B = Analyte detected in the associated blank
D = Analyte analyzed in a dilution
d = Data that exceeds the RSD criteria set by the SOP
E = Report concentration was above the instrument calibration range
H = Holding times for preparation or analysis exceeded
J = Analyte detected below quantitation limits, concentration is estimated
L = Sample condition at receipt out of compliance with method defined conditions
P = Library spectrum match, rsd >80% w RT match
Q = Result out of method specific acceptance QC criteria
R = RPD (relative percent difference) outside accepted recovery limits
S = Spike Recovery outside accepted recovery limits
U = Analyte analyzed for but not detected
Z = Not ELAP accredited analyte
N/A = Not Applicable
ND = Not Detected

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Laboratory Report

NIOSH 2522

Carl Howald IV

Washington River Protection
Solutions, LLC
P.O. Box 850 MSIN H6-16
Richland, WA 99352

RJ Lee Group No.: W607016
Samples Received: 07/07/16
Report Date: 07/26/16
COC No.: 20161909
Extraction Date: 7/12/2016

Client Project:
Cartridge Evaluation

Analyte: **N-Nitrosopyrrolidine**

CAS No.: **930-55-2**

Sample Identification		Sampling Date	Analyzed Date	Result µg/tube	RL µg/tube	Qualifiers
Client Sample ID	RJLG ID					
16-001-AP-EF-011H	S16T018848 | W607016-01	06/25/16	07/12/16	<0.022	0.022	
16-001-AP-IN-011H	S16T018849 | W607016-02	06/25/16	07/14/16	<0.022	0.022	
16-001-AP-IN-011H	S16T018849 | W607016-02	06/25/16	07/15/16	<0.021	0.021	
16-001-AP-IN-011H	S16T018849 | W607016-02	06/25/16	07/13/16	<0.022	0.022	
16-001-AP-EF-011G	S16T018850 | W607016-03	06/25/16	07/12/16	<0.022	0.022	
16-001-AP-EF-011F	S16T018851 | W607016-04	06/25/16	07/12/16	<0.022	0.022	
16-001-AP-EF-011E	S16T018852 | W607016-05	06/24/16	07/12/16	<0.022	0.022	
16-001-AP-EF-011D	S16T018853 | W607016-06	06/24/16	07/12/16	<0.022	0.022	
16-001-AP-EF-011C	S16T018854 | W607016-07	06/24/16	07/12/16	<0.022	0.022	
16-001-AP-EF-011B	S16T018855 | W607016-08	06/24/16	07/12/16	<0.022	0.022	
16-001-AP-EF-011A	S16T018856 | W607016-09	06/24/16	07/12/16	<0.022	0.022	
16-001-AP-IN-011A	S16T018857 | W607016-10	06/24/16	07/15/16	<0.021	0.021	
16-001-AP-IN-011A	S16T018857 | W607016-10	06/24/16	07/14/16	<0.022	0.022	
16-001-AP-IN-011A	S16T018857 | W607016-10	06/24/16	07/13/16	<0.022	0.022	
16-001-AP-EF-011BASE	S16T018858 | W607016-11	06/24/16	07/12/16	<0.022	0.022	
16-001-AP-IN-011BASE	S16T018859 | W607016-12	06/24/16	07/12/16	<0.022	0.022	
16-001-AP-BK-011BASE	S16T018860 | W607016-13	06/24/16	07/12/16	<0.022	0.022	
16-002-AP-EF-012H	S16T018861 | W607016-14	06/26/16	07/12/16	<0.022	0.022	
16-002-AP-IN-012H	S16T018862 | W607016-15	06/26/16	07/14/16	<0.022	0.022	
16-002-AP-IN-012H	S16T018862 | W607016-15	06/26/16	07/15/16	<0.021	0.021	
16-002-AP-IN-012H	S16T018862 | W607016-15	06/26/16	07/13/16	<0.022	0.022	
16-002-AP-EF-011G	S16T018863 | W607016-16	06/26/16	07/12/16	<0.022	0.022	
16-002-AP-EF-012F	S16T018864 | W607016-17	06/25/16	07/12/16	<0.022	0.022	
16-002-AP-EF-011E	S16T018865 | W607016-18	06/25/16	07/12/16	<0.022	0.022	
16-002-AP-EF-011D	S16T018866 | W607016-19	06/25/16	07/12/16	<0.022	0.022	
16-002-AP-EF-011C	S16T018867 | W607016-20	06/25/16	07/12/16	<0.022	0.022	
16-002-AP-EF-011B	S16T018868 | W607016-21	06/25/16	07/13/16	<0.021	0.021	
16-002-AP-EF-011A	S16T018869 | W607016-22	06/25/16	07/14/16	<0.022	0.022	
16-002-AP-EF-011A	S16T018869 | W607016-22	06/25/16	07/13/16	<0.021	0.021	
16-002-AP-IN-011A	S16T018870 | W607016-23	06/25/16	07/13/16	<0.021	0.021	

Report Qualifiers:

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d = Data that exceeds the RSD criteria set by the SOP
E = Report concentration was above the instrument calibration range
H = Holding times for preparation or analysis exceeded
J = Analyte detected below quantitation limits, concentration is estimated
L = Sample condition at receipt out of compliance with method defined conditions
P = Library spectrum match, rsd >90% w RT match
Q = Result out of method specific acceptance QC criteria
R = RPD (relative percent difference) outside accepted recovery limits
S = Spike Recovery outside accepted recovery limits
U = Analyte analyzed for but not detected
Z = Not ELAP accredited analyte
N/A = Not Applicable
ND = Not Detected

RJ LEE GROUP

Laboratory Report

NIOSH 2522

Carl Howald IV

Washington River Protection Solutions, LLC
P.O. Box 850 MSIN H6-16
Richland, WA 99352

RJ Lee Group No.: W607016
Samples Received: 07/07/16
Report Date: 07/26/16
COC No.: 20161909
Extraction Date: 7/12/2016

Client Project:
Cartridge Evaluation

Analyte: **N-Nitrosopyrrolidine**

CAS No.: **930-55-2**

Sample Identification			Sampling Date	Analyzed Date	Result µg/tube	RL µg/tube	Qualifiers
Client Sample ID		RJLG ID					
16-002-AP-EF-011BASE	S16T018871	W607016-24	06/25/16	07/13/16	<0.021	0.021	
16-002-AP-IN-011BASE	S16T018872	W607016-25	06/25/16	07/13/16	<0.021	0.021	
16-002-AP-BK-011BASE	S16T018873	W607016-26	06/25/16	07/13/16	<0.021	0.021	

Report Qualifiers:
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D = Analyte analyzed in a dilution
d = Data that exceeds the RSD criteria set by the SOP
E = Report concentration was above the instrument calibration range
H = Holding times for preparation or analysis exceeded
J = Analyte detected below quantitation limits, concentration is estimated
L = Sample condition at receipt out of compliance with method defined conditions
P = Library spectrum match, rsd >80% w RT match
Q = Result out of method specific acceptance QC criteria
R = RPD (relative percent difference) outside accepted recovery limits
S = Spike Recovery outside accepted recovery limits
U = Analyte analyzed for but not detected
Z = Not ELAP accredited analyte
N/A = Not Applicable
ND = Not Detected

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Laboratory Report

NIOSH 2522

Carl Howald IV

Washington River Protection
Solutions, LLC
P.O. Box 850 MSIN H6-16
Richland, WA 99352

RJ Lee Group No.: W607016
Samples Received: 07/07/16
Report Date: 07/26/16
COC No.: 20161909
Extraction Date: 7/12/2016

Client Project:
Cartridge Evaluation

Analyte: **N-Nitrosomorpholine**

CAS No.: **59-89-2**

Sample Identification		Sampling Date	Analyzed Date	Result µg/tube	RL µg/tube	Qualifiers
Client Sample ID	RJLG ID					
16-001-AP-EF-011H	S16T018848	W607016-01	06/25/16	07/12/16	<0.022	0.022	
16-001-AP-IN-011H	S16T018849	W607016-02	06/25/16	07/15/16	<0.021	0.021	
16-001-AP-IN-011H	S16T018849	W607016-02	06/25/16	07/13/16	<0.022	0.022	
16-001-AP-IN-011H	S16T018849	W607016-02	06/25/16	07/14/16	<0.022	0.022	
16-001-AP-EF-011G	S16T018850	W607016-03	06/25/16	07/12/16	<0.022	0.022	
16-001-AP-EF-011F	S16T018851	W607016-04	06/25/16	07/12/16	<0.022	0.022	
16-001-AP-EF-011E	S16T018852	W607016-05	06/24/16	07/12/16	<0.022	0.022	
16-001-AP-EF-011D	S16T018853	W607016-06	06/24/16	07/12/16	<0.022	0.022	
16-001-AP-EF-011C	S16T018854	W607016-07	06/24/16	07/12/16	<0.022	0.022	
16-001-AP-EF-011B	S16T018855	W607016-08	06/24/16	07/12/16	<0.022	0.022	
16-001-AP-EF-011A	S16T018856	W607016-09	06/24/16	07/12/16	<0.022	0.022	
16-001-AP-IN-011A	S16T018857	W607016-10	06/24/16	07/13/16	0.148	0.022	
16-001-AP-IN-011A	S16T018857	W607016-10	06/24/16	07/14/16	<0.022	0.022	
16-001-AP-IN-011A	S16T018857	W607016-10	06/24/16	07/15/16	<0.021	0.021	
16-001-AP-EF-011BASE	S16T018858	W607016-11	06/24/16	07/12/16	<0.022	0.022	
16-001-AP-IN-011BASE	S16T018859	W607016-12	06/24/16	07/12/16	<0.022	0.022	
16-001-AP-BK-011BASE	S16T018860	W607016-13	06/24/16	07/12/16	<0.022	0.022	
16-002-AP-EF-012H	S16T018861	W607016-14	06/26/16	07/12/16	<0.022	0.022	
16-002-AP-IN-012H	S16T018862	W607016-15	06/26/16	07/14/16	<0.022	0.022	
16-002-AP-IN-012H	S16T018862	W607016-15	06/26/16	07/15/16	<0.021	0.021	
16-002-AP-IN-012H	S16T018862	W607016-15	06/26/16	07/13/16	0.040	0.022	
16-002-AP-EF-011G	S16T018863	W607016-16	06/26/16	07/12/16	<0.022	0.022	
16-002-AP-EF-012F	S16T018864	W607016-17	06/25/16	07/12/16	<0.022	0.022	
16-002-AP-EF-011E	S16T018865	W607016-18	06/25/16	07/12/16	<0.022	0.022	
16-002-AP-EF-011D	S16T018866	W607016-19	06/25/16	07/12/16	<0.022	0.022	
16-002-AP-EF-011C	S16T018867	W607016-20	06/25/16	07/12/16	<0.022	0.022	
16-002-AP-EF-011B	S16T018868	W607016-21	06/25/16	07/13/16	<0.022	0.022	
16-002-AP-EF-011A	S16T018869	W607016-22	06/25/16	07/13/16	<0.022	0.022	
16-002-AP-EF-011A	S16T018869	W607016-22	06/25/16	07/14/16	<0.022	0.022	
16-002-AP-IN-011A	S16T018870	W607016-23	06/25/16	07/13/16	<0.022	0.022	

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Q = Result out of method specific acceptance QC criteria
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S = Spike Recovery outside accepted recovery limits
U = Analyte analyzed for but not detected
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N/A = Not Applicable
ND = Not Detected

RJ LEE GROUP

Laboratory Report

NIOSH 2522

Carl Howald IV

Washington River Protection Solutions, LLC
P.O. Box 850 MSIN H6-16
Richland, WA 99352

RJ Lee Group No.: W607016
Samples Received: 07/07/16
Report Date: 07/26/16
COC No.: 20161909
Extraction Date: 7/12/2016

Client Project:
Cartridge Evaluation

Analyte: **N-Nitrosomorpholine**

CAS No.: **59-89-2**

Sample Identification			Sampling Date	Analyzed Date	Result µg/tube	RL µg/tube	Qualifiers
Client Sample ID		RJLG ID					
16-002-AP-EF-011BASE	S16T018871	W607016-24	06/25/16	07/13/16	<0.022	0.022	
16-002-AP-IN-011BASE	S16T018872	W607016-25	06/25/16	07/13/16	<0.022	0.022	
16-002-AP-BK-011BASE	S16T018873	W607016-26	06/25/16	07/13/16	<0.022	0.022	

Report Qualifiers:
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B = Analyte detected in the associated blank
D = Analyte analyzed in a dilution
d = Data that exceeds the RSD criteria set by the SOP
E = Report concentration was above the instrument calibration range
H = Holding times for preparation or analysis exceeded
J = Analyte detected below quantitation limits, concentration is estimated
L = Sample condition at receipt out of compliance with method defined conditions
P = Library spectrum match, rsd >80% w RT match
Q = Result out of method specific acceptance QC criteria
R = RPD (relative percent difference) outside accepted recovery limits
S = Spike Recovery outside accepted recovery limits
U = Analyte analyzed for but not detected
Z = Not ELAP accredited analyte
N/A = Not Applicable
ND = Not Detected

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Carl Howald IV

Washington River Protection Solutions, LLC
P.O. Box 850 MSIN H6-16
Richland, WA 99352

Quality Control

NIOSH 2522

RJ Lee Group No.: W607016
Samples Received: 07/07/16
Report Date: 07/26/16
COC No.: 20161909
Extraction Date: 7/12/2016

Client Project:
Cartridge Evaluation

Analyte	CAS No.	Sample ID	Analyzed Date	Expected µg/tube	Result µg/tube	DE	DE Corrected	REC %	RSD %	Qualifier
N-Nitrosodiethylamine	55-18-5	LCS-1	07/12/16	0.200	0.192	0.93	0.206	103	5.42	
N-Nitrosodiethylamine	55-18-5	LCS-1	07/13/16	0.200	0.197	0.95	0.208	104	3.40	
N-Nitrosodiethylamine	55-18-5	LCS-1	07/13/16	0.200	0.179	0.91	0.196	97.4	2.27	
N-Nitrosodiethylamine	55-18-5	LCS-1	07/15/16	0.200	0.185	0.94	0.197	98.3	2.00	
N-Nitrosodimethylamine	62-75-9	LCS-1	07/12/16	0.200	0.181	0.91	0.199	99.0	2.90	
N-Nitrosodimethylamine	62-75-9	LCS-1	07/13/16	0.200	0.186	0.91	0.205	102	5.76	
N-Nitrosodimethylamine	62-75-9	LCS-1	07/13/16	0.200	0.168	0.89	0.189	94.2	5.21	
N-Nitrosodimethylamine	62-75-9	LCS-1	07/15/16	0.200	0.183	0.93	0.197	98.2	3.68	
N-Nitrosodi-n-butylamine	924-16-3	LCS-1	07/12/16	0.200	0.188	0.95	0.198	98.6	3.73	
N-Nitrosodi-n-butylamine	924-16-3	LCS-1	07/13/16	0.200	0.204	0.98	0.209	104	5.82	
N-Nitrosodi-n-butylamine	924-16-3	LCS-1	07/13/16	0.200	0.187	0.97	0.193	96.6	3.02	
N-Nitrosodi-n-butylamine	924-16-3	LCS-1	07/15/16	0.200	0.186	0.95	0.196	97.6	2.45	
N-Nitrosodi-n-propylamine	621-64-7	LCS-1	07/12/16	0.200	0.189	0.93	0.202	101	4.20	
N-Nitrosodi-n-propylamine	621-64-7	LCS-1	07/13/16	0.200	0.199	0.96	0.208	104	3.67	
N-Nitrosodi-n-propylamine	621-64-7	LCS-1	07/13/16	0.200	0.178	0.92	0.194	96.9	2.73	
N-Nitrosodi-n-propylamine	621-64-7	LCS-1	07/15/16	0.200	0.187	0.94	0.199	99.5	1.63	
N-Nitrosomethylethylamine	10595-95-6	LCS-1	07/12/16	0.200	0.187	0.89	0.210	105	4.78	
N-Nitrosomethylethylamine	10595-95-6	LCS-1	07/13/16	0.200	0.189	0.92	0.205	103	2.35	
N-Nitrosomethylethylamine	10595-95-6	LCS-1	07/13/16	0.200	0.176	0.89	0.197	98.1	1.76	
N-Nitrosomethylethylamine	10595-95-6	LCS-1	07/15/16	0.200	0.185	0.92	0.200	100	1.93	
N-Nitrosomorpholine	59-89-2	LCS-1	07/12/16	0.200	0.189	0.90	0.211	105	5.95	
N-Nitrosomorpholine	59-89-2	LCS-1	07/13/16	0.200	0.195	0.92	0.211	105	5.45	
N-Nitrosomorpholine	59-89-2	LCS-1	07/13/16	0.200	0.182	0.91	0.200	99.6	0.897	
N-Nitrosomorpholine	59-89-2	LCS-1	07/15/16	0.200	0.189	0.94	0.202	101	2.08	
N-Nitrosopiperidine	100-75-4	LCS-1	07/12/16	0.200	0.188	0.92	0.204	102	5.04	
N-Nitrosopiperidine	100-75-4	LCS-1	07/13/16	0.200	0.190	0.92	0.206	103	4.15	
N-Nitrosopiperidine	100-75-4	LCS-1	07/13/16	0.200	0.182	0.93	0.195	97.1	2.64	
N-Nitrosopiperidine	100-75-4	LCS-1	07/15/16	0.200	0.184	0.93	0.197	98.4	1.41	
N-Nitrosopyrrolidine	930-55-2	LCS-1	07/12/16	0.200	0.188	0.91	0.208	104	6.81	
N-Nitrosopyrrolidine	930-55-2	LCS-1	07/13/16	0.200	0.190	0.93	0.203	102	3.39	
N-Nitrosopyrrolidine	930-55-2	LCS-1	07/13/16	0.200	0.177	0.92	0.192	96.3	3.33	
N-Nitrosopyrrolidine	930-55-2	LCS-1	07/15/16	0.200	0.186	0.94	0.198	98.7	1.85	
N-Nitrosodiethylamine	55-18-5	LCS-2	07/12/16	0.200	0.193	0.93	0.207	103	5.42	
N-Nitrosodiethylamine	55-18-5	LCS-2	07/13/16	0.200	0.187	0.95	0.198	98.8	3.40	
N-Nitrosodiethylamine	55-18-5	LCS-2	07/13/16	0.200	0.186	0.91	0.203	102	2.27	

RJ LEE GROUP

Analyte	CAS No.	Sample ID	Analyzed Date	Expected µg/tube	Result µg/tube	DE	DE Corrected	REC %	RSD %	Qualifier
N-Nitrosodiethylamine	55-18-5	LCS-2	07/15/16	0.200	0.192	0.94	0.205	102	2.00	
N-Nitrosodimethylamine	62-75-9	LCS-2	07/12/16	0.200	0.188	0.91	0.206	103	2.90	
N-Nitrosodimethylamine	62-75-9	LCS-2	07/13/16	0.200	0.190	0.91	0.209	104	5.76	
N-Nitrosodimethylamine	62-75-9	LCS-2	07/13/16	0.200	0.186	0.89	0.209	104	5.21	
N-Nitrosodimethylamine	62-75-9	LCS-2	07/15/16	0.200	0.194	0.93	0.209	104	3.68	
N-Nitrosodi-n-butylamine	924-16-3	LCS-2	07/12/16	0.200	0.198	0.95	0.208	104	3.73	
N-Nitrosodi-n-butylamine	924-16-3	LCS-2	07/13/16	0.200	0.200	0.98	0.205	102	5.82	
N-Nitrosodi-n-butylamine	924-16-3	LCS-2	07/13/16	0.200	0.198	0.97	0.205	102	3.02	
N-Nitrosodi-n-butylamine	924-16-3	LCS-2	07/15/16	0.200	0.195	0.95	0.205	102	2.45	
N-Nitrosodi-n-propylamine	621-64-7	LCS-2	07/12/16	0.200	0.194	0.93	0.208	104	4.20	
N-Nitrosodi-n-propylamine	621-64-7	LCS-2	07/13/16	0.200	0.191	0.96	0.199	99.4	3.67	
N-Nitrosodi-n-propylamine	621-64-7	LCS-2	07/13/16	0.200	0.187	0.92	0.203	102	2.73	
N-Nitrosodi-n-propylamine	621-64-7	LCS-2	07/15/16	0.200	0.192	0.94	0.204	102	1.63	
N-Nitrosomethylethylamine	10595-95-6	LCS-2	07/12/16	0.200	0.179	0.89	0.201	100	4.78	
N-Nitrosomethylethylamine	10595-95-6	LCS-2	07/13/16	0.200	0.184	0.92	0.200	99.5	2.35	
N-Nitrosomethylethylamine	10595-95-6	LCS-2	07/13/16	0.200	0.182	0.89	0.204	101	1.76	
N-Nitrosomethylethylamine	10595-95-6	LCS-2	07/15/16	0.200	0.188	0.92	0.204	102	1.93	
N-Nitrosomorpholine	59-89-2	LCS-2	07/12/16	0.200	0.182	0.90	0.203	101	5.95	
N-Nitrosomorpholine	59-89-2	LCS-2	07/13/16	0.200	0.186	0.92	0.201	100	5.45	
N-Nitrosomorpholine	59-89-2	LCS-2	07/13/16	0.200	0.184	0.91	0.202	101	0.897	
N-Nitrosomorpholine	59-89-2	LCS-2	07/15/16	0.200	0.190	0.94	0.203	101	2.08	
N-Nitrosopiperidine	100-75-4	LCS-2	07/12/16	0.200	0.191	0.92	0.207	104	5.04	
N-Nitrosopiperidine	100-75-4	LCS-2	07/13/16	0.200	0.189	0.92	0.205	102	4.15	
N-Nitrosopiperidine	100-75-4	LCS-2	07/13/16	0.200	0.191	0.93	0.204	102	2.64	
N-Nitrosopiperidine	100-75-4	LCS-2	07/15/16	0.200	0.189	0.93	0.203	101	1.41	
N-Nitrosopyrrolidine	930-55-2	LCS-2	07/12/16	0.200	0.189	0.91	0.209	104	6.81	
N-Nitrosopyrrolidine	930-55-2	LCS-2	07/13/16	0.200	0.191	0.93	0.204	102	3.39	
N-Nitrosopyrrolidine	930-55-2	LCS-2	07/13/16	0.200	0.189	0.92	0.205	103	3.33	
N-Nitrosopyrrolidine	930-55-2	LCS-2	07/15/16	0.200	0.192	0.94	0.204	102	1.85	
N-Nitrosodiethylamine	55-18-5	LCS-3	07/12/16	0.200	0.175	0.93	0.188	93.7	5.42	
N-Nitrosodiethylamine	55-18-5	LCS-3	07/13/16	0.200	0.184	0.95	0.195	97.3	3.40	
N-Nitrosodiethylamine	55-18-5	LCS-3	07/13/16	0.200	0.185	0.91	0.202	101	2.27	
N-Nitrosodiethylamine	55-18-5	LCS-3	07/15/16	0.200	0.187	0.94	0.199	99.5	2.00	
N-Nitrosodimethylamine	62-75-9	LCS-3	07/12/16	0.200	0.178	0.91	0.195	97.7	2.90	
N-Nitrosodimethylamine	62-75-9	LCS-3	07/13/16	0.200	0.170	0.91	0.187	93.5	5.76	
N-Nitrosodimethylamine	62-75-9	LCS-3	07/13/16	0.200	0.181	0.89	0.204	102	5.21	
N-Nitrosodimethylamine	62-75-9	LCS-3	07/15/16	0.200	0.181	0.93	0.195	97.5	3.68	
N-Nitrosodi-n-butylamine	924-16-3	LCS-3	07/12/16	0.200	0.185	0.95	0.195	97.2	3.73	
N-Nitrosodi-n-butylamine	924-16-3	LCS-3	07/13/16	0.200	0.183	0.98	0.187	93.4	5.82	
N-Nitrosodi-n-butylamine	924-16-3	LCS-3	07/13/16	0.200	0.196	0.97	0.203	101	3.02	
N-Nitrosodi-n-butylamine	924-16-3	LCS-3	07/15/16	0.200	0.190	0.95	0.200	99.9	2.45	
N-Nitrosodi-n-propylamine	621-64-7	LCS-3	07/12/16	0.200	0.178	0.93	0.190	95.3	4.20	

RJ LEE GROUP

Analyte	CAS No.	Sample ID	Analyzed Date	Expected µg/tube	Result µg/tube	DE	DE Corrected	REC %	RSD %	Qualifier
N-Nitrosodi-n-propylamine	621-64-7	LCS-3	07/13/16	0.200	0.185	0.96	0.193	96.7	3.67	
N-Nitrosodi-n-propylamine	621-64-7	LCS-3	07/13/16	0.200	0.187	0.92	0.203	101	2.73	
N-Nitrosodi-n-propylamine	621-64-7	LCS-3	07/15/16	0.200	0.186	0.94	0.198	98.7	1.63	
N-Nitrosomethylethylamine	10595-95-6	LCS-3	07/12/16	0.200	0.170	0.89	0.191	95.2	4.78	
N-Nitrosomethylethylamine	10595-95-6	LCS-3	07/13/16	0.200	0.181	0.92	0.196	98.0	2.35	
N-Nitrosomethylethylamine	10595-95-6	LCS-3	07/13/16	0.200	0.180	0.89	0.201	100	1.76	
N-Nitrosomethylethylamine	10595-95-6	LCS-3	07/15/16	0.200	0.181	0.92	0.196	98.0	1.93	
N-Nitrosomorpholine	59-89-2	LCS-3	07/12/16	0.200	0.168	0.90	0.187	93.6	5.95	
N-Nitrosomorpholine	59-89-2	LCS-3	07/13/16	0.200	0.175	0.92	0.189	94.4	5.45	
N-Nitrosomorpholine	59-89-2	LCS-3	07/13/16	0.200	0.181	0.91	0.199	99.3	0.897	
N-Nitrosomorpholine	59-89-2	LCS-3	07/15/16	0.200	0.183	0.94	0.196	97.6	2.08	
N-Nitrosopiperidine	100-75-4	LCS-3	07/12/16	0.200	0.174	0.92	0.189	94.3	5.04	
N-Nitrosopiperidine	100-75-4	LCS-3	07/13/16	0.200	0.176	0.92	0.191	95.2	4.15	
N-Nitrosopiperidine	100-75-4	LCS-3	07/13/16	0.200	0.188	0.93	0.201	101	2.64	
N-Nitrosopiperidine	100-75-4	LCS-3	07/15/16	0.200	0.187	0.93	0.201	100	1.41	
N-Nitrosopyrrolidine	930-55-2	LCS-3	07/12/16	0.200	0.167	0.91	0.184	92.1	6.81	
N-Nitrosopyrrolidine	930-55-2	LCS-3	07/13/16	0.200	0.180	0.93	0.193	96.1	3.39	
N-Nitrosopyrrolidine	930-55-2	LCS-3	07/13/16	0.200	0.186	0.92	0.202	101	3.33	
N-Nitrosopyrrolidine	930-55-2	LCS-3	07/15/16	0.200	0.186	0.94	0.198	99.2	1.85	
N-Nitrosodiethylamine	55-18-5	MB	07/12/16		0.00	0.93	0.00			
N-Nitrosodiethylamine	55-18-5	MB	07/13/16		0.00	0.95	0.00			
N-Nitrosodiethylamine	55-18-5	MB	07/13/16		0.00	0.91	0.00			
N-Nitrosodiethylamine	55-18-5	MB	07/15/16		0.00	0.94	0.00			
N-Nitrosodimethylamine	62-75-9	MB	07/12/16		0.00	0.91	0.00			
N-Nitrosodimethylamine	62-75-9	MB	07/13/16		0.00	0.91	0.00			
N-Nitrosodimethylamine	62-75-9	MB	07/13/16		0.00	0.89	0.00			
N-Nitrosodimethylamine	62-75-9	MB	07/15/16		0.00	0.93	0.00			
N-Nitrosodi-n-butylamine	924-16-3	MB	07/12/16		0.00	0.95	0.00			
N-Nitrosodi-n-butylamine	924-16-3	MB	07/13/16		0.00	0.98	0.00			
N-Nitrosodi-n-butylamine	924-16-3	MB	07/13/16		0.00	0.97	0.00			
N-Nitrosodi-n-butylamine	924-16-3	MB	07/15/16		0.00	0.95	0.00			
N-Nitrosodi-n-propylamine	621-64-7	MB	07/12/16		0.00	0.93	0.00			
N-Nitrosodi-n-propylamine	621-64-7	MB	07/13/16		0.00	0.96	0.00			
N-Nitrosodi-n-propylamine	621-64-7	MB	07/13/16		0.00	0.92	0.00			
N-Nitrosodi-n-propylamine	621-64-7	MB	07/15/16		0.00	0.94	0.00			
N-Nitrosomethylethylamine	10595-95-6	MB	07/12/16		0.00	0.89	0.00			
N-Nitrosomethylethylamine	10595-95-6	MB	07/13/16		0.00	0.92	0.00			
N-Nitrosomethylethylamine	10595-95-6	MB	07/13/16		0.00	0.89	0.00			
N-Nitrosomethylethylamine	10595-95-6	MB	07/15/16		0.00	0.92	0.00			
N-Nitrosomorpholine	59-89-2	MB	07/12/16		0.00	0.90	0.00			
N-Nitrosomorpholine	59-89-2	MB	07/13/16		0.00	0.92	0.00			
N-Nitrosomorpholine	59-89-2	MB	07/13/16		0.00	0.91	0.00			

RJ LEE GROUP

Analyte	CAS No.	Sample ID	Analyzed Date	Expected µg/tube	Result µg/tube	DE	DE Corrected	REC %	RSD %	Qualifier
N-Nitrosomorpholine	59-89-2	MB	07/15/16		0.00	0.94	0.00			
N-Nitrosopiperidine	100-75-4	MB	07/12/16		0.00	0.92	0.00			
N-Nitrosopiperidine	100-75-4	MB	07/13/16		0.00	0.92	0.00			
N-Nitrosopiperidine	100-75-4	MB	07/13/16		0.00	0.93	0.00			
N-Nitrosopiperidine	100-75-4	MB	07/15/16		0.00	0.93	0.00			
N-Nitrosopyrrolidine	930-55-2	MB	07/12/16		0.00	0.91	0.00			
N-Nitrosopyrrolidine	930-55-2	MB	07/13/16		0.00	0.93	0.00			
N-Nitrosopyrrolidine	930-55-2	MB	07/13/16		0.00	0.92	0.00			
N-Nitrosopyrrolidine	930-55-2	MB	07/15/16		0.00	0.94	0.00			
N-Nitrosodiethylamine	55-18-5	MRL	07/12/16	0.020	0.021	0.93	0.023	113		
N-Nitrosodiethylamine	55-18-5	MRL	07/13/16	0.020	0.023	0.95	0.024	122		
N-Nitrosodiethylamine	55-18-5	MRL	07/13/16	0.020	0.019	0.91	0.021	106		
N-Nitrosodiethylamine	55-18-5	MRL	07/15/16	0.020	0.023	0.94	0.024	120		
N-Nitrosodimethylamine	62-75-9	MRL	07/12/16	0.020	0.020	0.91	0.022	110		
N-Nitrosodimethylamine	62-75-9	MRL	07/13/16	0.020	0.020	0.91	0.022	109		
N-Nitrosodimethylamine	62-75-9	MRL	07/13/16	0.020	0.023	0.89	0.026	128		
N-Nitrosodimethylamine	62-75-9	MRL	07/15/16	0.020	0.022	0.93	0.024	118		
N-Nitrosodi-n-butylamine	924-16-3	MRL	07/12/16	0.020	0.023	0.95	0.024	120		
N-Nitrosodi-n-butylamine	924-16-3	MRL	07/13/16	0.020	0.023	0.98	0.024	118		
N-Nitrosodi-n-butylamine	924-16-3	MRL	07/13/16	0.020	0.019	0.97	0.020	102		
N-Nitrosodi-n-butylamine	924-16-3	MRL	07/15/16	0.020	0.023	0.95	0.024	120		
N-Nitrosodi-n-propylamine	621-64-7	MRL	07/12/16	0.020	0.020	0.93	0.021	106		
N-Nitrosodi-n-propylamine	621-64-7	MRL	07/13/16	0.020	0.022	0.96	0.023	115		
N-Nitrosodi-n-propylamine	621-64-7	MRL	07/13/16	0.020	0.020	0.92	0.022	108		
N-Nitrosodi-n-propylamine	621-64-7	MRL	07/15/16	0.020	0.024	0.94	0.026	128		
N-Nitrosomethylethylamine	10595-95-6	MRL	07/12/16	0.020	0.019	0.89	0.021	102		
N-Nitrosomethylethylamine	10595-95-6	MRL	07/13/16	0.020	0.020	0.92	0.022	110		
N-Nitrosomethylethylamine	10595-95-6	MRL	07/13/16	0.020	0.020	0.89	0.022	112		
N-Nitrosomethylethylamine	10595-95-6	MRL	07/15/16	0.020	0.022	0.92	0.024	119		
N-Nitrosomorpholine	59-89-2	MRL	07/12/16	0.020	0.019	0.90	0.021	105		
N-Nitrosomorpholine	59-89-2	MRL	07/13/16	0.020	0.022	0.92	0.024	120		
N-Nitrosomorpholine	59-89-2	MRL	07/13/16	0.020	0.023	0.91	0.025	123		
N-Nitrosomorpholine	59-89-2	MRL	07/15/16	0.020	0.024	0.94	0.026	128		
N-Nitrosopiperidine	100-75-4	MRL	07/12/16	0.020	0.021	0.92	0.023	115		
N-Nitrosopiperidine	100-75-4	MRL	07/13/16	0.020	0.022	0.92	0.024	121		
N-Nitrosopiperidine	100-75-4	MRL	07/13/16	0.020	0.019	0.93	0.020	101		
N-Nitrosopiperidine	100-75-4	MRL	07/15/16	0.020	0.021	0.93	0.022	110		
N-Nitrosopyrrolidine	930-55-2	MRL	07/12/16	0.020	0.018	0.91	0.020	99.8		
N-Nitrosopyrrolidine	930-55-2	MRL	07/13/16	0.020	0.020	0.93	0.021	106		
N-Nitrosopyrrolidine	930-55-2	MRL	07/13/16	0.020	0.019	0.92	0.021	106		
N-Nitrosopyrrolidine	930-55-2	MRL	07/15/16	0.020	0.021	0.94	0.022	111		

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Report Qualifiers:

A = Target Analyte media breakthrough suspect, see analytical report
B = Analyte detected in the associated blank
D = Analyte analyzed in a dilution
d = Data that exceeds the RSD criteria set by the SOP
E = Report concentration was above the instrument calibration range
H = Holding times for preparation or analysis exceeded
J = Analyte detected below quantitation limits, concentration is estimated
L = Sample condition at receipt out of compliance with method defined conditions
P = Library spectrum match, rsd >90% w RT match
Q = Result out of method specific acceptance QC criteria
R = RPD (relative percent difference) outside accepted recovery limits
S = Spike Recovery outside accepted recovery limits
U = Analyte analyzed for but not detected
Z = Not ELAP accredited analyte
N/A = Not Applicable
ND = Not Detected

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These results are submitted pursuant to RJ Lee Group's current terms and conditions of sale, including the company's standard warranty and limitation of liability provisions. No responsibility or liability is assumed for the manner in which the results are used or interpreted. Unless notified in writing to return the samples covered by this report, RJ Lee Group will store the samples for a period of ninety (90) days before discarding. A shipping and handling fee will be assessed for the return of any samples. Unless otherwise noted, samples were received in an acceptable condition. This laboratory operates in accordance with ISO 17025 guidelines, and holds limited scopes of accreditation under ORELAP Lab Code 4061 AIHA-LAP, LLC Lab ID 178656 EPA ID WA01193 and WA DOE Lab ID C859. This report may not be used to claim product endorsement by any laboratory accrediting agency. The results contained in this report relate only to the items tested or to the sample(s) as received by the laboratory. Any reproduction of this document must be in full for the report to be

W607016

W607016 Rev. 1, Page 33 of 35

Assembler	CHAIN OF CUSTODY/SAMPLE ANALYSIS REQUEST	C.O.C. No.
N/A		20161909
		Page 1 of 3

Collector: JONES	Contact/Requestor: CARL HOWALD IV	Telephone No. 373-6861 MSIN T6-05 FAX 372-1878
SAF No.: N/A	Sample Origin: CARTRIDGE EVALUATION	Purchase Order/Charge Code: 202003/CB20
Project Title: CARTRIDGE EVALUATION	Logbook/ Work Package No.: N/A	Ice Chest No. Temp.
Shipped To (Lab): CBAL	Method of Shipment	Bill of Lading/Air Bill No.
Protocol: N/A	Data Turnaround: 10 DAYS	Parts and Return No.

Sample No.	Lab ID	*	Date	Time	No./Type Container	Sample Analysis	Preservative
	S16T018848	VA	6/25/16		Thermosorb-N	Nitrosamines 16-001-AP-EF-011H	N/A
	S16T018849	VA	6/25/16		Thermosorb-N	Nitrosamines 16-001-AP-IN-011H	N/A
	S16T018850	VA	6/25/16		Thermosorb-N	Nitrosamines 16-001-AP-EF-011G	N/A
	S16T018851	VA	6/25/16		Thermosorb-N	Nitrosamines 16-001-AP-EF-011F	N/A
	S16T018852	VA	6/24/16		Thermosorb-N	Nitrosamines 16-001-AP-EF-011E	N/A
	S16T018853	VA	6/24/16		Thermosorb-N	Nitrosamines 16-001-AP-EF-011D	N/A
	S16T018854	VA	6/24/16		Thermosorb-N	Nitrosamines 16-001-AP-EF-011C	N/A
	S16T018855	VA	6/24/16		Thermosorb-N	Nitrosamines 16-001-AP-EF-011B	N/A
	S16T018856	VA	6/24/16		Thermosorb-N	Nitrosamines 16-001-AP-EF-011A	N/A
	S16T018857	VA	6/24/16		Thermosorb-N	Nitrosamines 16-001-AP-IN-011A	N/A

POSSIBLE SAMPLE HAZARDS/REMARKS (List all known wastes) MSDS ○ Yes ◉ No

SPECIAL INSTRUCTIONS — Hold Time

Send Results to Robert Sosa & Greg Moore
Robert_W_Sosa@rl.gov and Greg_S_Moore@rl.gov
see SOW for email

CONTRACT 55503

RELEASE 5

Relinquished By (Print / Sign)	Date/Time	Received By (Print / Sign)	Date/Time
Sharon L Holder	7-7-16 0830	RE Rogers	7-7-16 0830
RE Rogers	7-7-16 10:56	C. LOPEZ RJ LEE GROUP	7-7-16 1056

Matrix*

S = Soil		DL = Drum Liquids	
SE = Sediment		T = Tissue	
SO = Solid		WI = Wipe	
SL = Sludge		L = Liquid	
W = Water		V = Vegetation	
O = Oil		VA = Vapor	
A = Air		X = Other	
DS = Drum Solids			

FINAL SAMPLE DISPOSITION	Disposal Method (e.g., Return to customer, per lab procedure, used in process)	Disposed By	Date/Time
	CONSUMED	T.P. Tuttle	07/19/16 13:30

All samples containing hazardous materials shall be picked up by requestor and returned to parent container or site of origin.

A-6003-962 (03/05)

C.336

Assembler	CHAIN OF CUSTODY/SAMPLE ANALYSIS REQUEST	C.O.C. No. 20161909
N/A		Page 2 of 3

Collector: JONES	Contact/Requestor: CARL HOWALD IV	Telephone No. 373-6861 MSIN T6-05 FAX 372-1878
SAF No.: N/A	Sample Origin: CARTRIDGE EVALUATION	Purchase Order/Charge Code: 202003/CB20
Project Title: CARTRIDGE EVALUATION	Logbook/ Work Package No.: N/A	Ice Chest No. Temp.
Shipped To (Lab): CBAL	Method of Shipment	Bill of Lading/Air Bill No.
Protocol: N/A	Data Turnaround: 10 DAYS	Parts and Return No.

Sample No.	Lab ID	*	Date	Time	No./Type Container	Sample Analysis	Preservative
	S16T018858	VA	6/24/16		Thermosorb-N	Nitrosamines 16-001-AP-EF-011BASE	N/A
	S16T018859	VA	6/24/16		Thermosorb-N	Nitrosamines 16-001-AP-IN-011BASE	N/A
	S16T018860	VA	6/24/16		Thermosorb-N	Nitrosamines 16-001-AP-BK-011BASE	N/A
	S16T018861	VA	6/26/16		Thermosorb-N	Nitrosamines 16-002-AP-EF-012H	N/A
	S16T018862	VA	6/26/16		Thermosorb-N	Nitrosamines 16-002-AP-IN-012H	N/A
	S16T018863	VA	6/26/16		Thermosorb-N	Nitrosamines 16-002-AP-EF-011G	N/A
	S16T018864	VA	6/25/16		Thermosorb-N	Nitrosamines 16-002-AP-EF-012F	N/A
	S16T018865	VA	6/25/16		Thermosorb-N	Nitrosamines 16-002-AP-EF-011E	N/A
	S16T018866	VA	6/25/16		Thermosorb-N	Nitrosamines 16-002-AP-EF-011D	N/A
	S16T018867	VA	6/25/16		Thermosorb-N	Nitrosamines 16-002-AP-EF-011C	N/A

POSSIBLE SAMPLE HAZARDS/REMARKS (List all known wastes) MSDS ○ Yes ◉ No

SPECIAL INSTRUCTIONS — Hold Time

2Send Results to Robert Sosa & Greg Moore
Robert_W_Sosa@rl.gov and Greg_S_Moore@rl.gov
see SOW for email

CONTRACT 55503

RELEASE 5

Relinquished By (Print / Sign)	Date/Time	Received By (Print / Sign)	Date/Time
Sharon L Holder / Sharon L Holder	7-7-16 0830	R E Rogers	7-7-16 0830
R E Rogers	7-7-16 1056	C. LOPEZ RJ LEE GROUP	7-7-16 1056

Matrix*

S = Soil		DL = Drum Liquids	
SE = Sediment		T = Tissue	
SO = Solid		WI = Wipe	
SL = Sludge		L = Liquid	
W = Water		V = Vegetation	
O = Oil		VA = Vapor	
A = Air		X = Other	
DS = Drum Solids			

FINAL SAMPLE DISPOSITION	Disposal Method (e.g., Return to customer, per lab procedure, used in process)	Disposed By	Date/Time
	CONSUMED	Z.P. Mills	07/19/16 13:30

All samples containing hazardous materials shall be picked up by requestor and returned to parent container or site of origin.

A-6003-962 (03/05)

W607016 Rev. 1, Page 35 of 35

Assembler	CHAIN OF CUSTODY/SAMPLE ANALYSIS REQUEST	C.O.C. No. 20161909
N/A		Page 3 of 3

Collector: JONES	Contact/Requestor: CARL HOWALD IV	Telephone No.: 373-6861	MSIN: T6-05 FAX: 372-1878
SAF No.: N/A	Sample Origin: CARTRIDGE EVALUATION	Purchase Order/Charge Code: 202003/CB20	
Project Title: CARTRIDGE EVALUATION	Logbook/ Work Package No.: N/A	Ice Chest No.	Temp.
Shipped To (Lab): CBAL	Method of Shipment	Bill of Lading/Air Bill No.	
Protocol: N/A	Data Turnaround: 10 DAYS	Parts and Return No.	

Sample No.	Lab ID	*	Date	Time	No./Type Container	Sample Analysis	Preservative
	S16T018868	VA	6/25/16		Thermosorb-N	Nitrosamines 16-002-AP-EF-011B	N/A
	S16T018869	VA	6/25/16		Thermosorb-N	Nitrosamines 16-002-AP-EF-011A	N/A
	S16T018870	VA	6/25/16		Thermosorb-N	Nitrosamines 16-002-AP-IN-011A	N/A
	S16T018871	VA	6/25/16		Thermosorb-N	Nitrosamines 16-002-AP-EF-011BASE	N/A
	S16T018872	VA	6/25/16		Thermosorb-N	Nitrosamines 16-002-AP-IN-011BASE	N/A
	S16T018873	VA	6/25/16		Thermosorb-N	Nitrosamines 16-002-AP-BK-011BASE	N/A

POSSIBLE SAMPLE HAZARDS/REMARKS (List all known wastes) MSDS ○ Yes ◉ No

SPECIAL INSTRUCTIONS — Hold Time

2Send Results to Robert Sosa & Greg Moore
Robert_W_Sosa@rl.gov and Greg_S_Moore@rl.gov
see SOW for email

CONTRACT 55503

RELEASE 5

Relinquished By (Print / Sign)	Date/Time	Received By (Print / Sign)	Date/Time
Shawn L Holden	7.7.16 0830	R E Rogers	7-7-16 0830
R E Rogers	7-7-16 10:56	C.LOPEZ RJ LEE GROUP	7-7-16 1056
Relinquished By	Date/Time	Received By	Date/Time
Relinquished By	Date/Time	Received By	Date/Time

Matrix*

S = Soil	DL = Drum Liquids		
SE = Sediment	T = Tissue		
SO = Solid	WI = Wipe		
SL = Sludge	L = Liquid		
W = Water	V = Vegetation		
O = Oil	VA = Vapor		
A = Air	X = Other		
DS = Drum Solids			

FINAL SAMPLE DISPOSITION	Disposal Method (e.g., Return to customer, per lab procedure, used in process)	Disposed By	Date/Time
	CONSUMED	J. P. Zuller	07/19/16 13:30

All samples containing hazardous materials shall be picked up by requestor and returned to parent container or site of origin.

A-6003-962 (03/05)

C.338

C.3.12 Supporting Emails

From: Frye, Jann M (WRPS)
To: Liu, Jian (LSL2)
Cc: Brouns, Thomas M; Jones, Parker L (WRPS)
Subject: Answer to nitrosamine question form meeting yesterday
Date: Thursday, August 18, 2016 2:28:19 PM

Jian,

I had to ask some questions about how the nitrosamines are reported to answer your question. As you noted the spreadsheet had some lines marked with D. This does mean dilution. If you look at the PDF report from RJL they have a table of samples with concentrations above their reporting limit. For example look at the line in the PDF for the following result:

16-001-AP-IN-011H W607016-02 N-Nitrosodimethylamine 5.234 µg/tube

On the spreadsheet look at the result lines for N-Nitrosodimethylamine labeled W607016-02 (4.89), W607016-02RE1 (0.299), and W607016-02RE2 (0.045) should be added together to equal 5.234 µg/tube.

Thanks.

Jann M. Frye
Manager Organic Studies, 222-S Laboratory
Washington River Protection Solutions, Inc.
Contractor to the US Department of Energy
Work: 509-376-8624, Cell: 509-531-1301

From: Freeman, Charles J
To: Liu, Jian (LSL2)
Subject: numbers for AP
Date: Tuesday, August 23, 2016 4:25:48 PM

From Parker today:

Analyte	Line	Line #
SVOC	A	3
VOC	B	4
Furans	C	2
Ethylamine	D	12
Acetonitrile	E	1
Mercury	F	5
Ammonia	G	6
Aldehyde	H	9
1,3-Butadiene	I	7
Pyridine	J	10
Nitrosamines	K	11

Charles Freeman

Manager, Hydrocarbon Processing
Pacific Northwest National Laboratory
Richland, WA
Office: 509-375-6368
charles.freeman@pnnl.gov

From: Jones, Parker L (WRPS)
To: Liu, Jian (LSL2); Frye, Jann M (WRPS)
Subject: RE: Butadiene data
Date: Wednesday, October 05, 2016 11:41:52 AM

Jian,

I believe Jann was saying they do need to be added together. We can discuss today at our meeting. See you then.

Parker

From: Liu, Jian (LSL2) [mailto:Jian.Liu@pnnl.gov]
Sent: Wednesday, October 05, 2016 10:22 AM
To: Jones, Parker L <Parker_L_Jones@rl.gov>; Frye, Jann M <Jann_M_Frye@rl.gov>
Subject: RE: Butadiene data

Hi Parker and Jann,

Thanks for the clarification. I have the flowrates.
So basically, I do not need to add tube A and B together, right? The results for A and B are similar.
Thanks.

Best regards,

Jian

From: Jones, Parker L (WRPS)
Sent: Wednesday, October 05, 2016 8:33 AM
To: Frye, Jann M (WRPS); Liu, Jian (LSL2)
Subject: RE: Butadiene data

The samples are labeled the same that go together with the Part A and Part B disguising identifier.

You should have the volume in previous files sent.

If you need further clarification on this give me a call.

Parker Jones MPH, CIH, CSP
Washington River Protection Solutions
Projects Industrial Hygiene
509-373-4966 – Office
509-942-9494 – Cell
Parker_L_Jones@rl.gov

washington river protection solutions

From: Frye, Jann M
Sent: Wednesday, October 05, 2016 8:30 AM
To: Liu, Jian <Jian.Liu@pnnl.gov>
Cc: Jones, Parker L <Parker_L_Jones@rl.gov>
Subject: RE: Butadiene data

The 1,3-butadiene sampling is a two tube set. The A tube is collected ahead of and in line with the B tube. The NIOSH method sums tube A and Tube B, however, we submit each tube whether part A or part B as a separate sample. You will need to know from Parker which customer sample numbers (part A and B) go together. Normally the results are reported as a concentration from the NIOSH method, but since we do not provide the offsite lab the air volume they reported the results as mg/sample.

Thanks,
Jann M. Frye
Manager Organic Studies, 222-S Laboratory
Washington River Protection Solutions, Inc.
Contractor to the US Department of Energy
Work: 509-376-8624. Cell: 509-531-1301

From: Liu, Jian (LSL2) [mailto:Jian.Liu@pnnl.gov]
Sent: Tuesday, October 04, 2016 4:59 PM
To: Frye, Jann M <Jann_M_Frye@rl.gov>; Jones, Parker L <Parker_L_Jones@rl.gov>
Subject: Butadiene data

Hi Jann and Parker,

Happy New Fiscal Year! Not sure if my questions are new. If not, please bear with me.
On the 1,3-Butadiene, why we have two sets of data (A and B) and which set to use or both? Thank you.

Best regards,

Jian

Jian Liu, Ph.D.

Senior Chemical Engineer
Hydrocarbon Processing
Pacific Northwest National Laboratory

Tel: (509) 372-4477
E-mail: Jian.Liu@pnnl.gov

From: Jones, Parker L (WRPS)
To: Liu, Jian (LSL2)
Subject: RE: Cartridge name
Date: Monday, May 01, 2017 7:26:32 AM

Confirmed

From: Liu, Jian (LSL2) [mailto:Jian.Liu@pnnl.gov]
Sent: Sunday, April 30, 2017 12:33 PM
To: Jones, Parker L <Parker_L_Jones@rl.gov>
Subject: Cartridge name

Hi Parker,

I know that we had talked about this and we made the correction to the cartridge names, i.e. swap SC-1 and SD-1 for three tanks.
In order to obtain a written record for the QA review, could you please confirm this information below? Thanks.

"About the cartridge name, Parker told me that actually SD1 is for survey 1 and SC1 is for survey 2 and they are consistent for all the tanks."

Best regards,

Jian

From: Frye, Jann M (WRPS)
To: Liu, Jian (LSL2)
Subject: RE: Data selection
Date: Wednesday, December 14, 2016 2:03:30 PM

See below.

Thanks,
Jann M. Frye
Manager Organic Studies, 222-S Laboratory
Washington River Protection Solutions, Inc.
Contractor to the US Department of Energy
Work: 509-376-8624, Cell: 509-531-1301

From: Liu, Jian (LSL2) [mailto:Jian.Liu@pnnl.gov]
Sent: Wednesday, December 14, 2016 1:05 PM
To: Frye, Jann M <Jann_M_Frye@rl.gov>
Subject: Data selection

Hi Jann,

As you know, some chemicals appeared multiple times in the data in different categories. I am trying to ask you to confirm what I have been using for each of them.

For furan (16), results from furan category instead of VOC (or VOA) were used. This is correct. The furan analysis method has lower detection limits than the VOA method.
For acetonitrile (34), results from VOC category were used. – This is correct depending on the level of acetonitrile. The VOC method is for trace concentrations. The dedicated acetonitrile tube is for higher concentrations. The NIOSH method 1606 says the range for this analysis is 2.6 µg to 2000 µg per sample. The VOC method is calibrated from 12ng to 400ng on tube.
For butanal (19), the results in VOC category were used not the results in the aldehydes category. This is correct.
For pyridine and 2,4-dimethylpyridine, the results in the VOC category were used. This is correct.

My understanding is that we generally select the set of data with lower DL (or RL). That is my understanding as well.
I would appreciate if you can confirm if my selections are right or not. Thank you.

Best regards,

Jian

Jian Liu, Ph.D.
Senior Chemical Engineer
Hydrocarbon Processing
Pacific Northwest National Laboratory

Tel: (509) 372-4477
E-mail: Jian.Liu@pnnl.gov

From: Jones, Parker L (WRPS)
To: Liu, Jian (LSL2); Frye, Jann M (WRPS)
Cc: Brouns, Thomas M; Stoner, Ryan M (WRPS)
Subject: RE: Possible error in some data
Date: Monday, August 08, 2016 11:23:13 AM

Jian,

I am confident that the sample labels were swapped. I imagine that we will have similar results for all of the samples AP-EF-006A and AP-IN-006A.

Thanks.

Parker

From: Liu, Jian (LSL2) [mailto:Jian.Liu@pnnl.gov]
Sent: Monday, August 08, 2016 10:25 AM
To: Jones, Parker L <Parker_L_Jones@rl.gov>; Frye, Jann M <Jann_M_Frye@rl.gov>
Cc: Brouns, Thomas M <tom.brouns@pnnl.gov>; Stoner, Ryan M <Ryan_M_Stoner@rl.gov>
Subject: Possible error in some data

Hi Parker ad Jann,

As we spoke, there might be some errors in the data that mistook "IN" with "EF".
Please see an example of NH3 in the attachment. In the survey 2 and sample bundle A, it would make more sense if the "IN" and "EF" switch.
Similar thing was observed for some other chemicals too.
Please take a look and check around to see if this is a recording error or not. Thank you.

Best regards,

Jian

Jian Liu, Ph.D.
Senior Chemical Engineer
Hydrocarbon Processing
Pacific Northwest National Laboratory

Tel: (509) 372-4477
E-mail: Jian.liu@pnnl.gov

From: Jones, Parker L (MRPS)
To: Clayton, Christopher K
Cc: Freeman, Charles J; Liu, Jian (LBL2); Brouns, Thomas M; Frye, Jann M (MRPS)
Subject: RE: Sample Lines
Date: Monday, January 16, 2017 6:18:24 AM
Attachments: image001.png
image002.png

Chris,

If I understand correctly the sample ID has an identifier of 12. There were only 11 different analytes and this is the confusion?

The 1,3 But. Media has 2 pieces of media that are analyzed. They are numbers 9 and 10, although they are on the same line. The 12 indicator for Nitrosamines is correct.

From: Clayton, Christopher K [mailto:christopher.clayton@pnnl.gov]
Sent: Thursday, January 12, 2017 4:41 PM
To: Jones, Parker L <Parker_L_Jones@rl.gov>
Cc: Freeman, Charles J <Charles.Freeman@pnnl.gov>; Liu, Jian <Jian.Liu@pnnl.gov>; Brouns, Thomas M <tom.brouns@pnnl.gov>; Frye, Jann M <Jann_M_Frye@rl.gov>
Subject: Sample Lines

Hi Parker,

I've found a discrepancy with the sample line numbering for the AX101 data from RJ Lee. The flowrate data lists 11 total sample lines, but the customer sample ID for the Nitrosoamines lists them as line 12 (see below). I've tracked this back to the chain of custody pages in the RJ Lee report and see the same thing. Should they be labeled as line 11 or should we have a 12th sample line.

SampleName	RJLG ID	Analyzed	Analyte	Results	RL	Units	Flags
16-07837-12-BASE-EFF	W609056-01	10/02/16	N-Nitrosodiethylamine	<0.021	0.021	µg/tube	
16-07837-12-BASE-EFF	W609056-01	10/02/16	N-Nitrosodimethylamine	<0.022	0.022	µg/tube	
16-07837-12-BASE-EFF	W609056-01	10/02/16	N-Nitrosodi-n-butylamine	<0.019	0.019	µg/tube	
16-07837-12-BASE-EFF	W609056-01	10/02/16	N-Nitrosodi-n-propylamine	<0.020	0.020	µg/tube	
16-07837-12-BASE-EFF	W609056-01	10/02/16	N-Nitrosomethylethylamine	<0.021	0.021	µg/tube	
16-07837-12-BASE-EFF	W609056-01	10/02/16	N-Nitrosomorpholine	<0.021	0.021	µg/tube	
16-07837-12-BASE-EFF	W609056-01	10/02/16	N-Nitrosopiperidine	<0.021	0.021	µg/tube	
16-07837-12-BASE-EFF	W609056-01	10/02/16	N-Nitrosopyrrolidine	<0.021	0.021	µg/tube	
16-07837-12-BASE-IN	W609056-02	10/02/16	N-Nitrosodiethylamine	<0.021	0.021	µg/tube	

Sample Analysis
Nitrosamines 16-07837-12-BASE-EFF
Nitrosamines 16-07837-12-BASE-IN
Nitrosamines 16-07837-12-BLANK1
Nitrosamines 16-07837-12-BLANK2
Nitrosamines 16-07837-12-EFF-A
Nitrosamines 16-07837-12-EFF-B
Nitrosamines 16-07837-12-EFF-C
Nitrosamines 16-07837-12-EFF-D
Nitrosamines 16-07837-12-EFF-E
Nitrosamines 16-07837-12-EFF-F

No | SPECIAL INSTRUCTIONS

Christopher K. Clayton, PhD

Pacific Northwest National Laboratory
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Richland, WA 99354
W: (509)375-6832

Appendix D

Data Reduction Steps

Appendix D

Data Reduction Steps

1. Only chemicals in the current Chemicals of Potential Concern (COPC) list were included in the calculated data. Nitrous oxide and methanol were not measured in the study. Any other missing COPCs were analyzed as "Tentatively Identified Compounds."
2. The COPCs are ranked in the order of their COPC number. Within the data section for each COPC, data are ranked in the order of survey (1 and 2). Within every survey, data are ranked in the order of inlet and outlet and following the time sequence.
3. Except for mercury, COPC concentrations were converted into parts per million (ppm) using their molecular weights and corresponding flow rates after volume correction[16] as shown in the following equation:

$$C = 24.45 \frac{r}{M\,V}$$

   where *C* is the concentration of COPC in ppmv; *r* is the analytical result with units of µg/sample (if the analytical result unit is expressed in mg/sample, the value of *C* needs to be multiplied by 1000; if the analytical result unit is in ng/sample the value of *C* needs to be divided by 1000); *V* is the collected volume in 2 hours expressed in liters; *M* is the molecular weight of COPC expressed as g/mol. When the ratio between concentration and the corresponding Occupational Exposure Limit (OEL) is larger than 10%, the fraction is shown in red.
4. The reported volume measurements in Appendix C were made via DryCal devices placed downstream of each sample media tube. This allowed for precise volume measurements through each of the tubes. However, to perform the concentration conversion to ppm, the "actual" volumetric values required conversion to standard temperature and pressure conditions.

   Ideal gas behavior was assumed for these volume corrections, and standard temperatures and pressures were assumed to be 298 K ($T_{standard}$) and 760 Torr ($P_{standard}$), respectively. For temperatures, the reported upstream temperatures for each time period were used ($T_{upstream}$, in Kelvin), and the temperature correction factor (i.e., the factor multiplied by each reported volume) was simply $T_{standard}/T_{upstream}$.

   For the pressure corrections, additional pressure drop information was gathered so that the pressure at the point of the DryCal device could be calculated. Each time step had reported upstream pressures ($P_{upstream}$, or upstream of the respirator cartridges). Therefore, pressure drop measurements across the respirator cartridge and each sample media tube were performed offline to gather the additional information necessary for the correction.

   The average reported pressure drop reading for the respirator cartridge ($P_{cartridge}$) tested was 3.2 inches of water column (WC). The pressure drop measurements across the individual sample tubes are shown in the table below (all expressed as inches of WC).

   The average pressure drops were then used in a pressure correction factor for the reported volumes. Note that all pressure values were first converted to units of Torr. For measurements made at

[16] Based on the standard temperature and pressure condition of P = 101325 Pa, R = 8.314 J/(mol.K), and T = 298.15 K.

the inlet of the respirator cartridge the pressure correction factor is $(P_{upstream} - P_{tube}) \div P_{standard}$. For measurements made at the outlet of the respirator cartridge the pressure correction factor is $(P_{upstream} - P_{cartridge} - P_{tube}) \div P_{standard}$.

Tube Location	First Measure (inches of WC, tube on cartridge inlet side)	Second Measure (inches of WC, tube on cartridge outlet side)	Average of Both Measurements (P_{tube}, inches of WC)
A	5.0	12.4	8.7
B	6.9	7.2	7.1
C	2.3	2.5	2.4
D	0.8	0.8	0.8
E	1.9	2.1	2.0
F	3.8	6.8	5.3
G	1.6	1.7	1.7
H	7.7	6.5	7.1
I	5.2	4.0	4.6
J	15.9	16.3	16.1
K	10.1	9.7	9.9

An example calculation of the correction factors follows. For a given time period, assume that the reported upstream pressure ($P_{upstream}$) was 734 Torr and the corresponding temperature ($T_{upstream}$) was 85.9ºF (or 302.9 K). Here, for tube location 'A' and upstream of the respirator cartridge, the corresponding temperature correction factor would be 0.984, and the pressure correction factor for the respirator cartridge outlet would be 0.944. When multiplied, these two factors equal 0.929, which would be the overall correction to the reported volume measurement.

5. The analytical detection limit (DL)—or reporting limit in some cases—for every COPC was obtained from the raw analytical data. Here, the average flow rate was used to calculate the approximate analytical DL as the percentage of the OEL for each COPC. Because the flow rates vary, the calculated concentrations were different for each point, even though some of the results are less than the DL in the original reading. The last column in the tables below indicate if the original readings were less than the DL or not.
   - For ammonia and mercury, only the results obtained from using method of total vapor of ammonia and mercury were used.
   - For furan, results from the furan tube instead of Carbotrap 300 TDU tube were used. For acetonitrile, results from the Carbotrap 300 TDU tube were used. For butanal, the results from the VOC category instead of the aldehydes category were used. For pyridine and 2,4-dimethylpyridine, the results from the Carbotrap 300 TDU tube were used.
   - For N-nitrosodimethylamine (NDMA) and other nitrosamines, data values above analytical DLs for the same time and position were added together because the original sample was diluted into three samples for measurements. This same rule applies to 1,3-butadiene. The results in the plots and tables reflect the sum of results.
6. The data as received from WRPS at PNNL was discovered to be mislabeled. During testing of the SC-1 cartridge the influent and effluent sample tube sets used during the first two-hour block of sampling (A) were incorrectly labeled. The influent tube set was labeled effluent and vice versa. The data provided within Appendix D along with the figures throughout the report are presented with this data switched to account for the error.

The following tables show the calculated concentrations for each of the COPC measurements conducted in this study. Red highlighted values reflect measurements that were above 10% of the respective OEL

values. COPCs with these highlights are plotted and shown in Section 5.0. Orange highlighted values reflect measurements in the 2 to 10% of the OEL range. COPCs with these highlights (only) are plotted and shown in Appendix E.

The position numbers that start with 001 are for the SCOTT 7422-SD1 cartridge, and the position numbers that start with 002 are for the SCOTT 7422-SC1 cartridge.

Note: All of the furan, 2,5-dihydrofuran, and 2-methylfuran Carbotrap 300 TDU measured results for the AP Exhauster from 2016 APR cartridge testing are documented in Freeman et al. [20].

Table D.1. SCOTT Cartridge-Testing Calculated Data

COPC #	Analyte	End Time (h)	Position	Conc. (ppm)	OEL (ppm)	Fraction of OEL	Measurement < DL|RL?	Quality Code	Approx. DL|RL (%OEL)
1	Ammonia	2	001-IN-A	6.3E+01	25	253%			2.5%
1	Ammonia	4			25				2.5%
1	Ammonia	6			25				2.5%
1	Ammonia	8			25				2.5%
1	Ammonia	10			25				2.5%
1	Ammonia	12			25				2.5%
1	Ammonia	14			25				2.5%
1	Ammonia	16	001-IN-H	7.0E+01	25	279%			2.5%
1	Ammonia	2	001-EF-A	6.1E-01	25	2.46%	YES		2.5%
1	Ammonia	4	001-EF-B	6.0E-01	25	2.42%	YES		2.5%
1	Ammonia	6	001-EF-C	5.7E+00	25	22.7%			2.5%
1	Ammonia	8	001-EF-D	1.3E+01	25	52.8%			2.5%
1	Ammonia	10	001-EF-E	3.5E+00	25	14.0%			2.5%
1	Ammonia	12	001-EF-F	3.9E+01	25	155%			2.5%
1	Ammonia	14	001-EF-G	4.6E+01	25	182%			2.5%
1	Ammonia	16	001-EF-H	5.4E+01	25	217%			2.5%
1	Ammonia	2	002-IN-A	5.9E+01	25	236%			2.5%
1	Ammonia	4			25				2.5%
1	Ammonia	6			25				2.5%
1	Ammonia	8			25				2.5%
1	Ammonia	10			25				2.5%
1	Ammonia	12			25				2.5%
1	Ammonia	14			25				2.5%
1	Ammonia	16	002-IN-H	6.0E+01	25	240%			2.5%
1	Ammonia	2	002-EF-A	6.1E-01	25	2.45%	YES		2.5%
1	Ammonia	4	002-EF-B	6.0E-01	25	2.41%	YES		2.5%
1	Ammonia	6	002-EF-C	6.0E-01	25	2.41%	YES		2.5%
1	Ammonia	8	002-EF-D	1.6E+00	25	6.41%			2.5%
1	Ammonia	10	002-EF-E	5.2E+00	25	20.9%			2.5%
1	Ammonia	12	002-EF-F	9.2E+00	25	36.6%			2.5%
1	Ammonia	14	002-EF-G	1.5E+01	25	61.9%			2.5%
1	Ammonia	16	002-EF-H	2.3E+01	25	91.9%			2.5%
3	Mercury	2	001-IN-A	1.3E-03	0.003	44.4%			7.2%
3	Mercury	4			0.003				7.2%
3	Mercury	6			0.003				7.2%
3	Mercury	8			0.003				7.2%
3	Mercury	10			0.003				7.2%
3	Mercury	12			0.003				7.2%
3	Mercury	14			0.003				7.2%
3	Mercury	16	001-IN-H	1.7E-03	0.003	56.6%			7.2%
3	Mercury	2	001-EF-A	2.1E-04	0.003	6.82%	YES		7.2%
3	Mercury	4	001-EF-B	2.0E-04	0.003	6.69%	YES		7.2%
3	Mercury	6	001-EF-C	2.0E-04	0.003	6.73%	YES		7.2%
3	Mercury	8	001-EF-D	2.0E-04	0.003	6.63%	YES		7.2%
3	Mercury	10	001-EF-E	2.1E-04	0.003	6.82%	YES		7.2%
3	Mercury	12	001-EF-F	2.1E-04	0.003	7.07%	YES		7.2%
3	Mercury	14	001-EF-G	2.2E-04	0.003	7.18%	YES		7.2%
3	Mercury	16	001-EF-H	2.1E-04	0.003	6.85%	YES		7.2%
3	Mercury	2	002-IN-A	1.4E-03	0.003	45.7%			7.2%
3	Mercury	4			0.003				7.2%
3	Mercury	6			0.003				7.2%
3	Mercury	8			0.003				7.2%
3	Mercury	10			0.003				7.2%
3	Mercury	12			0.003				7.2%
3	Mercury	14			0.003				7.2%
3	Mercury	16	002-IN-H	1.4E-03	0.003	47.8%			7.2%
3	Mercury	2	002-EF-A	2.1E-04	0.003	6.95%	YES		7.2%
3	Mercury	4	002-EF-B	2.1E-04	0.003	6.92%	YES		7.2%
3	Mercury	6	002-EF-C	2.1E-04	0.003	6.97%	YES		7.2%
3	Mercury	8	002-EF-D	2.1E-04	0.003	6.97%	YES		7.2%
3	Mercury	10	002-EF-E	2.2E-04	0.003	7.21%	YES		7.2%
3	Mercury	12	002-EF-F	2.1E-04	0.003	6.90%	YES		7.2%
3	Mercury	14	002-EF-G	2.1E-04	0.003	7.07%	YES		7.2%
3	Mercury	16	002-EF-H	2.1E-04	0.003	6.88%	YES		7.2%

COPC #	Analyte	End Time (h)	Position	Conc. (ppm)	OEL (ppm)	Fraction of OEL	Measurement < DL|RL?	Quality Code	Approx. DL|RL (%OEL)
4	1,3-Butadiene	2	001-IN-A	1.9E-02	1.000	1.91%	YES	U-U	2.1%
4	1,3-Butadiene	4			1.000				2.1%
4	1,3-Butadiene	6			1.000				2.1%
4	1,3-Butadiene	8			1.000				2.1%
4	1,3-Butadiene	10			1.000				2.1%
4	1,3-Butadiene	12			1.000				2.1%
4	1,3-Butadiene	14			1.000				2.1%
4	1,3-Butadiene	16	001-IN-H	1.9E-02	1.000	1.91%	YES	U-U	2.1%
4	1,3-Butadiene	2	001-EF-A	1.9E-02	1.000	1.91%	YES		2.1%
4	1,3-Butadiene	4	001-EF-B	1.9E-02	1.000	1.87%	YES	U-U	2.1%
4	1,3-Butadiene	6	001-EF-C	1.9E-02	1.000	1.87%	YES	U-U	2.1%
4	1,3-Butadiene	8	001-EF-D	1.8E-02	1.000	1.85%	YES	U-U	2.1%
4	1,3-Butadiene	10	001-EF-E	1.9E-02	1.000	1.93%	YES	U-U	2.1%
4	1,3-Butadiene	12	001-EF-F	2.0E-02	1.000	2.01%	YES	U-U	2.1%
4	1,3-Butadiene	14	001-EF-G	2.1E-02	1.000	2.05%	YES	U-U	2.1%
4	1,3-Butadiene	16	001-EF-H	1.9E-02	1.000	1.90%	YES		2.1%
4	1,3-Butadiene	2	002-IN-A	1.9E-02	1.000	1.94%	YES	U-U	2.1%
4	1,3-Butadiene	4			1.000				2.1%
4	1,3-Butadiene	6			1.000				2.1%
4	1,3-Butadiene	8			1.000				2.1%
4	1,3-Butadiene	10			1.000				2.1%
4	1,3-Butadiene	12			1.000				2.1%
4	1,3-Butadiene	14			1.000				2.1%
4	1,3-Butadiene	16	002-IN-H	1.9E-02	1.000	1.92%	YES	U-U	2.1%
4	1,3-Butadiene	2	002-EF-A	1.9E-02	1.000	1.91%	YES		2.1%
4	1,3-Butadiene	4	002-EF-B	1.9E-02	1.000	1.92%	YES	U-U	2.1%
4	1,3-Butadiene	6	002-EF-C	1.9E-02	1.000	1.91%	YES	U-U	2.1%
4	1,3-Butadiene	8	002-EF-D	1.9E-02	1.000	1.93%	YES	U-U	2.1%
4	1,3-Butadiene	10	002-EF-E	1.9E-02	1.000	1.94%	YES	U-U	2.1%
4	1,3-Butadiene	12	002-EF-F	2.0E-02	1.000	1.97%	YES	U-U	2.1%
4	1,3-Butadiene	14	002-EF-G	1.9E-02	1.000	1.95%	YES	U-U	2.1%
4	1,3-Butadiene	16	002-EF-H	2.0E-02	1.000	1.97%	YES		2.1%
5	Benzene	2	001-IN-A		0.500				0.02%
5	Benzene	4			0.500				0.02%
5	Benzene	6			0.500				0.02%
5	Benzene	8			0.500				0.02%
5	Benzene	10			0.500				0.02%
5	Benzene	12			0.500				0.02%
5	Benzene	14			0.500				0.02%
5	Benzene	16	001-IN-H		0.500				0.02%
5	Benzene	2	001-EF-A		0.500				0.02%
5	Benzene	4	001-EF-B		0.500				0.02%
5	Benzene	6	001-EF-C		0.500				0.02%
5	Benzene	8	001-EF-D		0.500				0.02%
5	Benzene	10	001-EF-E		0.500				0.02%
5	Benzene	12	001-EF-F		0.500				0.02%
5	Benzene	14	001-EF-G		0.500				0.02%
5	Benzene	16	001-EF-H		0.500				0.02%
5	Benzene	2	002-IN-A	4.9E-04	0.500	0.098%		BJ	0.02%
5	Benzene	4			0.500				0.02%
5	Benzene	6			0.500				0.02%
5	Benzene	8			0.500				0.02%
5	Benzene	10			0.500				0.02%
5	Benzene	12			0.500				0.02%
5	Benzene	14			0.500				0.02%
5	Benzene	16	002-IN-H	3.1E-04	0.500	0.062%		BJ	0.02%
5	Benzene	2	002-EF-A	4.6E-04	0.500	0.092%		BJ	0.02%
5	Benzene	4	002-EF-B	7.3E-04	0.500	0.146%		BJ	0.02%
5	Benzene	6	002-EF-C	2.6E-04	0.500	0.053%		BJ	0.02%
5	Benzene	8	002-EF-D	2.0E-04	0.500	0.041%		BJ	0.02%
5	Benzene	10	002-EF-E	1.5E-04	0.500	0.031%		BJ	0.02%
5	Benzene	12	002-EF-F	2.1E-04	0.500	0.041%		BJ	0.02%
5	Benzene	14	002-EF-G	1.2E-04	0.500	0.024%	YES		0.02%
5	Benzene	16	002-EF-H	1.8E-04	0.500	0.037%		BJ	0.02%

COPC #	Analyte	End Time (h)	Position	Conc. (ppm)	OEL (ppm)	Fraction of OEL	Measurement < DL|RL?	Quality Code	Approx. DL|RL (%OEL)
6	Biphenyl	2	001-IN-A		0.200				0.1%
6	Biphenyl	4			0.200				0.1%
6	Biphenyl	6			0.200				0.1%
6	Biphenyl	8			0.200				0.1%
6	Biphenyl	10			0.200				0.1%
6	Biphenyl	12			0.200				0.1%
6	Biphenyl	14			0.200				0.1%
6	Biphenyl	16	001-IN-H	7.5E-05	0.200	0.038%	YES		0.1%
6	Biphenyl	2	001-EF-A	9.2E-05	0.200	0.046%	YES		0.1%
6	Biphenyl	4	001-EF-B	9.8E-05	0.200	0.049%	YES		0.1%
6	Biphenyl	6	001-EF-C	1.0E-04	0.200	0.051%	YES		0.1%
6	Biphenyl	8	001-EF-D	8.8E-05	0.200	0.044%	YES		0.1%
6	Biphenyl	10	001-EF-E	8.7E-05	0.200	0.043%	YES		0.1%
6	Biphenyl	12	001-EF-F	1.1E-04	0.200	0.053%	YES	, S*	0.1%
6	Biphenyl	14	001-EF-G	9.5E-05	0.200	0.047%	YES		0.1%
6	Biphenyl	16	001-EF-H		0.200				0.1%
6	Biphenyl	2	002-IN-A	7.9E-05	0.200	0.040%	YES		0.1%
6	Biphenyl	4			0.200				0.1%
6	Biphenyl	6			0.200				0.1%
6	Biphenyl	8			0.200				0.1%
6	Biphenyl	10			0.200				0.1%
6	Biphenyl	12			0.200				0.1%
6	Biphenyl	14			0.200				0.1%
6	Biphenyl	16	002-IN-H	8.3E-05	0.200	0.042%	YES		0.1%
6	Biphenyl	2	002-EF-A	8.4E-05	0.200	0.042%	YES		0.1%
6	Biphenyl	4	002-EF-B	7.8E-05	0.200	0.039%	YES		0.1%
6	Biphenyl	6	002-EF-C	8.4E-05	0.200	0.042%	YES		0.1%
6	Biphenyl	8	002-EF-D	8.1E-05	0.200	0.041%	YES		0.1%
6	Biphenyl	10	002-EF-E	9.3E-05	0.200	0.046%	YES		0.1%
6	Biphenyl	12	002-EF-F	8.0E-05	0.200	0.040%	YES	, S*	0.1%
6	Biphenyl	14	002-EF-G	9.1E-05	0.200	0.045%	YES		0.1%
6	Biphenyl	16	002-EF-H	7.9E-05	0.200	0.039%	YES		0.1%
7	1-Butanol	2	001-IN-A		20.000				0.002%
7	1-Butanol	4			20.000				0.002%
7	1-Butanol	6			20.000				0.002%
7	1-Butanol	8			20.000				0.002%
7	1-Butanol	10			20.000				0.002%
7	1-Butanol	12			20.000				0.002%
7	1-Butanol	14			20.000				0.002%
7	1-Butanol	16	001-IN-H		20.000				0.002%
7	1-Butanol	2	001-EF-A		20.000				0.002%
7	1-Butanol	4	001-EF-B		20.000				0.002%
7	1-Butanol	6	001-EF-C		20.000				0.002%
7	1-Butanol	8	001-EF-D		20.000				0.002%
7	1-Butanol	10	001-EF-E		20.000				0.002%
7	1-Butanol	12	001-EF-F		20.000				0.002%
7	1-Butanol	14	001-EF-G		20.000				0.002%
7	1-Butanol	16	001-EF-H		20.000				0.002%
7	1-Butanol	2	002-IN-A	5.4E-02	20.000	0.272%		LY	0.002%
7	1-Butanol	4			20.000				0.002%
7	1-Butanol	6			20.000				0.002%
7	1-Butanol	8			20.000				0.002%
7	1-Butanol	10			20.000				0.002%
7	1-Butanol	12			20.000				0.002%
7	1-Butanol	14			20.000				0.002%
7	1-Butanol	16	002-IN-H	6.1E-02	20.000	0.306%		LY	0.002%
7	1-Butanol	2	002-EF-A	3.6E-04	20.000	0.002%	YES	LY	0.002%
7	1-Butanol	4	002-EF-B	3.8E-04	20.000	0.002%	YES	LY	0.002%
7	1-Butanol	6	002-EF-C	3.9E-04	20.000	0.002%	YES	LY	0.002%
7	1-Butanol	8	002-EF-D	3.8E-04	20.000	0.002%	YES	LY	0.002%
7	1-Butanol	10	002-EF-E	3.7E-04	20.000	0.002%	YES	LY	0.002%
7	1-Butanol	12	002-EF-F	3.6E-04	20.000	0.002%	YES	LY	0.002%
7	1-Butanol	14	002-EF-G	3.7E-04	20.000	0.002%	YES	LY	0.002%
7	1-Butanol	16	002-EF-H	3.6E-04	20.000	0.002%	YES	LY	0.002%

COPC #	Analyte	End Time (h)	Position	Conc. (ppm)	OEL (ppm)	Fraction of OEL	Measurement < DL|RL?	Quality Code	Approx. DL|RL (%OEL)
9	2-Hexanone	2	001-IN-A		5.000				0.003%
9	2-Hexanone	4			5.000				0.003%
9	2-Hexanone	6			5.000				0.003%
9	2-Hexanone	8			5.000				0.003%
9	2-Hexanone	10			5.000				0.003%
9	2-Hexanone	12			5.000				0.003%
9	2-Hexanone	14			5.000				0.003%
9	2-Hexanone	16	001-IN-H		5.000				0.003%
9	2-Hexanone	2	001-EF-A		5.000				0.003%
9	2-Hexanone	4	001-EF-B		5.000				0.003%
9	2-Hexanone	6	001-EF-C		5.000				0.003%
9	2-Hexanone	8	001-EF-D		5.000				0.003%
9	2-Hexanone	10	001-EF-E		5.000				0.003%
9	2-Hexanone	12	001-EF-F		5.000				0.003%
9	2-Hexanone	14	001-EF-G		5.000				0.003%
9	2-Hexanone	16	001-EF-H		5.000				0.003%
9	2-Hexanone	2	002-IN-A	4.0E-04	5.000	0.008%			0.003%
9	2-Hexanone	4			5.000				0.003%
9	2-Hexanone	6			5.000				0.003%
9	2-Hexanone	8			5.000				0.003%
9	2-Hexanone	10			5.000				0.003%
9	2-Hexanone	12			5.000				0.003%
9	2-Hexanone	14			5.000				0.003%
9	2-Hexanone	16	002-IN-H	3.4E-04	5.000	0.007%		J	0.003%
9	2-Hexanone	2	002-EF-A	1.5E-04	5.000	0.003%	YES	J	0.003%
9	2-Hexanone	4	002-EF-B	1.6E-04	5.000	0.003%	YES		0.003%
9	2-Hexanone	6	002-EF-C	1.7E-04	5.000	0.003%	YES		0.003%
9	2-Hexanone	8	002-EF-D	1.7E-04	5.000	0.003%	YES		0.003%
9	2-Hexanone	10	002-EF-E	1.6E-04	5.000	0.003%	YES		0.003%
9	2-Hexanone	12	002-EF-F	1.5E-04	5.000	0.003%	YES		0.003%
9	2-Hexanone	14	002-EF-G	1.6E-04	5.000	0.003%	YES		0.003%
9	2-Hexanone	16	002-EF-H	1.6E-04	5.000	0.003%	YES		0.003%
11	4-Methyl-2-hexanone	2	001-IN-A		0.500				0.03%
11	4-Methyl-2-hexanone	4			0.500				0.03%
11	4-Methyl-2-hexanone	6			0.500				0.03%
11	4-Methyl-2-hexanone	8			0.500				0.03%
11	4-Methyl-2-hexanone	10			0.500				0.03%
11	4-Methyl-2-hexanone	12			0.500				0.03%
11	4-Methyl-2-hexanone	14			0.500				0.03%
11	4-Methyl-2-hexanone	16	001-IN-H		0.500				0.03%
11	4-Methyl-2-hexanone	2	001-EF-A		0.500				0.03%
11	4-Methyl-2-hexanone	4	001-EF-B		0.500				0.03%
11	4-Methyl-2-hexanone	6	001-EF-C		0.500				0.03%
11	4-Methyl-2-hexanone	8	001-EF-D		0.500				0.03%
11	4-Methyl-2-hexanone	10	001-EF-E		0.500				0.03%
11	4-Methyl-2-hexanone	12	001-EF-F		0.500				0.03%
11	4-Methyl-2-hexanone	14	001-EF-G		0.500				0.03%
11	4-Methyl-2-hexanone	16	001-EF-H		0.500				0.03%
11	4-Methyl-2-hexanone	2	002-IN-A	1.5E-04	0.500	0.030%	YES		0.03%
11	4-Methyl-2-hexanone	4			0.500				0.03%
11	4-Methyl-2-hexanone	6			0.500				0.03%
11	4-Methyl-2-hexanone	8			0.500				0.03%
11	4-Methyl-2-hexanone	10			0.500				0.03%
11	4-Methyl-2-hexanone	12			0.500				0.03%
11	4-Methyl-2-hexanone	14			0.500				0.03%
11	4-Methyl-2-hexanone	16	002-IN-H	1.5E-04	0.500	0.030%	YES		0.03%
11	4-Methyl-2-hexanone	2	002-EF-A	1.4E-04	0.500	0.028%	YES		0.03%
11	4-Methyl-2-hexanone	4	002-EF-B	1.5E-04	0.500	0.029%	YES		0.03%
11	4-Methyl-2-hexanone	6	002-EF-C	1.5E-04	0.500	0.030%	YES		0.03%
11	4-Methyl-2-hexanone	8	002-EF-D	1.5E-04	0.500	0.030%	YES		0.03%
11	4-Methyl-2-hexanone	10	002-EF-E	1.4E-04	0.500	0.029%	YES		0.03%
11	4-Methyl-2-hexanone	12	002-EF-F	1.4E-04	0.500	0.028%	YES		0.03%
11	4-Methyl-2-hexanone	14	002-EF-G	1.4E-04	0.500	0.029%	YES		0.03%
11	4-Methyl-2-hexanone	16	002-EF-H	1.4E-04	0.500	0.028%	YES		0.03%

COPC #	Analyte	End Time (h)	Position	Conc. (ppm)	OEL (ppm)	Fraction of OEL	Measurement < DL|RL?	Quality Code	Approx. DL|RL (%OEL)
13	3-Buten-2-one	2	001-IN-A		0.200				0.1%
13	3-Buten-2-one	4			0.200				0.1%
13	3-Buten-2-one	6			0.200				0.1%
13	3-Buten-2-one	8			0.200				0.1%
13	3-Buten-2-one	10			0.200				0.1%
13	3-Buten-2-one	12			0.200				0.1%
13	3-Buten-2-one	14			0.200				0.1%
13	3-Buten-2-one	16	001-IN-H		0.200				0.1%
13	3-Buten-2-one	2	001-EF-A		0.200				0.1%
13	3-Buten-2-one	4	001-EF-B		0.200				0.1%
13	3-Buten-2-one	6	001-EF-C		0.200				0.1%
13	3-Buten-2-one	8	001-EF-D		0.200				0.1%
13	3-Buten-2-one	10	001-EF-E		0.200				0.1%
13	3-Buten-2-one	12	001-EF-F		0.200				0.1%
13	3-Buten-2-one	14	001-EF-G		0.200				0.1%
13	3-Buten-2-one	16	001-EF-H		0.200				0.1%
13	3-Buten-2-one	2	002-IN-A	3.8E-04	0.200	0.190%		J	0.1%
13	3-Buten-2-one	4			0.200				0.1%
13	3-Buten-2-one	6			0.200				0.1%
13	3-Buten-2-one	8			0.200				0.1%
13	3-Buten-2-one	10			0.200				0.1%
13	3-Buten-2-one	12			0.200				0.1%
13	3-Buten-2-one	14			0.200				0.1%
13	3-Buten-2-one	16	002-IN-H	6.6E-04	0.200	0.328%		J	0.1%
13	3-Buten-2-one	2	002-EF-A	2.1E-04	0.200	0.106%		J	0.1%
13	3-Buten-2-one	4	002-EF-B	3.1E-04	0.200	0.157%		J	0.1%
13	3-Buten-2-one	6	002-EF-C	2.0E-04	0.200	0.100%		J	0.1%
13	3-Buten-2-one	8	002-EF-D	2.7E-04	0.200	0.137%		J	0.1%
13	3-Buten-2-one	10	002-EF-E	1.7E-04	0.200	0.086%	YES		0.1%
13	3-Buten-2-one	12	002-EF-F	1.7E-04	0.200	0.084%	YES		0.1%
13	3-Buten-2-one	14	002-EF-G	1.7E-04	0.200	0.086%	YES		0.1%
13	3-Buten-2-one	16	002-EF-H	1.7E-04	0.200	0.085%	YES		0.1%
14	Formaldehyde	2	001-IN-A	1.2E-02	0.300	3.96%			0.6%
14	Formaldehyde	4			0.300				0.6%
14	Formaldehyde	6			0.300				0.6%
14	Formaldehyde	8			0.300				0.6%
14	Formaldehyde	10			0.300				0.6%
14	Formaldehyde	12			0.300				0.6%
14	Formaldehyde	14			0.300				0.6%
14	Formaldehyde	16	001-IN-H	2.9E-03	0.300	0.950%		U	0.6%
14	Formaldehyde	2	001-EF-A	4.9E-03	0.300	1.65%			0.6%
14	Formaldehyde	4	001-EF-B	4.2E-03	0.300	1.39%			0.6%
14	Formaldehyde	6	001-EF-C	3.8E-03	0.300	1.27%			0.6%
14	Formaldehyde	8	001-EF-D	1.7E-03	0.300	0.567%	YES	U	0.6%
14	Formaldehyde	10	001-EF-E	3.9E-03	0.300	1.29%			0.6%
14	Formaldehyde	12	001-EF-F	1.8E-03	0.300	0.593%	YES	U	0.6%
14	Formaldehyde	14	001-EF-G	1.9E-03	0.300	0.625%	YES	U	0.6%
14	Formaldehyde	16	001-EF-H	1.7E-03	0.300	0.572%	YES		0.6%
14	Formaldehyde	2	002-IN-A	1.8E-02	0.300	5.85%			0.6%
14	Formaldehyde	4			0.300				0.6%
14	Formaldehyde	6			0.300				0.6%
14	Formaldehyde	8			0.300				0.6%
14	Formaldehyde	10			0.300				0.6%
14	Formaldehyde	12			0.300				0.6%
14	Formaldehyde	14			0.300				0.6%
14	Formaldehyde	16	002-IN-H	4.5E-03	0.300	1.49%			0.6%
14	Formaldehyde	2	002-EF-A	1.0E-02	0.300	3.41%			0.6%
14	Formaldehyde	4	002-EF-B	3.5E-03	0.300	1.16%			0.6%
14	Formaldehyde	6	002-EF-C	4.5E-03	0.300	1.52%			0.6%
14	Formaldehyde	8	002-EF-D	3.9E-03	0.300	1.29%			0.6%
14	Formaldehyde	10	002-EF-E	2.2E-03	0.300	0.723%			0.6%
14	Formaldehyde	12	002-EF-F	3.3E-03	0.300	1.10%			0.6%

COPC #	Analyte	End Time (h)	Position	Conc. (ppm)	OEL (ppm)	Fraction of OEL	Measurement < DL|RL?	Quality Code	Approx. DL|RL (%OEL)
14	Formaldehyde	14	002-EF-G	1.8E-03	0.300	0.607%	YES	U	0.6%
14	Formaldehyde	16	002-EF-H	3.2E-03	0.300	1.08%			0.6%
15	Acetaldehyde	2	001-IN-A	2.5E-02	25.000	0.098%			0.005%
15	Acetaldehyde	4			25.000				0.005%
15	Acetaldehyde	6			25.000				0.005%
15	Acetaldehyde	8			25.000				0.005%
15	Acetaldehyde	10			25.000				0.005%
15	Acetaldehyde	12			25.000				0.005%
15	Acetaldehyde	14			25.000				0.005%
15	Acetaldehyde	16	001-IN-H	2.6E-02	25.000	0.106%			0.005%
15	Acetaldehyde	2	001-EF-A	1.3E-02	25.000	0.054%			0.005%
15	Acetaldehyde	4	001-EF-B	1.4E-02	25.000	0.054%			0.005%
15	Acetaldehyde	6	001-EF-C	1.6E-02	25.000	0.063%			0.005%
15	Acetaldehyde	8	001-EF-D	5.3E-03	25.000	0.021%			0.005%
15	Acetaldehyde	10	001-EF-E	1.3E-02	25.000	0.050%			0.005%
15	Acetaldehyde	12	001-EF-F	8.5E-03	25.000	0.034%			0.005%
15	Acetaldehyde	14	001-EF-G	1.0E-02	25.000	0.042%			0.005%
15	Acetaldehyde	16	001-EF-H	8.4E-03	25.000	0.034%			0.005%
15	Acetaldehyde	2	002-IN-A	2.6E-02	25.000	0.105%			0.005%
15	Acetaldehyde	4			25.000				0.005%
15	Acetaldehyde	6			25.000				0.005%
15	Acetaldehyde	8			25.000				0.005%
15	Acetaldehyde	10			25.000				0.005%
15	Acetaldehyde	12			25.000				0.005%
15	Acetaldehyde	14			25.000				0.005%
15	Acetaldehyde	16	002-IN-H	2.3E-02	25.000	0.091%			0.005%
15	Acetaldehyde	2	002-EF-A	1.1E-02	25.000	0.044%			0.005%
15	Acetaldehyde	4	002-EF-B	7.3E-03	25.000	0.029%			0.005%
15	Acetaldehyde	6	002-EF-C	1.2E-02	25.000	0.049%			0.005%
15	Acetaldehyde	8	002-EF-D	1.3E-02	25.000	0.052%			0.005%
15	Acetaldehyde	10	002-EF-E	1.1E-02	25.000	0.044%			0.005%
15	Acetaldehyde	12	002-EF-F	9.7E-03	25.000	0.039%			0.005%
15	Acetaldehyde	14	002-EF-G	1.1E-02	25.000	0.046%			0.005%
15	Acetaldehyde	16	002-EF-H	9.4E-03	25.000	0.038%			0.005%
16	Butanal/Butyraldehyde	2	001-IN-A	3.2E-03	25.000	0.013%			0.003%
16	Butanal/Butyraldehyde	4			25.000				0.003%
16	Butanal/Butyraldehyde	6			25.000				0.003%
16	Butanal/Butyraldehyde	8			25.000				0.003%
16	Butanal/Butyraldehyde	10			25.000				0.003%
16	Butanal/Butyraldehyde	12			25.000				0.003%
16	Butanal/Butyraldehyde	14			25.000				0.003%
16	Butanal/Butyraldehyde	16	001-IN-H	4.8E-03	25.000	0.019%			0.003%
16	Butanal/Butyraldehyde	2	001-EF-A	7.4E-04	25.000	0.003%	YES		0.003%
16	Butanal/Butyraldehyde	4	001-EF-B	7.2E-04	25.000	0.003%	YES		0.003%
16	Butanal/Butyraldehyde	6	001-EF-C	7.2E-04	25.000	0.003%	YES		0.003%
16	Butanal/Butyraldehyde	8	001-EF-D	7.1E-04	25.000	0.003%	YES		0.003%
16	Butanal/Butyraldehyde	10	001-EF-E	7.4E-04	25.000	0.003%	YES		0.003%
16	Butanal/Butyraldehyde	12	001-EF-F	7.4E-04	25.000	0.003%	YES		0.003%
16	Butanal/Butyraldehyde	14	001-EF-G	7.8E-04	25.000	0.003%	YES		0.003%
16	Butanal/Butyraldehyde	16	001-EF-H	7.1E-04	25.000	0.003%	YES		0.003%
16	Butanal/Butyraldehyde	2	002-IN-A	3.7E-03	25.000	0.015%			0.003%
16	Butanal/Butyraldehyde	4			25.000				0.003%
16	Butanal/Butyraldehyde	6			25.000				0.003%
16	Butanal/Butyraldehyde	8			25.000				0.003%
16	Butanal/Butyraldehyde	10			25.000				0.003%
16	Butanal/Butyraldehyde	12			25.000				0.003%
16	Butanal/Butyraldehyde	14			25.000				0.003%
16	Butanal/Butyraldehyde	16	002-IN-H	3.3E-03	25.000	0.013%		J	0.003%
16	Butanal/Butyraldehyde	2	002-EF-A	1.2E-03	25.000	0.005%		J	0.003%
16	Butanal/Butyraldehyde	4	002-EF-B	7.2E-04	25.000	0.003%	YES		0.003%
16	Butanal/Butyraldehyde	6	002-EF-C	7.3E-04	25.000	0.003%	YES		0.003%
16	Butanal/Butyraldehyde	8	002-EF-D	7.3E-04	25.000	0.003%	YES		0.003%

COPC #	Analyte	End Time (h)	Position	Conc. (ppm)	OEL (ppm)	Fraction of OEL	Measurement < DL|RL?	Quality Code	Approx. DL|RL (%OEL)
16	Butanal/Butyraldehyde	10	002-EF-E	7.4E-04	25.000	0.003%	YES		0.003%
16	Butanal/Butyraldehyde	12	002-EF-F	7.4E-04	25.000	0.003%	YES		0.003%
16	Butanal/Butyraldehyde	14	002-EF-G	7.6E-04	25.000	0.003%	YES		0.003%
16	Butanal/Butyraldehyde	16	002-EF-H	7.0E-04	25.000	0.003%	YES		0.003%
19	Furan	2	001-IN-A		0.001				15.7%
19	Furan	4			0.001				15.7%
19	Furan	6			0.001				15.7%
19	Furan	8			0.001				15.7%
19	Furan	10			0.001				15.7%
19	Furan	12			0.001				15.7%
19	Furan	14			0.001				15.7%
19	Furan	16	001-IN-H		0.001				15.7%
19	Furan	2	001-EF-A		0.001				15.7%
19	Furan	4	001-EF-B		0.001				15.7%
19	Furan	6	001-EF-C		0.001				15.7%
19	Furan	8	001-EF-D		0.001				15.7%
19	Furan	10	001-EF-E		0.001				15.7%
19	Furan	12	001-EF-F		0.001				15.7%
19	Furan	14	001-EF-G		0.001				15.7%
19	Furan	16	001-EF-H		0.001				15.7%
19	Furan	2	002-IN-A	3.9E-03	0.001	392%			15.7%
19	Furan	4			0.001				15.7%
19	Furan	6			0.001				15.7%
19	Furan	8			0.001				15.7%
19	Furan	10			0.001				15.7%
19	Furan	12			0.001				15.7%
19	Furan	14			0.001				15.7%
19	Furan	16	002-IN-H	3.2E-03	0.001	319%			15.7%
19	Furan	2	002-EF-A	1.5E-04	0.001	14.6%	YES		15.7%
19	Furan	4	002-EF-B	1.5E-04	0.001	15.2%	YES		15.7%
19	Furan	6	002-EF-C	1.6E-04	0.001	15.7%	YES		15.7%
19	Furan	8	002-EF-D	1.6E-04	0.001	15.5%	YES		15.7%
19	Furan	10	002-EF-E	1.5E-04	0.001	15.0%	YES		15.7%
19	Furan	12	002-EF-F	1.4E-04	0.001	14.5%	YES		15.7%
19	Furan	14	002-EF-G	1.5E-04	0.001	14.9%	YES		15.7%
19	Furan	16	002-EF-H	1.5E-04	0.001	14.7%	YES		15.7%
20	2,3-Dihydrofuran	2	001-IN-A	2.5E-05	0.001	2.54%		J	1.8%
20	2,3-Dihydrofuran	4			0.001				1.8%
20	2,3-Dihydrofuran	6			0.001				1.8%
20	2,3-Dihydrofuran	8			0.001				1.8%
20	2,3-Dihydrofuran	10			0.001				1.8%
20	2,3-Dihydrofuran	12			0.001				1.8%
20	2,3-Dihydrofuran	14			0.001				1.8%
20	2,3-Dihydrofuran	16	001-IN-H	1.6E-05	0.001	1.63%	YES		1.8%
20	2,3-Dihydrofuran	2	001-EF-A	1.8E-05	0.001	1.76%	YES		1.8%
20	2,3-Dihydrofuran	4	001-EF-B	1.7E-05	0.001	1.67%	YES		1.8%
20	2,3-Dihydrofuran	6	001-EF-C	1.8E-05	0.001	1.82%		J	1.8%
20	2,3-Dihydrofuran	8	001-EF-D	1.6E-05	0.001	1.65%	YES		1.8%
20	2,3-Dihydrofuran	10	001-EF-E	1.7E-05	0.001	1.70%	YES		1.8%
20	2,3-Dihydrofuran	12	001-EF-F	1.8E-05	0.001	1.76%	YES		1.8%
20	2,3-Dihydrofuran	14	001-EF-G	1.7E-05	0.001	1.73%	YES		1.8%
20	2,3-Dihydrofuran	16	001-EF-H	5.0E-05	0.001	5.01%		J	1.8%
20	2,3-Dihydrofuran	2	002-IN-A	1.6E-05	0.001	1.61%	YES		1.8%
20	2,3-Dihydrofuran	4			0.001				1.8%
20	2,3-Dihydrofuran	6			0.001				1.8%
20	2,3-Dihydrofuran	8			0.001				1.8%
20	2,3-Dihydrofuran	10			0.001				1.8%
20	2,3-Dihydrofuran	12			0.001				1.8%
20	2,3-Dihydrofuran	14			0.001				1.8%
20	2,3-Dihydrofuran	16	002-IN-H	1.9E-05	0.001	1.86%		J	1.8%
20	2,3-Dihydrofuran	2	002-EF-A	1.6E-05	0.001	1.62%	YES		1.8%
20	2,3-Dihydrofuran	4	002-EF-B	1.7E-05	0.001	1.72%		J	1.8%

COPC #	Analyte	End Time (h)	Position	Conc. (ppm)	OEL (ppm)	Fraction of OEL	Measurement < DL|RL?	Quality Code	Approx. DL|RL (%OEL)
20	2,3-Dihydrofuran	6	002-EF-C	1.6E-05	0.001	1.62%	YES		1.8%
20	2,3-Dihydrofuran	8	002-EF-D	1.6E-05	0.001	1.65%	YES		1.8%
20	2,3-Dihydrofuran	10	002-EF-E	1.6E-05	0.001	1.63%	YES		1.8%
20	2,3-Dihydrofuran	12	002-EF-F	1.6E-05	0.001	1.62%	YES		1.8%
20	2,3-Dihydrofuran	14	002-EF-G	1.6E-05	0.001	1.64%	YES		1.8%
20	2,3-Dihydrofuran	16	002-EF-H	1.6E-05	0.001	1.63%	YES		1.8%
21	2,5-Dihydrofuran	2	001-IN-A		0.001				20.9%
21	2,5-Dihydrofuran	4			0.001				20.9%
21	2,5-Dihydrofuran	6			0.001				20.9%
21	2,5-Dihydrofuran	8			0.001				20.9%
21	2,5-Dihydrofuran	10			0.001				20.9%
21	2,5-Dihydrofuran	12			0.001				20.9%
21	2,5-Dihydrofuran	14			0.001				20.9%
21	2,5-Dihydrofuran	16	001-IN-H		0.001				20.9%
21	2,5-Dihydrofuran	2	001-EF-A		0.001				20.9%
21	2,5-Dihydrofuran	4	001-EF-B		0.001				20.9%
21	2,5-Dihydrofuran	6	001-EF-C		0.001				20.9%
21	2,5-Dihydrofuran	8	001-EF-D		0.001				20.9%
21	2,5-Dihydrofuran	10	001-EF-E		0.001				20.9%
21	2,5-Dihydrofuran	12	001-EF-F		0.001				20.9%
21	2,5-Dihydrofuran	14	001-EF-G		0.001				20.9%
21	2,5-Dihydrofuran	16	001-EF-H		0.001				20.9%
21	2,5-Dihydrofuran	2	002-IN-A	2.0E-04	0.001	20.4%	YES		20.9%
21	2,5-Dihydrofuran	4			0.001				20.9%
21	2,5-Dihydrofuran	6			0.001				20.9%
21	2,5-Dihydrofuran	8			0.001				20.9%
21	2,5-Dihydrofuran	10			0.001				20.9%
21	2,5-Dihydrofuran	12			0.001				20.9%
21	2,5-Dihydrofuran	14			0.001				20.9%
21	2,5-Dihydrofuran	16	002-IN-H	2.1E-04	0.001	20.6%	YES		20.9%
21	2,5-Dihydrofuran	2	002-EF-A	1.9E-04	0.001	19.4%	YES		20.9%
21	2,5-Dihydrofuran	4	002-EF-B	2.0E-04	0.001	20.3%	YES		20.9%
21	2,5-Dihydrofuran	6	002-EF-C	2.1E-04	0.001	20.9%	YES		20.9%
21	2,5-Dihydrofuran	8	002-EF-D	2.1E-04	0.001	20.8%	YES		20.9%
21	2,5-Dihydrofuran	10	002-EF-E	2.0E-04	0.001	20.0%	YES		20.9%
21	2,5-Dihydrofuran	12	002-EF-F	1.9E-04	0.001	19.4%	YES		20.9%
21	2,5-Dihydrofuran	14	002-EF-G	2.0E-04	0.001	19.9%	YES		20.9%
21	2,5-Dihydrofuran	16	002-EF-H	2.0E-04	0.001	19.6%	YES		20.9%
22	2-Methylfuran	2	001-IN-A		0.001				10.6%
22	2-Methylfuran	4			0.001				10.6%
22	2-Methylfuran	6			0.001				10.6%
22	2-Methylfuran	8			0.001				10.6%
22	2-Methylfuran	10			0.001				10.6%
22	2-Methylfuran	12			0.001				10.6%
22	2-Methylfuran	14			0.001				10.6%
22	2-Methylfuran	16	001-IN-H		0.001				10.6%
22	2-Methylfuran	2	001-EF-A		0.001				10.6%
22	2-Methylfuran	4	001-EF-B		0.001				10.6%
22	2-Methylfuran	6	001-EF-C		0.001				10.6%
22	2-Methylfuran	8	001-EF-D		0.001				10.6%
22	2-Methylfuran	10	001-EF-E		0.001				10.6%
22	2-Methylfuran	12	001-EF-F		0.001				10.6%
22	2-Methylfuran	14	001-EF-G		0.001				10.6%
22	2-Methylfuran	16	001-EF-H		0.001				10.6%
22	2-Methylfuran	2	002-IN-A	1.0E-04	0.001	10.3%	YES		10.6%
22	2-Methylfuran	4			0.001				10.6%
22	2-Methylfuran	6			0.001				10.6%
22	2-Methylfuran	8			0.001				10.6%
22	2-Methylfuran	10			0.001				10.6%
22	2-Methylfuran	12			0.001				10.6%
22	2-Methylfuran	14			0.001				10.6%
22	2-Methylfuran	16	002-IN-H	1.0E-04	0.001	10.4%	YES		10.6%
22	2-Methylfuran	2	002-EF-A	9.8E-05	0.001	9.81%	YES		10.6%
22	2-Methylfuran	4	002-EF-B	1.0E-04	0.001	10.2%	YES		10.6%

COPC #	Analyte	End Time (h)	Position	Conc. (ppm)	OEL (ppm)	Fraction of OEL	Measurement < DL|RL?	Quality Code	Approx. DL|RL (%OEL)
22	2-Methylfuran	6	002-EF-C	1.1E-04	0.001	10.6%	YES		10.6%
22	2-Methylfuran	8	002-EF-D	1.0E-04	0.001	10.5%	YES		10.6%
22	2-Methylfuran	10	002-EF-E	1.0E-04	0.001	10.1%	YES		10.6%
22	2-Methylfuran	12	002-EF-F	9.8E-05	0.001	9.77%	YES		10.6%
22	2-Methylfuran	14	002-EF-G	1.0E-04	0.001	10.1%	YES		10.6%
22	2-Methylfuran	16	002-EF-H	9.9E-05	0.001	9.88%	YES		10.6%
23	2,5-Dimethylfuran	2	001-IN-A	2.7E-05	0.001	2.74%	YES		3.1%
23	2,5-Dimethylfuran	4			0.001				3.1%
23	2,5-Dimethylfuran	6			0.001				3.1%
23	2,5-Dimethylfuran	8			0.001				3.1%
23	2,5-Dimethylfuran	10			0.001				3.1%
23	2,5-Dimethylfuran	12			0.001				3.1%
23	2,5-Dimethylfuran	14			0.001				3.1%
23	2,5-Dimethylfuran	16	001-IN-H	2.8E-05	0.001	2.85%	YES		3.1%
23	2,5-Dimethylfuran	2	001-EF-A	3.1E-05	0.001	3.06%	YES		3.1%
23	2,5-Dimethylfuran	4	001-EF-B	2.9E-05	0.001	2.91%	YES		3.1%
23	2,5-Dimethylfuran	6	001-EF-C	3.0E-05	0.001	3.01%	YES		3.1%
23	2,5-Dimethylfuran	8	001-EF-D	2.9E-05	0.001	2.87%	YES		3.1%
23	2,5-Dimethylfuran	10	001-EF-E	3.0E-05	0.001	2.96%	YES		3.1%
23	2,5-Dimethylfuran	12	001-EF-F	3.1E-05	0.001	3.06%	YES		3.1%
23	2,5-Dimethylfuran	14	001-EF-G	3.0E-05	0.001	3.01%	YES		3.1%
23	2,5-Dimethylfuran	16	001-EF-H	2.8E-05	0.001	2.80%	YES		3.1%
23	2,5-Dimethylfuran	2	002-IN-A	2.8E-05	0.001	2.80%	YES		3.1%
23	2,5-Dimethylfuran	4			0.001				3.1%
23	2,5-Dimethylfuran	6			0.001				3.1%
23	2,5-Dimethylfuran	8			0.001				3.1%
23	2,5-Dimethylfuran	10			0.001				3.1%
23	2,5-Dimethylfuran	12			0.001				3.1%
23	2,5-Dimethylfuran	14			0.001				3.1%
23	2,5-Dimethylfuran	16	002-IN-H	2.8E-05	0.001	2.78%	YES		3.1%
23	2,5-Dimethylfuran	2	002-EF-A	2.8E-05	0.001	2.83%	YES		3.1%
23	2,5-Dimethylfuran	4	002-EF-B	2.8E-05	0.001	2.83%	YES		3.1%
23	2,5-Dimethylfuran	6	002-EF-C	2.8E-05	0.001	2.82%	YES		3.1%
23	2,5-Dimethylfuran	8	002-EF-D	2.9E-05	0.001	2.87%	YES		3.1%
23	2,5-Dimethylfuran	10	002-EF-E	2.8E-05	0.001	2.83%	YES		3.1%
23	2,5-Dimethylfuran	12	002-EF-F	2.8E-05	0.001	2.82%	YES		3.1%
23	2,5-Dimethylfuran	14	002-EF-G	2.9E-05	0.001	2.86%	YES		3.1%
23	2,5-Dimethylfuran	16	002-EF-H	2.8E-05	0.001	2.84%	YES		3.1%
27	2-Pentylfuran	2	001-IN-A	1.7E-05	0.001	1.73%		J	1.6%
27	2-Pentylfuran	4			0.001				1.6%
27	2-Pentylfuran	6			0.001				1.6%
27	2-Pentylfuran	8			0.001				1.6%
27	2-Pentylfuran	10			0.001				1.6%
27	2-Pentylfuran	12			0.001				1.6%
27	2-Pentylfuran	14			0.001				1.6%
27	2-Pentylfuran	16	001-IN-H	1.5E-05	0.001	1.52%	YES		1.6%
27	2-Pentylfuran	2	001-EF-A	1.6E-05	0.001	1.63%	YES		1.6%
27	2-Pentylfuran	4	001-EF-B	1.6E-05	0.001	1.56%	YES		1.6%
27	2-Pentylfuran	6	001-EF-C	1.9E-05	0.001	1.90%		J	1.6%
27	2-Pentylfuran	8	001-EF-D	1.5E-05	0.001	1.53%	YES		1.6%
27	2-Pentylfuran	10	001-EF-E	1.6E-05	0.001	1.58%	YES		1.6%
27	2-Pentylfuran	12	001-EF-F	1.6E-05	0.001	1.63%	YES		1.6%
27	2-Pentylfuran	14	001-EF-G	1.6E-05	0.001	1.61%	YES		1.6%
27	2-Pentylfuran	16	001-EF-H	1.8E-05	0.001	1.81%		J	1.6%
27	2-Pentylfuran	2	002-IN-A	2.3E-05	0.001	2.26%		J	1.6%
27	2-Pentylfuran	4			0.001				1.6%
27	2-Pentylfuran	6			0.001				1.6%
27	2-Pentylfuran	8			0.001				1.6%
27	2-Pentylfuran	10			0.001				1.6%
27	2-Pentylfuran	12			0.001				1.6%
27	2-Pentylfuran	14			0.001				1.6%
27	2-Pentylfuran	16	002-IN-H	1.9E-05	0.001	1.93%		J	1.6%
27	2-Pentylfuran	2	002-EF-A	1.5E-05	0.001	1.51%		J	1.6%
27	2-Pentylfuran	4	002-EF-B	2.0E-05	0.001	1.97%		J	1.6%

COPC #	Analyte	End Time (h)	Position	Conc. (ppm)	OEL (ppm)	Fraction of OEL	Measurement < DL|RL?	Quality Code	Approx. DL|RL (%OEL)
27	2-Pentylfuran	6	002-EF-C	1.9E-05	0.001	1.87%		J	1.6%
27	2-Pentylfuran	8	002-EF-D	1.5E-05	0.001	1.53%	YES		1.6%
27	2-Pentylfuran	10	002-EF-E	1.5E-05	0.001	1.51%	YES		1.6%
27	2-Pentylfuran	12	002-EF-F	1.5E-05	0.001	1.50%	YES		1.6%
27	2-Pentylfuran	14	002-EF-G	5.6E-05	0.001	5.56%		J	1.6%
27	2-Pentylfuran	16	002-EF-H	2.1E-05	0.001	2.06%		J	1.6%
28	2-Heptylfuran	2	001-IN-A	1.0E-05	0.001	0.996%	YES		1.1%
28	2-Heptylfuran	4			0.001				1.1%
28	2-Heptylfuran	6			0.001				1.1%
28	2-Heptylfuran	8			0.001				1.1%
28	2-Heptylfuran	10			0.001				1.1%
28	2-Heptylfuran	12			0.001				1.1%
28	2-Heptylfuran	14			0.001				1.1%
28	2-Heptylfuran	16	001-IN-H	1.1E-05	0.001	1.07%		J	1.1%
28	2-Heptylfuran	2	001-EF-A	1.2E-05	0.001	1.19%		J	1.1%
28	2-Heptylfuran	4	001-EF-B	1.4E-05	0.001	1.37%		J	1.1%
28	2-Heptylfuran	6	001-EF-C	1.3E-05	0.001	1.29%		J	1.1%
28	2-Heptylfuran	8	001-EF-D	1.0E-05	0.001	1.04%	YES		1.1%
28	2-Heptylfuran	10	001-EF-E	1.1E-05	0.001	1.07%	YES		1.1%
28	2-Heptylfuran	12	001-EF-F	1.1E-05	0.001	1.11%	YES		1.1%
28	2-Heptylfuran	14	001-EF-G	1.1E-05	0.001	1.09%	YES		1.1%
28	2-Heptylfuran	16	001-EF-H	1.0E-05	0.001	1.02%	YES		1.1%
28	2-Heptylfuran	2	002-IN-A	1.4E-05	0.001	1.39%			1.1%
28	2-Heptylfuran	4			0.001				1.1%
28	2-Heptylfuran	6			0.001				1.1%
28	2-Heptylfuran	8			0.001				1.1%
28	2-Heptylfuran	10			0.001				1.1%
28	2-Heptylfuran	12			0.001				1.1%
28	2-Heptylfuran	14			0.001				1.1%
28	2-Heptylfuran	16	002-IN-H	1.1E-05	0.001	1.08%		J	1.1%
28	2-Heptylfuran	2	002-EF-A	1.0E-05	0.001	1.03%	YES	J	1.1%
28	2-Heptylfuran	4	002-EF-B	1.5E-05	0.001	1.52%		J	1.1%
28	2-Heptylfuran	6	002-EF-C	1.6E-05	0.001	1.55%		J	1.1%
28	2-Heptylfuran	8	002-EF-D	1.2E-05	0.001	1.24%		J	1.1%
28	2-Heptylfuran	10	002-EF-E	1.0E-05	0.001	1.03%	YES		1.1%
28	2-Heptylfuran	12	002-EF-F	1.0E-05	0.001	1.02%	YES		1.1%
28	2-Heptylfuran	14	002-EF-G	1.4E-05	0.001	1.39%		J	1.1%
28	2-Heptylfuran	16	002-EF-H	1.1E-05	0.001	1.07%		J	1.1%
29	2-Propylfuran	2	001-IN-A	2.4E-05	0.001	2.45%			2.7%
29	2-Propylfuran	4			0.001				2.7%
29	2-Propylfuran	6			0.001				2.7%
29	2-Propylfuran	8			0.001				2.7%
29	2-Propylfuran	10			0.001				2.7%
29	2-Propylfuran	12			0.001				2.7%
29	2-Propylfuran	14			0.001				2.7%
29	2-Propylfuran	16	001-IN-H	2.5E-05	0.001	2.54%			2.7%
29	2-Propylfuran	2	001-EF-A	3.0E-05	0.001	2.98%			2.7%
29	2-Propylfuran	4	001-EF-B	2.6E-05	0.001	2.60%			2.7%
29	2-Propylfuran	6	001-EF-C	2.7E-05	0.001	2.69%			2.7%
29	2-Propylfuran	8	001-EF-D	2.6E-05	0.001	2.56%			2.7%
29	2-Propylfuran	10	001-EF-E	2.6E-05	0.001	2.64%			2.7%
29	2-Propylfuran	12	001-EF-F	2.7E-05	0.001	2.73%			2.7%
29	2-Propylfuran	14	001-EF-G	2.7E-05	0.001	2.69%			2.7%
29	2-Propylfuran	16	001-EF-H	2.5E-05	0.001	2.50%			2.7%
29	2-Propylfuran	2	002-IN-A	2.5E-05	0.001	2.50%			2.7%
29	2-Propylfuran	4			0.001				2.7%
29	2-Propylfuran	6			0.001				2.7%
29	2-Propylfuran	8			0.001				2.7%
29	2-Propylfuran	10			0.001				2.7%
29	2-Propylfuran	12			0.001				2.7%
29	2-Propylfuran	14			0.001				2.7%
29	2-Propylfuran	16	002-IN-H	2.5E-05	0.001	2.48%			2.7%
29	2-Propylfuran	2	002-EF-A	2.5E-05	0.001	2.52%			2.7%
29	2-Propylfuran	4	002-EF-B	2.5E-05	0.001	2.53%			2.7%

COPC #	Analyte	End Time (h)	Position	Conc. (ppm)	OEL (ppm)	Fraction of OEL	Measurement < DL|RL?	Quality Code	Approx. DL|RL (%OEL)
29	2-Propylfuran	6	002-EF-C	2.5E-05	0.001	2.52%			2.7%
29	2-Propylfuran	8	002-EF-D	2.6E-05	0.001	2.56%			2.7%
29	2-Propylfuran	10	002-EF-E	2.5E-05	0.001	2.53%			2.7%
29	2-Propylfuran	12	002-EF-F	2.5E-05	0.001	2.52%			2.7%
29	2-Propylfuran	14	002-EF-G	2.6E-05	0.001	2.56%			2.7%
29	2-Propylfuran	16	002-EF-H	2.5E-05	0.001	2.53%			2.7%
33	Diethylphthalate	2	001-IN-A		0.543				0.02%
33	Diethylphthalate	4			0.543				0.02%
33	Diethylphthalate	6			0.543				0.02%
33	Diethylphthalate	8			0.543				0.02%
33	Diethylphthalate	10			0.543				0.02%
33	Diethylphthalate	12			0.543				0.02%
33	Diethylphthalate	14			0.543				0.02%
33	Diethylphthalate	16	001-IN-H	7.3E-05	0.543	0.013%	YES		0.02%
33	Diethylphthalate	2	001-EF-A	8.9E-05	0.543	0.016%	YES		0.02%
33	Diethylphthalate	4	001-EF-B	9.5E-05	0.543	0.018%	YES		0.02%
33	Diethylphthalate	6	001-EF-C	9.9E-05	0.543	0.018%	YES		0.02%
33	Diethylphthalate	8	001-EF-D	8.6E-05	0.543	0.016%	YES		0.02%
33	Diethylphthalate	10	001-EF-E	8.4E-05	0.543	0.016%	YES		0.02%
33	Diethylphthalate	12	001-EF-F	1.0E-04	0.543	0.019%	YES	, S*	0.02%
33	Diethylphthalate	14	001-EF-G	9.2E-05	0.543	0.017%	YES		0.02%
33	Diethylphthalate	16	001-EF-H		0.543				0.02%
33	Diethylphthalate	2	002-IN-A	7.7E-05	0.543	0.014%	YES		0.02%
33	Diethylphthalate	4			0.543				0.02%
33	Diethylphthalate	6			0.543				0.02%
33	Diethylphthalate	8			0.543				0.02%
33	Diethylphthalate	10			0.543				0.02%
33	Diethylphthalate	12			0.543				0.02%
33	Diethylphthalate	14			0.543				0.02%
33	Diethylphthalate	16	002-IN-H	8.1E-05	0.543	0.015%	YES		0.02%
33	Diethylphthalate	2	002-EF-A	8.2E-05	0.543	0.015%	YES		0.02%
33	Diethylphthalate	4	002-EF-B	7.6E-05	0.543	0.014%	YES		0.02%
33	Diethylphthalate	6	002-EF-C	8.2E-05	0.543	0.015%	YES		0.02%
33	Diethylphthalate	8	002-EF-D	7.9E-05	0.543	0.015%	YES		0.02%
33	Diethylphthalate	10	002-EF-E	9.0E-05	0.543	0.017%	YES		0.02%
33	Diethylphthalate	12	002-EF-F	7.8E-05	0.543	0.014%	YES	, S*	0.02%
33	Diethylphthalate	14	002-EF-G	8.8E-05	0.543	0.016%	YES		0.02%
33	Diethylphthalate	16	002-EF-H	7.7E-05	0.543	0.014%	YES		0.02%
34	Acetonitrile	2	001-IN-A		20.000				0.001%
34	Acetonitrile	4			20.000				0.001%
34	Acetonitrile	6			20.000				0.001%
34	Acetonitrile	8			20.000				0.001%
34	Acetonitrile	10			20.000				0.001%
34	Acetonitrile	12			20.000				0.001%
34	Acetonitrile	14			20.000				0.001%
34	Acetonitrile	16	001-IN-H		20.000				0.001%
34	Acetonitrile	2	001-EF-A		20.000				0.001%
34	Acetonitrile	4	001-EF-B		20.000				0.001%
34	Acetonitrile	6	001-EF-C		20.000				0.001%
34	Acetonitrile	8	001-EF-D		20.000				0.001%
34	Acetonitrile	10	001-EF-E		20.000				0.001%
34	Acetonitrile	12	001-EF-F		20.000				0.001%
34	Acetonitrile	14	001-EF-G		20.000				0.001%
34	Acetonitrile	16	001-EF-H		20.000				0.001%
34	Acetonitrile	2	002-IN-A	7.4E-03	20.000	0.037%		B	0.001%
34	Acetonitrile	4			20.000				0.001%
34	Acetonitrile	6			20.000				0.001%
34	Acetonitrile	8			20.000				0.001%
34	Acetonitrile	10			20.000				0.001%
34	Acetonitrile	12			20.000				0.001%
34	Acetonitrile	14			20.000				0.001%
34	Acetonitrile	16	002-IN-H	7.0E-03	20.000	0.035%		B	0.001%
34	Acetonitrile	2	002-EF-A	1.8E-02	20.000	0.091%		B	0.001%
34	Acetonitrile	4	002-EF-B	6.6E-02	20.000	0.331%		BE	0.001%

COPC #	Analyte	End Time (h)	Position	Conc. (ppm)	OEL (ppm)	Fraction of OEL	Measurement < DL|RL?	Quality Code	Approx. DL|RL (%OEL)
34	Acetonitrile	6	002-EF-C	9.9E-03	20.000	0.050%		B	0.001%
34	Acetonitrile	8	002-EF-D	2.7E-01	20.000	1.37%		BE	0.001%
34	Acetonitrile	10	002-EF-E	5.6E-03	20.000	0.028%		B	0.001%
34	Acetonitrile	12	002-EF-F	2.7E-02	20.000	0.135%		B	0.001%
34	Acetonitrile	14	002-EF-G	4.3E-03	20.000	0.022%		B	0.001%
34	Acetonitrile	16	002-EF-H	8.7E-02	20.000	0.433%		BE	0.001%
35	Propanenitrile	2	001-IN-A		6.000				0.004%
35	Propanenitrile	4			6.000				0.004%
35	Propanenitrile	6			6.000				0.004%
35	Propanenitrile	8			6.000				0.004%
35	Propanenitrile	10			6.000				0.004%
35	Propanenitrile	12			6.000				0.004%
35	Propanenitrile	14			6.000				0.004%
35	Propanenitrile	16	001-IN-H		6.000				0.004%
35	Propanenitrile	2	001-EF-A		6.000				0.004%
35	Propanenitrile	4	001-EF-B		6.000				0.004%
35	Propanenitrile	6	001-EF-C		6.000				0.004%
35	Propanenitrile	8	001-EF-D		6.000				0.004%
35	Propanenitrile	10	001-EF-E		6.000				0.004%
35	Propanenitrile	12	001-EF-F		6.000				0.004%
35	Propanenitrile	14	001-EF-G		6.000				0.004%
35	Propanenitrile	16	001-EF-H		6.000				0.004%
35	Propanenitrile	2	002-IN-A	4.4E-04	6.000	0.007%			0.004%
35	Propanenitrile	4			6.000				0.004%
35	Propanenitrile	6			6.000				0.004%
35	Propanenitrile	8			6.000				0.004%
35	Propanenitrile	10			6.000				0.004%
35	Propanenitrile	12			6.000				0.004%
35	Propanenitrile	14			6.000				0.004%
35	Propanenitrile	16	002-IN-H	5.0E-04	6.000	0.008%		J	0.004%
35	Propanenitrile	2	002-EF-A	2.0E-04	6.000	0.003%	YES	J	0.004%
35	Propanenitrile	4	002-EF-B	2.1E-04	6.000	0.004%	YES		0.004%
35	Propanenitrile	6	002-EF-C	2.2E-04	6.000	0.004%	YES		0.004%
35	Propanenitrile	8	002-EF-D	2.2E-04	6.000	0.004%	YES		0.004%
35	Propanenitrile	10	002-EF-E	2.1E-04	6.000	0.003%	YES		0.004%
35	Propanenitrile	12	002-EF-F	2.0E-04	6.000	0.003%	YES		0.004%
35	Propanenitrile	14	002-EF-G	2.1E-04	6.000	0.003%	YES		0.004%
35	Propanenitrile	16	002-EF-H	2.0E-04	6.000	0.003%	YES		0.004%
36	Butanenitrile	2	001-IN-A		8.000				0.003%
36	Butanenitrile	4			8.000				0.003%
36	Butanenitrile	6			8.000				0.003%
36	Butanenitrile	8			8.000				0.003%
36	Butanenitrile	10			8.000				0.003%
36	Butanenitrile	12			8.000				0.003%
36	Butanenitrile	14			8.000				0.003%
36	Butanenitrile	16	001-IN-H		8.000				0.003%
36	Butanenitrile	2	001-EF-A		8.000				0.003%
36	Butanenitrile	4	001-EF-B		8.000				0.003%
36	Butanenitrile	6	001-EF-C		8.000				0.003%
36	Butanenitrile	8	001-EF-D		8.000				0.003%
36	Butanenitrile	10	001-EF-E		8.000				0.003%
36	Butanenitrile	12	001-EF-F		8.000				0.003%
36	Butanenitrile	14	001-EF-G		8.000				0.003%
36	Butanenitrile	16	001-EF-H		8.000				0.003%
36	Butanenitrile	2	002-IN-A	3.2E-04	8.000	0.004%			0.003%
36	Butanenitrile	4			8.000				0.003%
36	Butanenitrile	6			8.000				0.003%
36	Butanenitrile	8			8.000				0.003%
36	Butanenitrile	10			8.000				0.003%
36	Butanenitrile	12			8.000				0.003%
36	Butanenitrile	14			8.000				0.003%
36	Butanenitrile	16	002-IN-H	3.7E-04	8.000	0.005%		J	0.003%
36	Butanenitrile	2	002-EF-A	1.9E-04	8.000	0.002%	YES	J	0.003%
36	Butanenitrile	4	002-EF-B	2.8E-04	8.000	0.004%		J	0.003%

COPC #	Analyte	End Time (h)	Position	Conc. (ppm)	OEL (ppm)	Fraction of OEL	Measurement < DL|RL?	Quality Code	Approx. DL|RL (%OEL)
36	Butanenitrile	6	002-EF-C	2.0E-04	8.000	0.003%	YES		0.003%
36	Butanenitrile	8	002-EF-D	2.0E-04	8.000	0.003%	YES		0.003%
36	Butanenitrile	10	002-EF-E	1.9E-04	8.000	0.002%	YES		0.003%
36	Butanenitrile	12	002-EF-F	1.9E-04	8.000	0.002%	YES		0.003%
36	Butanenitrile	14	002-EF-G	1.9E-04	8.000	0.002%	YES		0.003%
36	Butanenitrile	16	002-EF-H	1.9E-04	8.000	0.002%	YES		0.003%
37	Pentanenitrile	2	001-IN-A		6.000				0.003%
37	Pentanenitrile	4			6.000				0.003%
37	Pentanenitrile	6			6.000				0.003%
37	Pentanenitrile	8			6.000				0.003%
37	Pentanenitrile	10			6.000				0.003%
37	Pentanenitrile	12			6.000				0.003%
37	Pentanenitrile	14			6.000				0.003%
37	Pentanenitrile	16	001-IN-H		6.000				0.003%
37	Pentanenitrile	2	001-EF-A		6.000				0.003%
37	Pentanenitrile	4	001-EF-B		6.000				0.003%
37	Pentanenitrile	6	001-EF-C		6.000				0.003%
37	Pentanenitrile	8	001-EF-D		6.000				0.003%
37	Pentanenitrile	10	001-EF-E		6.000				0.003%
37	Pentanenitrile	12	001-EF-F		6.000				0.003%
37	Pentanenitrile	14	001-EF-G		6.000				0.003%
37	Pentanenitrile	16	001-EF-H		6.000				0.003%
37	Pentanenitrile	2	002-IN-A	2.0E-04	6.000	0.003%	YES		0.003%
37	Pentanenitrile	4			6.000				0.003%
37	Pentanenitrile	6			6.000				0.003%
37	Pentanenitrile	8			6.000				0.003%
37	Pentanenitrile	10			6.000				0.003%
37	Pentanenitrile	12			6.000				0.003%
37	Pentanenitrile	14			6.000				0.003%
37	Pentanenitrile	16	002-IN-H	2.1E-04	6.000	0.003%	YES		0.003%
37	Pentanenitrile	2	002-EF-A	1.9E-04	6.000	0.003%	YES		0.003%
37	Pentanenitrile	4	002-EF-B	2.0E-04	6.000	0.003%	YES		0.003%
37	Pentanenitrile	6	002-EF-C	2.1E-04	6.000	0.003%	YES		0.003%
37	Pentanenitrile	8	002-EF-D	2.1E-04	6.000	0.003%	YES		0.003%
37	Pentanenitrile	10	002-EF-E	2.0E-04	6.000	0.003%	YES		0.003%
37	Pentanenitrile	12	002-EF-F	1.9E-04	6.000	0.003%	YES		0.003%
37	Pentanenitrile	14	002-EF-G	2.0E-04	6.000	0.003%	YES		0.003%
37	Pentanenitrile	16	002-EF-H	2.0E-04	6.000	0.003%	YES		0.003%
38	Hexanenitrile	2	001-IN-A		6.000				0.003%
38	Hexanenitrile	4			6.000				0.003%
38	Hexanenitrile	6			6.000				0.003%
38	Hexanenitrile	8			6.000				0.003%
38	Hexanenitrile	10			6.000				0.003%
38	Hexanenitrile	12			6.000				0.003%
38	Hexanenitrile	14			6.000				0.003%
38	Hexanenitrile	16	001-IN-H		6.000				0.003%
38	Hexanenitrile	2	001-EF-A		6.000				0.003%
38	Hexanenitrile	4	001-EF-B		6.000				0.003%
38	Hexanenitrile	6	001-EF-C		6.000				0.003%
38	Hexanenitrile	8	001-EF-D		6.000				0.003%
38	Hexanenitrile	10	001-EF-E		6.000				0.003%
38	Hexanenitrile	12	001-EF-F		6.000				0.003%
38	Hexanenitrile	14	001-EF-G		6.000				0.003%
38	Hexanenitrile	16	001-EF-H		6.000				0.003%
38	Hexanenitrile	2	002-IN-A	1.7E-04	6.000	0.003%	YES		0.003%
38	Hexanenitrile	4			6.000				0.003%
38	Hexanenitrile	6			6.000				0.003%
38	Hexanenitrile	8			6.000				0.003%
38	Hexanenitrile	10			6.000				0.003%
38	Hexanenitrile	12			6.000				0.003%
38	Hexanenitrile	14			6.000				0.003%
38	Hexanenitrile	16	002-IN-H	1.8E-04	6.000	0.003%	YES		0.003%
38	Hexanenitrile	2	002-EF-A	1.7E-04	6.000	0.003%	YES		0.003%
38	Hexanenitrile	4	002-EF-B	1.7E-04	6.000	0.003%	YES		0.003%

COPC #	Analyte	End Time (h)	Position	Conc. (ppm)	OEL (ppm)	Fraction of OEL	Measurement < DL|RL?	Quality Code	Approx. DL|RL (%OEL)
38	Hexanenitrile	6	002-EF-C	1.8E-04	6.000	0.003%	YES		0.003%
38	Hexanenitrile	8	002-EF-D	1.8E-04	6.000	0.003%	YES		0.003%
38	Hexanenitrile	10	002-EF-E	1.7E-04	6.000	0.003%	YES		0.003%
38	Hexanenitrile	12	002-EF-F	1.7E-04	6.000	0.003%	YES		0.003%
38	Hexanenitrile	14	002-EF-G	1.7E-04	6.000	0.003%	YES		0.003%
38	Hexanenitrile	16	002-EF-H	1.7E-04	6.000	0.003%	YES		0.003%
42	Ethylamine	2	001-IN-A	1.2E-02	5.000	0.240%			0.1%
42	Ethylamine	4			5.000				0.1%
42	Ethylamine	6			5.000				0.1%
42	Ethylamine	8			5.000				0.1%
42	Ethylamine	10			5.000				0.1%
42	Ethylamine	12			5.000				0.1%
42	Ethylamine	14			5.000				0.1%
42	Ethylamine	16	001-IN-H	2.1E-02	5.000	0.429%			0.1%
42	Ethylamine	2	001-EF-A	4.7E-03	5.000	0.093%	YES	U	0.1%
42	Ethylamine	4	001-EF-B	4.4E-03	5.000	0.088%	YES	U	0.1%
42	Ethylamine	6	001-EF-C	4.3E-03	5.000	0.086%	YES	U	0.1%
42	Ethylamine	8	001-EF-D	4.5E-03	5.000	0.089%	YES	U	0.1%
42	Ethylamine	10	001-EF-E	4.7E-03	5.000	0.094%	YES	U	0.1%
42	Ethylamine	12	001-EF-F	4.9E-03	5.000	0.098%	YES	U	0.1%
42	Ethylamine	14	001-EF-G	4.9E-03	5.000	0.098%	YES	U	0.1%
42	Ethylamine	16	001-EF-H	4.5E-03	5.000	0.089%	YES	U	0.1%
42	Ethylamine	2	002-IN-A	4.6E-03	5.000	0.093%	YES	U	0.1%
42	Ethylamine	4			5.000				0.1%
42	Ethylamine	6			5.000				0.1%
42	Ethylamine	8			5.000				0.1%
42	Ethylamine	10			5.000				0.1%
42	Ethylamine	12			5.000				0.1%
42	Ethylamine	14			5.000				0.1%
42	Ethylamine	16	002-IN-H	2.4E-02	5.000	0.483%			0.1%
42	Ethylamine	2	002-EF-A	4.5E-03	5.000	0.091%	YES	U	0.1%
42	Ethylamine	4	002-EF-B	4.5E-03	5.000	0.089%	YES	U	0.1%
42	Ethylamine	6	002-EF-C	4.6E-03	5.000	0.092%	YES	U	0.1%
42	Ethylamine	8	002-EF-D	4.6E-03	5.000	0.092%	YES	U	0.1%
42	Ethylamine	10	002-EF-E	4.8E-03	5.000	0.095%	YES	U	0.1%
42	Ethylamine	12	002-EF-F	4.9E-03	5.000	0.098%	YES	U	0.1%
42	Ethylamine	14	002-EF-G	4.5E-03	5.000	0.090%	YES	U	0.1%
42	Ethylamine	16	002-EF-H	4.5E-03	5.000	0.091%	YES	U	0.1%
43	N-Nitrosodimethylamine	2	001-IN-A	1.1E-02	0.0003	3629%		D	10.6%
43	N-Nitrosodimethylamine	4			0.0003				10.6%
43	N-Nitrosodimethylamine	6			0.0003				10.6%
43	N-Nitrosodimethylamine	8			0.0003				10.6%
43	N-Nitrosodimethylamine	10			0.0003				10.6%
43	N-Nitrosodimethylamine	12			0.0003				10.6%
43	N-Nitrosodimethylamine	14			0.0003				10.6%
43	N-Nitrosodimethylamine	16	001-IN-H	7.4E-03	0.0003	2470%		D	10.6%
43	N-Nitrosodimethylamine	2	001-EF-A	3.1E-05	0.0003	10.4%	YES		10.6%
43	N-Nitrosodimethylamine	4	001-EF-B	3.1E-05	0.0003	10.4%	YES		10.6%
43	N-Nitrosodimethylamine	6	001-EF-C	3.1E-05	0.0003	10.4%	YES		10.6%
43	N-Nitrosodimethylamine	8	001-EF-D	3.1E-05	0.0003	10.4%	YES		10.6%
43	N-Nitrosodimethylamine	10	001-EF-E	3.1E-05	0.0003	10.4%	YES		10.6%
43	N-Nitrosodimethylamine	12	001-EF-F	3.1E-05	0.0003	10.5%	YES		10.6%
43	N-Nitrosodimethylamine	14	001-EF-G	3.1E-05	0.0003	10.5%	YES		10.6%
43	N-Nitrosodimethylamine	16	001-EF-H	3.1E-05	0.0003	10.5%	YES		10.6%
43	N-Nitrosodimethylamine	2	002-IN-A	3.7E-03	0.0003	1231%		D	10.6%
43	N-Nitrosodimethylamine	4			0.0003				10.6%
43	N-Nitrosodimethylamine	6			0.0003				10.6%
43	N-Nitrosodimethylamine	8			0.0003				10.6%
43	N-Nitrosodimethylamine	10			0.0003				10.6%
43	N-Nitrosodimethylamine	12			0.0003				10.6%
43	N-Nitrosodimethylamine	14			0.0003				10.6%
43	N-Nitrosodimethylamine	16	002-IN-H	7.9E-03	0.0003	2625%		D	10.6%
43	N-Nitrosodimethylamine	2	002-EF-A	3.1E-05	0.0003	10.4%	YES		10.6%
43	N-Nitrosodimethylamine	4	002-EF-B	3.0E-05	0.0003	10.0%	YES		10.6%

COPC #	Analyte	End Time (h)	Position	Conc. (ppm)	OEL (ppm)	Fraction of OEL	Measurement < DL|RL?	Quality Code	Approx. DL|RL (%OEL)
43	N-Nitrosodimethylamine	6	002-EF-C	3.1E-05	0.0003	10.2%	YES		10.6%
43	N-Nitrosodimethylamine	8	002-EF-D	3.2E-05	0.0003	10.6%	YES		10.6%
43	N-Nitrosodimethylamine	10	002-EF-E	3.1E-05	0.0003	10.5%	YES		10.6%
43	N-Nitrosodimethylamine	12	002-EF-F	3.0E-05	0.0003	10.1%	YES		10.6%
43	N-Nitrosodimethylamine	14	002-EF-G	3.1E-05	0.0003	10.5%	YES		10.6%
43	N-Nitrosodimethylamine	16	002-EF-H	2.9E-05	0.0003	9.80%	YES		10.6%
44	N-Nitrosodiethylamine	2	001-IN-A	2.3E-05	0.0001	23.0%	YES		23.0%
44	N-Nitrosodiethylamine	4			0.0001				23.0%
44	N-Nitrosodiethylamine	6			0.0001				23.0%
44	N-Nitrosodiethylamine	8			0.0001				23.0%
44	N-Nitrosodiethylamine	10			0.0001				23.0%
44	N-Nitrosodiethylamine	12			0.0001				23.0%
44	N-Nitrosodiethylamine	14			0.0001				23.0%
44	N-Nitrosodiethylamine	16	001-IN-H	2.3E-05	0.0001	22.6%	YES		23.0%
44	N-Nitrosodiethylamine	2	001-EF-A	2.2E-05	0.0001	21.6%	YES		23.0%
44	N-Nitrosodiethylamine	4	001-EF-B	2.2E-05	0.0001	21.5%	YES		23.0%
44	N-Nitrosodiethylamine	6	001-EF-C	2.2E-05	0.0001	21.6%	YES		23.0%
44	N-Nitrosodiethylamine	8	001-EF-D	2.2E-05	0.0001	21.6%	YES		23.0%
44	N-Nitrosodiethylamine	10	001-EF-E	2.2E-05	0.0001	21.7%	YES		23.0%
44	N-Nitrosodiethylamine	12	001-EF-F	2.2E-05	0.0001	21.7%	YES		23.0%
44	N-Nitrosodiethylamine	14	001-EF-G	2.2E-05	0.0001	21.7%	YES		23.0%
44	N-Nitrosodiethylamine	16	001-EF-H	2.2E-05	0.0001	21.8%	YES		23.0%
44	N-Nitrosodiethylamine	2	002-IN-A	2.2E-05	0.0001	21.9%	YES	*	23.0%
44	N-Nitrosodiethylamine	4			0.0001				23.0%
44	N-Nitrosodiethylamine	6			0.0001				23.0%
44	N-Nitrosodiethylamine	8			0.0001				23.0%
44	N-Nitrosodiethylamine	10			0.0001				23.0%
44	N-Nitrosodiethylamine	12			0.0001				23.0%
44	N-Nitrosodiethylamine	14			0.0001				23.0%
44	N-Nitrosodiethylamine	16	002-IN-H	2.3E-05	0.0001	22.8%	YES		23.0%
44	N-Nitrosodiethylamine	2	002-EF-A	2.2E-05	0.0001	21.5%	YES		23.0%
44	N-Nitrosodiethylamine	4	002-EF-B	2.1E-05	0.0001	20.8%	YES		23.0%
44	N-Nitrosodiethylamine	6	002-EF-C	2.1E-05	0.0001	21.3%	YES		23.0%
44	N-Nitrosodiethylamine	8	002-EF-D	2.2E-05	0.0001	22.0%	YES		23.0%
44	N-Nitrosodiethylamine	10	002-EF-E	2.2E-05	0.0001	21.8%	YES		23.0%
44	N-Nitrosodiethylamine	12	002-EF-F	2.1E-05	0.0001	21.1%	YES		23.0%
44	N-Nitrosodiethylamine	14	002-EF-G	2.2E-05	0.0001	21.7%	YES		23.0%
44	N-Nitrosodiethylamine	16	002-EF-H	2.0E-05	0.0001	20.4%	YES		23.0%
45	N-Nitrosomethylethylamine	2	001-IN-A	1.3E-04	0.0003	44.9%			8.9%
45	N-Nitrosomethylethylamine	4			0.0003				8.9%
45	N-Nitrosomethylethylamine	6			0.0003				8.9%
45	N-Nitrosomethylethylamine	8			0.0003				8.9%
45	N-Nitrosomethylethylamine	10			0.0003				8.9%
45	N-Nitrosomethylethylamine	12			0.0003				8.9%
45	N-Nitrosomethylethylamine	14			0.0003				8.9%
45	N-Nitrosomethylethylamine	16	001-IN-H	8.9E-05	0.0003	29.8%			8.9%
45	N-Nitrosomethylethylamine	2	001-EF-A	2.6E-05	0.0003	8.76%	YES		8.9%
45	N-Nitrosomethylethylamine	4	001-EF-B	2.6E-05	0.0003	8.71%	YES		8.9%
45	N-Nitrosomethylethylamine	6	001-EF-C	2.6E-05	0.0003	8.76%	YES		8.9%
45	N-Nitrosomethylethylamine	8	001-EF-D	2.6E-05	0.0003	8.76%	YES		8.9%
45	N-Nitrosomethylethylamine	10	001-EF-E	2.6E-05	0.0003	8.77%	YES		8.9%
45	N-Nitrosomethylethylamine	12	001-EF-F	2.6E-05	0.0003	8.80%	YES		8.9%
45	N-Nitrosomethylethylamine	14	001-EF-G	2.6E-05	0.0003	8.80%	YES		8.9%
45	N-Nitrosomethylethylamine	16	001-EF-H	2.6E-05	0.0003	8.82%	YES		8.9%
45	N-Nitrosomethylethylamine	2	002-IN-A	7.0E-05	0.0003	23.5%			8.9%
45	N-Nitrosomethylethylamine	4			0.0003				8.9%
45	N-Nitrosomethylethylamine	6			0.0003				8.9%
45	N-Nitrosomethylethylamine	8			0.0003				8.9%
45	N-Nitrosomethylethylamine	10			0.0003				8.9%
45	N-Nitrosomethylethylamine	12			0.0003				8.9%
45	N-Nitrosomethylethylamine	14			0.0003				8.9%
45	N-Nitrosomethylethylamine	16	002-IN-H	2.6E-05	0.0003	8.81%	YES		8.9%
45	N-Nitrosomethylethylamine	2	002-EF-A	2.6E-05	0.0003	8.72%	YES		8.9%
45	N-Nitrosomethylethylamine	4	002-EF-B	2.5E-05	0.0003	8.43%	YES		8.9%

COPC #	Analyte	End Time (h)	Position	Conc. (ppm)	OEL (ppm)	Fraction of OEL	Measurement < DL|RL?	Quality Code	Approx. DL|RL (%OEL)
45	N-Nitrosomethylethylamine	6	002-EF-C	2.6E-05	0.0003	8.61%	YES		8.9%
45	N-Nitrosomethylethylamine	8	002-EF-D	2.7E-05	0.0003	8.91%	YES		8.9%
45	N-Nitrosomethylethylamine	10	002-EF-E	2.6E-05	0.0003	8.81%	YES		8.9%
45	N-Nitrosomethylethylamine	12	002-EF-F	2.6E-05	0.0003	8.53%	YES		8.9%
45	N-Nitrosomethylethylamine	14	002-EF-G	2.6E-05	0.0003	8.80%	YES		8.9%
45	N-Nitrosomethylethylamine	16	002-EF-H	2.5E-05	0.0003	8.24%	YES		8.9%
46	N-Nitrosomorpholine	2	001-IN-A	1.4E-04	0.001	22.7%			3.4%
46	N-Nitrosomorpholine	4			0.001				3.4%
46	N-Nitrosomorpholine	6			0.001				3.4%
46	N-Nitrosomorpholine	8			0.001				3.4%
46	N-Nitrosomorpholine	10			0.001				3.4%
46	N-Nitrosomorpholine	12			0.001				3.4%
46	N-Nitrosomorpholine	14			0.001				3.4%
46	N-Nitrosomorpholine	16	001-IN-H	2.0E-05	0.001	3.31%	YES		3.4%
46	N-Nitrosomorpholine	2	001-EF-A	2.0E-05	0.001	3.32%	YES		3.4%
46	N-Nitrosomorpholine	4	001-EF-B	2.0E-05	0.001	3.31%	YES		3.4%
46	N-Nitrosomorpholine	6	001-EF-C	2.0E-05	0.001	3.32%	YES		3.4%
46	N-Nitrosomorpholine	8	001-EF-D	2.0E-05	0.001	3.32%	YES		3.4%
46	N-Nitrosomorpholine	10	001-EF-E	2.0E-05	0.001	3.33%	YES		3.4%
46	N-Nitrosomorpholine	12	001-EF-F	2.0E-05	0.001	3.34%	YES		3.4%
46	N-Nitrosomorpholine	14	001-EF-G	2.0E-05	0.001	3.34%	YES		3.4%
46	N-Nitrosomorpholine	16	001-EF-H	2.0E-05	0.001	3.34%	YES		3.4%
46	N-Nitrosomorpholine	2	002-IN-A	1.9E-05	0.001	3.21%	YES		3.4%
46	N-Nitrosomorpholine	4			0.001				3.4%
46	N-Nitrosomorpholine	6			0.001				3.4%
46	N-Nitrosomorpholine	8			0.001				3.4%
46	N-Nitrosomorpholine	10			0.001				3.4%
46	N-Nitrosomorpholine	12			0.001				3.4%
46	N-Nitrosomorpholine	14			0.001				3.4%
46	N-Nitrosomorpholine	16	002-IN-H	3.6E-05	0.001	6.08%			3.4%
46	N-Nitrosomorpholine	2	002-EF-A	2.0E-05	0.001	3.31%	YES		3.4%
46	N-Nitrosomorpholine	4	002-EF-B	1.9E-05	0.001	3.20%	YES		3.4%
46	N-Nitrosomorpholine	6	002-EF-C	2.0E-05	0.001	3.27%	YES		3.4%
46	N-Nitrosomorpholine	8	002-EF-D	2.0E-05	0.001	3.38%	YES		3.4%
46	N-Nitrosomorpholine	10	002-EF-E	2.0E-05	0.001	3.34%	YES		3.4%
46	N-Nitrosomorpholine	12	002-EF-F	1.9E-05	0.001	3.24%	YES		3.4%
46	N-Nitrosomorpholine	14	002-EF-G	2.0E-05	0.001	3.34%	YES		3.4%
46	N-Nitrosomorpholine	16	002-EF-H	1.9E-05	0.001	3.13%	YES		3.4%
47	Tributyl phosphate	2	001-IN-A		0.200				0.1%
47	Tributyl phosphate	4			0.200				0.1%
47	Tributyl phosphate	6			0.200				0.1%
47	Tributyl phosphate	8			0.200				0.1%
47	Tributyl phosphate	10			0.200				0.1%
47	Tributyl phosphate	12			0.200				0.1%
47	Tributyl phosphate	14			0.200				0.1%
47	Tributyl phosphate	16	001-IN-H	1.3E-04	0.200	0.065%	YES		0.1%
47	Tributyl phosphate	2	001-EF-A	1.6E-04	0.200	0.080%	YES		0.1%
47	Tributyl phosphate	4	001-EF-B	1.7E-04	0.200	0.085%	YES		0.1%
47	Tributyl phosphate	6	001-EF-C	1.8E-04	0.200	0.088%	YES		0.1%
47	Tributyl phosphate	8	001-EF-D	1.5E-04	0.200	0.077%	YES		0.1%
47	Tributyl phosphate	10	001-EF-E	1.5E-04	0.200	0.076%	YES		0.1%
47	Tributyl phosphate	12	001-EF-F	1.8E-04	0.200	0.092%	YES		0.1%
47	Tributyl phosphate	14	001-EF-G	1.6E-04	0.200	0.082%	YES		0.1%
47	Tributyl phosphate	16	001-EF-H		0.200				0.1%
47	Tributyl phosphate	2	002-IN-A	1.4E-04	0.200	0.069%	YES		0.1%
47	Tributyl phosphate	4			0.200				0.1%
47	Tributyl phosphate	6			0.200				0.1%
47	Tributyl phosphate	8			0.200				0.1%
47	Tributyl phosphate	10			0.200				0.1%
47	Tributyl phosphate	12			0.200				0.1%
47	Tributyl phosphate	14			0.200				0.1%
47	Tributyl phosphate	16	002-IN-H	1.4E-04	0.200	0.072%	YES		0.1%
47	Tributyl phosphate	2	002-EF-A	1.5E-04	0.200	0.073%	YES		0.1%
47	Tributyl phosphate	4	002-EF-B	1.4E-04	0.200	0.068%	YES		0.1%

COPC #	Analyte	End Time (h)	Position	Conc. (ppm)	OEL (ppm)	Fraction of OEL	Measurement < DL|RL?	Quality Code	Approx. DL|RL (%OEL)
47	Tributyl phosphate	6	002-EF-C	1.5E-04	0.200	0.073%	YES		0.1%
47	Tributyl phosphate	8	002-EF-D	1.4E-04	0.200	0.071%	YES		0.1%
47	Tributyl phosphate	10	002-EF-E	1.6E-04	0.200	0.081%	YES		0.1%
47	Tributyl phosphate	12	002-EF-F	1.4E-04	0.200	0.070%	YES		0.1%
47	Tributyl phosphate	14	002-EF-G	1.6E-04	0.200	0.079%	YES		0.1%
47	Tributyl phosphate	16	002-EF-H	1.4E-04	0.200	0.068%	YES		0.1%
48	Dibutyl butylphosphonate	2	001-IN-A		0.007				1.3%
48	Dibutyl butylphosphonate	4			0.007				1.3%
48	Dibutyl butylphosphonate	6			0.007				1.3%
48	Dibutyl butylphosphonate	8			0.007				1.3%
48	Dibutyl butylphosphonate	10			0.007				1.3%
48	Dibutyl butylphosphonate	12			0.007				1.3%
48	Dibutyl butylphosphonate	14			0.007				1.3%
48	Dibutyl butylphosphonate	16	001-IN-H	6.7E-05	0.007	0.959%	YES		1.3%
48	Dibutyl butylphosphonate	2	001-EF-A	8.2E-05	0.007	1.17%	YES		1.3%
48	Dibutyl butylphosphonate	4	001-EF-B	8.8E-05	0.007	1.25%	YES		1.3%
48	Dibutyl butylphosphonate	6	001-EF-C	9.1E-05	0.007	1.30%	YES		1.3%
48	Dibutyl butylphosphonate	8	001-EF-D	7.9E-05	0.007	1.13%	YES		1.3%
48	Dibutyl butylphosphonate	10	001-EF-E	7.8E-05	0.007	1.11%	YES		1.3%
48	Dibutyl butylphosphonate	12	001-EF-F	9.4E-05	0.007	1.35%	YES		1.3%
48	Dibutyl butylphosphonate	14	001-EF-G	8.5E-05	0.007	1.21%	YES		1.3%
48	Dibutyl butylphosphonate	16	001-EF-H		0.007				1.3%
48	Dibutyl butylphosphonate	2	002-IN-A	7.1E-05	0.007	1.01%	YES		1.3%
48	Dibutyl butylphosphonate	4			0.007				1.3%
48	Dibutyl butylphosphonate	6			0.007				1.3%
48	Dibutyl butylphosphonate	8			0.007				1.3%
48	Dibutyl butylphosphonate	10			0.007				1.3%
48	Dibutyl butylphosphonate	12			0.007				1.3%
48	Dibutyl butylphosphonate	14			0.007				1.3%
48	Dibutyl butylphosphonate	16	002-IN-H	7.5E-05	0.007	1.06%	YES		1.3%
48	Dibutyl butylphosphonate	2	002-EF-A	7.5E-05	0.007	1.08%	YES		1.3%
48	Dibutyl butylphosphonate	4	002-EF-B	7.0E-05	0.007	0.999%	YES		1.3%
48	Dibutyl butylphosphonate	6	002-EF-C	7.5E-05	0.007	1.07%	YES		1.3%
48	Dibutyl butylphosphonate	8	002-EF-D	7.3E-05	0.007	1.04%	YES		1.3%
48	Dibutyl butylphosphonate	10	002-EF-E	8.3E-05	0.007	1.18%	YES		1.3%
48	Dibutyl butylphosphonate	12	002-EF-F	7.2E-05	0.007	1.03%	YES		1.3%
48	Dibutyl butylphosphonate	14	002-EF-G	8.1E-05	0.007	1.16%	YES		1.3%
48	Dibutyl butylphosphonate	16	002-EF-H	7.0E-05	0.007	1.01%	YES		1.3%
51	Pyridine	2	001-IN-A		1.000				0.02%
51	Pyridine	4			1.000				0.02%
51	Pyridine	6			1.000				0.02%
51	Pyridine	8			1.000				0.02%
51	Pyridine	10			1.000				0.02%
51	Pyridine	12			1.000				0.02%
51	Pyridine	14			1.000				0.02%
51	Pyridine	16	001-IN-H		1.000				0.02%
51	Pyridine	2	001-EF-A		1.000				0.02%
51	Pyridine	4	001-EF-B		1.000				0.02%
51	Pyridine	6	001-EF-C		1.000				0.02%
51	Pyridine	8	001-EF-D		1.000				0.02%
51	Pyridine	10	001-EF-E		1.000				0.02%
51	Pyridine	12	001-EF-F		1.000				0.02%
51	Pyridine	14	001-EF-G		1.000				0.02%
51	Pyridine	16	001-EF-H		1.000				0.02%
51	Pyridine	2	002-IN-A	2.3E-04	1.000	0.023%	YES		0.02%
51	Pyridine	4			1.000				0.02%
51	Pyridine	6			1.000				0.02%
51	Pyridine	8			1.000				0.02%
51	Pyridine	10			1.000				0.02%
51	Pyridine	12			1.000				0.02%
51	Pyridine	14			1.000				0.02%
51	Pyridine	16	002-IN-H	2.3E-04	1.000	0.023%	YES		0.02%
51	Pyridine	2	002-EF-A	2.2E-04	1.000	0.022%	YES		0.02%
51	Pyridine	4	002-EF-B	2.3E-04	1.000	0.023%	YES		0.02%

COPC #	Analyte	End Time (h)	Position	Conc. (ppm)	OEL (ppm)	Fraction of OEL	Measurement < DL|RL?	Quality Code	Approx. DL|RL (%OEL)
51	Pyridine	6	002-EF-C	2.4E-04	1.000	0.024%	YES		0.02%
51	Pyridine	8	002-EF-D	2.3E-04	1.000	0.023%	YES		0.02%
51	Pyridine	10	002-EF-E	2.3E-04	1.000	0.023%	YES		0.02%
51	Pyridine	12	002-EF-F	2.2E-04	1.000	0.022%	YES		0.02%
51	Pyridine	14	002-EF-G	2.2E-04	1.000	0.022%	YES		0.02%
51	Pyridine	16	002-EF-H	2.2E-04	1.000	0.022%	YES		0.02%
52	2,4-Dimethylpyridine	2	001-IN-A		0.500				0.1%
52	2,4-Dimethylpyridine	4			0.500				0.1%
52	2,4-Dimethylpyridine	6			0.500				0.1%
52	2,4-Dimethylpyridine	8			0.500				0.1%
52	2,4-Dimethylpyridine	10			0.500				0.1%
52	2,4-Dimethylpyridine	12			0.500				0.1%
52	2,4-Dimethylpyridine	14			0.500				0.1%
52	2,4-Dimethylpyridine	16	001-IN-H		0.500				0.1%
52	2,4-Dimethylpyridine	2	001-EF-A		0.500				0.1%
52	2,4-Dimethylpyridine	4	001-EF-B		0.500				0.1%
52	2,4-Dimethylpyridine	6	001-EF-C		0.500				0.1%
52	2,4-Dimethylpyridine	8	001-EF-D		0.500				0.1%
52	2,4-Dimethylpyridine	10	001-EF-E		0.500				0.1%
52	2,4-Dimethylpyridine	12	001-EF-F		0.500				0.1%
52	2,4-Dimethylpyridine	14	001-EF-G		0.500				0.1%
52	2,4-Dimethylpyridine	16	001-EF-H		0.500				0.1%
52	2,4-Dimethylpyridine	2	002-IN-A	2.5E-04	0.500	0.050%	YES		0.1%
52	2,4-Dimethylpyridine	4			0.500				0.1%
52	2,4-Dimethylpyridine	6			0.500				0.1%
52	2,4-Dimethylpyridine	8			0.500				0.1%
52	2,4-Dimethylpyridine	10			0.500				0.1%
52	2,4-Dimethylpyridine	12			0.500				0.1%
52	2,4-Dimethylpyridine	14			0.500				0.1%
52	2,4-Dimethylpyridine	16	002-IN-H	2.5E-04	0.500	0.050%	YES		0.1%
52	2,4-Dimethylpyridine	2	002-EF-A	2.4E-04	0.500	0.047%	YES		0.1%
52	2,4-Dimethylpyridine	4	002-EF-B	2.5E-04	0.500	0.049%	YES		0.1%
52	2,4-Dimethylpyridine	6	002-EF-C	2.6E-04	0.500	0.051%	YES		0.1%
52	2,4-Dimethylpyridine	8	002-EF-D	2.5E-04	0.500	0.051%	YES		0.1%
52	2,4-Dimethylpyridine	10	002-EF-E	2.4E-04	0.500	0.049%	YES		0.1%
52	2,4-Dimethylpyridine	12	002-EF-F	2.4E-04	0.500	0.047%	YES		0.1%
52	2,4-Dimethylpyridine	14	002-EF-G	2.4E-04	0.500	0.049%	YES		0.1%
52	2,4-Dimethylpyridine	16	002-EF-H	2.4E-04	0.500	0.048%	YES		0.1%

Appendix E

Plots of Other COPCs with Significant (2–10% of the OEL) Detected Values

Appendix E

Plots of Other COPCs with Significant (2–10% of the OEL) Detected Values

1,3-Butadiene (see Figure E.1) – The detection limit (DL) for 1,3-butadiene corresponds to approximately 2.1% of its OEL. All inlet and outlet values measured between the two respirator cartridges were less than the DL. There is no indication of breakthrough for 1,3-butadiene.

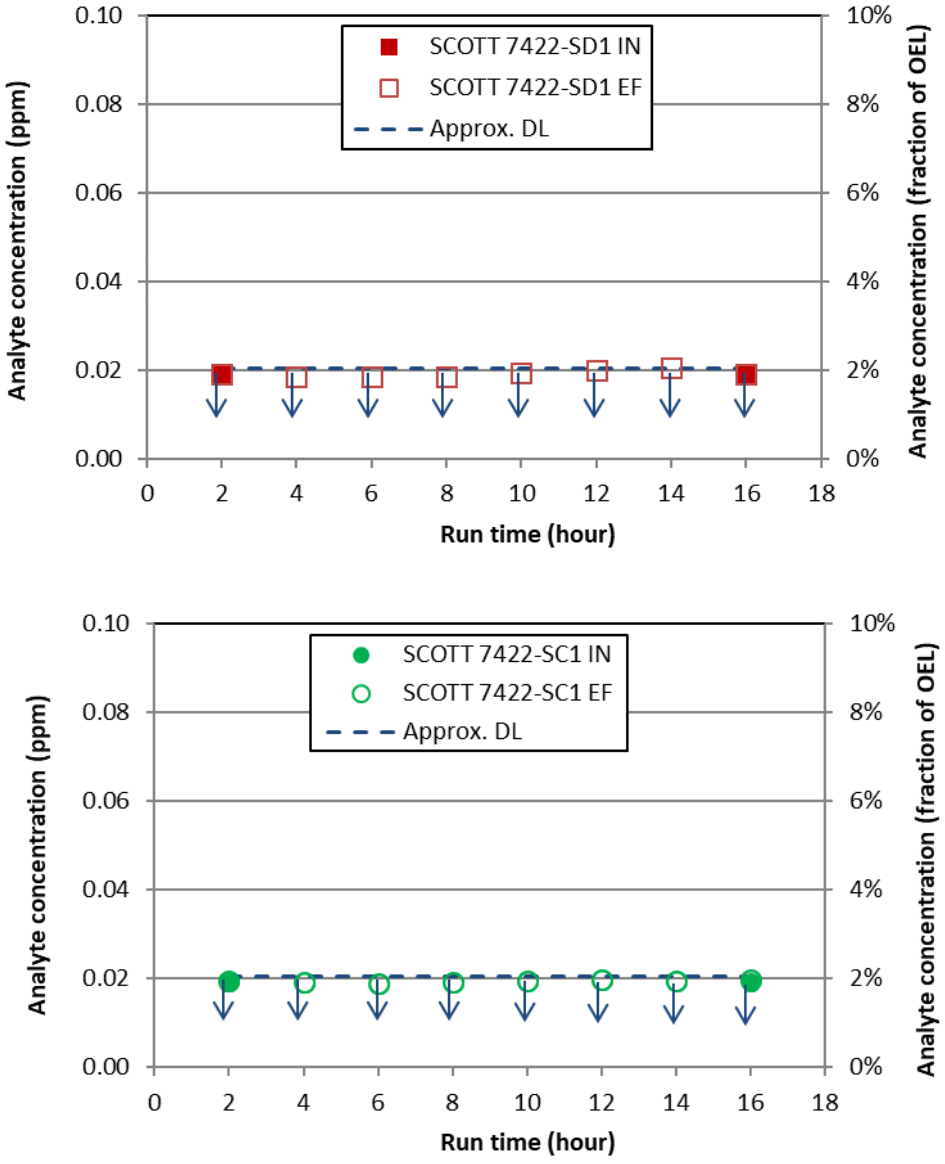

Figure E.1. Plot of Measured 1,3-Butadiene Concentrations before the Inlets and after the Outlets of the two Respirator Cartridges Tested (SCOTT 7422-SD1 and SCOTT 7422-SC1). Data points noted with ↓ indicates measurements less than the DL or reporting limit (RL).

Formaldehyde (see Figure E.2) – The DL for formaldehyde corresponds to approximately 0.62% of its OEL. All inlet and outlet values measured between the two respirator cartridges were less than 10% of the OEL—specifically, less than 6%. The first inlet values for both respirator cartridges were the highest of all measurements (4.0% and 5.9% of the OEL, respectively). These inlet measurements were much lower at the end of each campaign (0.95% and 1.5% of the OEL, respectively). The outlet measurements for both respirators were greater than the DL for the early readings, but generally appeared to follow a decrease with time like the inlet values. Since the outlet concentrations were higher than the DL, early breakthrough could be an explanation. However, environmental background interference is another possibility.

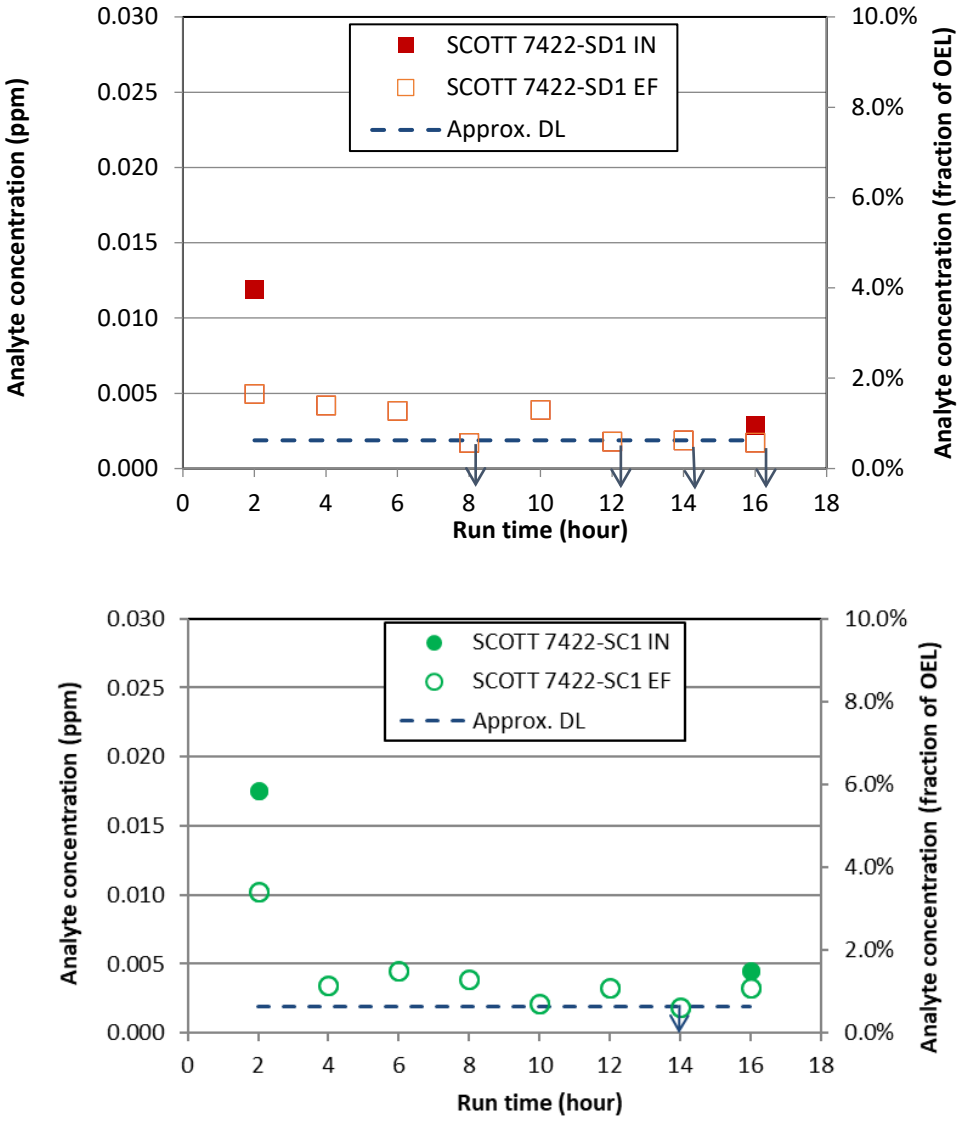

Figure E.2. Plot of Measured Formaldehyde Concentrations before the Inlets and after the Outlets of the two Respirator Cartridges Tested (SCOTT 7422-SD1 and SCOTT 7422-SC1). Data points noted with ↓ indicates measurements less than the DL or RL.

***Furan (see Figure E.3)* –** Using the Tenax method,[17] the DL for furan corresponds to approximately 0.9% of the OEL. However, the analytical RL is approximately 26% of the OEL.[18] Despite low level detections of furan up to 2.4% of the OEL, all inlet and outlet measurements were less than the RL. Therefore, there is no indication of breakthrough over the measured time period for either cartridge tested.

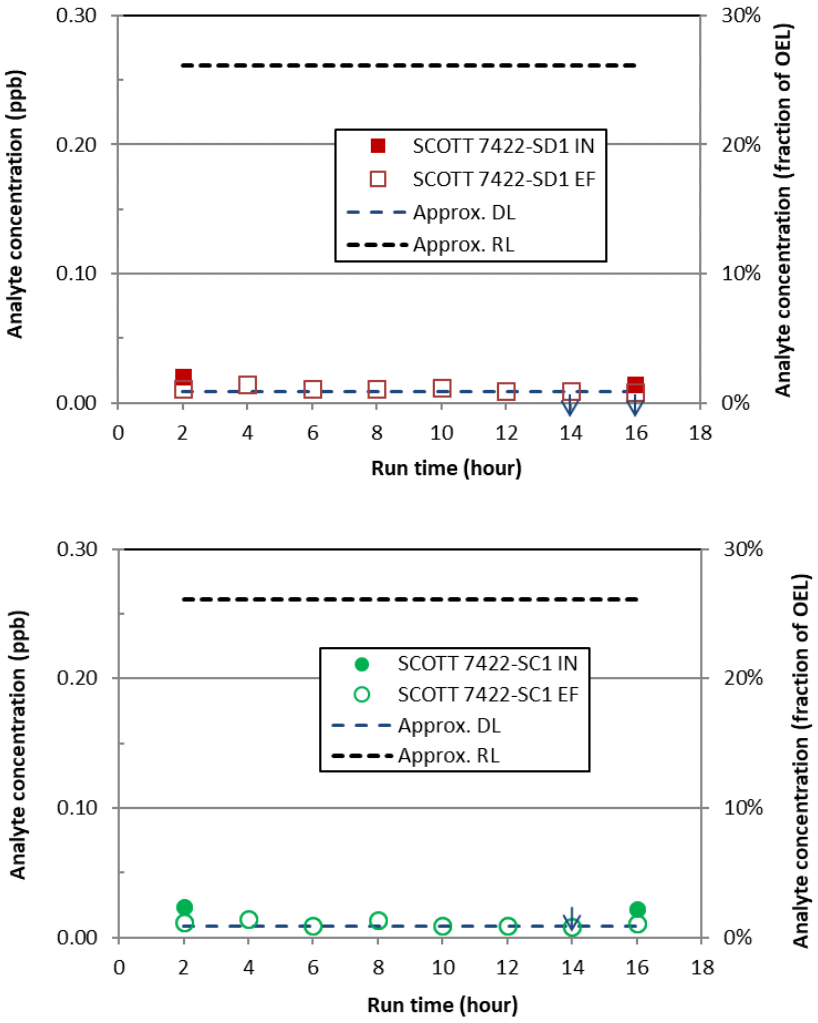

Figure E.3. Plot of Measured Furan Concentrations before the Inlets and after the Outlets of the two Respirator Cartridges Tested (SCOTT 7422-SD1 and SCOTT 7422-SC1). Data points noted with ↓ indicates measurements less than the DL.

[17] Using the Carbotrap 300 TDU method, only two Influent readings for furan (both on SC1 319% and 392% of the OEL) were above the RL/DL. All other Influent and Effluent readings for furan using the Carbotrap 300 TDU method were below the RL/DL.

[18] Furan and substituted furans were reported in cartridge tests to a DL, which is a statistically calculated value. Most COPC analyses, including historic furan analysis has been reported to an RL, which represents a quantitation limit referring to the minimum mass of an analyte that can be measured within specified limits of precision and accuracy. Freeman et al. [19] discusses DL and RL differences for the furan COPCs in more detail and recommends the use of RLs versus DLs for interpretation of cartridge breakthrough data.

***2,3-Dihydrofuran* (*see Figure E.4*)** – The DL for 2,3-dihydrofuran corresponds to approximately 1.8% of the OEL. However, the analytical RL is approximately 25% of the OEL. Despite low-level detections of 2,3-dihydrofuran up to 5.0% of the OEL, all inlet and outlet measurements were less than the RL, and most measurements were also less than the DL. Only two inlet and three outlet points between the two cartridges were greater than the DL. There is no indication of breakthrough over the measured time period for either cartridge tested.

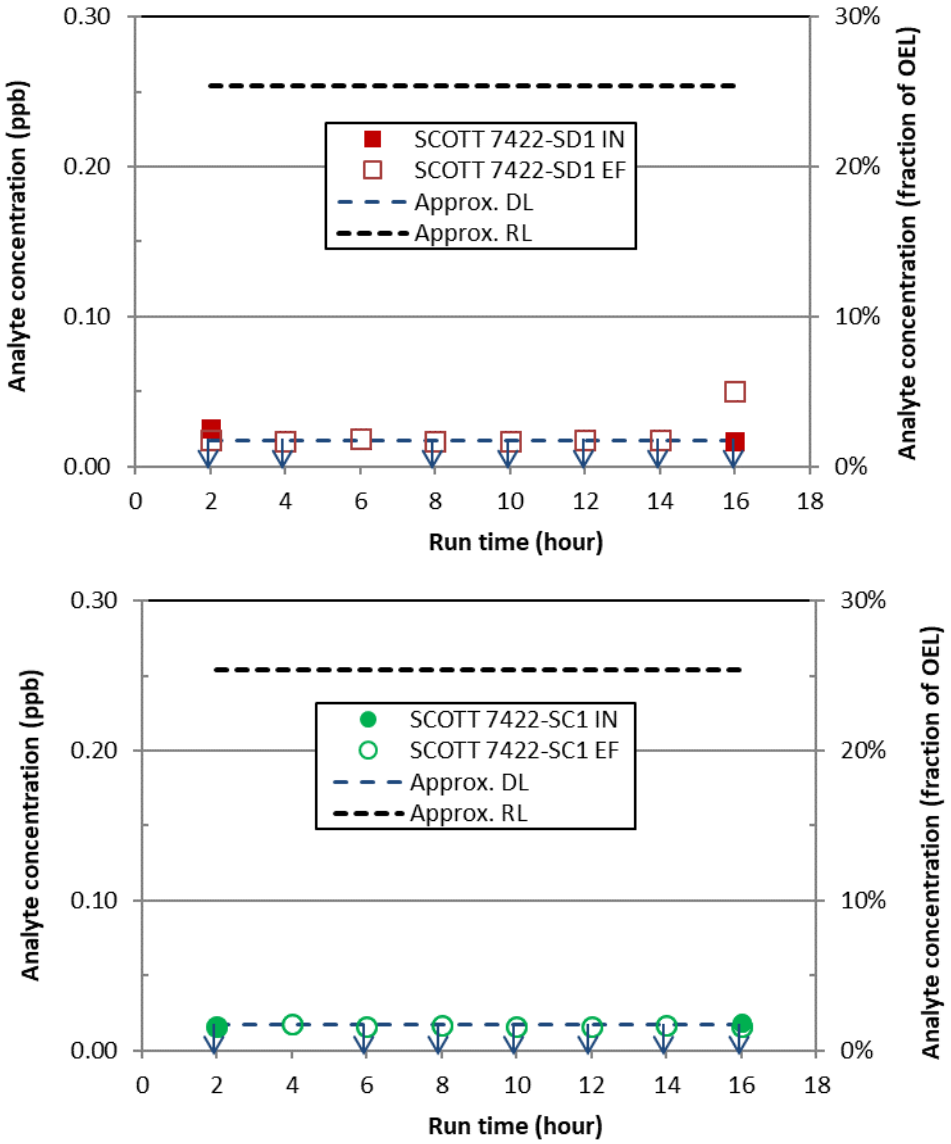

Figure E.4. Plot of Measured 2,3-Dihydrofuran Concentrations before the Inlets and after the Outlets of the two Respirator Cartridges Tested (SCOTT 7422-SD1 and SCOTT 7422-SC1). Data points noted with ↓ indicates measurements less than the DL.

2,5-Dihydrofuran (see Figure E.5) **–** Using the Tenax method,[19] the DL for 2,5-dihydrofuran corresponds to approximately 2.2% of the OEL. However, the analytical RL is approximately 25% of the OEL. Despite a single low-level inlet detection of 2,3-dihydrofuran up to 2.8% of the OEL, all other inlet and outlet measurements were less than the DL, and all measurements were significantly less than the RL. There is no indication of breakthrough over the measured time period for either cartridge tested.

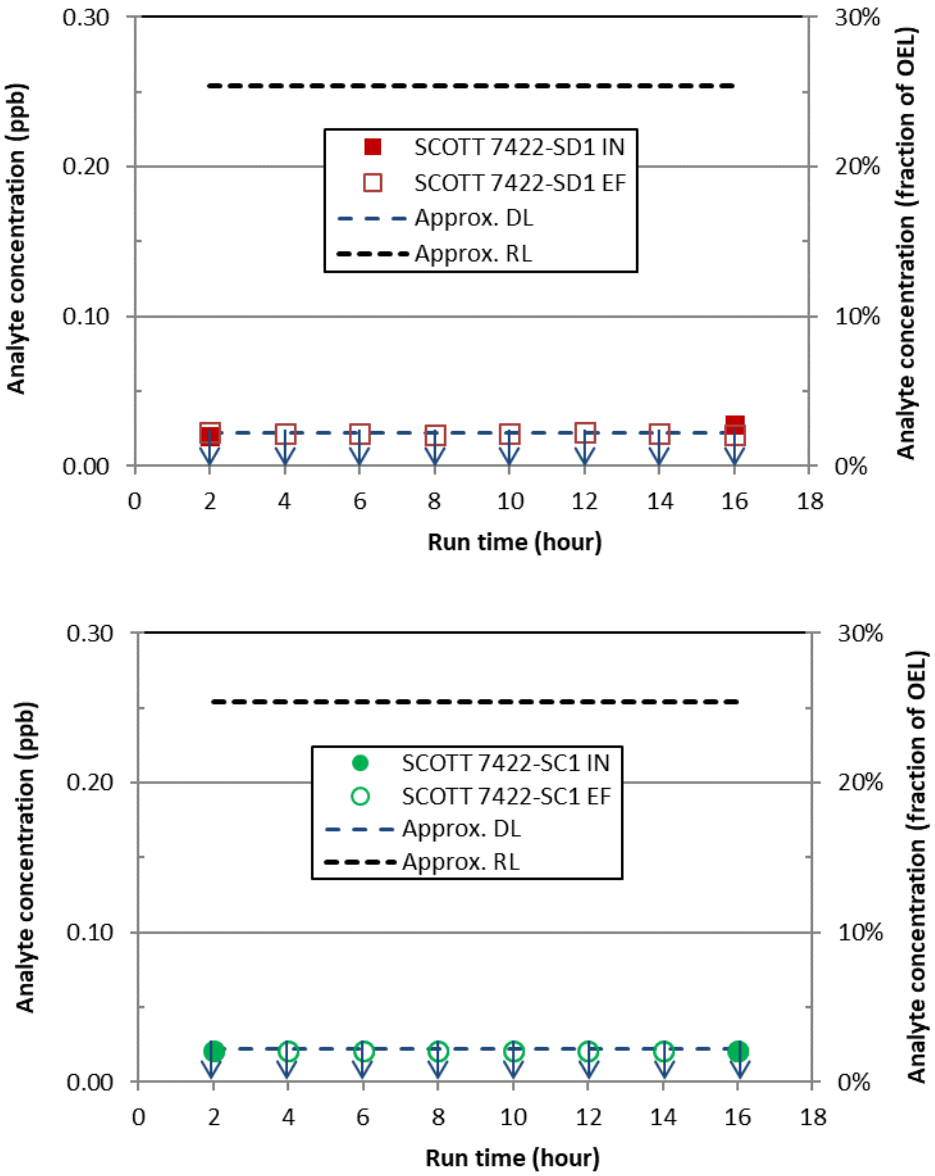

Figure E.5. Plot of Measured 2,5-Dihydrofuran Concentrations before the Inlets and after the Outlets of the two Respirator Cartridges Tested (SCOTT 7422-SD1 and SCOTT 7422-SC1). Data points noted with ↓ indicates measurements less than the DL.

[19] All 2,5-dihydrofuran measurements using the Carbotrap 300 TDU method were below the RL/DL.

2-Methylfuran (see Figure E.6) **–** Using the Tenax method,[20] the DL for 2-methylfuran corresponds to approximately 1.9% of the OEL. However, the analytical RL is approximately 22% of the OEL. Despite low level detections of 2-methylfuran up to 4.7% of the OEL, all other inlet and outlet measurements were less than the DL, and all measurements were significantly less than the RL. There is no indication of breakthrough over the measured time period for either cartridge tested.

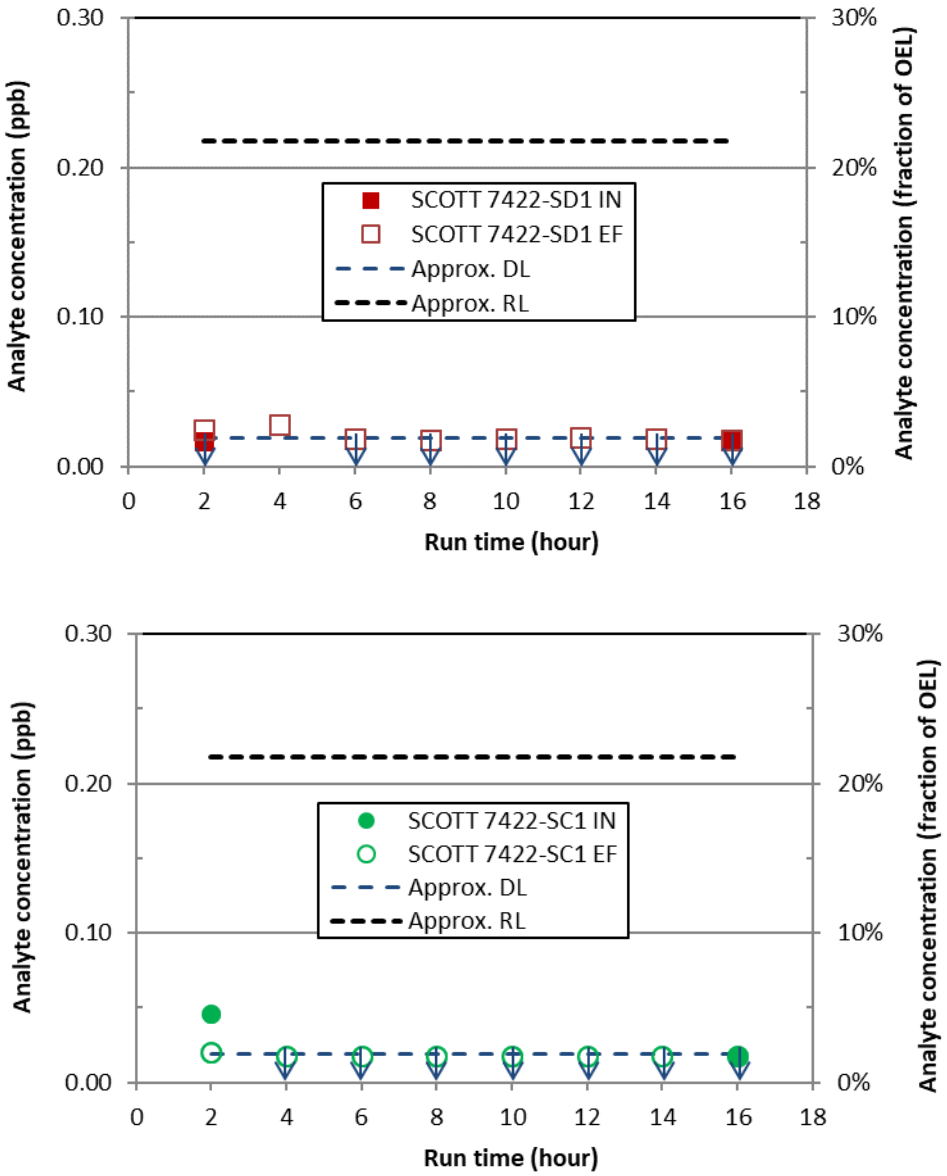

Figure E.6. Plot of Measured 2-Methylfuran Concentrations before the Inlets and after the Outlets of the Two Respirator Cartridges Tested (SCOTT 7422-SD1 and SCOTT 7422-SC1). Data points noted with ↓ indicates measurements less than the DL.

[20] All the 2-methylfuran measurements using the Carbotrap 300 TDU method were below the RL/DL.

2,5-Dimethylfuran (see Figure E.7) **–** The DL for 2,5-dimethylfuran corresponds to approximately 3.1% of the OEL. However, the analytical RL is approximately 19% of the OEL. All inlet and outlet measurements were less than the DL and RL. There is no indication of breakthrough over the measured time period for either cartridge tested.

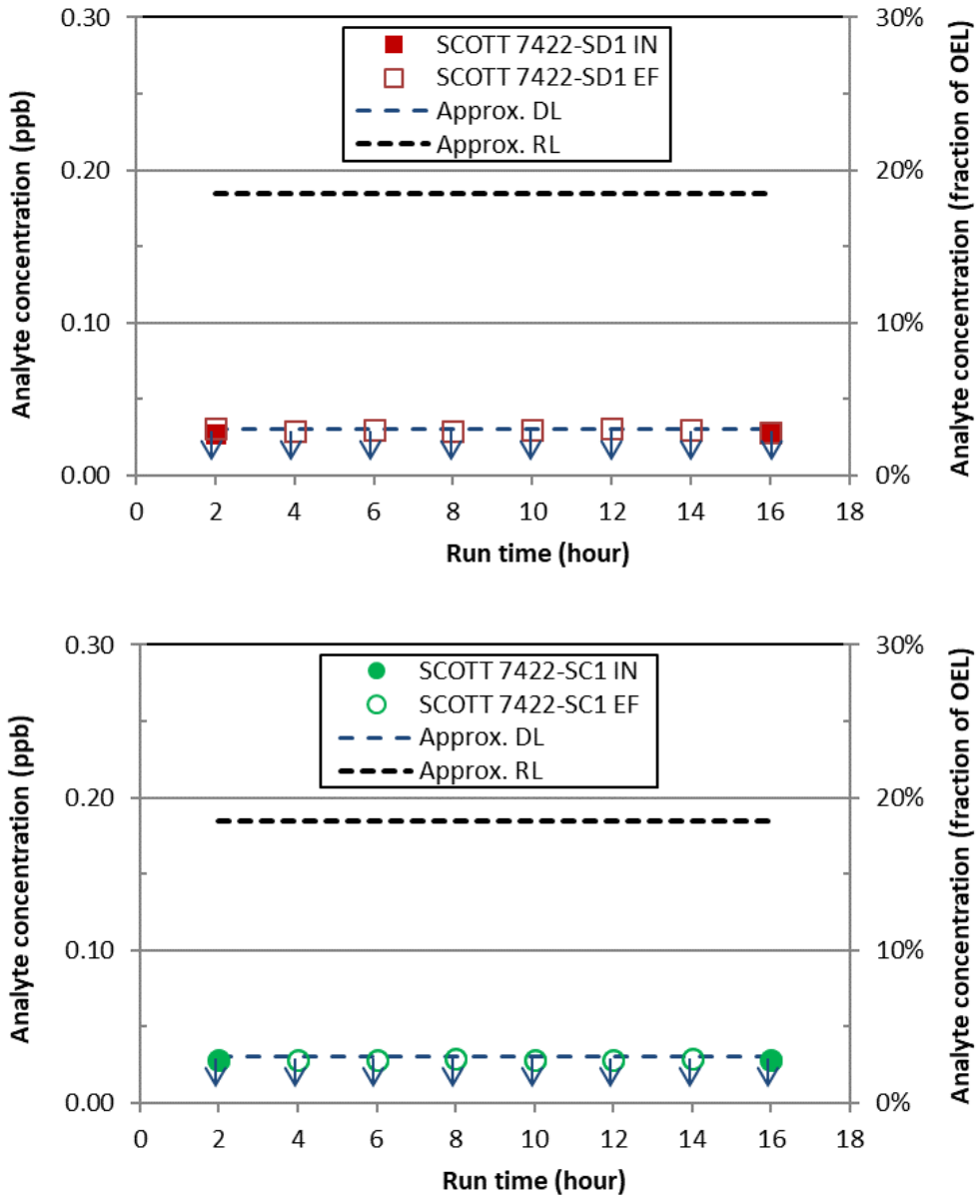

Figure E.7. Plot of Measured 2,5-Dimethylfuran Concentrations before the Inlets and after the Outlets of the Two Respirator Cartridges Tested (SCOTT 7422-SD1 and SCOTT 7422-SC1). Data points noted with ↓ indicates measurements less than the DL.

2-Pentylfuran (see Figure E.8) **–** The DL for 2-pentylfuran corresponds to approximately 1.6% of the OEL. However, the analytical RL is approximately 13% of the OEL. Despite low level detections of 2-pentylfuran up to 5.6% of the OEL, most of the inlet and outlet measurements were less than 2% of the OEL and less than the DL. All inlet and outlet measurements were significantly less than the RL. There is no indication of breakthrough over the measured time period for either cartridge tested.

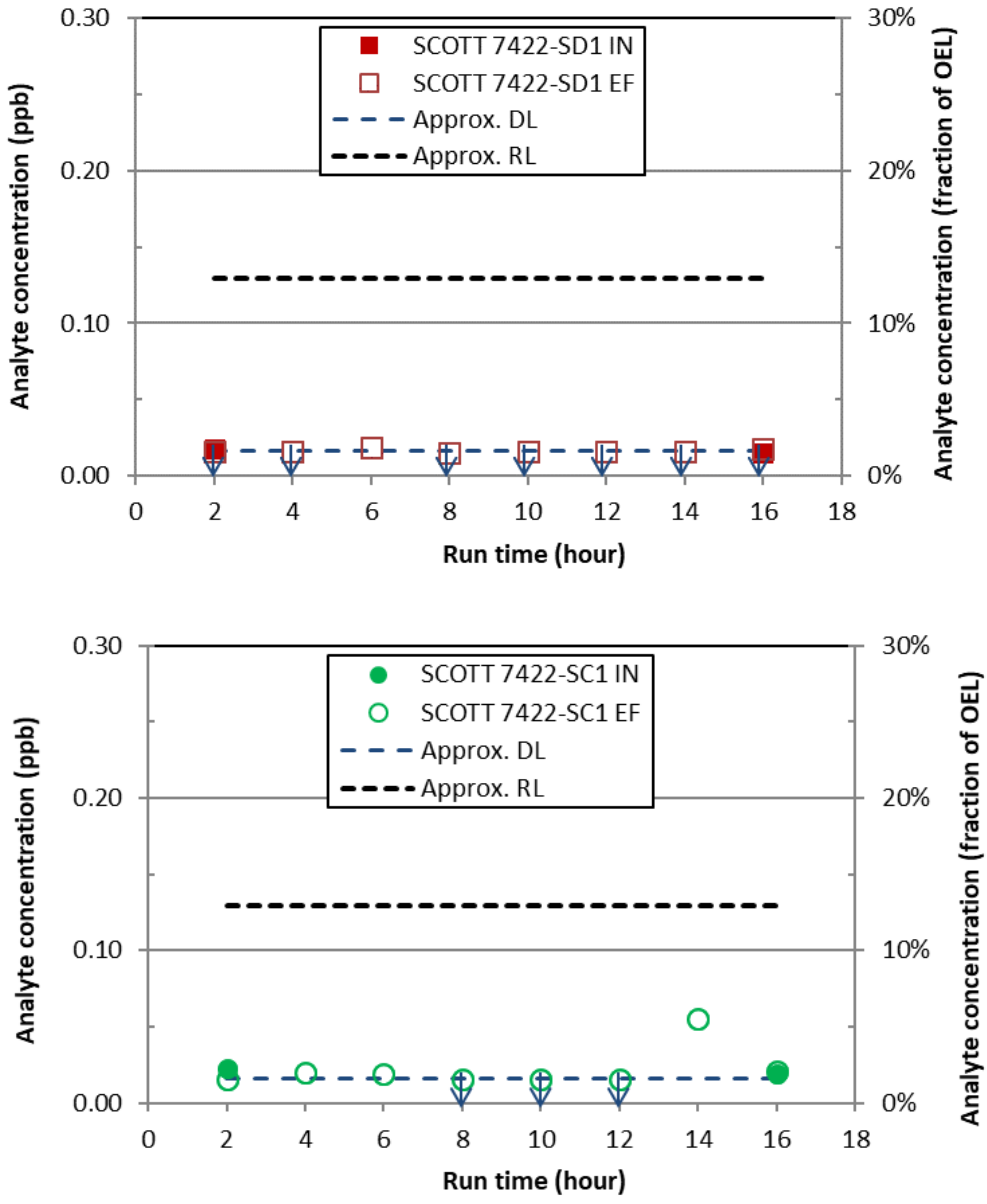

Figure E.8. Plot of Measured 2-Pentylfuran Concentrations before the Inlets and after the Outlets of the Two Respirator Cartridges Tested (SCOTT 7422-SD1 and SCOTT 7422-SC1). Data points noted with ↓ indicates measurements less than the DL.

***2-Propylfuran* (*see Figure E.9*)** – The DL for 2-propylfuran corresponds to approximately 2.7% of the OEL. However, the analytical RL is approximately 16% of the OEL. Despite a single low level inlet detection of 2-propylfuran up to 3.0% of the OEL, all other inlet and outlet measurements were less than the DL, and all measurements were significantly less than the RL. There is no indication of breakthrough over the measured time period for either cartridge tested.

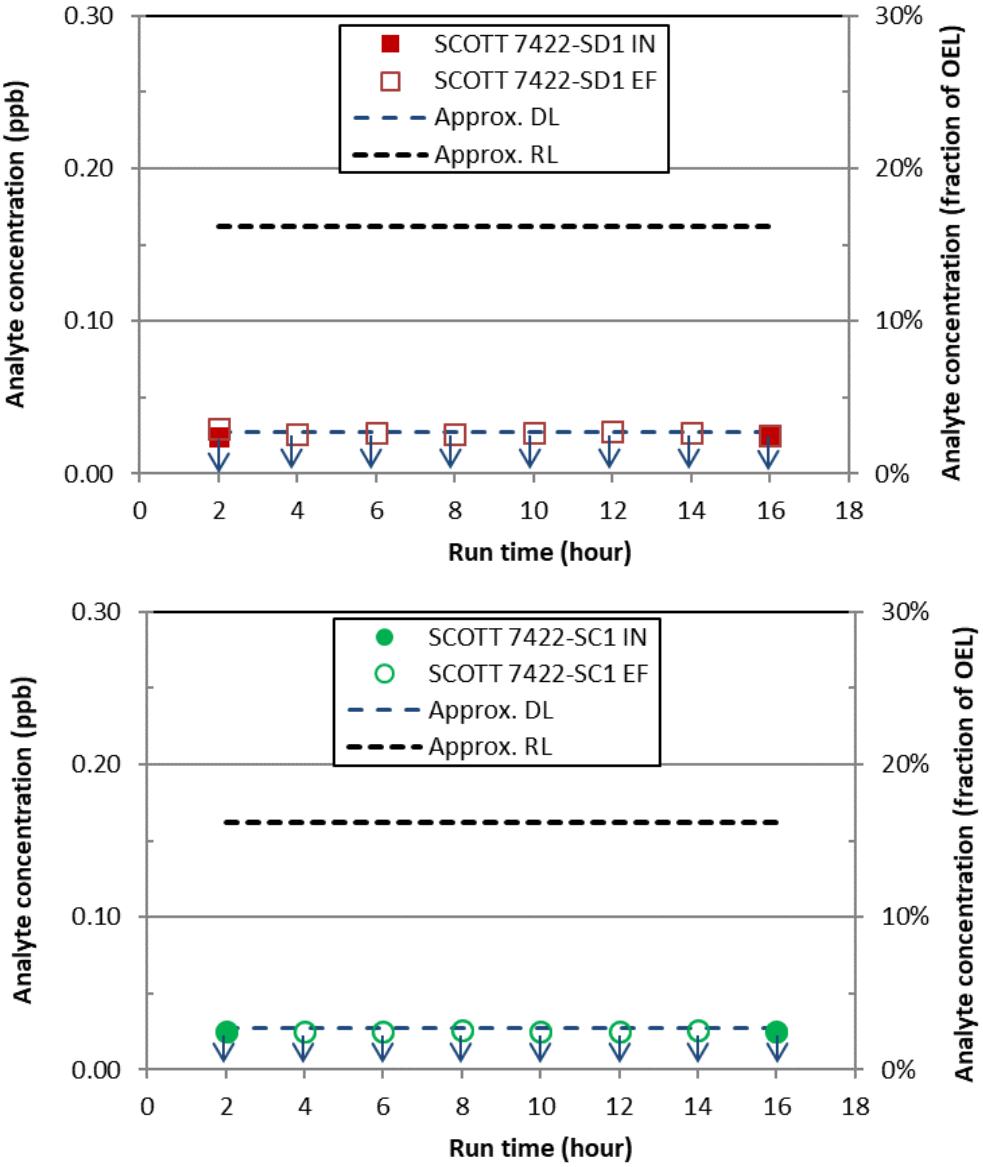

Figure E.9. Plot of Measured 2-Propylfuran Concentrations before the Inlets and after the Outlets of the Two Respirator Cartridges Tested (SCOTT 7422-SD1 and SCOTT 7422-SC1). Data points noted with ↓ indicates measurements less than the DL.

Appendix F

Historical Data Comparison

Appendix F

Historical Data Comparison

Headspace-characterization data and Industrial-Hygiene data—hereafter referred to as "TWINS HS" and "TWINS IH"—were obtained from the Tank Characterization Database via the Tank Waste Information Network System (TWINS). All vapor analysis results for the AP exhaust were obtained via a TWINS query on June 20, 2016, for TWINS HS,[21] and another query on March 8, 2017, for TWINS IH. More recent headspace data were also obtained from the Site-Wide Industrial Hygiene Database (SWIHD) by a query on March 8, 2017, that obtained all headspace data present as of that date, producing a set referred to as "SWIHD HS."

F.1 Data Handling and Filtering

For the TWINS IH and SWIHD HS data sets, each line of data in the set represents a measurement made on the contents of a single sorbent tube (or other collector). It was frequently the case that a single sample air stream passed through a series of two or more collectors, which meant that the actual sample concentration was the sum of the contributions from all the collectors in the series. The intent of this sample collection method was to have most or all of the vapor deposited in the first collector, with a relatively small amount of breakthrough into the second collector.

The TWINS IH and SWIHD HS data sets currently do not contain explicit information to denote which data came from collectors in series or to identify which collectors belong in a set. This absence causes some difficulty in identifying which data should be summed together to obtain the true concentration for the sample stream. For the purpose of providing a historical data set for comparison to cartridge data, use of the uncombined raw data was considered to be adequate. Some historical concentration maxima and averages will be underestimated as a result; the underestimates are expected to be within a factor of 2 of the true (summed) concentration value because in almost all cases there are no more than two collectors in series.

Some historical concentration data were removed from consideration because they were flagged as being "bad" data for the current purpose; i.e., they had certain measurement quality issues. TWINS HS data were eliminated from consideration if they were

- Quality Assurance samples (blanks, laboratory control samples, or spikes)
- Marked as suspect (Data Qualifier flag S)
- Associated with a contaminant in a blank, trip blank, or field blank (Data Qualifier flags B, T, or F)
- Marked with a laboratory-defined flag whose meaning was not generically defined and might indicate a serious data-quality issue (Data Qualifier flag Y).

[21] No data have been added to TWINS HS since April 2005, so the June 2016 download does not require updating.

TWINS IH and SWIHD HS data were eliminated from consideration if they

- Were associated with a contaminant in a blank (Data Qualifier flag b or B), a laboratory control sample that was out of range (Data Qualifier flag a), a low-level standard with a percent recovery outside the specified range (Data Qualifier flag L)
- Had an excessive relative percent difference between duplicates (Data Qualifier flag c)
- Were marked with a laboratory-defined flag whose meaning was not generically defined and might indicate a serious data-quality issue (Data Qualifier flag Y).

TWINS HS results associated with chemicals that were ambiguously identified (e.g., "alkane," "unknown," "C6 ketone") were deleted unless the molecular weight of one of the chemicals could be unambiguously specified (e.g., "octanenitrile and others" was kept). In these mixture cases, where the Chemical ID consisted of a Chemical Abstracts Service (CAS) number followed by M, the molecular weight of the identified chemical was added to the data record, the CAS number was used for the Chemical ID, and the concentration expressed in parts per million (absent from the downloaded database) was calculated from the concentration in milligrams per cubic meter at 25°C and the molecular weight.

A number of chemicals in the TWINS IH data set had "needs conversion" notes in the concentration (mg/m^3 and ppm) columns, rather than numbers, and required calculations to supply these concentrations. The calculations made use of values already in the database: the molecular weight, the Reported Value and its units, and the Sample Volume and its units. A temperature of 25°C and a pressure of 1 atm were assumed.

The method described above was consistent with that used in PNNL-26820 Rev. A[22] (the FY17 update to the COPC assessment), except that measurements that were non-reports – less than the reporting limit (RL) for the analyte – were excluded in PNNL-26820 and were not excluded in this study. More detail of the data processing method is given in PNNL-26820.

Finally, the data were filtered to make sure the historical sampling location was similar to the cartridge test sampling location. For comparison to cartridge tests that were made using a gas stream from the AP stack, only exhaust measurements were appropriate. The TWINS HS database contained data identified as having the location "AP Ventilation", which were included as part of this analysis. The SWIHD HS database contained no data for the AP stack and therefore was not used in this analysis. The TWINS IH database required sorting, as described below, so that only exhaust data were used.

The AP Farm data in the TWINS IH database that were used in analysis all had the location "Primary Exhauster" listed. Data where the location was an individual tank name, "CAM Cabinet", or "Inside Farm" were not used. They may have been relevant to in-stack concentrations, but their apparent location made that unclear. The data that were used almost all had "stack" or "exhauster" somewhere in the survey title. No data from the upgraded AP exhauster that began operations in September 2016, subsequent to these cartridge tests, were included in this historic analysis.

[22] Mahoney, LA and EW Hoppe. 2017. *Hanford Tank Vapor FY 2017 Chemicals of Potential Concern Update*. PNNL-26820 Rev. A, Pacific Northwest National Laboratory, Richland, Washington. Unpublished.

F.2 Data Tabulation

Maximum and average[23] exhaust concentrations were found for each analyte for the combined TWINS IH and SWIHD HS databases.[24] These maxima and averages are given in Table F.1, [25] together with Occupational Exposure Limits (OELs) and counts of the number of samples. The notation "n/a" is used where there were no measurements of the analyte.

Because the TWINS HS data were older, they were considered less representative of the vapors present during cartridge testing and the default was to omit them from calculations. However, in some cases the maximum and average for an analyte were considerably different if they were determined from a combination of all three databases. Whenever this was the case,(26) the results for the three-database combination are tabulated along with those for the default two-database combination. That is, Table F.1 contains two rows for the chemical instead of one, with the upper row (the default two-database combination) in normal font and the lower row (the two-database combination) in italics. The two criteria for tabulating this extra information were 1) at least one historical concentration for the chemical exceeded the OEL and 2) there was a significant difference between the value obtained from the two-database combination and that from the three-database combination. The significant difference could be either that there were data for the three-database set but no data for the two-database set (i.e., data only in TWINS HS), or that there was a difference of a factor of three or more, in either direction, between the value obtained from the two-database combination and that from the three-database combination.

Because the reporting limits on concentrations in the historical database were generally higher than the reporting limits or DLs in the cartridge tests, it was necessary to analyze data in a way that would let the effect of <RL historical data be recognized. To do this, it was assumed that all of the non-reports in the databases had concentrations equal to the measurements' RLs. Then the following rules were applied:

1. If a maximum value was a non-report, it was marked as "<RL" in the table.
2. If all the data contributing to an average were non-reports, the average was marked as "<RL".
3. If the inclusion of non-reports in an average caused it to be more than a factor of two different, in either direction, from the value it would have had if only the reported concentrations were averaged, the average was marked with an asterisk ("*").

F.3 AP Exhauster: Comparison with Historical Data[27]

The maximum and average COPC concentrations measured during cartridge testing were compared to the maximum and average historical concentrations, and where there were differences, the historical data were examined for explanations in the type or circumstances of sampling.

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[23] Arithmetic average.

[24] Because the SWIHD HS database contained no exhauster data, the TWINS IH data were the only concentrations present in the "two-database" combination.

[25] All % OEL values were calculated from concentration data that had been rounded to a minimum of 3 significant figures.

[26] For the AP exhauster, no measurements met the criteria for including TWINS HS data in the table. None of the COPCs that were above their OELs had TWINS HS data that caused a factor of three change when included or that were the only data available. Therefore, TWINS HS data did not have a large enough impact to be included in the tables.

[27] Section F.3 was previously documented in Freeman et al.,[19] and is reproduced here for completeness.

Generally speaking, AP Farm tanks with headspaces upstream of the AP stack have been active over the whole period of record. A number of waste transfers, exchanges, or receipts from the 242-A evaporator have occurred between 2000 (when TWINS headspace data were taken) and the initiation of 2016 cartridge testing (June 24, 2016). These changes in waste contents have included receipts from the SY-102 and BY tanks and numerous interchanges within the A tank complex. The most recent activities, before cartridge testing, were in April 2016. So, on the one hand, the waste present in the AP tanks during cartridge testing could be different from that present during earlier stack sampling. On the other hand, activities in tanks affecting the AP stack will continue, and there is no way to be sure that historical data could not apply to future stack concentrations. Therefore, in the case of the AP stack, the age of historical data will not be taken as a reason to consider the historical data irrelevant.

The larger discrepancies, or apparent discrepancies, between cartridge inlet and historical concentrations are discussed in the following sections. Discrepancies are discussed if the historical concentration of a compound was greater than 10% of the OEL and the cartridge inlet concentration is between 20and 50% of the historical value. Discrepancies are considered significant only if the historical concentration was greater than 10% of the OEL and the cartridge inlet concentration is less than 20% of the historical value.

Many of these apparent discrepancies can be explained by the presence of historical disturbance conditions that were different from those present during cartridge testing. Appendix C of Freeman et al. [19] contains more information about assessing waste-disturbing operational activities, ventilation disturbances, and other conditions that would mean that a historical concentration was not appropriate for comparison to cartridge test inlet concentrations.

F.3.1 Nitrous Oxide

Nitrous oxide was not measured in cartridge testing. The highest nitrous oxide concentration found in the TWINS IH database was 25 ppm (50% of the OEL). This concentration was measured on September 6, 2006, during a 242-A evaporator campaign. Two of the three above-report results were from samples taken on May 9, 2006, during an SY-101 to AP-107 waste transfer (as recorded in the Best Basis Inventory (BBI)[28] activity database). The remaining above-report result was from a sample taken on June 23, 2005, more than a month after the end of the last preceding waste transfer on May 18, 2005. This June 23, 2005, measurement of 6.73 ppm (13% of the OEL) is the only one considered to have occurred during non-disturbance conditions.

F.3.2 Mercury

The maximum cartridge inlet concentration of 56% of the OEL is low compared to the historical maximum concentration of 0.117 mg/m^3 (468% of the OEL), although the average concentrations are similar for historical data and cartridge data. The maximum found in the historical data was measured on December 17, 2014, during a waste-disturbing activity involving a tank-to-tank transfer from AP-104 to AW-102 (December 15–19, 2014, according to the BBI tank activity database). Other high historical concentrations, listed in order of decreasing concentration, were:

- 0.110 mg/m^3, August 22, 2012, survey title “AP 104 Recirc Stack Sampling” – The BBI database confirms that AP-104 waste was being recirculated during August 20-23, 2012, which includes the survey date, with enough effect to release 3 kgal of gas.

[28] The BBI is the official database for tank waste inventory estimates at Hanford.

- 0.0269 mg/m^3, July 16, 2015, survey title indicates an evaporator campaign – The BBI database states that a transfer occurred from 242-A to AP-103 during July 12–22, 2015, which includes the survey date.

The highest of the remaining above-report concentrations is 0.0209 mg/m^3 (84% of the OEL). This and all lower concentrations, whether measured during waste disturbance or not, are low enough that the cartridge inlet maximum is greater than 20% of those historical data. The cartridge maximum is consistent[29] with the non-disturbed historical concentrations.

F.3.3 1,3-Butadiene

The maximum cartridge inlet concentration of <2% of the OEL, which is below the DL, is low compared to the historical maximum concentration, a below-report datum that had an RL of 0.145 ppm (<15% of the OEL), although the average concentrations are similar for historical and cartridge data. Most of the historical RLs are 0.05 ppm (5% of the OEL) or less. There are no above-report historical measurements. Because the cartridge test concentration was below its DL and there are no above-report historical data, it is unclear whether the inlet concentration was less than 20% of the historical maximum.

F.3.4 Formaldehyde

The maximum cartridge inlet concentration of 4% of the OEL is low compared to the historical maximum concentration of 0.0985 ppm (33% of the OEL). This maximum was measured during a transfer on May 13, 2014. Other high historical concentrations, listed in order of decreasing concentration, were:

- 0.081 ppm, August 29, 2012, survey title indicates a transfer – The BBI database indicates a transfer from AP-104 to 241-AW-106 occurred during August 27–31, 2012, which includes the survey date.
- 0.078 ppm, April 30, 2012, survey title indicates a transfer baseline – The BBI database shows no AP Farm transfer on or near this date, which confirms the baseline.

The maximum above-report concentration for non-disturbed conditions was 0.078 ppm (26% of the OEL). The cartridge inlet maximum inlet concentration was about 20% of this non-disturbance historical maximum concentration and is considered to be significantly lower than historical data.

F.3.5 Furan

The maximum cartridge inlet concentration of 392% of the OEL (measured by the Carbotrap 300 TDU tube) is very low compared to the historical maximum concentration, a below-report datum that had an RL of 52.3 ppb (<5230% of the OEL). That maximum historical measurement came from a Carbotrap 300 TDU tube sample taken on January 11, 2007. At 0.97 L, the sample volume was small compared to most of the AP samples in which furan was measured; this explains the high RL. The second-highest RL was 8.4 ppb (<840% of the OEL), and all other RLs were less than 1 ppb (<100% of the OEL). The unusually high <RL maximum accounts for the high average furan concentration as well. The highest above-reportable historical concentrations, listed in order of decreasing concentration, were:

[29] This section uses the thresholds from Appendix C in Freeman et al. [20]. Discrepancies are discussed if the maximum historical concentration of a compound was greater than 10% of the OEL and the maximum cartridge inlet concentration was less than 50% of the historical value. However, discrepancies are considered significant only if the maximum historical concentration was greater than 10% of the OEL and the maximum cartridge inlet concentration is less than 20% of the historical value.

- 2.8 ppb, December 17, 2014, survey title indicates a transfer – The BBI database indicates a transfer from AP-104 to AW-102 during December 15-19, 2014, which includes the survey date.
- 2.5 ppb, September 21, 2012, survey title indicates a transfer baseline – The BBI database shows the last preceding AP Farm transfer ended on September 4, 2012, which confirms the baseline.

The maximum above-report concentration for non-disturbed conditions was 2.5 ppb (250% of the OEL). Three other above-report measurements that are identified as transfer baselines are also above 1 ppb (100% of the OEL). The cartridge inlet maximum inlet concentration is higher than 20% of the maximum historical above-report concentration under non-disturbed conditions and is considered to be consistent.

F.3.6 2,3-Dihydrofuran

The maximum cartridge inlet concentration of 2.5% of the OEL (a below-report for which the RL was 25% of the OEL) is low compared to the historical maximum concentration, a below-report datum from April 27, 2016 that had an RL of 0.356 ppb (<36% of the OEL). However, there are no above-report historical concentrations, so no firm conclusion can be drawn about where the cartridge inlet concentration for this chemical lies with respect to historical data.

F.3.7 2,5-Dihydrofuran, 2-Methylfuran

As for furan, the maximum and average historical concentrations are controlled by the RL from a 0.97 L Carbotrap 300 TDU sample. Because these two furan chemicals have no above-report historical data, no conclusion can be drawn about where their cartridge inlet concentrations lie with respect to historical data.

F.3.8 2,5-Dimethylfuran, 2-Pentylfuran, 2-Heptylfuran, 2-Propylfuran

The maximum and average cartridge inlet concentration appear to be low compared to the historical maximum concentrations, which in all cases are below-report data. There are no above-report historical data for these chemicals, so no conclusion can be drawn about where their cartridge inlet concentrations lie with respect to historical data.

F.3.9 Ethylamine

The maximum cartridge inlet concentration of 0.4% of the OEL is low compared to the historical maximum concentration of 0.829 ppm (17% of the OEL). The historical data maximum, from an above-report data subset of eight values, was measured on November 11, 2005, with no indication either in the survey title or the BBI activity database that a disturbance had occurred. The cartridge inlet maximum inlet concentration is much less than 20% of the maximum historical above-report concentration under non-disturbed conditions.

F.3.10 N-nitrosodiethylamine

The maximum cartridge inlet concentration of <23% of the OEL, which is below the DL, is low compared to the historical maximum concentration of 0.328 ppb (328% of the OEL). This measurement was taken on August 16, 2012, during a tank-to-tank transfer from AW-106 to AP-101. There were six above-report concentrations in the data set. Other high above-report historical concentrations, listed in order of decreasing concentration, were:

- 0.088 ppb, August 22, 2012, during AP-104 recirculation (as was discussed for mercury data).
- 0.053 ppb, April 30, 2012, survey title indicates a transfer baseline – The BBI database shows no AP Farm transfer on or near this date, which confirms the baseline.

Of the six above-report concentrations in historical data, the highest for which there was no indication of disturbance was 0.053 ppm (53% of the OEL). Because the cartridge test concentration was below its DL, it is unclear whether it was less than 20% of the non-disturbance historical maximum.

F.3.11 N-nitrosomethylethylamine

The maximum cartridge inlet concentration of 45% of the OEL is lower than the historical maximum concentration of 0.334 ppb (111% of the OEL). This measurement was taken on October 31, 2013, and was titled as a baseline for a tank-to-tank transfer from AN-101 to AP-104. According to the BBI tank activity database, the last AP Farm transfer had ended on September 25, 2013, which confirms the baseline. The maximum cartridge inlet concentration was less than 50% but greater than 20% of the non-disturbance historical maximum and, therefore, was not substantially lower than the historical concentration.

F.3.12 N-nitrosomorpholine

The maximum cartridge inlet concentration of 23% of the OEL is lower than the historical maximum concentration of 0.309 ppb (52% of the OEL). This measurement, taken on October 23, 2011, was identified as a tank-to-tank transfer from AN-106 to AP-104. According to the BBI tank activity database, the transfer did occur on that date. There were 21 above-report concentrations in the data set. Other high above-report historical concentrations, listed in order of decreasing concentration, were:

- 0.26 ppb, August 6, 2012, survey title indicates an AP-101 to AP-105 transfer – The BBI database shows a transfer on this date.
- 0.20 ppb, August 22, 2012, during AP-104 recirculation (as was discussed for mercury data).
- 0.19 ppb, August 10, 2012, survey title indicates an AN-106 to AP-104 transfer – The BBI database shows a transfer from AP-105 to AP-101 on the preceding day, August 9, 2012. Headspace vapors could still have been elevated from a transfer that took place this soon before sampling.

Most of the remaining above-report data, whether measured during disturbance or not, are in the range from 0.11 ppb to 0.18 ppb (18 to 30% of the OEL). The maximum cartridge inlet concentration was less than 50% but greater than 20% of the non-disturbance historical maxima and, therefore, was not substantially lower than undisturbed historical concentrations.

F.3.13 Dibutyl Butylphosphonate (DBBP)

The maximum cartridge inlet concentration of <1% of the OEL, which is below the DL, is low compared to the historical maximum concentration, a below-report datum with an RL of 0.00387 ppm (55% of the OEL). The maximum historical measurement came from an April 26, 2005, semi-volatile organic analysis sample with a volume of 0.25 L, which is a small volume compared to most of the AP samples in which DBBP was measured; this explains the high RL. All other historical RLs were ≤0.0001 ppm (1.4% of the OEL). The unusually high <RL maximum accounts for the high average concentration as well. There are no above-report historical data for this chemical, so no conclusion can be drawn about where its cartridge inlet concentration lies with respect to historical data.

F.3.14 Pyridine

The maximum cartridge inlet concentration of <0.2% of the OEL is low compared to the historical maximum concentration, a below-report datum that had an RL of 0.127 ppm (<13% of the OEL). The historical measurement came from a July 24, 2013, 24.3 L pyridines sample. It is not clear why a sample with a volume this high had such a high RL. The second-highest RL was 0.086 ppm (8.6% of the OEL) for a 0.97 L sample taken on January 11, 2007, and all other RLs were less than 0.01 ppm (1% of the OEL). The unusually high <RL maximum accounts for the high average pyridine concentration as well.

There were three above-report concentrations in historical data. According to both the survey title and the BBI tank activity database, the highest concentration was 0.0012 ppm (0.12% of the OEL), which was measured on July 16, 2015, during a 242-A campaign. The highest concentration (i.e., 0.00053 ppm [0.05% of the OEL]) for which no disturbance was indicated in the survey title was taken on July 31, 2014. The most recent AP Farm transfer had ended on May 28, 2014. The cartridge test inlet concentrations are considered to be similar to the non-disturbance historical data.

F.3.15 2,4-Dimethylpyridine

The maximum and average historical concentrations are controlled by the RL from the same 0.97 L Carbotrap 300 TDU sample that was mentioned as producing the second-high RL for pyridine. Because this substituted pyridine has no above-report historical data, no conclusion can be drawn about where its cartridge inlet concentration lies with respect to historical data.

F.3.16 Methyl Isocyanate

This chemical was a tentatively identified compound at the inlet in cartridge testing. There is only one historical concentration, a below-report datum that had an RL of 0.00729 ppm (<36% of the OEL). Given the scarcity of data, no conclusion can be drawn about where this chemical's cartridge inlet concentration lies with respect to historical data.

F.3.17 Summary of Historical Data for the AP Exhauster

In summary, cartridge inlet concentrations for the AP exhaust that were substantially lower than historical data can be described as follows:

- Differences arose from using historical data taken during disturbance for the historical maximum: mercury.
- Differences arose from using the RLs of below-report data for the historical maximum: pyridine.

- Differences arose from using data for vapor produced by a no-longer-existing inventory for the historical maximum: none.
- Differences could not be resolved because of the scarcity of non-disturbance above-report data: 1,3-butadiene, 2,3-dihydrofuran, 2,5-dihydrofuran, 2-methylfuran, 2,5-dimethylfuran, 2-pentylfuran, 2-heptylfuran, 2-propylfuran, N-nitrosodiethylamine, dibutyl butylphosphonate, 2,4-dimethylpyridine, methyl isocyanate.
- Cartridge inlet concentrations were determined to be significantly lower than above-report historical concentrations: formaldehyde, ethylamine.

Table F.1. COPC Comparison to Historical AP Tank Farms Exhauster Measurements

	COPC Number and Name	CAS Number	Boiling Point (°F)	Boiling Point Source	Occupational Exposure Limit (OEL)	Historical Measurements[1]					Measurements in this study			
						Number of Values	Maximum Value	Average Value	Maximum Value (%OEL)	Average Value (%OEL)	Max Inlet (%OEL)	Avg. Inlet (%OEL)	Max Outlet (%OEL)	Approx. DL[13] (%OEL)
Inorganic														
1	Ammonia	7664-41-7	-28	Poling et al., 2007[2]	25 ppm	45	119	33.6	476%	134%	279%	252%	217%	2.46% (RL)
2	Nitrous Oxide	10024-97-2	-127	Poling et al., 2007	50 ppm	4	25.2	12.7	50.4%	25.4%	Not Measured			
3	Mercury	7439-97-6	674	Poling et al., 2007	0.025 mg/m^3	42	0.117	0.01	468%	40.0%	55.9%	48.0%	<RL	7.12% (RL)
Hydrocarbons														
4	1,3-Butadiene	106-99-0	24	Poling et al., 2007	1 ppm	55	<RL	<RL	<RL	<RL	<RL	<RL	<RL	2.05% (RL)
5	Benzene	71-43-2	176	Poling et al., 2007	0.5 ppm	38	<RL	0.00236*	<RL	0.47%*	0.098%	0.080%	0.15%	0.024%
6	Biphenyl	92-52-4	491	Poling et al., 2007	0.2 ppm	33	<RL	<RL	<RL	<RL	<DL	<DL	<DL	0.053%
Alcohols														
7	1-Butanol	71-36-3	243	NIOSH	20 ppm	34	0.123	0.0403	0.62%	0.20%	0.31%	0.29%	<DL	0.002%
8	Methanol	67-56-1	148	Poling et al., 2007	200 ppm	30	<RL	1.03	<RL	0.52%	Not Measured			
Ketones														
9	2-Hexanone	591-78-6	262	NIOSH	5 ppm	37	<RL	0.0024	<RL	0.05%	0.008%	0.007%	<DL	0.003%
10	3-Methyl-3-butene-2-one	814-78-8	208	CRC Handbook 1989[4]	0.02 ppm	0	n/a	n/a	n/a	n/a	Not Detected - TIC[12]			
11	4-Methyl-2-hexanone	105-42-0	282	Predicted ACD/Labs[5]	0.5 ppm	24	0.00128	0.000506*	0.26%	0.10%*	<DL	<DL	<DL	0.030%
12	6-Methyl-2-heptanone	928-68-7	333	Predicted ACD/Labs	8 ppm	0	n/a	n/a	n/a	n/a	t Detected - TIC			
13	3-Buten-2-one	78-94-4	179	CRC Handbook 1989	0.2 ppm	31	<RL	0.00108	<RL	0.54%	0.33%	0.26%	0.16%	0.086%
Aldehydes														
14	Formaldehyde	50-00-0	-6	NIOSH	0.3 ppm	63	0.0985	0.0234	33%	7.80%	5.85%	3.07%	3.41%	0.62% (RL)
15	Acetaldehyde	75-07-0	69	NIOSH	25 ppm	27	0.165	0.0766*	0.66%	0.31%*	0.11%	0.10%	0.063%	0.005% (RL)
16	Butanal	123-72-8	167	Oxford safety data[6]	25 ppm	61	<RL	0.0215*	<RL	0.09%*	0.019%	0.015%	0.005%	0.003%
17	2-Methyl-2-butenal	1115-11-3	244	United Nations[7]	0.03 ppm	0	n/a	n/a	n/a	n/a	Not Detected - TIC			
18	2-Ethyl-hex-2-enal	645-62-5	347	Predicted ACD/Labs	0.1 ppm	0	n/a	n/a	n/a	n/a	Not Detected - TIC			

Table F.1. (continued)

	COPC Number and Name	CAS Number	Boiling Point (°F)	Boiling Point Source	Occupational Exposure Limit (OEL)	Historical Measurements[1]				Measurements in this study			
						Number of Values	Maximum Value	Average Value	Maximum Value (%OEL)	Average Value (%OEL)	Max Inlet (%OEL)	Avg. Inlet (%OEL)	Max Outlet (%OEL)	Approx. DL[13] (%OEL)
Furans														
19	Furan	110-00-9	88	Poling et al., 2007	1 ppb	54	<RL	2.6	<RL	260%	2.39%	2.01%	1.44%	DL / RL[13] 0.89% / 26.1%
20	2,3-Dihydrofuran	1191-99-7	130	Alfa Aesar[8]	1 ppb	23	<RL	<RL	<RL	<RL	2.54%	1.91%	5.01%	1.76% / 25.4%
21	2,5-Dihydrofuran	1708-29-8	152	Aldrich[9]	1 ppb	55	<RL	<RL	<RL	<RL	2.81%	<DL	<DL	2.24% / 25.4%
22	2-Methylfuran	534-22-5	147	Oxford safety data	1 ppb	54	<RL	<RL	<RL	<RL	4.65%	2.47%	2.78%	1.91% / 21.7%
23	2,5-Dimethylfuran	625-86-5	199	Alfa Aesar	1 ppb	23	<RL	<RL	<RL	<RL	<DL	<DL	<DL	3.06% / 18.5%
24	2-Ethyl-5-methylfuran	1703-52-2	246	Predicted ACD/Labs	1 ppb	0	n/a	n/a	n/a	n/a	Not Detected - TIC			
25	4-(1-Methylpropyl)-2,3-dihydrofuran	34379-54-9	328	Predicted ACD/Labs	1 ppb	0	n/a	n/a	n/a	n/a	Not Detected - TIC			
26	3-(1,1-Dimethylethyl)-2,3-dihydrofuran	34314-82-4	306	Predicted ACD/Labs	1 ppb	0	n/a	n/a	n/a	n/a	Not Detected - TIC			
27	2-Pentylfuran	3777-69-3	333	Alfa Aesar	1 ppb	23	<RL	<RL	<RL	<RL	2.26%	1.86%	5.56%	1.63% / 12.9%
28	2-Heptylfuran	3777-71-7	410	Alfa Aesar	1 ppb	23	<RL	<RL	<RL	<RL	1.39%	1.14%	1.55%	1.11% / 10.7%
29	2-Propylfuran	4229-91-8	231	Alfa Aesar	1 ppb	23	<RL	<RL	<RL	<RL	<DL	<DL	2.98%	2.73% /16.2%
30	2-Octylfuran	4179-38-8	452	Predicted ACD/Labs	1 ppb	0	n/a	n/a	n/a	n/a	Not Detected - TIC			
31	2-(3-Oxo-3-phenylprop-1-enyl)furan	717-21-5	605	Predicted ACD/Labs	1 ppb	0	n/a	n/a	n/a	n/a	Not Detected - TIC			
32	2-(2-Methyl-6-oxoheptyl)furan	51595-87-0	Not available	Not available	1 ppb	0	n/a	n/a	n/a	n/a	Not Detected - TIC			
Phthalates														
33	Diethylphthalate	84-66-2	563	NIOSH	5 mg/m^3	29	0.0133	0.00206*	0.27%	0.04%*	<DL	<DL	<DL	0.019%

Table F.1. (continued)

	COPC Number and Name	CAS Number	Boiling Point (°F)	Boiling Point Source	Occupational Exposure Limit (OEL)	Historical Measurements[1]					Measurements in this study			
						Number of Values	Maximum Value	Average Value	Maximum Value (%OEL)	Average Value (%OEL)	Max Inlet (%OEL)	Avg. Inlet (%OEL)	Max Outlet (%OEL)	Approx. DL[13] (%OEL)
Nitriles														
34	Acetonitrile	75-05-8	179	NIOSH	20 ppm	25	0.727	0.109	3.64%	0.55%	0.037%	0.036%	1.37%	0.001%
35	Propanenitrile	107-12-0	207	NIOSH	6 ppm	37	<RL	0.00259*	<RL	0.04%*	0.008%	0.008%	<DL	0.004%
36	Butanenitrile	109-74-0	244	NIOSH	8 ppm	36	<RL	0.00306*	<RL	0.04%*	0.005%	0.004%	0.004%	0.003%
37	Pentanenitrile	110-59-8	284	Alfa Aesar	6 ppm	36	<RL	0.00197*	<RL	0.03%*	<DL	<DL	<DL	0.003%
38	Hexanenitrile	628-73-9	328	Predicted ACD/Labs	6 ppm	36	<RL	0.00124	<RL	0.02%	<DL	<DL	<DL	0.003%
39	Heptanenitrile	629-08-3	368	Alfa Aesar	6 ppm	0	n/a	n/a	n/a	n/a	Not Detected - TIC			
40	2-Methylene butanenitrile	1647-11-6	Not available	Not available	0.3 ppm	0	n/a	n/a	n/a	n/a	Not Detected - TIC			
41	2,4-Pentadienenitrile	1615-70-9	278	Predicted ACD/Labs	0.3 ppm	0	n/a	n/a	n/a	n/a	Not Detected - TIC			
Amines														
42	Ethylamine	75-04-7	62	Poling et al., 2007	5 ppm	36	0.829	0.0769*	16.6%	1.54%*	0.48%	0.31%	<RL	0.098% (RL)
Nitrosamines														
43	N-Nitrosodimethylamine	62-75-9	306	NIOSH	0.3 ppb	45	19.0	7.47	6333%	2490%	3629%	2489%	<RL	10.6% (RL)
44	N-Nitrosodiethylamine	55-18-5	351	Oxford safety data	0.1 ppb	45	0.328	0.0798	328%	79.8%	<RL	<RL	<RL	23.0% (RL)
45	N-Nitrosomethylethylamine	10595-95-6	310	Predicted ACD/Labs	0.3 ppb	44	0.334	0.138	111%	46.0%	44.9%	26.7%	<RL	8.91% (RL)
46	N-Nitrosomorpholine	59-89-2	435	Oxford safety data	0.6 ppb	45	0.309	0.127	51.5%	21.2%	22.7%	8.82%	<RL	3.38% (RL)
Organophospates														
47	Tributyl phosphate	126-73-8	552	NIOSH	0.2 ppm	33	<RL	<RL	<RL	<RL	<DL	<DL	<DL	0.092%
48	Dibutyl butylphosphonate	78-46-6	602	Predicted ACD/Labs	0.007 ppm	32	<RL	<RL	<RL	<RL	<DL	<DL	<DL	1.35%
Halogenated														
49	Chlorinated Biphenyls	Varies	Varies	Varies	1 mg/m^3	0	n/a	n/a	n/a	n/a	Not Detected - TIC			
50	2-Fluoropropene	1184-60-7	-11	SynQuest[11]	0.1 ppm	1	<RL	<RL	<RL	<RL	Not Detected - TIC			

Table F.1. (continued)

						Historical Measurements[1]					Measurements in this study			
COPC Number	COPC Name	CAS Number	Boiling Point (°F)	Boiling Point Source	Occupational Exposure Limit (OEL)	Number of Values	Maximum Value	Average Value	Maximum Value (%OEL)	Average Value (%OEL)	Max Inlet (%OEL)	Avg. Inlet (%OEL)	Max Outlet (%OEL)	Approx. DL[13] (%OEL)
Pyridines														
51	Pyridine	110-86-1	240	NIOSH	1 ppm	60	<RL	0.00783*	<RL	0.78%*	<RL	<RL	<RL	0.21% (RL)
52	2,4-Dimethylpyridine	108-47-4	318	Alfa Aesar	0.5 ppm	60	<RL	<RL	<RL	<RL	<RL	<RL	<RL	0.31% (RL)
Organonitrites														
53	Methyl nitrite	624-91-9	10	Oxford safety data	0.1 ppm	0	n/a	n/a	n/a	n/a	Not Detected - TIC			
54	Butyl nitrite	544-16-1	172	Alfa Aesar	0.1 ppm	0	n/a	n/a	n/a	n/a	Not Detected - TIC			
Organonitrates														
55	Butyl nitrate	928-45-0	276	Predicted ACD/Labs	2.5 ppm	0	n/a	n/a	n/a	n/a	Not Detected - TIC			
56	1,4-Butanediol, dinitrate	3457-91-8	499	Predicted ACD/Labs	0.05 ppm	0	n/a	n/a	n/a	n/a	Not Detected - TIC			
57	2-Nitro-2-methylpropane	594-70-7	260	Alfa Aesar	0.3 ppm	0	n/a	n/a	n/a	n/a	Not Detected - TIC			
58	1,2,3-Propanetriol, 1,3-dinitrate	623-87-0	338	Predicted ACD/Labs	0.05 ppm	0	n/a	n/a	n/a	n/a	Not Detected - TIC			
Isocyanates														
59	Methyl Isocyanate	624-83-9	103	NIOSH	0.02 ppm	1	<RL	<RL	<RL	<RL	Not Detected - TIC			

[1] Historical data from TWINS industrial hygiene vapor database and SWIH database; see text for links and dates of queries. Values in italics include those data plus data from the TWINS headspace database, all samples earlier than May 2005.

** indicates that the value of the average would differ by a factor of 2 or more (in either direction) if non-reports were excluded.*

"< RL" indicates that all pertinent measurements of the analyte were less than the reporting limit

Plain font in the table indicates that only the recent databases (SWIHD headspace and TWINS Industrial Hygiene) were included. Italics mean that the pre-2006 TWINS headspace data were also included.

"n/a" indicates no historical data was found in the databases

[2] Poling, B. E.; Prausnitz, J. M.; O'Connell, J. P. The Properties of Gases and Liquids. McGraw Hill, 2007.

[3] NIOSH: National Institute of Occupational Safety and Health

[4] CRC Handbook of Chemistry and Physics, CRC Press, 1989.

[5] ACD/Labs software http://www.acdlabs.com/products/percepta/predictors.php

[6] Oxford safety data from The Physical and Theoretical Chemistry Laboratory at Oxford University

[7] Food and Agriculture Organization of the United Nations

[8] Alfa Aesar: https://www.alfa.com/

[9] Aldrich: https://www.sigmaaldrich.com/

[10] OSHA: Occupational Safety and Health Administration

[11] SynQuest: http://synquestlabs.com/product/id/8330.html

[12] TIC: Tentatively Identified Compounds that were not observed in this study using the specified analytical methods.

[13] Approximate Detection Limit (DL) is calculated using the reported detection limit (or reporting limit) from the analytical laboratory and the average volume (from flowrate x time) of vapor exposed to the sorbent tube. For the Furans, both DL and RL values are reported as "DL / RL" (See App. D, Freeman et al., 2017 [19]).

Appendix G

Uncertainty Analysis

Appendix G

Uncertainty Analysis

Concentrations measurements of tank farm vapors, for quantifying the respirator cartridge effectiveness, are assumed to have errors arising from three major sources of variability. These three sources are as follows:

1. σ_L is the uncertainty due to the laboratory analytical error (typically reported by the laboratory).
2. σ_D is the uncertainty due to the particular type of collection tube being used.
3. σ_F is the uncertainty due to field work variability.

The three sources of uncertainty are considered as relative standard deviations. The combined relative uncertainty of a measurement error σ_C is calculated as follows:

$$\sigma_C = \sqrt{\sigma_L^2 + \sigma_D^2 + \sigma_F^2}$$

The expected ranges of values for each of the input terms, as well as the combined uncertainty, are shown in Table G.1.

Table G.1. Measurement Error Uncertainty Budget

Laboratory Analytical Error	Collection Tube Variability	Field Work Error	Combined Relative Uncertainty
5% to 7%	2% to 40%	3% to 20%	6.2% to 45.3%

The values used in the calculations above represent initial estimates of the corresponding uncertainties. Lower and higher values were considered as a bounding case, a possible lower and upper limit on particular uncertainty source. The calculation of combined relative uncertainty will change as input values are updated, or if results are desired for more specific combinations of input values.

The relative uncertainty value of 6.2% (above) is assumed to be appropriate for the measurement of the primary COPC vapors of interest. With combined relative uncertainties and the assumption of a multiplicative measurement error structure, the two-sigma uncertainty limits of a measurement M are $(Me^{-2\sigma_C}, Me^{2\sigma_C})$.

The combined relative uncertainty described above does not include actual variation in concentration of a particular COPC; it represents analytical and measurement uncertainty only. The multiplying factor of 2 mentioned above relative to the two-sigma uncertainty limits is a commonly used multiplier for forming estimation intervals. It is based on an assumption of approximate normality for the response variable (concentration), and it represents an approximate 95% confidence level. The value of the multiplying factor could be updated as additional sample data are analyzed and the normality assumption is assessed, or if different confidence levels are desired.

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