

# Workplace Monitoring Report - Respirable Dust & Inhalable Dust July 2019

Cargill Australia Limited

30 July 2019



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## Cargill Australia Limited

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## 1 Introduction

Cargill Australia Limited, herein referred to as Cargill, commissioned MJM Environmental (MJM) to conduct workplace air quality monitoring on 3 July 2019 at Cargill's facility located on Raven Street, Kooragang Island, NSW 2304. Air quality monitoring was performed for respirable and inhalable dust on employees working in identified areas of Cargill's site. The monitoring was conducted to measure respirable and inhalable dust exposure during the oilseed processing conducted at the facility.

The facility operates 24 hours per day, 7 days per week. Dust sampling was completed over the period of 08:03 to 15:36 on 3 July 2019.

The sampling points were located in eight (8) areas of the facility, which were:

- Meal Load Out
- Refinery
- Maintenance Flaker
- Pre-Press
- Seed Lab
- Extraction
- Terminal
- Meal Load Out Stationary

This report outlines and evaluates the results from the workplace air quality monitoring performed at Cargill's workplace areas.

## 2 Methodology

The sampling methods used are shown in Table 2.1.

**Table 2.1: Sampling parameters, sampling methodology and method of analysis**

Points	Test Parameters (Pollutant)	Test Method	Sampling Technique	Method of Analysis
Personnel Sampling	Dust Respirable, Nuisance	OSHA <sup>1</sup> CSI/ AS 2985:2009	Filtration	Gravimetry
Personnel Sampling	Dust Inhalable	NIOSH 0500 / AS 3640:2009	Filtration	Gravimetry

<sup>1</sup> OSHA – Occupational Safety and Health Administration

The respirable dust sampling method was referenced from the *Occupational Safety and Health Administration* method for determining respirable dust (OSHA CSI). This method involved withdrawing ambient air from the workplace areas through 25mm diameter and 5.0 µm nominal pore size polyvinyl chloride (PVC) membrane filters at a set flow rate over a period of four (4) to eight (8) hours. This method collects dust particles with a diameter size ≤10 µm, which are analysed for respirable dust by a gravimetric method.

The inhalable dust sampling was performed in line with *Australian Standard 3640:2009 – Workplace atmospheres: Method for sampling and gravimetric determination of inhalable dust*. The inhalable dust method involved withdrawing ambient air from the workplace areas through 25mm diameter and 5.0 µm nominal pore size polyvinyl chloride (PVC) membrane filters at a set flow rate over a period of four (4) to eight (8) hours. This method collects dust particles with a diameter size ≤100 µm, which are analysed for inhalable dust by a gravimetric method.

### 2.1 Potential Health Effects

The following is a summary of the main health effects of respirable dust and inhalable dust. For more information, an occupational physician should be consulted for a professional opinion.

Total inhalable dust is the fraction of airborne material measuring up to 100 microns in diameter. Inhalable dust can enter the nose and mouth during breathing, and is therefore able to deposit anywhere in the respiratory tract. Respirable dust considers

the particles normally less than seven (7) microns in diameter and can reach the lower oxygen transfer section of the lungs and be respired. Thus inhalable dust can include a large proportion of particles that are not considered to be respirable. Respirable dust is an irritant to the mouth, nose and throat. Respiratory irritants can trigger an asthma attack in a person who already has this condition.

## 2.2 Legislation

The *Work Health and Safety Act 2011* requires employers to protect the health, safety and welfare of employees at work and visitors to workplaces. The *Work Health and Safety Regulation 2011* requires employers to identify hazards then assess and control risks.

## 2.3 Exposure Standards

Airborne contaminant concentrations can be compared with published exposure standards. The National Occupational Health and Safety Commission (NOHSC) *Exposure Standards for Atmospheric Contaminants in the Occupational Environment* are recognised by WorkSafe NSW. Safe Work Australia has now succeeded the NOHSC.

Samples should be collected in the breathing zone of the operator in accordance with a recognised method. Airborne contaminants are measured in parts per million (ppm) or milligrams per cubic metre (mg/m<sup>3</sup>). The time-weighted average (TWA) exposure standards are based on an 8-hour average and generally protect against long-term effects.

## 2.4 Sampling Device and Monitoring

The sampling performed was to assess and evaluate the workplace air quality at identified locations within Cargill's oilseed production processes. The equipment used for respirable dust sampling were pre-calibrated SKC Air-Chek XR-5000 model pump, 25mm 5.0 µm PVC filters and 25 mm cassette holders. Respirable dust sampling was performed in line with standards from the *Workplace Atmospheres-Method for Sampling and Gravimetric Determination of Respirable Dust (AS 2985:2009)*. The inhalable dust sampling was performed in line with *Australian Standard 3640:2009 – Workplace atmospheres: Method for sampling and gravimetric determination of inhalable dust*.

The sampling apparatus used for the respirable and inhalable dust sampling are shown below in Figure 2.1.



Figure 2.1: Apparatus used for respirable and inhalable dust sampling

One set of the pictured apparatus was attached to each of the nominated employees. Samples were taken at the 'breathing zone' (the hemisphere of 300 mm radius extending in front of the face and measured from the midpoint of an imaginary line between a person's ears) over the course of one work shift.

A *short-term exposure limit* (STEL) was requested to be used during the operation of the Flaker. STEL is the average exposure over a short period of time, usually 15 minutes, as long as the Time Weighted Average (TWA) is not exceeded.

## 2.5 Station Identification and Locations

The nominated Cargill employees were fitted with the sampling apparatus for the duration of their shift. The locations of the employees are identified in Table 2.2.

Table 2.2: Sampling locations and identification

Location No.	Personnel	Area	Description	Dust fraction tested
1	Heath Robertson	Meal Load Out	Loading Operator	Respirable
2	Ken McGuinness	Refinery	Refinery Operator	Respirable
3	Steve Trennick	Maintenance	Flaker Grinding was performed	Respirable
4	Craig Fisher	Pre Press	Pre Press Operator	Respirable
5	Melody Van Balen	Seed Lab	Seed Lab	Inhalable
6	Matt Biscoe	Extraction/Pre press	Extraction Operator Grinding was performed	Inhalable
7	Graham Bird	Terminal	Operator	Inhalable
8	Stationary	Meal Load Out	Beside load out station	Inhalable

## 2.6 Quality Assurance and Quality Control

MJM employed the following to ensure quality assurance and quality control during the sampling program:

- Employed appropriate test method(s) and analysis (OSHA CSI/ AS 2985:2009).
- Proper handling and recovery of samples was ensured.
- The MJM air quality management team was comprised of experienced technical personnel.

## 2.7 Analysis

At the completion of sampling, the loaded and labelled filters were recovered and submitted for analysis.

All samples for analysis were submitted to Australian Laboratory Services (ALS), a NATA accredited laboratory with accreditation number 825 located at Mayfield West, NSW, 2304. Raw laboratory results are presented in Appendix A.

## 3 Assessment Criteria and Calculations

The respirable and inhalable dust fraction measured was assessed and compared in line with the *Work Health and Safety Act 2011* standard time-weighted average (TWA). Respirable and inhalable dust was assessed and compared to the best available standard under *Workplace Exposure Standards for Airborne Contaminants* (April 2018). If the number of hours worked per day is different than eight hours the standard exposure limit can be adjusted using the Adjusted Exposure Standard TWA calculation below.

$$\text{TWA} = \frac{C_1T_1 + C_2T_2 + C_3T_3 \dots\dots C_nT_n}{8 \text{ hr}} \quad \text{where TWA = Time Weighted Average concentrations (mg/m}^3 \text{ or ppm)}$$

C = Concentration of contaminant during an incremental exposure time (mg/m<sup>3</sup>)  
T = Time: Incremental exposure time

$$\text{Adjusted Exposure Standard TWA} = \frac{8(24\text{-h}) (8 \text{ hour TWA}_{\text{standard}})}{16\text{h}}$$

where h = hours worked per day

## 4 Results

Table 4.1 presents the results for the air quality monitoring conducted at the Cargill site on 3 July 2019.

Results have been compared to both the respirable dust, inhalable dust and grain dust exposure limits.

The TWA was adjusted for a 12 hour shift at the following locations:

- Extraction/Pre-press
- Meal Loadout
- Pre-Press

All other locations were compared to the exposure standard based on 8 hours TWA exposure.

**Table 4.1: Respirable and inhalable dust results – 3 July 2019**

Station No.	Area	Result (mg/m <sup>3</sup> )	Exposure Standard Threshold Limits (mg/m <sup>3</sup> )		
			Respirable Dust	Inhalable Dust	Grain Dust (oats, wheat, barley)
1	Meal Loadout <sup>1</sup>	0.33	2 <sup>1</sup>	N/A	2 <sup>1</sup>
2	Refinery	0.09	3	N/A	4
3	Maintenance	0.48	3	N/A	4
4	Pre-Press <sup>1</sup>	0.05	2 <sup>1</sup>	N/A	2 <sup>1</sup>
5	Seed Lab <sup>2</sup>	1.5	N/A	10	4
6	Extraction/Pre press <sup>1,2</sup>	<b>4.1</b>	N/A	5 <sup>1</sup>	2 <sup>1</sup>
7	Terminal <sup>2</sup>	1.3	N/A	10	4
8	Meal Loadout <sup>2</sup>	0.95	N/A	10	4

N/D = refers to result being not detectable; N/A refers to analyte not tested

<sup>1</sup> Adjusted Exposure Standard Threshold Limit – 12 hours

<sup>2</sup> Sampled for Inhalable Dust

## 5 Discussion

The air inhaled at workplaces should not contain chemical agents at concentrations that produce adverse effects on health, safety or wellbeing. To assist occupational health and safety practitioners, employers and employees or their representatives, and regulatory agencies to secure workplace atmospheres which are as free as practicable from risks associated with hazardous contaminants, the *Work Health and Safety Act 2011* has produced the *Workplace Exposure Standards for Airborne Contaminants (April 2018)*.

The exposure standards are largely based upon the threshold limit value (TLV) determined by the American Conference of Government Industrial Hygienists (ACGIH). The TLV represents airborne concentrations of individual chemical substances, which according to current knowledge, should neither impair the health of nor cause undue discomfort to nearly all workers. Additionally, the exposure standards are believed to guard against narcosis or irritation, which could precipitate industrial accidents. Exposure standards apply to long-term exposure to a substance over an eight-hour day, for a five-day working week, over an entire working life, except where modified by consideration of excursion limits.

The exposure standards do not represent 'no-effect' levels that guarantee protection to every worker. Given the nature of biological variation and the range of individual susceptibility, it is inevitable that a very small proportion of workers who are exposed to concentrations around or below the exposure standard may suffer mild and transitory discomfort. An even smaller number may exhibit symptoms of illness. It follows that the exposure standards are not fine dividing lines between satisfactory and unsatisfactory working conditions, but rather that they are best used to assess the quality of the working environment and indicate where appropriate control measures are required.

The measured results from air at Cargill's workplace have been compared with recognised Work Health and Safety Exposure Standards. Australian Exposure Standards are published by Safe Work Australia in the document *Workplace Exposure Standards*



for Airborne Contaminants (April 2018). Where no specific exposure standard has been assigned and the substance is both of inherently low toxicity and free from toxic impurities, the recommended exposure standard for the Respirable and Inhalable Dust tested was tabulated and is shown in Table 4.1. The grain dust exposure limit has been included for comparison due to the processing performed at Cargill.

Respirable and inhalable dust results for each of the chosen identified areas at the Cargill site were compared with the 8 hour exposure standard TWA, with the exception of the Pre-press, Meal Loadout personnel sample and Extraction area sample which was compared to an adjusted TWA based on a 12 hour shift.

It is noted here that the Extraction / Prep area (Station 6) inhalable dust result approached the 12-hour adjusted exposure standard threshold of 5 mg/m<sup>3</sup> with a result of 4.2 mg/m<sup>3</sup>. The result of 4.2 mg/m<sup>3</sup> also appeared to exceed the adjusted Grain Dust exposure limit of 2 mg/m<sup>3</sup> if it is assumed that all dust collected in the sample was grain dust. The analysis performed does not differentiate between individual components of the dust collected.

All remaining monitoring locations were below the prescribed threshold limits.

## 6 Conclusion

Workplace monitoring for airborne exposure to respirable dust and inhalable dust has been conducted at the Cargill site on Raven Street, Kooragang Island, NSW 2304.

The Extraction / Prep area (Station 6) inhalable dust of 4.2 mg/m<sup>3</sup> appeared to exceed the adjusted Grain Dust exposure limit of 2 mg/m<sup>3</sup> if it is assumed that all dust collected in the sample was grain dust. The analysis performed does not differentiate between individual components of the dust collected.

The remaining respirable dust and inhalable dust results recorded for all monitoring locations were below the standard and adjusted exposure threshold limits.



## **7 Limitations**

### **7.1 Scope of Services and Reliance of Data**

This Workplace Monitoring Report ('the report') has been prepared in accordance with the scope of work/services agreed, between MJM Environmental Pty Ltd (MJM) and the Client. In preparing the report, MJM has relied upon data and other information provided by the Client and other individuals and organisations. Except as otherwise stated in the report, MJM has not verified the accuracy or completeness of the data. To the extent that the statements, opinions, facts, information, conclusions and/or recommendations in the report ("conclusions/summary") are based in whole or part on the data, those conclusions are contingent upon the accuracy and completeness of the data. MJM will not be liable in relation to incorrect conclusions should any data, information or condition be incorrect or have been concealed, withheld, misrepresented or otherwise not fully disclosed to MJM.

## **8 Study for Benefit of Client**

This report has been prepared for the exclusive benefit of the Client and no other party. MJM assumes no responsibility and will not be liable to any other person or organisation for or in relation to any matter dealt with in this report, or for any loss or damage suffered by any other person or organisation arising from matters dealt with or conclusions expressed in this report (including without limitation matters arising from any negligent act or omission of MJM or for any loss or damage suffered by any other party relying upon the matters dealt with or conclusions expressed in this report). Other parties should not rely upon the report or the accuracy or completeness of any conclusions and should make their own inquiries and obtain independent advice in relation to such matters.

## **9 Other Limitations**

To the best of MJM's knowledge, the proposal presented and the facts and matters described in this report reasonably represent the Client's intentions at the time of printing of the report. However, the passage of time, the manifestation of latent conditions or the impact of future events (including a change in applicable law) may have resulted in a variation of the Proposal and of its possible environmental or health impact. MJM will not be liable to update or revise the report to take into account any events or emergent circumstances or facts occurring or becoming apparent after the date of the report.

## Appendix A – NATA Laboratory Results

## CERTIFICATE OF ANALYSIS

**Work Order** : **EN1904580**  
**Client** : **MJM ENVIRONMENTAL PTY LTD**  
**Contact** : **MS BRIGID KELLY**  
**Address** : **OFFICE 1, 335 WHARF ROAD**  
**NEWCASTLE NSW, AUSTRALIA 2300**  
**Telephone** : **+61 49264222**  
**Project** : **036 1867**  
**Order number** :  
**C-O-C number** :  
**Sampler** :  
**Site** :  
**Quote number** : **EN/222**  
**No. of samples received** : **12**  
**No. of samples analysed** : **12**

**Page** : 1 of 12  
**Laboratory** : Environmental Division Newcastle  
**Contact** :  
**Address** : 5/585 Maitland Road Mayfield West NSW Australia 2304  
**Telephone** : +61 2 4014 2500  
**Date Samples Received** : 03-Jul-2019 16:18  
**Date Analysis Commenced** : 08-Jul-2019  
**Issue Date** : 11-Jul-2019 19:56



Accreditation No. 825  
 Accredited for compliance with  
 ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

**Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.**

### Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	Position	Accreditation Category
Dianne Blane	Laboratory Coordinator (2IC)	Newcastle - Inorganics, Mayfield West, NSW
Karinne Gelderman	Analyst	Newcastle - Organics, Mayfield West, NSW



## General Comments

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contact for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.

LOR = Limit of reporting

^ = This result is computed from individual analyte detections at or above the level of reporting

Ø = ALS is not NATA accredited for these tests.

~ = Indicates an estimated value.

- EP091: Sample EN1904580-011 was received with the cap detached from the end of the charcoal sorbent tube. Results should be scrutinised accordingly.
- EP091: The LOR values for EP091 have been raised due to increased charcoal sample size (400/200 mg) over the standard charcoal sample size (100/50mg) requiring greater extraction volume of solvent.
- EA143-OC: Sampling was not conducted by ALS and may not fall under accredited methods for sampling of inhalable and respirable dusts. Particulates outside the inhalable and respirable dust definitions under AS3640 and AS2985 respectively have the potential to introduce a bias. Results should be scrutinised accordingly.



## Analytical Results

Sub-Matrix: **FILTER**  
 (Matrix: **AIR**)

Client sample ID

				PVC2512510 PVC2512510	PVC2512511 PVC2512511	PVC2512512 PVC2512512	PVC2512513 PVC2512513	PVC2513241 PVC2513241
Client sampling date / time				03-Jul-2019 00:00	03-Jul-2019 00:00	03-Jul-2019 00:00	03-Jul-2019 00:00	03-Jul-2019 00:00
Compound	CAS Number	LOR	Unit	EN1904580-001	EN1904580-002	EN1904580-003	EN1904580-004	EN1904580-005
				Result	Result	Result	Result	Result
<b>EA143: Particulates in Air</b>								
Inhalable Dust	----	10	µg/filter	239	----	----	----	----
Respirable Dust	----	10	µg/filter	----	70	595	48	113



## Analytical Results

Sub-Matrix: **FILTER**  
 (Matrix: **AIR**)

Client sample ID

				PVC2512514 PVC2512514	PVC2512515 PVC2512515	PVC2512516 PVC2512516	PVC2512508 PVC2512508	----
Client sampling date / time				03-Jul-2019 00:00	03-Jul-2019 00:00	03-Jul-2019 00:00	03-Jul-2019 00:00	----
Compound	CAS Number	LOR	Unit	EN1904580-006	EN1904580-007	EN1904580-008	EN1904580-009	-----
				Result	Result	Result	Result	----
<b>EA143: Particulates in Air</b>								
Inhalable Dust	----	10	µg/filter	<b>4940</b>	<b>68</b>	<b>550</b>	----	----
Respirable Dust	----	10	µg/filter	----	----	----	<10	----



## Analytical Results

Sub-Matrix: **SORBENT TUBE**  
 (Matrix: **AIR**)

Client sample ID

				VOC4	VOC1	VOC3	----	----
Client sampling date / time				03-Jul-2019 00:00	03-Jul-2019 00:00	03-Jul-2019 00:00	----	----
Compound	CAS Number	LOR	Unit	EN1904580-010	EN1904580-011	EN1904580-012	-----	-----
				Result	Result	Result	----	----
<b>EP091A: Aliphatic Hydrocarbons - Total</b>								
1-heptene	592-76-7	0.5	µg/sample	<1.0	<1.0	<1.0	----	----
Heptane	142-82-5	0.5	µg/sample	<1.0	<b>5.8</b>	<1.0	----	----
Decane	124-18-5	0.5	µg/sample	<1.0	<b>1.5</b>	<1.0	----	----
n-Hexane	110-54-3	0.5	µg/sample	<1.0	<b>131</b>	<b>1060</b>	----	----
Cyclohexane	110-82-7	0.5	µg/sample	<1.0	<b>19.9</b>	<b>202</b>	----	----
Isooctane	540-84-1	0.5	µg/sample	<1.0	<b>21.6</b>	<1.0	----	----
n-Octane	111-65-9	0.5	µg/sample	<1.0	<1.0	<1.0	----	----
n-Nonane	111-84-2	0.5	µg/sample	<1.0	<b>1.2</b>	<1.0	----	----
<b>EP091B: Monocyclic Aromatic Hydrocarbons - Total</b>								
Benzene	71-43-2	0.5	µg/sample	<1.0	<1.0	<1.0	----	----
Toluene	108-88-3	0.5	µg/sample	<1.0	<1.0	<b>3.4</b>	----	----
Ethylbenzene	100-41-4	0.5	µg/sample	<1.0	<1.0	<1.0	----	----
meta- & para-Xylene	108-38-3 106-42-3	1.0	µg/sample	<2.0	<2.0	<2.0	----	----
Styrene	100-42-5	0.5	µg/sample	<1.0	<1.0	<1.0	----	----
ortho-Xylene	95-47-6	0.5	µg/sample	<1.0	<1.0	<1.0	----	----
1,3,5-Trimethylbenzene	108-67-8	0.5	µg/sample	<1.0	<1.0	<1.0	----	----
1,2,4-Trimethylbenzene	95-63-6	0.5	µg/sample	<1.0	<1.0	<1.0	----	----
n-Butylbenzene	104-51-8	0.5	µg/sample	<1.0	<1.0	<1.0	----	----
Isopropylbenzene	98-82-8	0.5	µg/sample	<1.0	<1.0	<1.0	----	----
n-Propylbenzene	103-65-1	0.5	µg/sample	<1.0	<1.0	<1.0	----	----
tert-Butylbenzene	98-06-6	0.5	µg/sample	<1.0	<1.0	<1.0	----	----
sec-Butylbenzene	135-98-8	0.5	µg/sample	<1.0	<1.0	<1.0	----	----
p-Isopropyltoluene	99-87-6	0.5	µg/sample	<1.0	<1.0	<1.0	----	----
Total Xylenes	----	1.5	µg/sample	<3.0	<3.0	<3.0	----	----
<b>EP091C: Oxygenated Compounds - Total</b>								
2-Propanone (Acetone)	67-64-1	1.0	µg/sample	<2.0	<b>59.2</b>	<b>6.9</b>	----	----
2-Butanone (MEK)	78-93-3	0.5	µg/sample	<1.0	<1.0	<1.0	----	----
4-Methyl-2-pentanone (MIBK)	108-10-1	0.5	µg/sample	<1.0	<1.0	<1.0	----	----
2-Hexanone (MBK)	591-78-6	0.5	µg/sample	<1.0	<1.0	<1.0	----	----
<b>EP091D: Halogenated Compounds - Total</b>								
1,1-Dichloroethane	75-34-3	0.5	µg/sample	<1.0	<1.0	<1.0	----	----
Chloroform	67-66-3	0.5	µg/sample	<1.0	<1.0	<1.0	----	----
Trichloroethene	79-01-6	0.5	µg/sample	<1.0	<1.0	<1.0	----	----
Chlorobenzene	108-90-7	0.5	µg/sample	<1.0	<1.0	<1.0	----	----





## Analytical Results

Sub-Matrix: **SORBENT TUBE**  
 (Matrix: **AIR**)

Client sample ID

				VOC4	VOC1	VOC3	----	----
Client sampling date / time				03-Jul-2019 00:00	03-Jul-2019 00:00	03-Jul-2019 00:00	----	----
Compound	CAS Number	LOR	Unit	EN1904580-010	EN1904580-011	EN1904580-012	-----	-----
				Result	Result	Result	----	----

### EP091D: Halogenated Compounds - Total - Continued

2-Chlorotoluene	95-49-8	0.5	µg/sample	<1.0	<1.0	<1.0	----	----
4-Chlorotoluene	106-43-4	0.5	µg/sample	<1.0	<1.0	<1.0	----	----
1,3-Dichlorobenzene	541-73-1	0.5	µg/sample	<1.0	<1.0	<1.0	----	----
1,4-Dichlorobenzene	106-46-7	0.5	µg/sample	<1.0	<1.0	<1.0	----	----
1,2-Dichlorobenzene	95-50-1	0.5	µg/sample	<1.0	<1.0	<1.0	----	----
Hexachlorobutadiene	87-68-3	0.5	µg/sample	<1.0	<1.0	<1.0	----	----
trans-1,2-Dichloroethene	156-60-5	0.5	µg/sample	<1.0	<1.0	<1.0	----	----
cis-1,2-Dichloroethene	156-59-2	0.5	µg/sample	<1.0	<1.0	<1.0	----	----
Bromochloromethane	74-97-5	0.5	µg/sample	<1.0	<1.0	<1.0	----	----
2,2-Dichloropropane	594-20-7	0.5	µg/sample	<1.0	<1.0	<1.0	----	----
1,2-Dichloroethane	107-06-2	0.5	µg/sample	<1.0	<1.0	<1.0	----	----
1,1,1-Trichloroethane	71-55-6	0.5	µg/sample	<1.0	<1.0	<1.0	----	----
1,1-Dichloropropene	563-58-6	0.5	µg/sample	<1.0	<1.0	<1.0	----	----
Carbon Tetrachloride	56-23-5	0.5	µg/sample	<1.0	<1.0	<1.0	----	----
Dibromomethane	74-95-3	0.5	µg/sample	<1.0	<1.0	<1.0	----	----
1,2-Dichloropropane	78-87-5	0.5	µg/sample	<1.0	<1.0	<1.0	----	----
Bromodichloromethane	75-27-4	0.5	µg/sample	<1.0	<1.0	<1.0	----	----
cis-1,3-Dichloropropylene	10061-01-5	0.5	µg/sample	<1.0	<1.0	<1.0	----	----
trans-1,3-Dichloropropene	10061-02-6	0.5	µg/sample	<1.0	<1.0	<1.0	----	----
1,1,2-Trichloroethane	79-00-5	0.5	µg/sample	<1.0	<1.0	<1.0	----	----
1,3-Dichloropropane	142-28-9	0.5	µg/sample	<1.0	<1.0	<1.0	----	----
Dibromochloromethane	124-48-1	0.5	µg/sample	<1.0	<1.0	<1.0	----	----
1,2-Dibromoethane (EDB)	106-93-4	0.5	µg/sample	<1.0	<1.0	<1.0	----	----
Tetrachloroethene	127-18-4	0.5	µg/sample	<1.0	<1.0	<1.0	----	----
1,1,1,2-Tetrachloroethane	630-20-6	0.5	µg/sample	<1.0	<1.0	<1.0	----	----
Bromoform	75-25-2	0.5	µg/sample	<1.0	<1.0	<1.0	----	----
1,1,1,2,2-Tetrachloroethane	79-34-5	0.5	µg/sample	<1.0	<1.0	<1.0	----	----
1,2,3-Trichloropropane	96-18-4	0.5	µg/sample	<1.0	<1.0	<1.0	----	----
Bromobenzene	108-86-1	0.5	µg/sample	<1.0	<1.0	<1.0	----	----
1,2-Dibromo-3-chloropropane	96-12-8	0.5	µg/sample	<1.0	<1.0	<1.0	----	----
1,2,4-Trichlorobenzene	120-82-1	0.5	µg/sample	<1.0	<1.0	<1.0	----	----
1,2,3-Trichlorobenzene	87-61-6	0.5	µg/sample	<1.0	<1.0	<1.0	----	----
1,1-Dichloroethene	75-35-4	0.5	µg/sample	<1.0	<1.0	<1.0	----	----

### EP091E: Polycyclic Aromatic Hydrocarbons - Total

Naphthalene	91-20-3	0.5	µg/sample	<1.0	<1.0	<1.0	----	----
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## Analytical Results

Sub-Matrix: **SORBENT TUBE**  
 (Matrix: **AIR**)

Client sample ID

				VOC4	VOC1	VOC3	----	----
Client sampling date / time				03-Jul-2019 00:00	03-Jul-2019 00:00	03-Jul-2019 00:00	----	----
Compound	CAS Number	LOR	Unit	EN1904580-010	EN1904580-011	EN1904580-012	-----	-----
				Result	Result	Result	----	----
<b>EP091E: Polycyclic Aromatic Hydrocarbons (Section 2)</b>								
Naphthalene	91-20-3	0.5	µg	<1.0	<1.0	<1.0	----	----
<b>EP091X: VOCs in Air - Extended List (non-NATA)</b>								
Vinyl chloride	75-01-4	2	µg	<2	<2	<2	----	----
Bromomethane	74-83-9	2	µg	<2	<2	<2	----	----
Trichlorofluoromethane	75-69-4	1	µg	<1	<1	<1	----	----
Vinyl chloride	75-01-4	2	µg	<2	<2	<2	----	----
Bromomethane	74-83-9	2	µg	<2	<2	<2	----	----
Trichlorofluoromethane	75-69-4	1	µg	<1	<1	<1	----	----
Vinyl chloride	75-01-4	2	µg/sample	<4	<4	<4	----	----
Bromomethane	74-83-9	2	µg/sample	<4	<4	<4	----	----
Trichlorofluoromethane	75-69-4	1	µg/sample	<2	<2	<2	----	----
<b>EP091A: Aliphatic Hydrocarbons (Section 1)</b>								
1-heptene	592-76-7	0.5	µg	<1.0	<1.0	<1.0	----	----
Heptane	142-82-5	0.5	µg	<1.0	<b>5.8</b>	<1.0	----	----
Decane	124-18-5	0.5	µg	<1.0	<b>1.5</b>	<1.0	----	----
n-Hexane	110-54-3	0.5	µg	<1.0	<b>131</b>	<b>1060</b>	----	----
Cyclohexane	110-82-7	0.5	µg	<1.0	<b>19.9</b>	<b>202</b>	----	----
Isooctane	540-84-1	0.5	µg	<1.0	<b>21.6</b>	<1.0	----	----
n-Octane	111-65-9	0.5	µg	<1.0	<1.0	<1.0	----	----
n-Nonane	111-84-2	0.5	µg	<1.0	<b>1.2</b>	<1.0	----	----
<b>EP091B: Monocyclic Aromatic Hydrocarbons (Section 1)</b>								
Benzene	71-43-2	0.5	µg	<1.0	<1.0	<1.0	----	----
Toluene	108-88-3	0.5	µg	<1.0	<1.0	<b>3.4</b>	----	----
Ethylbenzene	100-41-4	0.5	µg	<1.0	<1.0	<1.0	----	----
meta- & para-Xylene	108-38-3 106-42-3	1	µg	<2	<2	<2	----	----
Styrene	100-42-5	0.5	µg	<1.0	<1.0	<1.0	----	----
ortho-Xylene	95-47-6	0.5	µg	<1.0	<1.0	<1.0	----	----
1,3,5-Trimethylbenzene	108-67-8	0.5	µg	<1.0	<1.0	<1.0	----	----
1,2,4-Trimethylbenzene	95-63-6	0.5	µg	<1.0	<1.0	<1.0	----	----
n-Butylbenzene	104-51-8	0.5	µg	<1.0	<1.0	<1.0	----	----
Isopropylbenzene	98-82-8	0.5	µg	<1.0	<1.0	<1.0	----	----
n-Propylbenzene	103-65-1	0.5	µg	<1.0	<1.0	<1.0	----	----
tert-Butylbenzene	98-06-6	0.5	µg	<1.0	<1.0	<1.0	----	----
sec-Butylbenzene	135-98-8	0.5	µg	<1.0	<1.0	<1.0	----	----



## Analytical Results

Sub-Matrix: **SORBENT TUBE**  
 (Matrix: **AIR**)

Client sample ID

				VOC4	VOC1	VOC3	----	----
Client sampling date / time				03-Jul-2019 00:00	03-Jul-2019 00:00	03-Jul-2019 00:00	----	----
Compound	CAS Number	LOR	Unit	EN1904580-010	EN1904580-011	EN1904580-012	-----	-----
				Result	Result	Result	----	----
<b>EP091B: Monocyclic Aromatic Hydrocarbons (Section 1) - Continued</b>								
p-Isopropyltoluene	99-87-6	0.5	µg	<1.0	<1.0	<1.0	----	----
<b>EP091C: Oxygenated Compounds (Section 1)</b>								
2-Propanone (Acetone)	67-64-1	1.0	µg	<1.0	<b>59.2</b>	<b>6.9</b>	----	----
2-Butanone (MEK)	78-93-3	0.5	µg	<1.0	<1.0	<1.0	----	----
4-Methyl-2-pentanone (MIBK)	108-10-1	0.5	µg	<1.0	<1.0	<1.0	----	----
2-Hexanone (MBK)	591-78-6	0.5	µg	<1.0	<1.0	<1.0	----	----
<b>EP091D: Halogenated Compounds (Section 1)</b>								
1,1-Dichloroethane	75-34-3	0.5	µg	<1.0	<1.0	<1.0	----	----
Chloroform	67-66-3	0.5	µg	<1.0	<1.0	<1.0	----	----
Trichloroethene	79-01-6	0.5	µg	<1.0	<1.0	<1.0	----	----
Chlorobenzene	108-90-7	0.5	µg	<1.0	<1.0	<1.0	----	----
2-Chlorotoluene	95-49-8	0.5	µg	<1.0	<1.0	<1.0	----	----
4-Chlorotoluene	106-43-4	0.5	µg	<1.0	<1.0	<1.0	----	----
1,3-Dichlorobenzene	541-73-1	0.5	µg	<1.0	<1.0	<1.0	----	----
1,4-Dichlorobenzene	106-46-7	0.5	µg	<1.0	<1.0	<1.0	----	----
1,2-Dichlorobenzene	95-50-1	0.5	µg	<1.0	<1.0	<1.0	----	----
Hexachlorobutadiene	87-68-3	0.5	µg	<1.0	<1.0	<1.0	----	----
trans-1,2-Dichloroethene	156-60-5	0.5	µg	<1.0	<1.0	<1.0	----	----
cis-1,2-Dichloroethene	156-59-2	0.5	µg	<1.0	<1.0	<1.0	----	----
Bromochloromethane	74-97-5	0.5	µg	<1.0	<1.0	<1.0	----	----
2,2-Dichloropropane	594-20-7	0.5	µg	<1.0	<1.0	<1.0	----	----
1,2-Dichloroethane	107-06-2	0.5	µg	<1.0	<1.0	<1.0	----	----
1,1,1-Trichloroethane	71-55-6	0.5	µg	<1.0	<1.0	<1.0	----	----
1,1-Dichloropropene	563-58-6	0.5	µg	<1.0	<1.0	<1.0	----	----
Carbon Tetrachloride	56-23-5	0.5	µg	<1.0	<1.0	<1.0	----	----
Dibromomethane	74-95-3	0.5	µg	<1.0	<1.0	<1.0	----	----
1,2-Dichloropropane	78-87-5	0.5	µg	<1.0	<1.0	<1.0	----	----
Bromodichloromethane	75-27-4	0.5	µg	<1.0	<1.0	<1.0	----	----
cis-1,3-Dichloropropylene	10061-01-5	0.5	µg	<1.0	<1.0	<1.0	----	----
trans-1,3-Dichloropropene	10061-02-6	0.5	µg	<1.0	<1.0	<1.0	----	----
1,1,2-Trichloroethane	79-00-5	0.5	µg	<1.0	<1.0	<1.0	----	----
1,3-Dichloropropane	142-28-9	0.5	µg	<1.0	<1.0	<1.0	----	----
Dibromochloromethane	124-48-1	0.5	µg	<1.0	<1.0	<1.0	----	----
1,2-Dibromoethane (EDB)	106-93-4	0.5	µg	<1.0	<1.0	<1.0	----	----



## Analytical Results

Sub-Matrix: **SORBENT TUBE**  
 (Matrix: **AIR**)

Client sample ID

				VOC4	VOC1	VOC3	----	----
Client sampling date / time				03-Jul-2019 00:00	03-Jul-2019 00:00	03-Jul-2019 00:00	----	----
Compound	CAS Number	LOR	Unit	EN1904580-010	EN1904580-011	EN1904580-012	-----	-----
				Result	Result	Result	----	----
<b>EP091D: Halogenated Compounds (Section 1) - Continued</b>								
Tetrachloroethene	127-18-4	0.5	µg	<1.0	<1.0	<1.0	----	----
1.1.1.2-Tetrachloroethane	630-20-6	0.5	µg	<1.0	<1.0	<1.0	----	----
Bromoform	75-25-2	0.5	µg	<1.0	<1.0	<1.0	----	----
1.1.2.2-Tetrachloroethane	79-34-5	0.5	µg	<1.0	<1.0	<1.0	----	----
1.2.3-Trichloropropane	96-18-4	0.5	µg	<1.0	<1.0	<1.0	----	----
Bromobenzene	108-86-1	0.5	µg	<1.0	<1.0	<1.0	----	----
1.2-Dibromo-3-chloropropane	96-12-8	0.5	µg	<1.0	<1.0	<1.0	----	----
1.2.4-Trichlorobenzene	120-82-1	0.5	µg	<1.0	<1.0	<1.0	----	----
1.2.3-Trichlorobenzene	87-61-6	0.5	µg	<1.0	<1.0	<1.0	----	----
1.1-Dichloroethene	75-35-4	0.5	µg	<1.0	<1.0	<1.0	----	----
<b>EP091E: Polycyclic Aromatic Hydrocarbons (Section 1)</b>								
Naphthalene	91-20-3	0.5	µg	<1.0	<1.0	<1.0	----	----
<b>EP091A: Aliphatic Hydrocarbons (Section 2)</b>								
1-heptene	592-76-7	0.5	µg	<1.0	<1.0	<1.0	----	----
Heptane	142-82-5	0.5	µg	<1.0	<1.0	<1.0	----	----
Decane	124-18-5	0.5	µg	<1.0	<1.0	<1.0	----	----
n-Hexane	110-54-3	0.5	µg	<1.0	<1.0	<1.0	----	----
Cyclohexane	110-82-7	0.5	µg	<1.0	<1.0	<1.0	----	----
Isooctane	540-84-1	0.5	µg	<1.0	<1.0	<1.0	----	----
n-Octane	111-65-9	0.5	µg	<1.0	<1.0	<1.0	----	----
n-Nonane	111-84-2	0.5	µg	<1.0	<1.0	<1.0	----	----
<b>EP091B: Monocyclic Aromatic Hydrocarbons (Section 2)</b>								
Benzene	71-43-2	0.5	µg	<1.0	<1.0	<1.0	----	----
Toluene	108-88-3	0.5	µg	<1.0	<1.0	<1.0	----	----
Ethylbenzene	100-41-4	0.5	µg	<1.0	<1.0	<1.0	----	----
meta- & para-Xylene	108-38-3 106-42-3	1	µg	<2	<2	<2	----	----
Styrene	100-42-5	0.5	µg	<1.0	<1.0	<1.0	----	----
ortho-Xylene	95-47-6	0.5	µg	<1.0	<1.0	<1.0	----	----
1.3.5-Trimethylbenzene	108-67-8	0.5	µg	<1.0	<1.0	<1.0	----	----
1.2.4-Trimethylbenzene	95-63-6	0.5	µg	<1.0	<1.0	<1.0	----	----
n-Butylbenzene	104-51-8	0.5	µg	<1.0	<1.0	<1.0	----	----
Isopropylbenzene	98-82-8	0.5	µg	<1.0	<1.0	<1.0	----	----
n-Propylbenzene	103-65-1	0.5	µg	<1.0	<1.0	<1.0	----	----
tert-Butylbenzene	98-06-6	0.5	µg	<1.0	<1.0	<1.0	----	----



## Analytical Results

Sub-Matrix: **SORBENT TUBE**  
 (Matrix: **AIR**)

Client sample ID

				VOC4	VOC1	VOC3	----	----
Client sampling date / time				03-Jul-2019 00:00	03-Jul-2019 00:00	03-Jul-2019 00:00	----	----
Compound	CAS Number	LOR	Unit	EN1904580-010	EN1904580-011	EN1904580-012	-----	-----
				Result	Result	Result	----	----
<b>EP091B: Monocyclic Aromatic Hydrocarbons (Section 2) - Continued</b>								
sec-Butylbenzene	135-98-8	0.5	µg	<1.0	<1.0	<1.0	----	----
p-Isopropyltoluene	99-87-6	0.5	µg	<1.0	<1.0	<1.0	----	----
<b>EP091C: Oxygenated Compounds (Section 2)</b>								
2-Propanone (Acetone)	67-64-1	1.0	µg	<1.0	<1.0	<1.0	----	----
2-Butanone (MEK)	78-93-3	0.5	µg	<1.0	<1.0	<1.0	----	----
4-Methyl-2-pentanone (MIBK)	108-10-1	0.5	µg	<1.0	<1.0	<1.0	----	----
2-Hexanone (MBK)	591-78-6	0.5	µg	<1.0	<1.0	<1.0	----	----
<b>EP091D: Halogenated Compounds (Section 2)</b>								
1.1-Dichloroethane	75-34-3	0.5	µg	<1.0	<1.0	<1.0	----	----
Chloroform	67-66-3	0.5	µg	<1.0	<1.0	<1.0	----	----
Trichloroethene	79-01-6	0.5	µg	<1.0	<1.0	<1.0	----	----
Chlorobenzene	108-90-7	0.5	µg	<1.0	<1.0	<1.0	----	----
2-Chlorotoluene	95-49-8	0.5	µg	<1.0	<1.0	<1.0	----	----
4-Chlorotoluene	106-43-4	0.5	µg	<1.0	<1.0	<1.0	----	----
1.3-Dichlorobenzene	541-73-1	0.5	µg	<1.0	<1.0	<1.0	----	----
1.4-Dichlorobenzene	106-46-7	0.5	µg	<1.0	<1.0	<1.0	----	----
1.2-Dichlorobenzene	95-50-1	0.5	µg	<1.0	<1.0	<1.0	----	----
Hexachlorobutadiene	87-68-3	0.5	µg	<1.0	<1.0	<1.0	----	----
trans-1.2-Dichloroethene	156-60-5	0.5	µg	<1.0	<1.0	<1.0	----	----
cis-1.2-Dichloroethene	156-59-2	0.5	µg	<1.0	<1.0	<1.0	----	----
Bromochloromethane	74-97-5	0.5	µg	<1.0	<1.0	<1.0	----	----
2.2-Dichloropropane	594-20-7	0.5	µg	<1.0	<1.0	<1.0	----	----
1.2-Dichloroethane	107-06-2	0.5	µg	<1.0	<1.0	<1.0	----	----
1.1.1-Trichloroethane	71-55-6	0.5	µg	<1.0	<1.0	<1.0	----	----
1.1-Dichloropropene	563-58-6	0.5	µg	<1.0	<1.0	<1.0	----	----
Carbon Tetrachloride	56-23-5	0.5	µg	<1.0	<1.0	<1.0	----	----
Dibromomethane	74-95-3	0.5	µg	<1.0	<1.0	<1.0	----	----
1.2-Dichloropropane	78-87-5	0.5	µg	<1.0	<1.0	<1.0	----	----
Bromodichloromethane	75-27-4	0.5	µg	<1.0	<1.0	<1.0	----	----
cis-1.3-Dichloropropylene	10061-01-5	0.5	µg	<1.0	<1.0	<1.0	----	----
trans-1.3-Dichloropropene	10061-02-6	0.5	µg	<1.0	<1.0	<1.0	----	----
1.1.2-Trichloroethane	79-00-5	0.5	µg	<1.0	<1.0	<1.0	----	----
1.3-Dichloropropane	142-28-9	0.5	µg	<1.0	<1.0	<1.0	----	----
Dibromochloromethane	124-48-1	0.5	µg	<1.0	<1.0	<1.0	----	----



## Analytical Results

Sub-Matrix: **SORBENT TUBE**  
 (Matrix: **AIR**)

Client sample ID

				VOC4	VOC1	VOC3	----	----
Client sampling date / time				03-Jul-2019 00:00	03-Jul-2019 00:00	03-Jul-2019 00:00	----	----
Compound	CAS Number	LOR	Unit	EN1904580-010	EN1904580-011	EN1904580-012	-----	-----
				Result	Result	Result	----	----
<b>EP091D: Halogenated Compounds (Section 2) - Continued</b>								
1,2-Dibromoethane (EDB)	106-93-4	0.5	µg	<1.0	<1.0	<1.0	----	----
Tetrachloroethene	127-18-4	0.5	µg	<1.0	<1.0	<1.0	----	----
1,1,1,2-Tetrachloroethane	630-20-6	0.5	µg	<1.0	<1.0	<1.0	----	----
Bromoform	75-25-2	0.5	µg	<1.0	<1.0	<1.0	----	----
1,1,2,2-Tetrachloroethane	79-34-5	0.5	µg	<1.0	<1.0	<1.0	----	----
1,2,3-Trichloropropane	96-18-4	0.5	µg	<1.0	<1.0	<1.0	----	----
Bromobenzene	108-86-1	0.5	µg	<1.0	<1.0	<1.0	----	----
1,2-Dibromo-3-chloropropane	96-12-8	0.5	µg	<1.0	<1.0	<1.0	----	----
1,2,4-Trichlorobenzene	120-82-1	0.5	µg	<1.0	<1.0	<1.0	----	----
1,2,3-Trichlorobenzene	87-61-6	0.5	µg	<1.0	<1.0	<1.0	----	----
1,1-Dichloroethene	75-35-4	0.5	µg	<1.0	<1.0	<1.0	----	----
<b>EP091: Chlorinated Organic Surrogates (Section 1)</b>								
1,2-Dichloroethane-D4	17060-07-0	0.5	%	107	91.6	102	----	----
4-Bromofluorobenzene	460-00-4	0.5	%	78.0	65.9	72.0	----	----
<b>EP091: Chlorinated Organic Surrogates (Section 2)</b>								
1,2-Dichloroethane-D4	17060-07-0	0.5	%	96.4	99.8	104	----	----
4-Bromofluorobenzene	460-00-4	0.5	%	71.6	68.1	74.6	----	----
<b>EP091: MAH Surrogates (Section 1)</b>								
Toluene-D8	2037-26-5	0.5	%	101	85.6	91.3	----	----
<b>EP091: MAH Surrogates (Section 2)</b>								
Toluene-D8	2037-26-5	0.5	%	87.7	84.7	89.3	----	----



## Surrogate Control Limits

Sub-Matrix: SORBENT TUBE		Recovery Limits (%)	
Compound	CAS Number	Low	High
EP091: Chlorinated Organic Surrogates (Section 1)			
1,2-Dichloroethane-D4	17060-07-0	70	130
4-Bromofluorobenzene	460-00-4	60	130
EP091: Chlorinated Organic Surrogates (Section 2)			
1,2-Dichloroethane-D4	17060-07-0	60	140
4-Bromofluorobenzene	460-00-4	60	140
EP091: MAH Surrogates (Section 1)			
Toluene-D8	2037-26-5	70	130
EP091: MAH Surrogates (Section 2)			
Toluene-D8	2037-26-5	60	140