



**metro**vancouver

# Analysis of the Potential Dispersion and Deposition Effects of Particulate Matter Emissions from the Metro Vancouver Waste-to-Energy Facility on the Surrounding Environment

Waste-to-Energy Facility

*Burnaby, British Columbia*



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# **Analysis of the Potential Dispersion and Deposition Effects of Particulate Matter Emissions from the Metro Vancouver Waste-to-Energy Facility on the Surrounding Environment**

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## Executive Summary

Metro Vancouver owns the Waste-to-Energy Facility, a mass burn combustion facility designed to process 750 tonnes per day (tpd) (approximately 240,000 tonnes per year) of municipal solid waste in Burnaby. In early 2025, Mr. Peter Harco approached Metro Vancouver with concerns that particulate matter accumulating on the roof of his warehouse located at 8355 Wiggins Street originated from the Waste-to-Energy Facility. Additionally, he believed that metal and dioxin and furan analytical results of particulate samples he had collected from both the roof of his warehouse and surrounding streets and parking lots were elevated because of particulate emissions from the Waste-to-Energy Facility.

The purpose of this report was to investigate Mr. Harco's hypothesis that the Waste-to-Energy Facility stack emissions of particulate matter are accumulating on the roof of his warehouse and that metal and dioxin levels in the particulate matter on his roof (Wigg roof) and in surrounding streets and parking lots are elevated due to emissions from the Waste-to-Energy Facility. This rooftop is located approximately 500 m east-south-east from the Waste-to-Energy Facility. Mr. Harco independently sampled the accumulated rooftop material, as well as roadside dust at sites along nearby streets, and sent those samples for laboratory analysis of a suite of metals and dioxins and furans.

There is no standard environmental investigation or sampling approach available to guide the undertaking of this type of assessment. Therefore, HDR adopted a multiple lines of evidence approach, including – review of the facility operations and handling of ash material, evaluation of metal and dioxins and furans stack emissions from the Waste-to-Energy Facility and sampling, laboratory analysis and statistical analysis of environmental media on rooftops, soils and roadside dust.

The following are the conclusions and recommendations from the investigation.

### **Facility Operations Assessment**

The baghouses at the Waste-to-Energy Facility are performing as designed and meet or exceed the particulate matter removal efficiency performance standards for this type of equipment. For almost 40 years the Waste-to-Energy Facility has operated well below the regulatory standards for discharge of particulate matter, which indicates that the baghouses are operating as designed. In addition, the Waste-to-Energy Facility is adhering to its Bottom Ash and Fly Ash Management Plans, as well as generally accepted industry standards.

During the site visit, there were no observed releases of fugitive dust either from normal operations or during the loadout operations for bottom ash or conditioned fly ash. The facility operations meet the Operational Certificate requirements, meets or exceeds industry standards, and is not a source of significant particulate release from any sources other than as measured through environmental monitoring of stack emissions. This analysis provides no information supporting the hypothesis that particulate emissions from the Waste-to-Energy Facility are resulting in the accumulation of particulate matter on the Wigg roof.

### **Air Quality Emissions from Waste-to-Energy Facility**

Overall, after review of the Waste-to-Energy Facility stack emissions and the deposition rates and benchmarking against the environmental media chemical results the following conclusions can be reached:

- Stack test data shows that the Waste-to-Energy Facility operates consistently within the allowable emission limits for particulate matter. Statistical analysis of the most recent 5-year stack test data indicates with a high probability (95% confidence level) that actual particulate matter emissions are consistently 16% of the Operating Certificate limits or less.
- Continuous opacity and operating parameter monitoring indicates that incidents of excessive stack particulate matter emissions did not occur. This is consistent with the quarterly stack test results for particulate matter from the Waste-to-Energy Facility. Therefore, particulate matter observed locally on rooftops cannot be attributed to a malfunction at the combustion units or emissions control systems at the Waste-to-Energy Facility that could conceivably result in excess particulate matter emissions.
- Based on dispersion modelling and actual particulate matter emission monitoring results, the calculated annual rate of deposition of particulate matter in the vicinity of the Wigg roof is 0.00226 g/m<sup>2</sup>/yr. Mr. Harco reported to Metro Vancouver an estimate of 10 g/m<sup>2</sup>/yr of particulate matter deposited on the roof corresponding to the amount of particulates he observed. On this basis, the calculated deposition rate is 4,400 times less than the deposition rate reported by Mr. Harco.
- Based on dispersion modelling and Waste-to-Energy Facility emission monitoring results, the expected concentrations of metals and dioxins and furans resulting from the Waste-to-Energy Facility emissions would not be detectable on the Wigg roof or any other surface. Therefore, any concentrations of metals or dioxins and furans on the Wigg roof would not have been influenced by the Waste-to-Energy Facility emissions and it is not a source of the levels of metals or dioxins and furans detected.

In summary, the measured stack emission rates, opacity and operating parameter monitoring, and calculated deposition rates, together indicate that it is not plausible that the Waste-to-Energy Facility is the source of the accumulated particulate matter or concentrations of metals and dioxins and furans material observed on the Wigg roof.

### **Environmental Media Sampling**

The environmental media sampling program sought to understand the characteristics of rooftops, soil sample and roadside dust with the goal of determining whether particulate emissions from the Waste-to-Energy Facility impacted the environmental media. Rooftop samples were collected from the Wigg warehouse, a second nearby warehouse and the Waste-to-Energy Facility. A second Wigg warehouse is located in Surrey, and samples were also collected from that roof. Roadside dust samples and soil samples were collected within 500 metres of the Waste-to-Energy Facility. For comparison purposes roadside dust and soil samples were collected from five distant sites, near Metro Vancouver solid waste facilities, in similarly industrially zoned neighbourhoods. In total 52 environmental media samples were collected for analysis.

Primary analysis included sampling for metals and dioxins and furans. Statistical analysis was conducted through t-tests comparing two groups of samples and multivariate statistical analysis was conducted through Principal Component Analysis. Finally, the size, morphology (shape and form), and metal composition of the environmental media was achieved through Scanning Electron Microscopy/Energy-Dispersive X-Ray Spectroscopy (SEM/EDX) analysis. The following conclusions were drawn:

- The level of metals in all samples were below the British Columbia Contaminated Sites Regulation (Contaminated Sites Regulation) for Industrial Land use Standards, with the exception of lead in 2 of 13 samples on the Waste-to-Energy Facility roof. All results are below the Contaminated Sites Regulation health guidelines.
- The level of dioxins and furans in all samples was below the Contaminated Sites Regulation Industrial Land Use Standard, including concentrations on the Waste-to-Energy Facility roof. The concentration of dioxins and furans (reported as toxicity equivalent) collected on the Wigg roof of 34.1 p/g is almost 45 times lower than the Contaminated Sites Regulation industrial standard.
- The statistical t-test shows that the concentrations of metals on the Wigg Surrey roof (~25 km from the Waste-to-Energy Facility) are the same, or in some cases significantly higher, than those found on the Wigg roof and on the second roof adjacent to the Waste-to-Energy Facility.
- Soil and roadside dust samples showed equal or lower concentrations in metals and dioxins and furans concentrations in the soil and dust samples near to the Waste-to-Energy Facility compared to the samples from the distant sites, and showed no correlation with distance to the Waste-to-Energy Facility for samples in the vicinity of the Waste-to-Energy Facility.
- The statistical t-test shows that there is no statistically significant difference between the metal concentrations in samples located less than 500 m from the Waste-to-Energy Facility compared to samples located greater than 10 km from the Waste-to-Energy Facility for both roadside dust and soil. The Waste-to-Energy Facility does not contribute significantly to the metal concentrations in soil or roadside dust surrounding the facility.
- The results of the statistical Principal Component Analysis showed no correlation between the metal concentrations in fly-ash to those in roof, roadside dust or soil samples.
- The University of British Columbia SEM/EDX results indicate that the size, morphology and metal composition of the particles on the stack testing filter nor the fly ash samples match the size, morphology and metal composition the Wigg roof or other sampled roofs. In general the particulates emitted from the Waste-to-Energy Facility are far smaller than the particles from the Wigg roof, the fly-ash sample particles are homogeneous compared to highly variable shaped rooftop samples, and the metal composition of the fly ash is primarily products of lime compared to the environmental media samples that contained ferrous and other metals.
- The University of British Columbia results were confirmed by additional third party-validation work completed by MVA Scientific Consultants (MVA), and they concluded the particles collected from stack testing filters were primarily calcium chloride with trace amounts of iron

or zinc. The conclusion is that most particles originate from the hydrated lime and subsequent reaction with the trace particles of metallic nature coming from corrosion inside the stack. The particle size distribution analysis revealed that, on average, 89.1% of the particles were in the PM<sub>2.5</sub> range.

### **Overall Conclusion**

Multiple lines of evidence were pursued to test Mr. Harco's hypothesis that particulates accumulating on the roof of the Wigg warehouse originated from the Waste-to-Energy Facility, and that the metal and dioxin and furan concentrations in samples he collected from the Wigg roof and surrounding streets and parking lots were caused by emissions from the Waste-to-Energy Facility.

Facility operations, air emissions and environmental media sampling and analysis were all investigated. No information from any of the lines of evidence support the hypothesis that particulates accumulating on the Wigg roof originate from the Waste-to-Energy Facility, and in addition no information from any of the lines of evidence support the hypothesis that concentrations of metals and dioxins in rooftop dust, roadside dust or soil samples near to the Waste-to-Energy Facility are caused by metals and dioxins and furans emitted from the Waste-to-Energy Facility.

On this basis, this study concludes that the particulate matter accumulating on the Wigg roof is not the result of deposition from Waste-to-Energy Facility. Additionally, metal and dioxin and furan concentrations on the Wigg roof, other nearby roofs, in roadside dust, and in soils near the Waste-to-Energy Facility are not significantly impacted by emissions from the Waste-to-Energy Facility. Metals and dioxins and furans concentrations both near the Waste-to-Energy Facility and in the other locations sampled are within the appropriate levels for industrial activity, which is consistent with the uses of all the locations sampled.



## Table Of Contents

Executive Summary .....	i
1 Introduction .....	1
1.1 Investigation Approach .....	1
2 Facility Operations and Handling .....	2
2.1 The Waste-to-Energy Facility Operations .....	2
2.2 Baghouse Performance Review .....	5
2.3 Ash Management Performance Review .....	7
2.4 Waste-to-Energy Facility Operations Conclusions .....	10
3 Air Emissions Analysis .....	10
3.1 Stack Test Measurements .....	11
3.2 Actual Emission Rates .....	22
3.3 Continuous Opacity Monitoring Systems Review .....	22
3.4 Modeled Deposition Rates Associated with Operational Certificate Emission Limits .....	23
3.5 Conclusions of the Air Quality Analysis .....	26
4 Environmental Media Sampling .....	27
4.1 Overview .....	27
4.2 Sample Locations .....	28
4.3 Sample Type .....	30
4.4 Sample Collection .....	31
4.5 Laboratory Analysis .....	31
4.6 Environmental Standards .....	33
4.7 Environmental Media Testing Results .....	33
4.8 Statistical Analysis .....	43
4.9 Principal Component Analysis .....	46
4.10 Results of UBC’s Scanning Electron Microscope/Energy Dispersive X-ray Spectroscopy Analysis .....	48
4.11 Results of MVA’s Scanning Electron Microscope/Energy Dispersive X-ray Spectroscopy Analysis .....	52
4.12 Comparison of UBC and MVA Results .....	55
4.13 Conclusions of the Environmental Media Sampling .....	55
5 Summary of Study Conclusions .....	56
6 Closure .....	60
Bibliography .....	61

## Figures

Figure 1. Schematic of the Metro Vancouver Waste-to-Energy Facility .....	4
Figure 2. Schematic of Metro Vancouver Waste-to-Energy Facility Baghouses .....	6
Figure 3. Schematic of Metro Vancouver Waste-to-Energy Facility Baghouses .....	7
Figure 4. Quarterly Stack Test Results for Particulate Matter .....	14
Figure 5. Quarterly Stack Test Results for Cadmium .....	15
Figure 6. Quarterly Stack Test Results for Lead .....	16
Figure 7. Quarterly Stack Test Results for Arsenic.....	17
Figure 8. Quarterly Stack Test Results for Chromium .....	18
Figure 9. Quarterly Stack Test Results for Cobalt .....	19
Figure 10. Quarterly Stack Test Results for Nickel.....	20
Figure 11. Annual Stack Test Results for dioxins and furans .....	21
Figure 12. Receptor Locations from the 2018 Public Health Risk Assessment. ....	24
Figure 13. Sample Locations Around the Waste-to-Energy Facility.....	29
Figure 14. Far Field sample locations (>10 km from the Waste-to-Energy Facility stack) near other Metro Vancouver solid waste facilities.....	29
Figure 15. Sample Locations at Wigg Surrey Warehouse.....	30
Figure 16. Accumulated material on roofs, from left to right Waste-to-Energy Facility roof, Garibaldi Glass roof, Wigg roof, and Wigg Surrey roof.....	30
Figure 17. Three sample types. From left to right, soil, roadside dust, and roof. ....	31
Figure 18. Sample results for samples collected around the Waste-to-Energy Facility. Exceedances of one or more metals in the sample are shown in red. ....	35
Figure 19. Sample results for samples collected on the Waste-to-Energy Facility roof. Exceedances of the industrial standard for at least one metal are shown in red. ....	36
Figure 20. Sample results for samples collected at the Wigg Surrey warehouse (25 km East of the Waste-to-Energy Facility). Exceedances of the industrial standard for at least one metal are shown in red.....	37
Figure 21. Location of dioxin and furan samples collected from the Wigg roof, Waste-to-Energy Facility roof, Garibaldi Glass roof, and soil nearby to the Waste-to-Energy. ....	42
Figure 22. Principal Component Analysis, Log-Transformed Concentrations.....	47
Figure 23. Comparison of the particle size differences between the stack filter, fly ash particles, and the roof samples.....	49

Figure 24. SEM Image of HDR Stack Filter .....	49
Figure 25. EDX Spectrum of HDR Stack Filter .....	50
Figure 26. SEM Image of Wigg roof.....	50
Figure 27: EDX spectrum of Wigg roof .....	51
Figure 28. SEM image of Fly Ash .....	51
Figure 29. SEM image of Wigg Surrey roof .....	52
Figure 30. EDX spectrum of Wigg Surrey roof.....	52
Figure 31. SEM Backscattered Electron Image of Stack Filter #1 .....	53
Figure 32. EDX Spectrum for Stack Filter Sample #1 .....	53
Figure 33. SEM Backscattered Electron Image of Stack Filter #2.....	54
Figure 34. EDX Spectrum for Stack Filter Sample #2 .....	54



## Tables

Table 1. Facility Stack Test Results Summary .....	12
Table 2. Comparison of Average Actual Emission Rates to 2018 Risk Assessment Modeled Emission Rates .....	22
Table 3. Modeled Maximum Deposition Rates at BC Roofing Receptor .....	25
Table 4. Calculated Peak Actual Deposition Rates .....	26
Table 5. Seven metals carried forward in the assessment and their Contaminated Sites Regulation Industrial land use standard (expressed in mg/kg).....	34
Table 6. Metal Results From Roof Samples (mg/kg).....	38
Table 7. Metal Results From Soil Samples (mg/kg).....	39
Table 8. Metal Results From Roadside Dust Samples (mg/kg).....	40
Table 9. Metal Results From The Fly Ash Samples (mg/kg).....	41
Table 10. Environmental Media Sampling Results for dioxins and furans.....	43
Table 11. Statistical T-Test Results Between the Wigg Roof and the Wigg Surrey Roof .....	44
Table 12. Statistical T-Test Results Between the Soil Samples <500 m from the Waste-to-Energy Facility and the Soil Samples >10 km from the Waste-to-Energy Facility .....	45
Table 13. Statistical T-Test Results Between the Roadside Dust Samples <500 m from the Waste-to-Energy Facility and the Roadside Dust Samples >10 km from the Waste-to-Energy Facility.....	46
Table 14. Particle size distribution for two filter samples.....	55

## Appendices

Appendix A	Stack Test Results
Appendix B	Sampling Locations and Results
Appendix C	Wigg Holding Suggestions
Appendix D	ALS Lab Reports
Appendix E	Scanning Electron Microscope/Energy Dispersive X-ray Spectroscopy UBC Lab Report
Appendix F	Scanning Electron Microscope/Energy Dispersive X-ray Spectroscopy MVA Lab Report
Appendix G	Principal Component Analysis Report

# 1 Introduction

Metro Vancouver owns the Metro Vancouver Waste-to-Energy Facility, a mass burn combustion facility designed to process 750 tonnes per day (tpd) (approximately 240,000 tonnes per year) of municipal solid waste (municipal solid waste). The Waste-to-Energy Facility, located at 5150 Riverbend Drive, Burnaby, began operation in 1988 and has been in commercial operation since then. The Waste-to-Energy Facility has been operated and maintained on the Metro Vancouver's behalf by a number of private third-party operators since the start of operations, currently Veolia Environmental (Veolia) is the operator.

In 2025, Mr. Peter Harco approached Metro Vancouver with concerns that he believed particulate emissions from the Waste-to-Energy Facility were causing the accumulation of particulates on his warehouse roof at 8355 Wiggins Street (the 'Wigg roof'). Mr. Harco also speculated that metals and dioxins and furans in those particulate emissions were causing elevated levels of metals and dioxins and furans both on the Wigg roof and in roadside and parking lot dust samples in the vicinity of the Waste-to-Energy Facility.

HDR Corporation (HDR) was retained by Metro Vancouver to investigate Mr. Harco's hypothesis that the Waste-to-Energy Facility stack emissions of particulate matter are unduly impacting the Wigg roof as well as dust on nearby streets and parking lots. To that end, HDR retained Dr. Christopher Ollson of Ollson Environmental Health Management (OEHM) who has over 25 years of experience in environmental investigations and public health risk assessment to assist with the investigation. He has also conducted numerous public health risk assessments for waste-to-energy facilities around North America, including for the Metro Vancouver facility in 2018.

## 1.1 Investigation Approach

Mr. Harco is concerned about Waste-to-Energy Facility stack emissions impacting the roof of his warehouse facility. This rooftop is located approximately 500 m east-south-east from the Waste-to-Energy Facility. Mr. Harco independently sampled the accumulated rooftop material, as well as roadside dust at sites along nearby streets, and sent those samples for laboratory analysis of a suite of metals and dioxins and furans.

There is no standard environmental investigation or sampling approach available to guide the undertaking of this type of assessment. Therefore, HDR adopted the following multiple lines of evidence approach:

1. Review of the facility operations, baghouse and handling of ash material from the facility.
2. Evaluation of Waste-to-Energy Facility stack particulate matter, metals and dioxins and furans emissions and evaluation of anticipated impacts, including the following activities:
  - a. Stack test results over the past five years
  - b. Annual emissions rates estimate
  - c. Stack metals concentrations by mass of particulate matter
  - d. Modeled deposition rates compared to Mr. Harco's reported rates

3. Sampling and laboratory analysis of chemical constituents of environmental media. This was conducted at the Waste-to-Energy Facility, the Wigg roof, soils and roadside dust in the local area, soil samples sites near Metro Vancouver solid waste facilities in similarly industrially zoned neighbourhoods far from the Waste-to-Energy Facility a minimum of 10 km from the Wigg warehouse (Far Field samples). Samples were also collected both of rooftop dust and soil from a second Wigg warehouse (Wigg Surrey) located in Surrey approximately 25 kilometres from the Waste-to-Energy Facility. This included collection of the following substrates:
  - a. Rooftop material
  - b. Soils
  - c. Roadside dust

Statistical analysis of the collected samples was completed in an attempt to ascertain which environmental samples had similar chemical composition, or chemical fingerprinting.

4. Microscopic analysis of the roof samples, stack filter samples, and fly ash were conducted at the University of British Columbia (UBC). The microscopic analysis was conducted using scanning electron microscope/Energy-Dispersive X-Ray Spectroscopy (SEM/EDX) to assess particle size, morphology and metal content, providing a physical approach to supplement the chemical approach. In addition, stack filters samples were sent to MVA Scientific Consultants in Duluth, Georgia for particle size distribution and SEM/EDX characterization. Although MVA uses a slightly different acronym for the same technique, the analyses by both laboratories are referred to collectively in this report as SEM/EDX for clarity and consistency.

The results of each of the investigations of these lines of evidence was used to test Mr. Harco's hypothesis that particulate from the Waste-to-Energy Facility is accumulating on the Wigg roof and impacting concentrations of metal and dioxins and furans both on the Wigg roof and in roadside and parking lot dust near the Waste-to-Energy Facility.

## 2 Facility Operations and Handling

The first step in this investigation was to determine whether or not the Waste-to-Energy Facility is under good working order and operating within its permitted conditions. There are two potential sources of particulate matter that could be released from the Waste-to-Energy Facility – through stack emission and during the handling and shipping of the bottom and fly ash. To that end, HDR conducted a review of the pertinent facility operations.

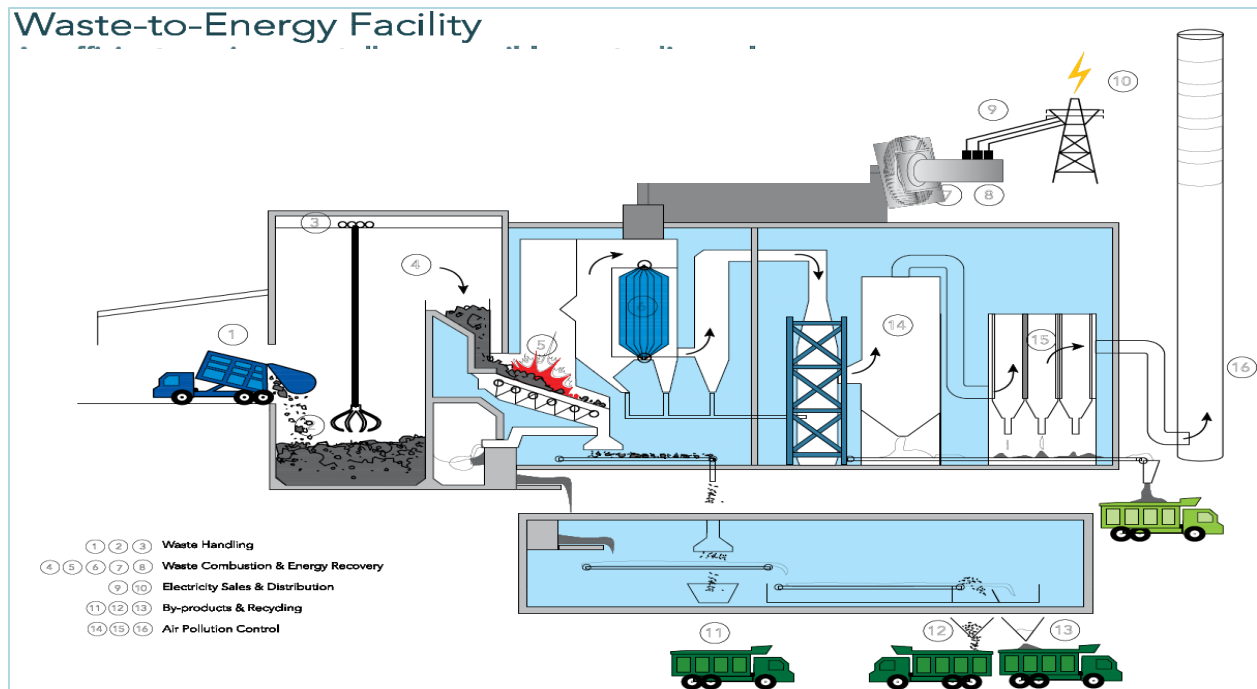
### 2.1 The Waste-to-Energy Facility Operations

The Waste-to-Energy Facility is located in a commercial/industrial area of south Burnaby, British Columbia, Canada on a 1.8-hectare site near the Fraser River. The Waste-to-Energy Facility commenced operation in 1988 and has been in commercial operation since that time. The Waste-to-Energy Facility has been operated and maintained on the Corporation's behalf by a number of contractors. The Waste-to-Energy Facility was designed and constructed by GKN Birwelco, Ltd.

The Waste-to-Energy Facility consists of three identical, mass burn type combustion units and currently processes approximately 240,000 tonnes per year of municipal solid waste, or approximately 25% of the residual municipal solid waste managed by Metro Vancouver. Each combustion train consists of a feed hopper/chute, a stoker grate and a waterwall boiler. Municipal solid waste is stored in a bunker and fed into each feed hopper using an overhead refuse crane. Heat is recovered from the combustion process in the form of superheated steam. The steam is used to generate approximately 23 megawatts of gross electrical power at full load using a steam turbine and electric generator. All of the electricity generated by the Waste-to-Energy Facility is sold to B.C. Hydro under a power purchase agreement. Approximately 3 megawatts of electrical power is purchased directly from B.C. Hydro to satisfy the in-house load required to operate the Waste-to-Energy Facility. The Waste-to-Energy Facility is also able to export steam through a dedicated turbine extraction port. The Waste-to-Energy Facility previously sold steam to an adjacent paper facility operated by Norampac. Steam export was discontinued in 2011 due to the closure of the steam host facility, but Metro Vancouver is currently developing a district energy system to supply heat and hot water to nearby neighbourhoods.

The flue gases from each combustion unit are treated in an air pollution control system prior to discharge to the atmosphere. The existing air pollution control system equipment on each unit consists of a heat recovery unit, a dry hydrated lime scrubber, and a multi-compartment fabric filter baghouse. The air pollution control system heat recovery unit, referred to as the primary economizer, is used to cool the flue gases leaving the boiler and provides a second means of preheating the boiler feed water. Hydrated lime and activated carbon are injected into the dry scrubber to reduce acid gases and emissions of mercury (Hg) and dioxins and furans, respectively.

The baghouse removes particulates from the flue gas including fly ash from the combustion process and by-products from the dry scrubber. An induced draft fan is located downstream of each baghouse and is used to maintain a negative draft through the combustion and air pollution control system train. The cleaned flue gas is discharged from the ID fan through a dedicated flue inside a common concrete stack. In 2014, a Low Nitrogen Oxide (NO<sub>x</sub>) (or LN™) technology consisting of staged combustion air and aqueous ammonia injection into each furnace was installed. Figure 1 provides a representative cross section of the Waste-to-Energy Facility.



**Figure 1. Schematic of the Metro Vancouver Waste-to-Energy Facility**

By-products from the combustion process include bottom ash from the boiler system and fly ash from the air pollution control system, which are stored and disposed separately. Ferrous metal is recovered from the bottom ash using a belt magnet positioned perpendicular to the bottom ash conveyor on each combustion unit. Bottom ash and recovered ferrous metals are stored temporarily in a bunker and loaded out with an overhead ash crane.

A non-ferrous metal recovery system was installed in 2018. Bottom ash is batch fed to this system using the ash crane and recovers both non-ferrous metals and an incremental amount of additional ferrous metal. Fly ash is collected in hoppers beneath the dry scrubber and baghouse and conveyed pneumatically to a storage silo. Phosphoric acid is added to the bottom ash to stabilize metal constituents before being loaded into covered trailers. Fly ash is conditioned with water and phosphoric acid in a pugmill to reduce dusting and stabilize metals.

There are two types of emissions monitoring that are employed by the Waste-to-Energy Facility. The first is an in-stack continuous emissions monitoring and continuous opacity monitoring systems, as well as applicable operating parameters. The air quality related parameters that are continuously monitored for compliance purposes include:

- Stack temperature
- Stack gas oxygen (O<sub>2</sub>) concentration
- Stack gas sulfur dioxide (SO<sub>2</sub>) concentration
- Stack gas hydrogen chloride (HCl)
- Stack gas nitrogen oxides (NO<sub>x</sub>) concentration

- Stack gas carbon monoxide (CO) concentration
- Stack gas total hydrocarbons (THC) concentration
- Opacity (as a surrogate for particulate matter)
- Furnace temperature

The second is quarterly stack testing conducted for a number of constituents and annually for another set of pollutants. The quarterly testing includes:

- Particulate matter (filterable)
- Hydrogen fluoride
- Seventeen (17) metals

The annual testing includes:

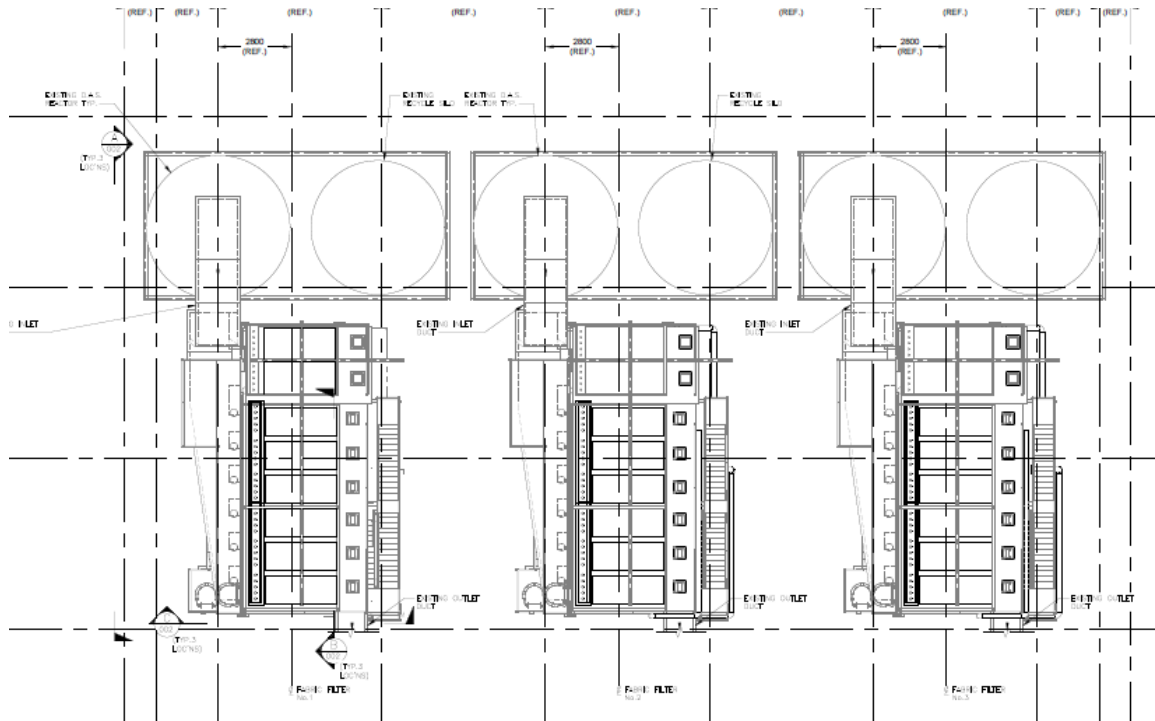
- dioxins and furans
- Polychlorinated biphenyl (PCB)
- Polycyclic aromatic hydrocarbons (PAH)
- Hexachlorobenzenes (HCB)
- Chlorobenzene (CB)
- Chlorophenols (CP)

As compared to other facilities located in North America and Europe, the quarterly stack testing is a greater frequency than most facilities. Typically, the Waste-to-Energy Facility facilities have a requirement for annual or semi-annual stack testing.

## 2.2 Baghouse Performance Review

### 2.2.1 Review of Baghouse Operations and Maintenance

The primary flue gas treatment device used to control particulates at the Waste-to-Energy Facility are the baghouses. Each of the three processing lines is fitted with a dedicated pulse jet baghouse that can reduce the particulate emissions generated from the combustion of municipal solid waste by up to 99.9%. Baghouses are a proven control method for particulate emissions in the industrial and power generation industries. Each baghouse includes eight compartments with up to 80 filter bags each for a total of 640 filter bags per baghouse. Figure 2 provides a schematic of the three existing baghouses at the Waste-to-Energy Facility.



**Figure 2. Schematic of Metro Vancouver Waste-to-Energy Facility Baghouses**

A baghouse works by directing the “dirty” flue gas through the outside of the bags where particulates collect and form a filter cake, then the “clean” flue gas travels up the inside of the bags and eventually to the atmosphere through the facility stack. Baghouses also provide secondary control of acid gas and metals emissions, such as hydrogen chloride, sulfur dioxide, dioxins and furans and mercury, through the reaction of unspent reagents (i.e. hydrated lime and activated carbon) in the filter cake built up on the filter bags.

As the filter cake builds up on the outside of the bags, the pressure drop across the baghouse increases. The particulate cake build-up is removed using a pulse of dry compressed air on the inside, or “clean” side of the bags. The particulates drop into a receiving hopper beneath each compartment and are transferred pneumatically to the fly ash storage silo before conditioning.

There are several design and key operating parameters that were evaluated as part of our review of the baghouse operations at the Waste-to-Energy Facility. A critical design factor for the baghouses is the air-to-cloth ratio, which is defined as the amount of air flowing through each square centimetre of filter media. This parameter determines the operating efficiency of the filtration system. A good operating baghouse should have an air-to-cloth ratio of no greater than 4 to 1 under maximum flue gas flow conditions. The Waste-to-Energy Facility added two additional baghouse modules to each of the three units in 2011 to improve the air-to-cloth ratio of the Waste-to-Energy Facility baghouses to ensure operation at a ratio well below 4:1. Therefore, the baghouse is operating in compliance with the recommended design criterion.

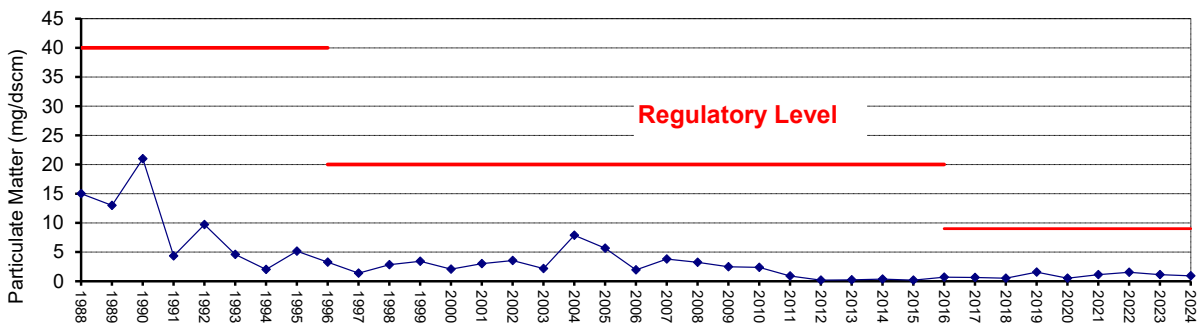
The bag materials used are also an important design feature of the baghouses. Currently, the Waste-to-Energy Facility utilizes polytetrafluoroethylene bags in the three baghouses. These bags are widely used in the waste-to-energy and power generation industry and offer numerous advantages over other bag materials including, but not limited to, higher particulate removal efficiencies (including for submicron particles) and greater chemical resistivity and durability.

HDR also evaluated several of the key operating indicators, including the baghouse differential pressures, differential temperatures, and bag life. The baghouse differential pressure trends observed at the facility were within design ranges, indicating that bags are pulsed in regular intervals. The baghouse differential temperature trends, measured as the difference between the inlet flue gas temperature versus the outlet temperatures, and the differential oxygen percentages were also reviewed. These parameters are used as an indication of whether the baghouse is airtight. A review of recent trends for these parameters indicates that air leakage into the units is being controlled and baghouse performance is within range of industry standards.

HDR’s review of maintenance records and standard operating practice indicates that the bags are changed out every three years, which meets industry standards for bag change outs (typically every 3 to 4 years). The Waste-to-Energy Facility operators also perform routine maintenance of the baghouse as part of regularly scheduled outages, including addressing the corrosion of the baghouse sidewalls and hoppers to prevent air leakage into the units that can affect performance. In addition, the facility recently replaced the hoppers in all three baghouse units during the 2024 and 2025 scheduled maintenance outages. This is important since the hoppers tend to be a main source of air-in leakage in baghouses caused by cold temperature corrosion.

Overall, based on our assessment, the baghouses at the Waste-to-Energy Facility are performing as designed and meet or exceed the particulate matter removal efficiency performance standards for this type of equipment. Figure 3 provides a summary of the actual historical particulate stack test results for the Waste-to-Energy Facility versus the applicable regulatory standard(s) at the time of the stack test. This figure demonstrates that the Waste-to-Energy Facility typically operates well below the regulatory standards for discharge of particulate matter and indicates that the baghouses are operating as designed. A discussion of the Continuous Opacity Monitoring System is provided in Section 3.3.

**Particulate Matter**



**Figure 3. Schematic of Metro Vancouver Waste-to-Energy Facility Baghouses**

## 2.3 Ash Management Performance Review

### 2.3.1 Operations Overview

The Waste-to-Energy Facility produces two types of ash streams. Incinerator bottom ash is the heavy fraction produced after the municipal solid waste is combusted on the inclined grate-type stokers. Fly ash is the lighter fraction that results from the combustion process and remains airborne, traveling in the flue gas and collecting on the boiler tubes and walls and in the air pollution control equipment. As

noted in the previous section, fly ash is primarily controlled by the baghouses at the Waste-to-Energy Facility and transferred pneumatically in sealed piping to a storage silo for further conditioning.

Bottom ash is largely comprised of slag, ceramic, glass, ferrous and non-ferrous metals, and un-combusted organics. There are generally two bottom ash streams that are managed separately; processed versus unprocessed bottom ash. Processed bottom ash testing shows more consistency and lower potential for individual sample results to exceed regulatory standards for trace heavy metals. As such, processed bottom ash is suitable for beneficial reuse at a cement plant as an alternative to landfill disposal.

The Bottom Ash Management Plan approved for the Waste-to-Energy Facility by the BC Ministry of Environment (now Ministry Parks and Environment) contains different sampling methodologies for processed and unprocessed bottom ash. Processed bottom ash currently represents approximately 95% of all bottom ash produced, with unprocessed bottom ash only being produced during non-ferrous metal recovery system maintenance periods.

Bottom Ash is collected at the bottom of the combustion grate where it is quenched with water and cooled before storage in a separate storage pit. Bottom ash contains larger sized particles that are not easily entrained into the air. The Waste-to-Energy Facility staff collect processed and unprocessed bottom ash samples for testing on a daily and weekly basis. After sampling, bottom ash is loaded into cover transfer trailers and hauled directly for landfill disposal (beneficial use at cement plants has been implemented on a pilot basis but is not in place at full-scale). A summary of the bottom ash testing results from 2018 through 2025 can be found on Metro Vancouver's website ([Reports and Operational Certificate | Metro Vancouver](#)).

Fly ash is smaller, lighter particles that have a greater tendency to become airborne if not treated and conditioned. Fly ash is considered hazardous if not conditioned and contains measurable levels of various trace metals, particularly lead and cadmium. For purposes of this study, HDR focused our assessment on the fly ash handling and management at the Waste-to-Energy Facility since it would have a greater chance of contributing to metals and dioxins and furans concentrations in the surrounding environment given it is more likely to be emitted through fugitive emissions because of the nature of the fly ash.

Fly ash is handled, treated, and tested in accordance with the Waste-to-Energy Facility's Fly Ash Management Plan, dated August 2017. As noted, fly ash is collected from the units at the Waste-to-Energy Facility from two sources; the fly ash collected from the boilers during online and offline cleaning, and the fly ash residuals collected from the air pollution control equipment, particularly from the baghouses. Raw fly ash is pneumatically conveyed in airtight piping from the dry ash silos and from underneath the baghouse hoppers to a fly ash storage silo. Raw fly ash is then fed from the storage silo at a controlled rate through an enclosed system to the enclosed fly ash mixer.

A solution of phosphoric acid and water is sprayed on the fly ash at a predetermined rate as the material is processed through the mixer. The mixer (or pug mill) consists of two counter rotating screws that ensure the ash is well mixed with the phosphoric acid solution. This is a batch process called the Wes-PHix fly ash stabilization process. The process is designed to reduce the leachability of certain trace heavy metals through the addition of soluble phosphate, lime and water to form geochemically stable metal phosphate compounds that are resistant to leaching. The Waste-to-Energy Facility manages fly ash alkalinity through the addition of hydrated lime into the facilities' air pollution control

system. Post treatment alkalinity is managed by adjusting the phosphoric acid feed rate to the pug mill. This process also wets the fly ash significantly to prevent dusting and entrainment into the air.

The treated fly ash is loaded directly into a transfer trailer located beneath the pug mill outlet drop chute. Loaded fly ash trailers are covered and remain on-site at the Waste-to-Energy Facility until an analysis is performed to confirm that the fly ash meets all regulatory requirements and is suitable for off-site transport and landfill disposal. Composite samples are collected from loaded fly ash trailers and sent to an approved analytical laboratory for chemical analysis. The chemical analysis performed on the treated fly ash includes a pH analysis and the Toxicity Characteristic Leaching Procedure (or “TCLP”) Method 1311, which are commonly used methods in the solid waste industry to determine the leachability of certain trace heavy metals, such as cadmium and lead, in a waste stream. The Waste-to-Energy Facility operator targets a final lab TCLP pH range of 9.5 to 11.5 (corresponding to a treated fly ash alkalinity range of 2.75 to 3.25 meq/g). Fly ash loads which meet the Leachate Quality Standards (LQS) and pH requirements of the Hazardous Waste Regulation are released for transport and landfill disposal. The Waste-to-Energy Facility operator holds all composite fly ash sample material for a minimum of four (4) weeks after the loads have been released for disposal.

Based on HDR’s review of the available laboratory test results for the conditioned fly ash, the Waste-to-Energy Facility complies with the TCLP standards for trace heavy metals, including cadmium and lead.

### 2.3.2 Observations of Operation and Maintenance of the Waste-to-Energy Facility Fly Ash Handling Systems

As part of this analysis, HDR performed observations of the operation and maintenance of the bottom ash and fly ash management and treatment systems at the Waste-to-Energy Facility. During these site visits, our assessment included direct visual observations of the bottom ash and fly ash loadout operations, as well as the condition of the ash management systems and general observations of the Waste-to-Energy Facility grounds and surrounding area. During our observations of both the bottom ash and fly ash loadout operations into transfer trailers, minor spillage was observed onto the concrete pads under the loadout areas. The spillage under both loadout areas was wet and could stick to the transfer truck tires and conceivably be tracked offsite to the roadways outside of the Waste-to-Energy Facility. HDR did not observe any tracking off-site during our site visits but cannot rule out that it has occurred in the past.

HDR also observed periodic puffs of steam or water vapour coming from the bottom of the storage silo as conditioned fly ash dropped from the chute into the transfer trailer. Although it is feasible that these puffs of steam may have contained some particulate matter there was no evidence of dust or fly ash on the surrounding equipment or structures, and the puffs of steam typically dissipated quickly. HDR also walked around the area on the Waste-to-Energy Facility site used to stage the covered loaded fly ash trailers and did not observe any leaking fly ash from the trailers or on the grounds.

HDR observed housekeeping activities and the operating condition of the fly ash management systems located within the Waste-to-Energy Facility buildings, including the boiler and air pollution control buildings. HDR did observe some dust and fly ash under some of the hoppers in both the boiler and the air pollution control buildings, but they were contained within the enclosed building. Furthermore, the operator was in the middle of performing maintenance on some of the units and stated the material would be vacuumed up and properly disposed of. HDR did not observe any fugitive

dust emissions escaping from the operating equipment or outside of the building. The operating condition of the fly ash handling equipment and transfer piping also appeared to be intact.

### 2.3.3 Conclusions

Overall, the Waste-to-Energy Facility is operating in accordance with the approved Bottom Ash and Fly Ash Management Plans, as well as generally accepted industry standards. During our site observations, HDR did not observe any releases of fugitive dust either from normal operations or during the loadout operations for bottom ash or conditioned fly ash.

## 2.4 Waste-to-Energy Facility Operations Conclusions

The baghouses at the Waste-to-Energy Facility are performing as designed and meet or exceed the particulate matter removal efficiency performance standards for this type of equipment. The Waste-to-Energy Facility operates well below the regulatory standards for discharge of particulate matter, which indicates that the baghouses are operating as designed. In addition, the Waste-to-Energy Facility is adhering to its Bottom Ash and Fly Ash Management Plans, as well as generally accepted industry standards. During the site visit, there were no observed releases of fugitive dust either from normal operations or during the loadout operations for bottom ash or conditioned fly ash. Given that facility operations meet the Operational Certificate requirements, and meets or exceeds industry standards, the facility is not a source of significant particulate release from any source other than as authorized by the Operational Certificate through emissions from the facility stack.

## 3 Air Emissions Analysis

To understand and evaluate the significance of the impact that the Waste-to-Energy Facility has had on contributing to particulate matter deposition locally, and particularly in the direction of the Wigg roof, HDR reviewed and analyzed:

- Actual emissions measurements from compliance stack testing
- Continuous stack emissions monitoring data
- Quantities of municipal solid waste burned
- 2018 dispersion and deposition modeling study
- 2018 public health risk assessment study

The stack test results indicate that the Waste-to-Energy Facility has consistently met the allowable emission limits of its Operational Certificate by a wide margin. As discussed in Section 2.2.1 review of historic baghouse performance parameters indicates that they are performing according to their design specifications and, therefore, the stack test results accurately represent actual facility particulate matter emissions. The stack test results from the last five-year period were statistically analyzed for variability and used to quantify actual mass emission rates of particulate matter, metals and dioxins and furans to estimate maximum deposition rates in the local area. This information is presented and interpreted in the context of the rooftop sampling study discussed in Section 4.

## 3.1 Stack Test Measurements

The Waste-to-Energy Facility routinely conducts stack testing at each of the three combustion units in accordance with Operational Certificate 107051 (Operational Certificate, dated December 15, 2015, amended September 23, 2025) issued by the British Columbia Ministry of Environment and Parks (Ministry of Environment). The Operational Certificate requires the use of specific well-established, reliable, and widely used methods for measuring actual stack emission rates. The Ministry of Environment's guidance regarding stack testing methods and procedures is contained in Part B of their Field Sampling Manual (2020, accessible at [https://www2.gov.bc.ca/assets/gov/environment/research-monitoring-and-reporting/monitoring/emre/manuals/field-sampling-manual/bc\\_field\\_sampling\\_manual\\_part\\_b.pdf](https://www2.gov.bc.ca/assets/gov/environment/research-monitoring-and-reporting/monitoring/emre/manuals/field-sampling-manual/bc_field_sampling_manual_part_b.pdf)).

Stack testing requires specialized skills and equipment, so it is typically conducted by an independent third-party firm that is contracted by a given facility. Metro Vancouver has historically used the firm A. Lanfranco & Associates, Inc., based in Surrey, BC, to conduct the Waste-to-Energy Facility stack testing.

Quarterly testing is routinely performed at each of the three combustors to measure the actual emission concentrations of particulate matter, hydrogen fluoride (HF), and trace metals. The collected stack samples are analyzed for fifteen individual metals. HDR reviewed the stack test reports available for each quarter over the most recent 5-year period (Q4 2020 through Q3 2025), with a focus on emissions rates of particulate matter and metals. Special attention was given to the metals that were detected in the environmental media sampling described in subsequent sections.

In accordance with its Operational Certificate, the Waste-to-Energy Facility routinely conducts stack testing for total dioxins and furans [reported as (polychlorinated dibenzo-p-dioxins) and (polychlorinated dibenzofurans) dioxins and furans toxicity equivalent value (TEQ)], as well as other organics. Stack tests for dioxins and furans are conducted annually for one of the boilers, meaning that each boiler is tested on a three-year cycle. HDR reviewed results of the seven most recent dioxins and furans tests (2018-2024).

Table 1 summarizes the actual average stack gas concentrations (mg/dscm @ 11% O<sub>2</sub>) for the metals which were also detected in the environmental media samples (dscm is dry standard cubic meters, where standard conditions are defined as 293.15 K and 101.325 kPa). Total particulate matter and dioxins and furans TEQ values are also shown. Review of the quarterly stack test results indicates that the facility has operated with stack emissions consistently below the Operational Certificate limits. The 95<sup>th</sup> upper confidence limit of particulate matter emissions was 16% of Operational Certificate limits over the duration of the review period.



**Table 1. Facility Stack Test Results Summary**

Analyte	Operating Limit (mg/dscm)	Average (mg/dscm)	Standard Deviation (mg/dscm)	Median (mg/dscm)	Minimum (mg/dscm)	Maximum (mg/dscm)	95% Lower Confidence Level (mg/dscm)	95% Upper Confidence Level (mg/dscm)	95%UCL as % of Operating Limit
Lead	0.064	0.00236	0.0010	0.00216	0.00061	0.0049	0.00191	0.00281	10%
Arsenic		0.00069	0.0003	0.00071	0.00033	0.0012	0.00057	0.00081	
Chromium		0.00201	0.0016	0.00144	0.00044	0.0062	0.00129	0.00273	
Cobalt	--	0.00016	0.0001	0.00013	0.00010	0.0005	0.00012	0.00020	--
Cadmium	0.007	0.00028	0.0003	0.00021	0.00008	0.0013	0.00016	0.00040	5.7%
dioxins and furans TEQ	8E-08	1.8E-09	1.5E-09	2.0E-9	0.00000	4.2E-9	7.3E-10	2.96E-09	3.7%
Nickel	--	0.00266	0.0023	0.00188	0.00052	0.0097	0.00167	0.00365	--
PM	9.0	1.178	0.558	1.11	0.380	2.24	0.933	1.422	16%

Statistical metrics are shown for the five-year dataset for the metals and particulate matter, as well as for the seven tests available for dioxins and furans from 2018-2024. The statistical analysis indicates that emissions vary within a relatively narrow range. Examining the 95% Upper Confidence Level (UCL) on the mean for each parameter shows a high probability that emission rates are consistently below the respective operating limits by a margin of 84% or greater.

The stack test results are summarized in Appendix A and presented graphically in Figures 4 to 11. There are no Operational Certificate limits for cobalt and nickel, while the Operational Certificate limit is for the combined emission of lead, arsenic and chromium and hence not shown on the graphs below, but as per Table 1 the upper confidence limit of sum of these parameters was 10% of Operational Certificate limits over the review period.

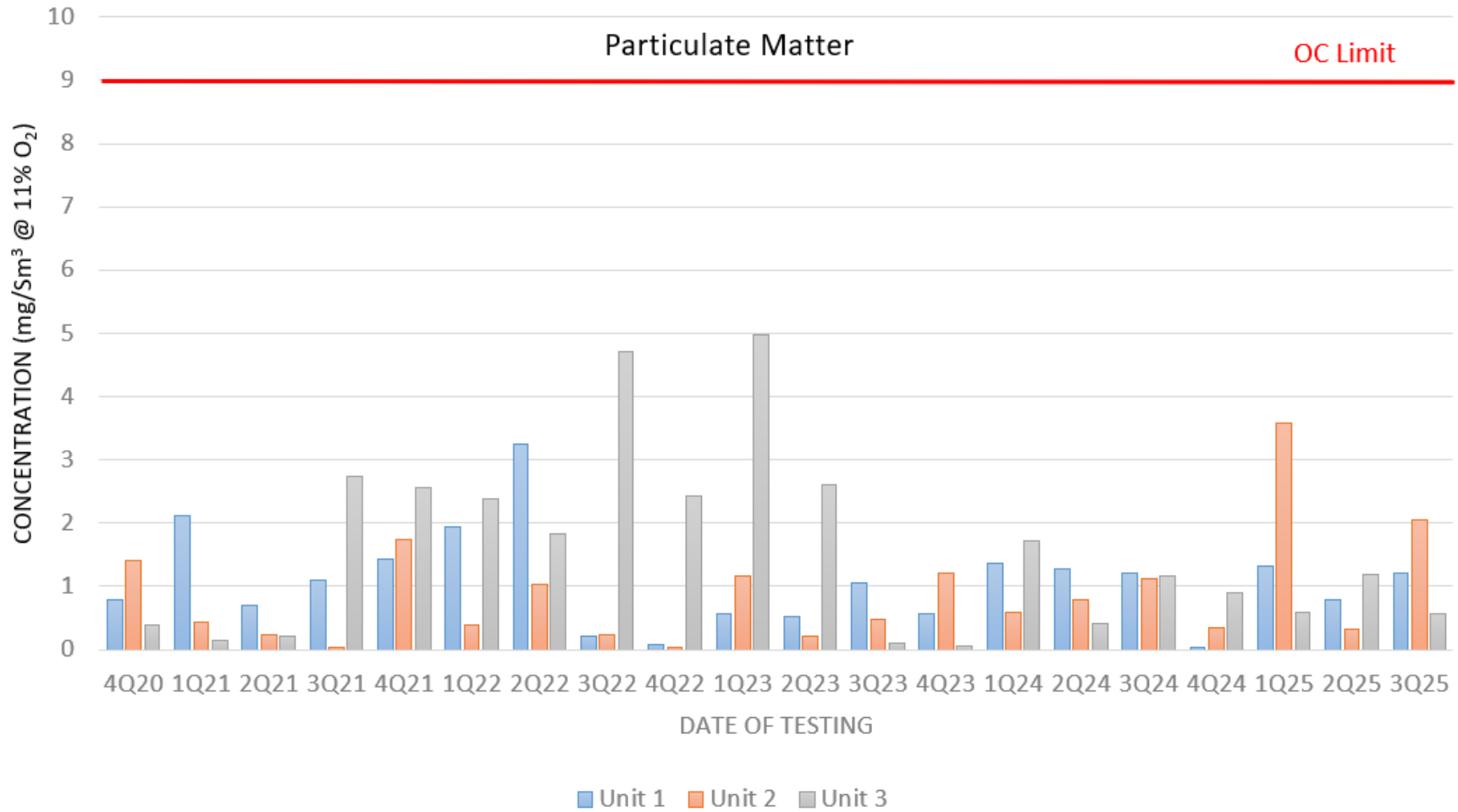


Figure 4. Quarterly Stack Test Results for Particulate Matter

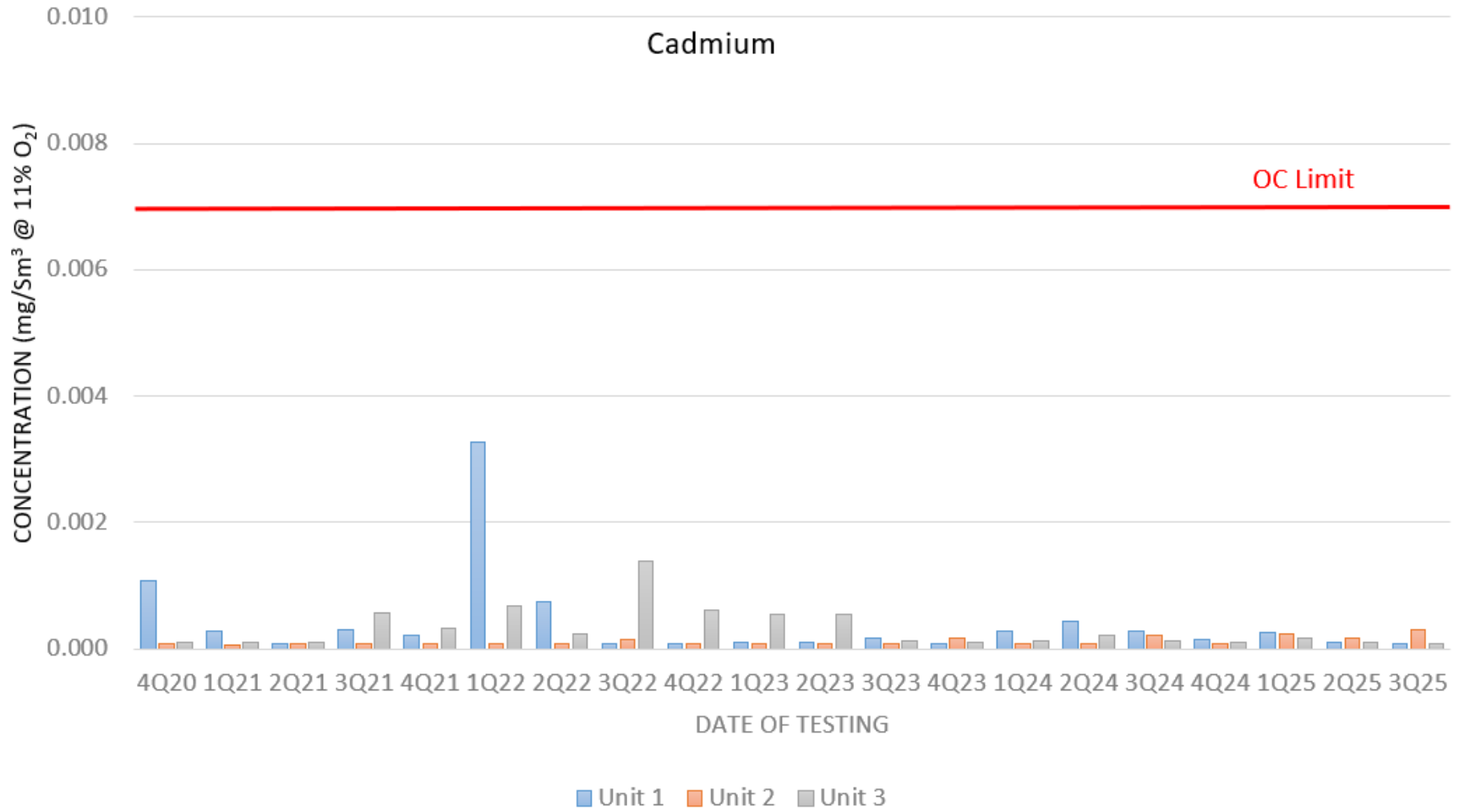


Figure 5. Quarterly Stack Test Results for Cadmium

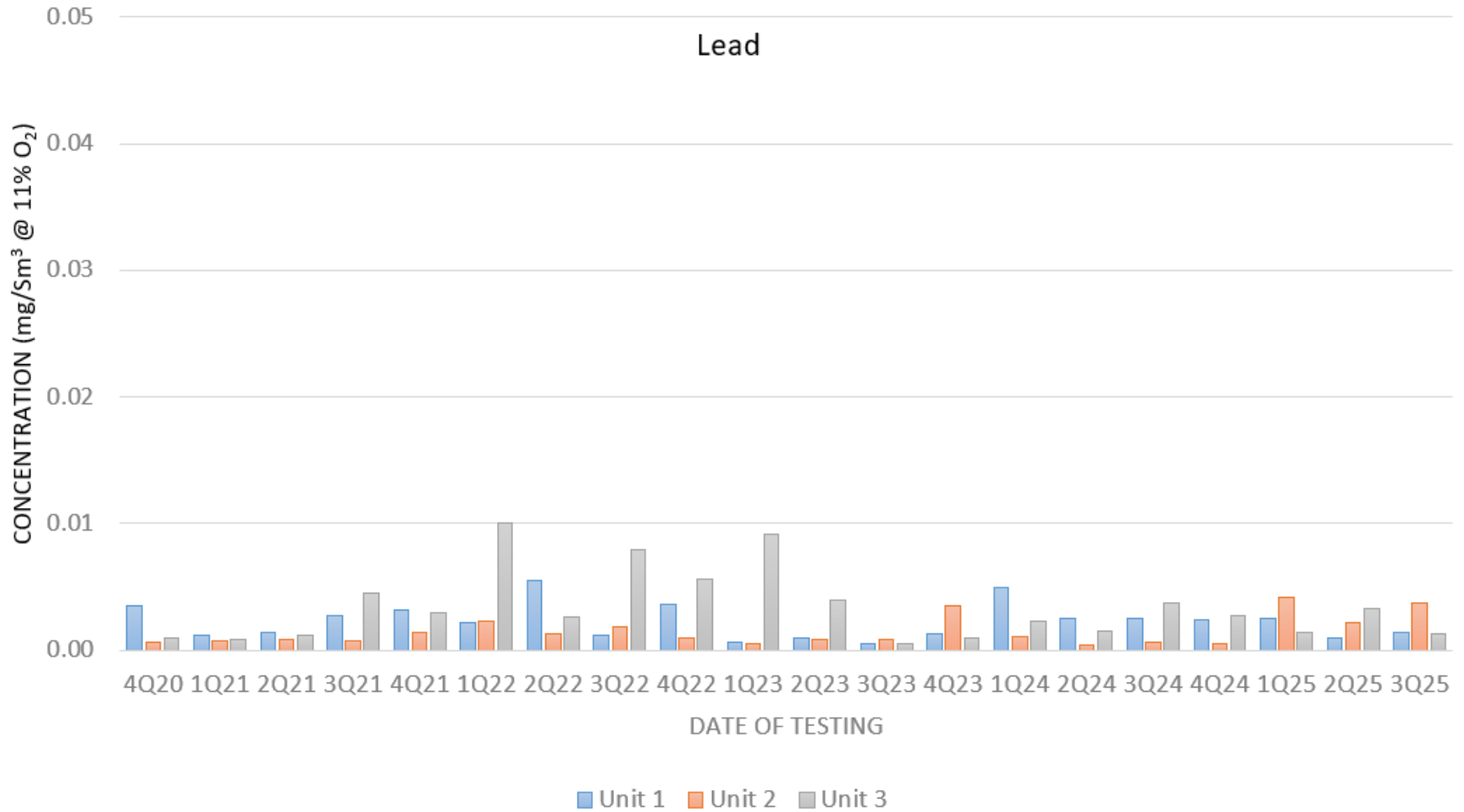


Figure 6. Quarterly Stack Test Results for Lead

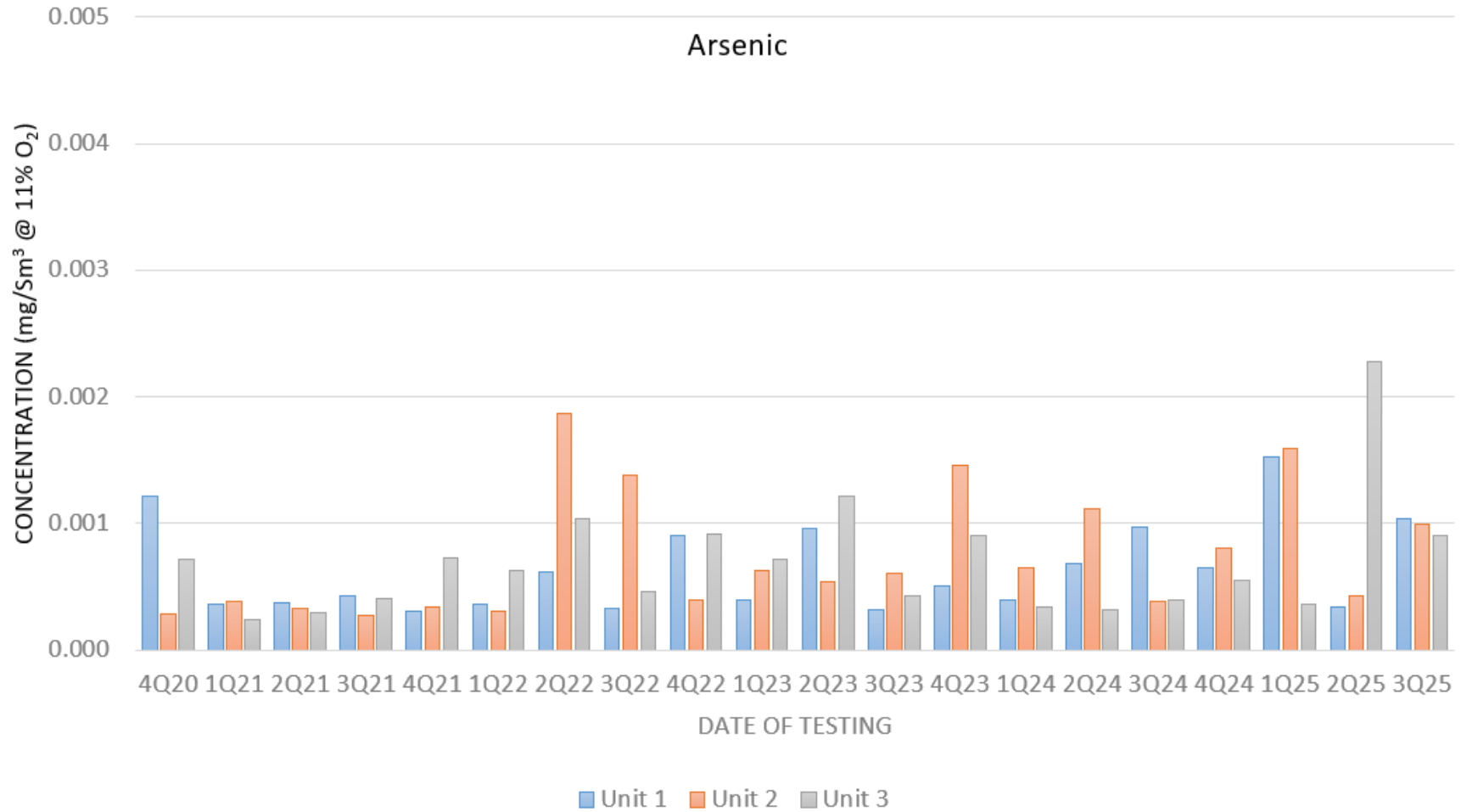


Figure 7. Quarterly Stack Test Results for Arsenic

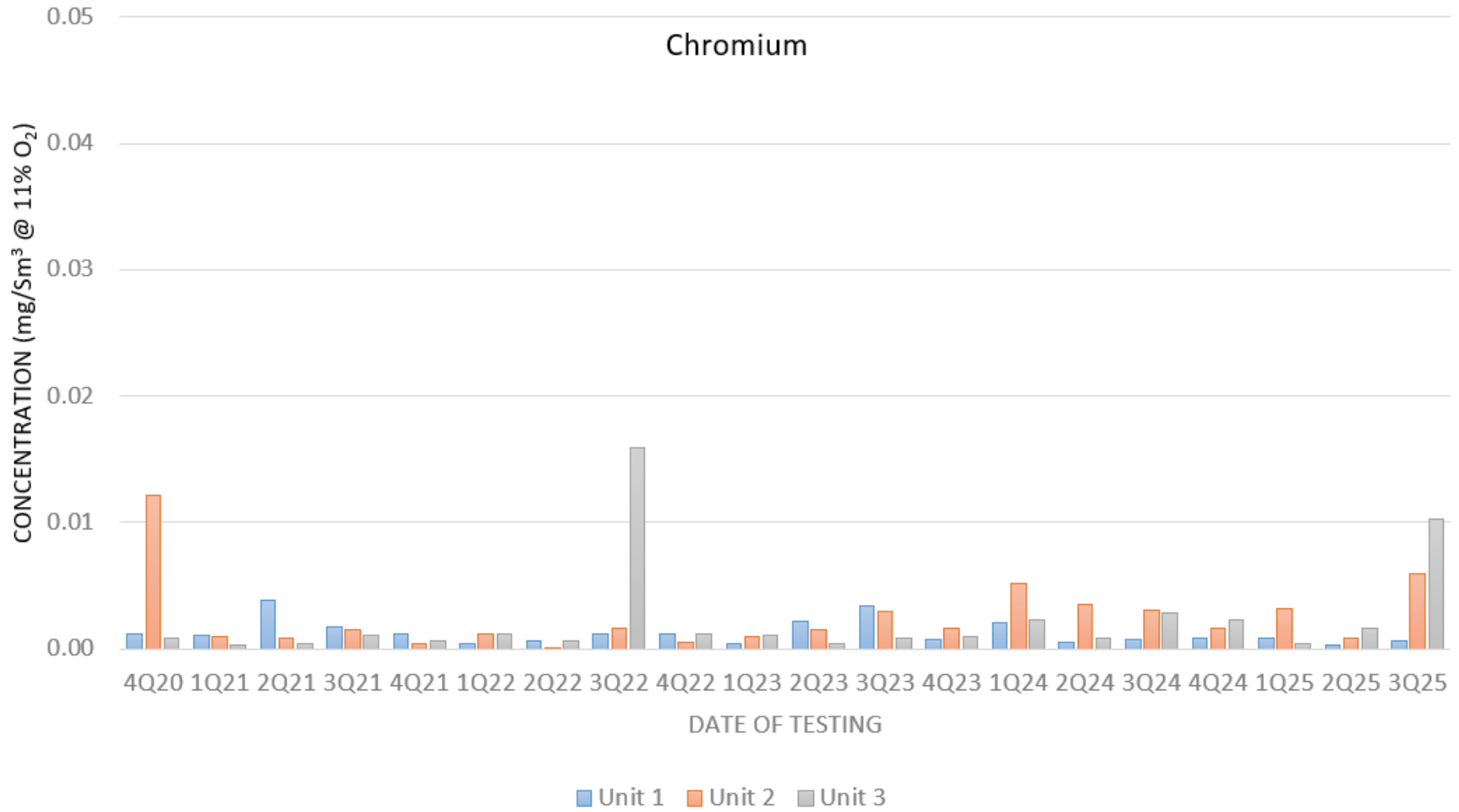


Figure 8. Quarterly Stack Test Results for Chromium

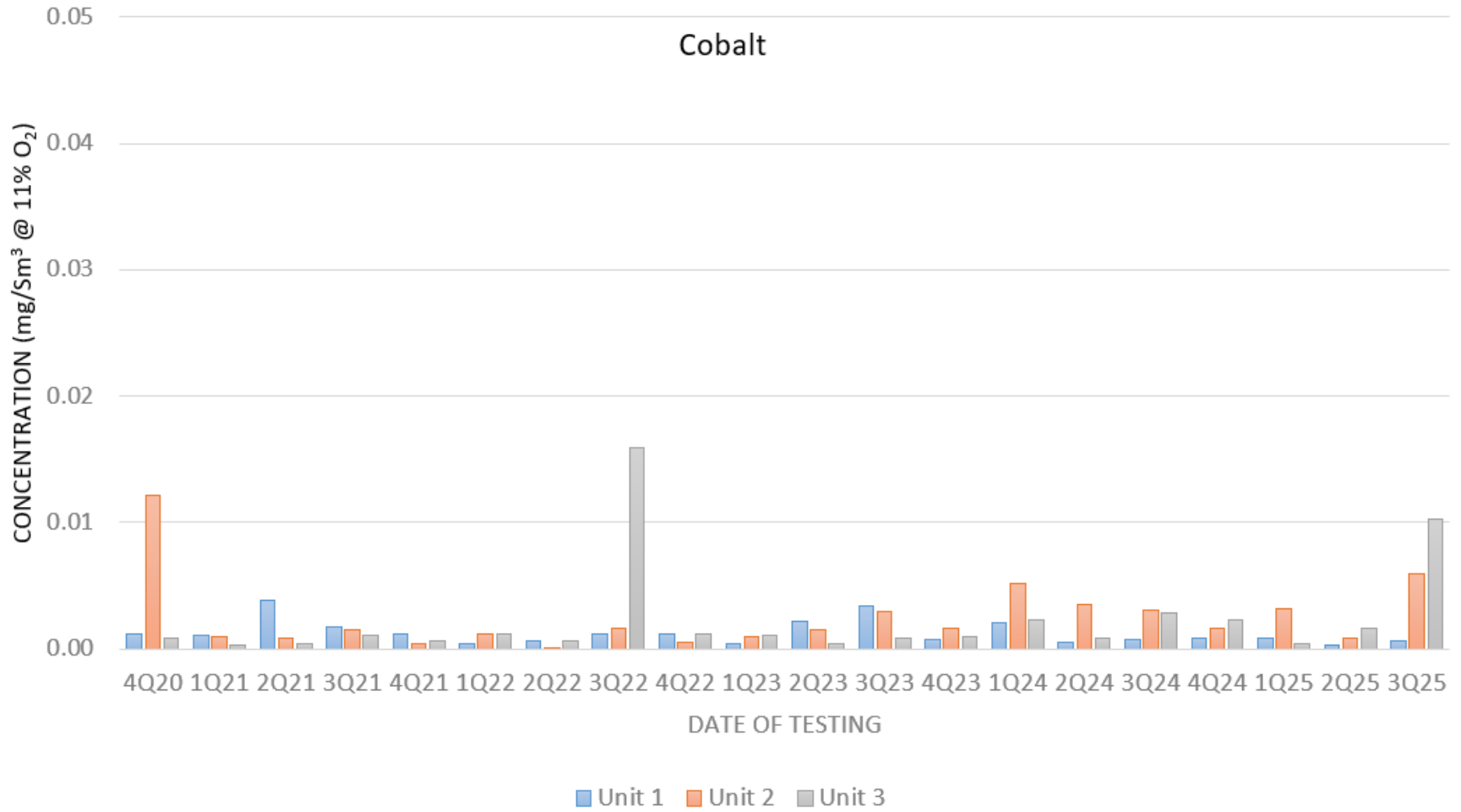


Figure 9. Quarterly Stack Test Results for Cobalt

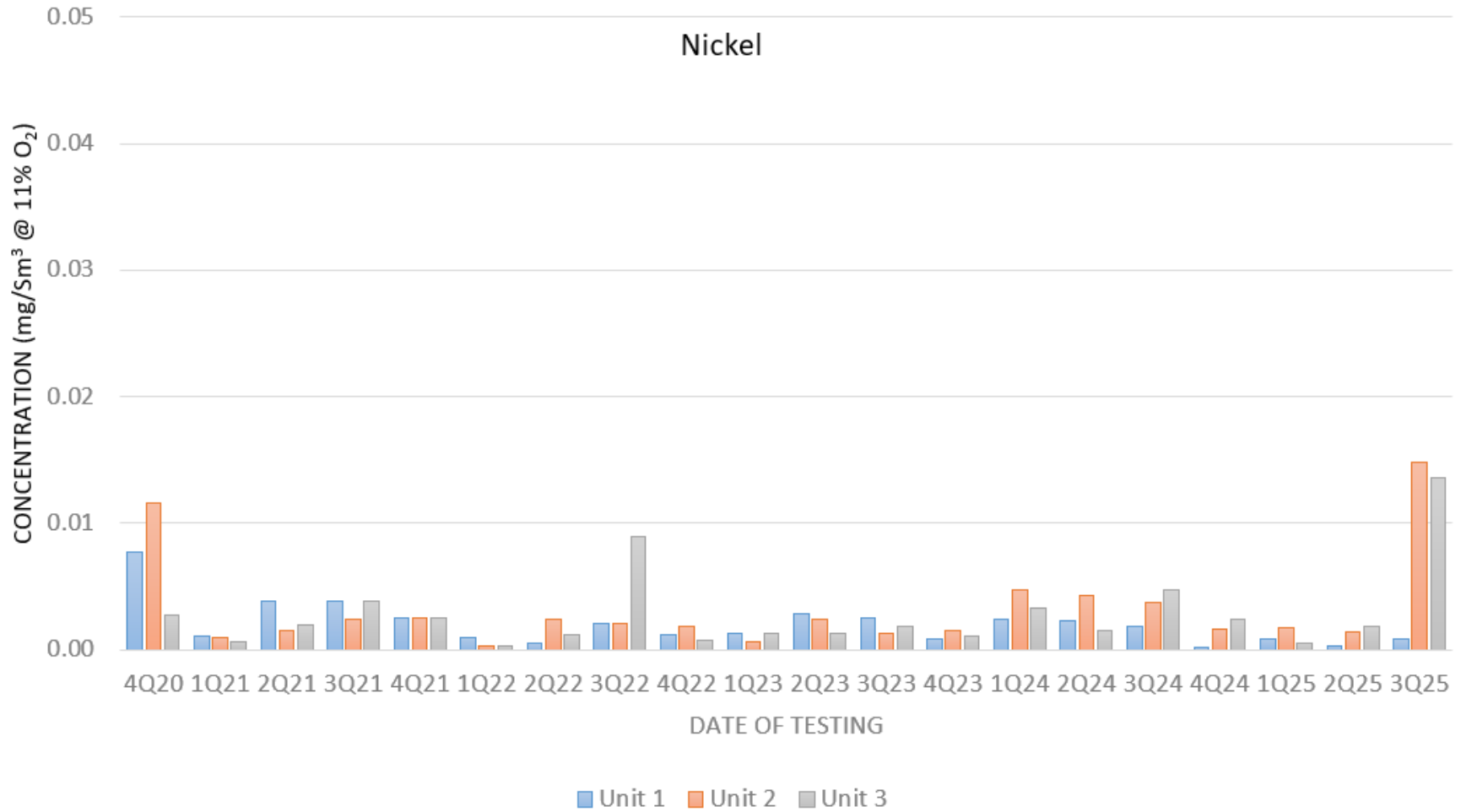


Figure 10. Quarterly Stack Test Results for Nickel

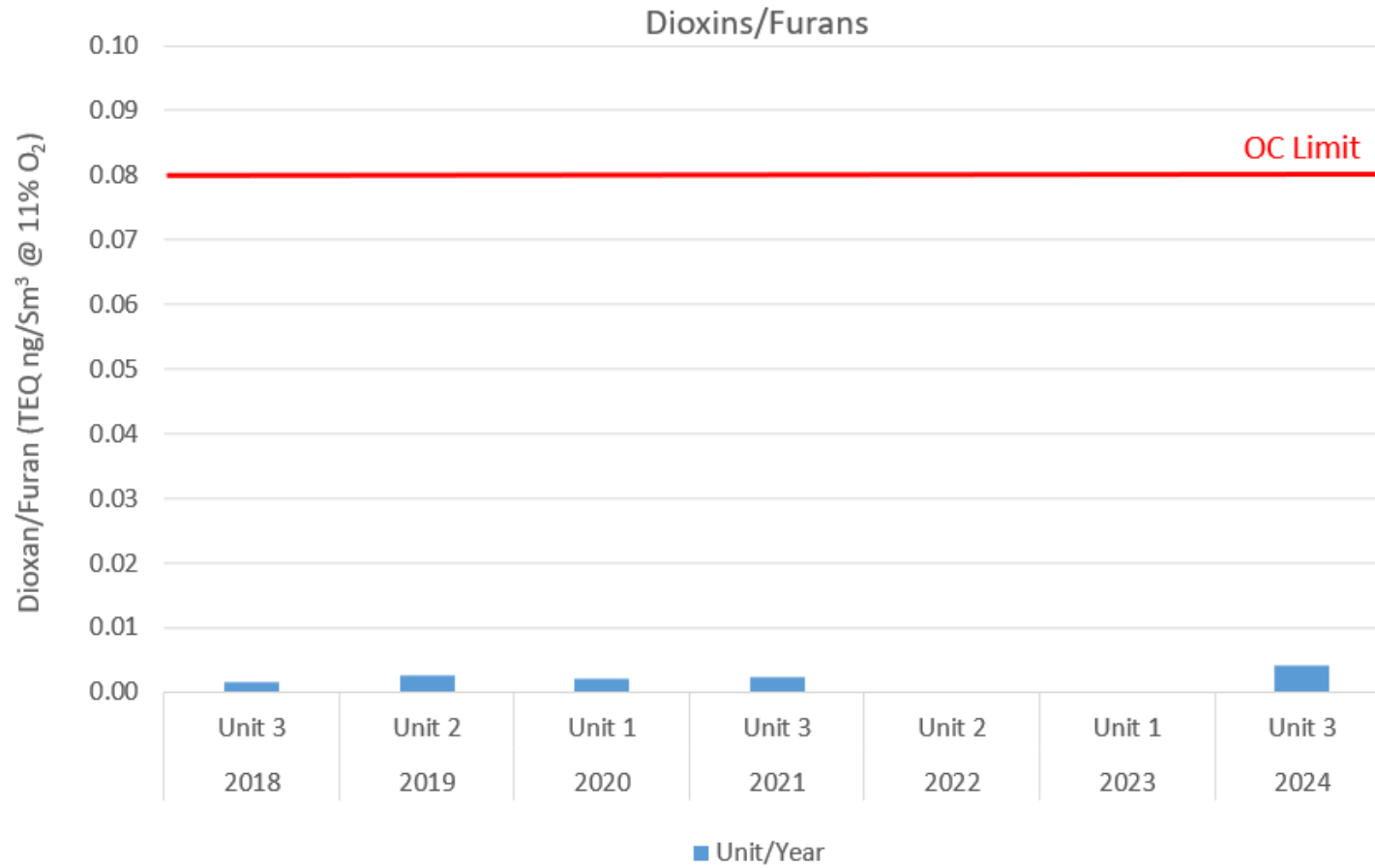


Figure 11. Annual Stack Test Results for dioxins and furans

## 3.2 Actual Emission Rates

In 2018, a Waste-to-Energy Facility air quality modeling report and public health risk assessment (Public Health Risk Assessment) were completed as part of the requirement of the facility Operational Certificate. Based on the emissions information from the stack tests, HDR calculated actual short term mass emission rates (Table 2) and an average emission factor normalized on a per-tonne municipal solid waste firing rate that was concurrently measured during some of the stack tests. This emission factor was subsequently used with actual annual quantities of municipal solid waste combusted to estimate actual annual emission rates of each of the metals, particulate matter, and dioxins and furans. Actual quantities (tonnes) of municipal solid waste for this calculation were obtained from the Facility’s annual operating records (available at <https://metrovancouver.org/services/solid-waste/reports-and-operational-certificate>). Per the annual operating records, the facility combusted an average of 246,290 tonnes municipal solid waste per year over the 8-year period between 2017-2024 and the respective emissions estimates are shown in Table 2.

**Table 2. Comparison of Average Actual Emission Rates to 2018 Risk Assessment Modeled Emission Rates**

Analyte	2018 Public Health Risk Assessment Operating Limit Modeled Emission Rate (g/s)	Updated Average Actual Emission Rate (g/s)	Updated Stack Test Actual Emission Rate as % of 2018 Risk Assessment Modeled Emission Rate	Stack Test Data Period
Arsenic	8.76E-4	5.8E-05	6.6%	Q4 2020-Q3 2025
Chromium	5.48E-4	1.2E-04	22%	Q4 2020-Q3 2025
Lead	3.18E-3	2.1E-04	6.6%	Q4 2020-Q3 2025
Pb+As+Cr	4.60E-03	3.8E-04	8.3%	Q4 2020-Q3 2025
PM10/PM2.5	0.648	0.099	15%	Q4 2020-Q3 2025
Cadmium	5.00E-04	3.8E-05	7.6%	Q4 2020-Q3 2025
dioxins and furans	5.80E-09	1.34E-10	2.3%	2017-2024

The stack test short term emission rates are consistently less than the maximum potential emission rates that were analyzed in the 2018. As a result, the Public Health Risk Assessment evaluation and conclusions continue to be a conservative representation of the facility’s actual operating conditions.

## 3.3 Continuous Opacity Monitoring Systems Review

As discussed previously the Waste-to-Energy Facility continuously monitors a number of parameters to demonstrate compliance with respective emission limits specified in the Operational Certificate. One component of these systems is the Continuous Opacity Monitoring System installed on each unit to measure visible emissions in real time prior to venting to the atmosphere. Opacity can be correlated to particulate matter concentrations and is widely used as an indicator of changes in

particulate matter emissions resulting from an upset in the combustors or malfunction of air pollution control systems. Upon detection of elevated opacity, the Waste-to-Energy Facility follows response procedures to restore normal operating conditions or shut down the malfunctioning unit to investigate the cause of the elevated opacity reading.

HDR reviewed the Continuous Opacity Monitoring System records for Q4 2020 through Q3 2025 and identified no exceedances of the opacity standard during this 5-year period. This is consistent with the facility's baghouses performing as designed and meet or exceed the particulate matter removal efficiency performance standards for this type of equipment. The opacity results are consistent with the particulate matter stack test results (Figure 3) that demonstrates that the Waste-to-Energy Facility operates well below Operational Certificate limits for discharge of particulate matter.

### 3.4 Modeled Deposition Rates Associated with Operational Certificate Emission Limits

HDR on behalf of Metro Vancouver prepared an air quality modeling of contaminant stack dispersion and Public Health Risk Assessment in 2018 to evaluate the potential exposures and protection levels associated with Operational Certificate emission limits. Air dispersion and deposition modeling methods were used in accordance with Ministry of Environment Air Quality Dispersion Modeling Guidelines to estimate the maximum ambient air concentrations ( $\mu\text{g}/\text{m}^3$ ) and deposition rates ( $\mu\text{g}/\text{m}^2/\text{s}$ ) for metals, dioxins and furans, and volatile organic compounds.

The CALPUFF dispersion and deposition model was used to predict deposition rates in the area surrounding the Waste-to-Energy Facility. It assumed the Waste-to-Energy Facility was hypothetically releasing emissions of each regulated air pollutant from the stack at its maximum allowable level specified in the Operational Certificate. CALPUFF is a widely used and scientifically robust Lagrangian puff model that simulates time-varying meteorological conditions to simulate pollutant plumes as they move through three-dimensional wind fields. CALPUFF is recommended by the Ministry of Environment for conducting air quality and human health risk analyses in Metro Vancouver due to its capability to represent atmospheric conditions in regions with complex terrain (i.e. mountainous and coastal features) and complex meteorology (i.e. mountain-valley winds, sea breeze circulations).

When preparing the 2018 Public Health Risk Assessment, deposition rates were evaluated at a series of nearby sensitive receptor locations, one of which was the BC Roofing facility located approximately 500 meters east of the Waste-to-Energy Facility. This receptor is located in very close proximity to the Wigg roof. Figure 12 is an excerpt from the 2018 Air Dispersion Modeling Study used as the basis for the Public Health Risk Assessment which illustrates the location of the BC Roofing Receptor.

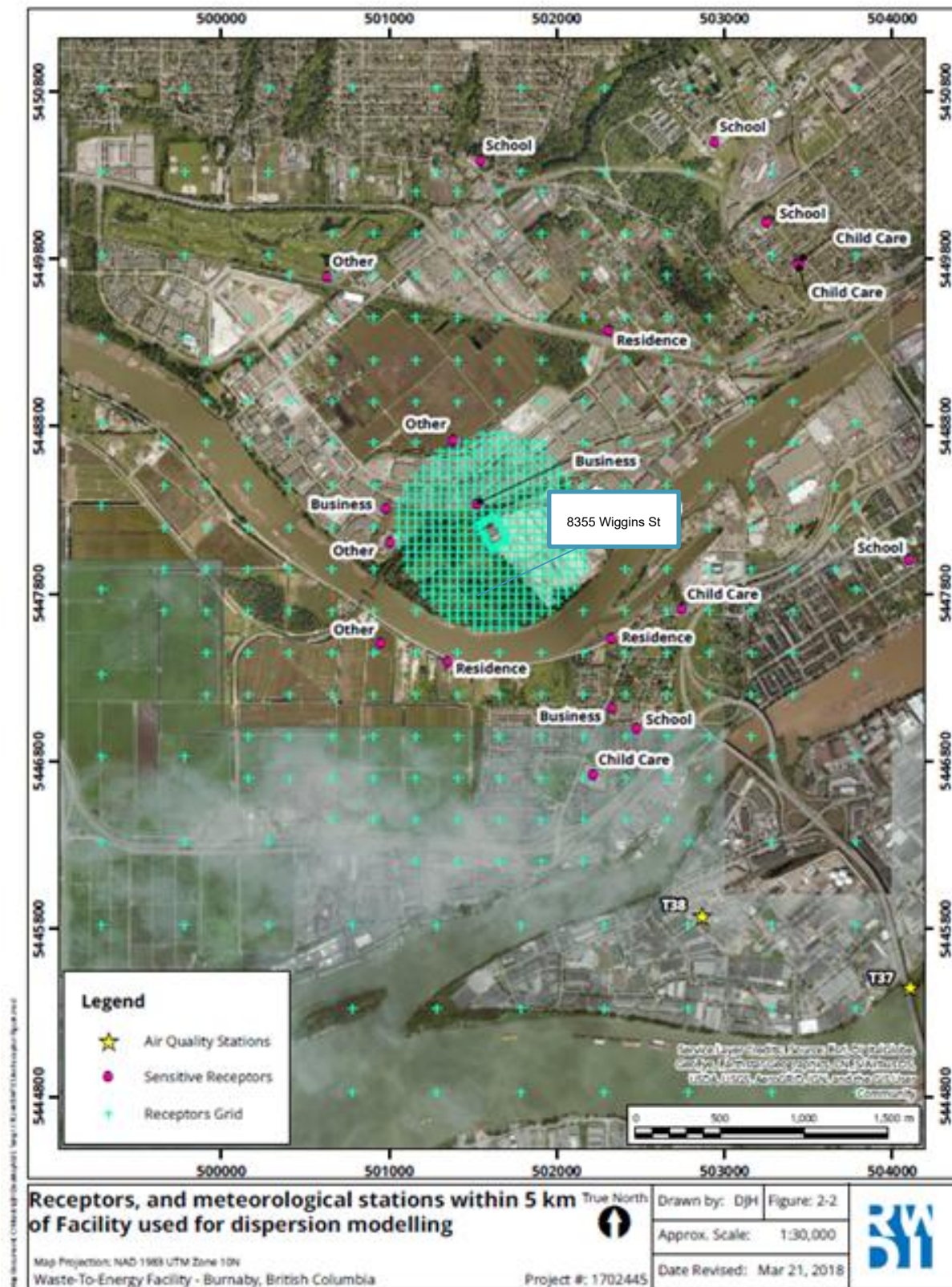


Figure 12. Receptor Locations from the 2018 Public Health Risk Assessment.

The modeled representation of the stack emissions is based on the most recently air quality dispersion modelling study conducted in 2018. Updated dispersion modelling is being undertaken as part of the work required in the amended Operational Certificate.

Table 3 summarizes the deposition rates from the 2018 Public Health Risk Assessment, with the Waste-to-Energy Facility’s emission rates set equal to the Operational Certificate allowable limits.

Table 3 is a conservative estimation as it assumes that the peak deposition rate occurs over entire surface area. In addition, the estimate does not account for surface runoff, erosion, or natural degradation over time due to photolysis, hydrolysis, secondary chemical reactions, or biological pathways.

**Table 3. Modeled Maximum Deposition Rates at BC Roofing Receptor**

Analyte	Operating Limit Model Emission Rate (g/s) <sup>(a)</sup>	Peak Deposition Rate in the vicinity of the Wigg roof (g/m <sup>2</sup> /yr)
PM <sub>10</sub> /PM <sub>2.5</sub>	0.648	1.41E-02
Arsenic	8.76E-4	1.0E-04
Chromium	5.48E-4	1.0E-04
Lead	3.18E-3	1.0E-04
Pb+As+Cr	4.60E-03	3.0E-04
Cadmium	5.00E-04	1.09E-05
PCDD/F	5.80E-09	2.04E-10

(a) Ref: *Metro Vancouver Waste to Energy Facility Public Health Risk Assessment*, Table 6.

The peak deposition rate of particulate matter on the Wigg roof was calculated to be 0.0141 g/m<sup>2</sup>/yr. In a letter to Metro Vancouver dated August 15<sup>th</sup>, 2025, Mr. Harco indicated that he had calculated a particulate deposition rate of 10 g/m<sup>2</sup>/yr. Mr. Harco’s unsupported deposition calculation is ~700 times greater than the theoretical maximum deposition rate that could have occurred if the Waste-to-Energy Facility was releasing particulate matter at the permitted discharge limit.

To better understand the actual deposition of particulate matter onto the Wigg roof Table 4 provides calculated deposition rates based on actual stack test data rather than Operational Certificate maximum limits.

**Table 4. Calculated Peak Actual Deposition Rates**

Analyte	Operating Limit Model Emission Rate (g/s) <sup>a</sup>	5-year Average Actual Emission Rate (g/s)	Modeled Peak Deposition Rate at Wigg roof (g/m <sup>2</sup> /yr)	Calculated Actual Deposition Rate in the vicinity of the Wigg Roof Receptor (g/m <sup>2</sup> /yr)
PM <sub>10</sub> /PM <sub>2.5</sub>	0.648	0.104	1.41E-02	2.26E-03
Arsenic	8.76E-4	5.8E-05	1.0E-04	6.62E-06
Chromium	5.48E-4	1.2E-04	1.0E-04	2.19E-05
Lead	3.18E-3	2.1E-04	1.0E-04	6.60E-06
Pb+As+Cr	4.60E-03	3.8E-04	3.0E-04	2.48E-05
Cadmium	5.00E-04	3.8E-05	1.09E-05	8.31E-07
dioxins and furans	5.80E-09	1.34E-10	2.04E-10	4.71E-12

The calculated deposition rate of particulate matter in the vicinity of the Wigg roof based on actual particulate emissions is 0.00226 g/m<sup>2</sup>/yr. This is approximately 4,400 times lower than Mr. Harco’s reported deposition rate of 10 g/m<sup>2</sup>/yr.

Per the 2018 Public Health Risk Assessment:

*...soil loading of each COPC [Chemical of Potential Concern] was either at (PCDD/F) or well below (all other COPCs) the analytical reporting limits. This means that after 10 years of WTEF emissions deposition in soil at the MPOI [Maximum Point of Impingement], the change in COPC concentration would be analytically insignificant, and likely not detectable. This indicates that there would be no appreciable increase in human health risk due to deposited COPC.*

The calculated actual deposition rate for each analyte is less than the respective maximum rate reported in the Public Health Risk Assessment, which indicates that the resultant potential maximum deposition rates over a 10-year period are analytically insignificant.

Given the insignificant loading of material on the Wigg roof from the Waste-to-Energy Facility stack emissions, one would not be able to analytically detect the concentrations of metals or dioxins and furans contribution from the Waste-to-Energy Facility in the Wigg roof material. Therefore, any concentrations of analytes on the Wigg roof or in nearby streets or parking lots would not have been significantly influenced by the Waste-to-Energy Facility emissions and it is not a source of the levels of metals or dioxins and furans measured through environmental media testing (see Section 4.8).

### 3.5 Conclusions of the Air Quality Analysis

Overall, after review of the Waste-to-Energy Facility stack emissions and the deposition rates and benchmarking against the environmental media chemical results, the following conclusions can be reached:

- Stack test data shows that the Waste-to-Energy Facility operates consistently within the allowable emission limits. Statistical analysis of the most recent 5-year stack test data indicates with a high probability (95% upper confidence limit) that actual particulate emissions are consistently 16% of the Operational Certificate limits or less.

- Continuous opacity and operating parameter monitoring indicates that incidents of excessive stack particulate matter emissions did not occur. This is consistent with the quarterly stack test results for particulate matter from the Waste-to-Energy Facility. Therefore, particulate matter observed locally on rooftops cannot be attributed to a malfunction at the combustion units or emissions control systems at the Waste-to-Energy Facility that could conceivably result in excess particulate matter emissions.
- The calculated deposition rate of particulate matter in the vicinity of the Wigg roof based on actual particulate emissions is 0.00226 g/m<sup>2</sup>/yr. This is approximately 4,400 times lower than Mr. Harco's reported deposition rate of 10 g/m<sup>2</sup>/yr.
- Given the insignificant loading of particulate matter on the Wigg roof from the Waste-to-Energy Facility stack emissions, the concentrations of metals or dioxins and furans contribution from the Waste-to-Energy Facility in the Wigg roof material would not be detectable. Therefore, any concentrations of analytes on the Wigg roof on or on nearby streets or parking lots would not have been influenced by the Waste-to-Energy Facility emissions and it is not considered a source of the levels of metals or dioxins and furans detected.

In summary, the stack measurements and emission rates, and calculated deposition rates, together show that it is not plausible that the Waste-to-Energy Facility is the source of the observed particulate matter on the Wigg roof or the concentrations of metals and dioxins and furans material observed on the Wigg rooftop or on surrounding streets and parking lots.

## 4 Environmental Media Sampling

### 4.1 Overview

An environmental media sampling program was developed to assess the levels of metals and dioxins and furans on the Wigg roof compared to other roofs. In addition, an evaluation of soil and roadside dust samples collected less than 500 m from the Waste-to-Energy Facility was compared to samples collected greater than 10 km from the facility. Locations were selected in the vicinity of the Waste-to-Energy Facility. For comparison purposes six distant locations were selected. Five of the locations were near to other Metro Vancouver solid waste facilities in similarly industrial zoned neighbourhoods a minimum of 10 kilometres from the Waste-to-Energy Facility, and the sixth location was a second Wigg Holdings warehouse located in Surrey approximately 25 kilometres from the Waste-to-Energy Facility also in a similarly industrial zoned neighbourhood.

Statistical analysis of the samples through t-tests and Principal Component Analysis was completed to ascertain if metal composition in the various environmental sample locations were similar in nature. Furthermore, environmental samples were physically and chemically examined through scanning electron microscope (SEM) / Energy-Dispersive X-ray (EDX) analysis. Collectively, this approach serves to understand the whether the physical material and chemical composition found on the Wigg roof is similar to that emitted from the Waste-to-Energy Facility.

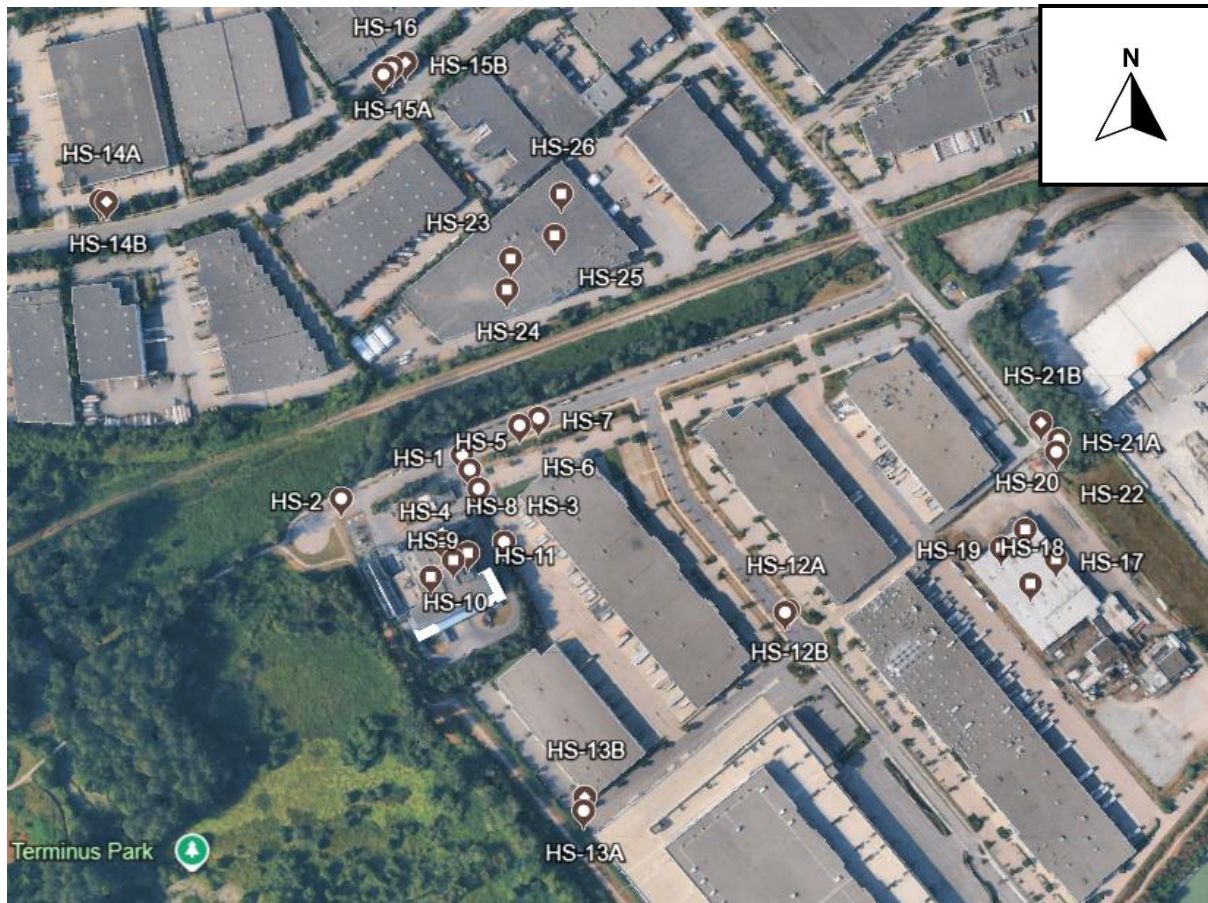
## 4.2 Sample Locations

Sample locations, with GPS coordinates and sample type are summarized in Appendix B. Sample locations were chosen based on their proximity to the Waste-to-Energy Facility. Twelve soil samples were collected within 500 m of the Waste-to-Energy Facility as shown in Figure 13. The twelve soil samples collected within 500 m of the Waste-to-Energy Facility have a soil sample (denoted as a pin with a circle in it) and a roadside dust companion sample (denoted as a pin with a diamond in it). The roadside dust companion sample was collected in as close a proximity as possible to corresponding soil samples.

The maximum predicted ground level concentration of particulate matter according to the dispersion modelling conducted in 2018, is directly East of the Waste-to-Energy Facility stack. Consequently, a cluster of soil samples were collected at this location for metal analysis including Hand Sample (HS)-1, HS-4, and HS-5, as well as for dioxin and furan analysis (HS-6 and HS-7) all collected at a depth of 0-2 cm below ground surface.

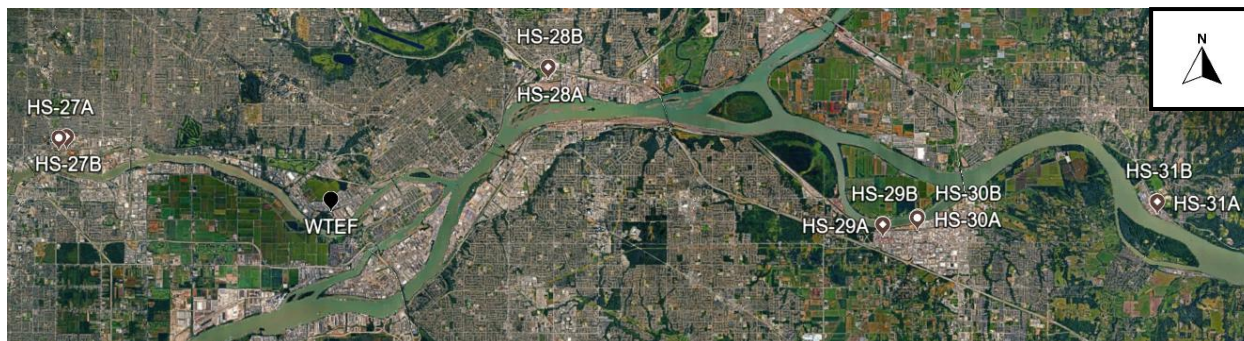
Accumulated material on two roofs nearby to the Waste-to-Energy Facility along with the Waste-to-Energy Facility roof were sampled. Three samples were analyzed for metals and mercury and one sample for dioxins and furans for each roof. The roofs were selected in consultation with Mr. Harco and Metro Vancouver, and the selected roofs were the Wigg roof, Garibaldi Glass roof, and the Waste-to-Energy Facility roof. A second round of sampling was conducted in January 2026 on the Waste-to-Energy Facility roof. The two of the initial three sample results (HS-9 and HS-10) were substantially different from the third sample HS-8, and thus an additional 10 samples (HS-36 to HS-45) were collected for analysis.

Five comparative locations denoted as Far Field locations (>10 km from the Waste-to-Energy Facility stack) near other Metro Vancouver solid waste facilities in similarly industrial zoned neighborhoods were chosen for comparison purposes and are shown in Figure 14. Wigg Holding's second warehouse facility is approximately 25 km east of the Waste-to-Energy Facility and located in Surrey BC (Wigg Surrey warehouse) (Figure 15). Soil sample and roadside dust samples were collected near the Surrey warehouse, and the roof was sampled.



**Figure 13. Sample Locations Around the Waste-to-Energy Facility.**

*Note:* soil samples shown as a pin with a circle, roadside dust is shown as a pin with a diamond, and roof samples are shown as a pin with a square.



**Figure 14. Far Field sample locations (>10 km from the Waste-to-Energy Facility stack) near other Metro Vancouver solid waste facilities.**

*Note:* One roadside dust and one soil sample were collected at each location.



**Figure 15. Sample Locations at Wigg Surrey Warehouse.**

*Note:* soil samples shown as a pin with a circle, roadside dust is shown as a pin with a diamond, and roof samples are shown as a pin with a square.

Figure 16 shows that the rooftop material that was found across the four different roofs varied substantially. The composition of the rooftop material also varied substantially on each of the roofs. Those two factors meant that sample collection across the roofs varied. For example, the Garibaldi Glass roof was entirely covered in typical rooftop aggregate material, so the sample was collected from the fine material below the gravel layer. Both roofs owned by Wigg Holdings had a solid asphalt roof with a green-coloured material resembling algae on the surface that was sampled. The Waste-to-Energy Facility roof was primarily covered in aggregate material with some material accumulated along edges. The material along the edges appeared to have accumulated over a long period of time, potentially many years. To capture representative results, both sample locations were collected on the Waste-to-Energy Facility roof.



**Figure 16. Accumulated material on roofs, from left to right Waste-to-Energy Facility roof, Garibaldi Glass roof, Wigg roof, and Wigg Surrey roof.**

### 4.3 Sample Type

Three sample types of environmental media were collected; soil (from 0-2 cm below ground surface), roadside dust (collected from the road along curbs), and roof (accumulated material) as shown in Figure 17.



**Figure 17. Three sample types. From left to right, soil, roadside dust, and roof.**

Roadside dust is not a representative sample across time as it can be swept away through street sweeping or rain events and it can also be deposited by material from traffic as opposed to deposition from air. Soil samples are more representative of deposition from air emissions over time so surface soil samples from 0-2 cm below ground were collected. Roadside dust samples (denoted with a B after the Hand-Sample ID) were collected for comparison purposes, in as close proximity as possible to corresponding soil samples (denoted with an A after the Hand-Sample ID).

Additionally, three samples of fly ash from the Waste-to-Energy Facility were collected and analyzed for metals to investigate the extent to which the metals in fly ash could be contributing to metals in rooftop material. On the day of sampling, Unit 2 was offline and not producing fly ash, so untreated fly ash samples were collected from Unit 1, Unit 3, and a composite sample of all three units.

## 4.4 Sample Collection

Tools used for sample collection were all plastic to eliminate any risk of contamination from a metal sampler. Surface soil samples were collected using a plastic trowel, roadside dust was collected using a smaller plastic trowel, and roof samples were collected using a plastic dustpan. Between samples, all equipment was decontaminated. Decontamination included removing excess soil from equipment, washing with Alconox detergent to remove excess soil, and rinsing with de-ionized water. Nitrile gloves were changed in between samples to avoid cross contamination between samples.

## 4.5 Laboratory Analysis

### 4.5.1 Metal and Dioxins and Furans Analysis

Samples were submitted to ALS Laboratory in Burnaby, BC for chemical analysis. Metals in soil/solid were analyzed by Collision Reaction Cell Inductively Coupled Mass Spectrometry (CRC ICPMS) and dioxins and furans were analyzed by Gas Chromatography-High Resolution Mass Spectrometry (GC-HRMS). The analysis for metals under the British Columbia Contaminated Sites Regulation (Contaminated Sites Regulation) tests for a total of 35 metals. ALS is a Canadian Association for Laboratory Accreditation Inc. accredited laboratory.

As conveyed by the laboratory, method blanks, control standards samples, certified reference material standards, method spikes, replicates, duplicates and instrument blanks are routinely analyzed as part of their quality control (QC) programs.

#### 4.5.2 UBC Scanning Electron Microscope/Energy Dispersive X-Ray Analysis

Particle morphology and distribution and metal composition analysis was conducted via SEM/EDX at the Centre for High-Throughput Phenogenomics at the University of British Columbia (UBC). The full UBC SEM/EDX report is included in Appendix E.

The soil samples were first dried out by heating to 60°C using a combination of an oven and a heat lamp until they were completely free of any moisture. Once dried, a thin layer of sample material was spread on a 24.5mm diameter SEM stub. Three such stubs were prepared for each sample to allow for a larger sampling volume. It must be acknowledged that even with multiple stubs prepared the sample size is still quite small and may not necessarily be completely representative of the bulk distribution of particles in the soil samples.

To quickly survey the samples for candidate particles to have their compositions analyzed, the samples were imaged in a scanning electron microscope (SEM). Images collected from backscattered electron signal will be used to identify metal containing particles. Once identified, the particles were analyzed using energy dispersive x-ray analysis (EDX) to determine their composition.

Prior to imaging the samples were coated with a thin (~10 nm) layer of conductive carbon to mitigate charging during analyses. Carbon is used as a coating material over more typical conductive coating materials (i.e. gold) because it has negligible contribution to the backscattered electron signal its characteristic x-ray peaks in EDX spectra do not overlap with those from other elements. It is to be noted that this will result in a small increase in the carbon concentration in the sample during quantitative analysis. Full details are provided in the SEM/EDX report in Appendix E.

#### 4.5.3 MVA Scanning Electron Microscope/Energy Dispersive X-Ray Analysis

Particle size distribution and metal analysis of the stack filters was conducted via SEM/EDX at the MVA Scientific Consultant Lab in Duluth, Georgia. The full MVA report is included in Appendix F.

The samples were prepared for analysis in accordance with MVA SOP 310, “Sample Preparation Methods for Total Particle Sizing Using Microscopical Techniques.”

The particle size distributions of the stack filter samples were measured in accordance with MVA SOP 318, “Manual Feature Sizing in Digital Images Using ImageJ” from digital images of the particles on the filters obtained using a JEOL JSM-6500F field emission scanning electron microscope equipped with a Thermo Scientific Noran System 7 x-ray analysis system.

The particle size distributions of the rinse samples were measured in accordance with MVA SOP 316, “Automated Particle Size Analysis Using the JEOL JSM-6500F and Thermo Scientific Noran System 7” using a JEOL JSM-6500F field emission scanning electron microscope equipped with a Thermo Scientific Noran System 7 x-ray analysis system.

The particle size data is presented in terms of particle number and in terms of estimated mass. The assumption has been made that the particles are all of similar density, and therefore, the particle volume distribution is equivalent to the particle mass distribution.

The samples were examined visually and with the aid of a stereomicroscope. Portions of each sample for material characterization were analyzed by scanning electron microscopy-energy dispersive x-ray spectrometry (SEM-EDS), confocal Raman microscopy (CRM), and Fourier transform infrared spectroscopy (FTIR) as necessary. SEM-EDX analysis was performed using a JEOL JSM-IT700HR field emission scanning electron microscope equipped with a Thermo Scientific Noran System 7 energy dispersive x-ray spectrometer. CRM analysis was performed using a Renishaw inVia confocal Raman microscope. FTIR analysis was conducted using a SpectrumiLLuminatIR infrared spectrometer attached to an Olympus BX51 compound microscope.

In the included EDX spectra, the presence of a peak labeled with an element symbol indicates the presence of that element in the sample, and the height of the peak can be related to the concentration of the element.

## 4.6 Environmental Standards

All concentrations of metals and dioxins and furans were benchmarked against the Contaminated Sites Regulation Schedule 3.1. These regulations include acceptable levels of chemicals in soil via the ingestion, particulate inhalation, and dermal exposure pathways. Therefore, the site-specific factor chosen is the Human Health Protection – Intake of Contaminated Soil pathway. The regulation lists standards based on land use, including wetlands, agricultural, residential (both low-density and high-density), commercial, and industrial. All the samples collected were on industrially zoned properties, so the applicable standard is industrial.

The Industrial Human Health Protection Guidelines are risk-based and were derived assuming that on-site industrial workers would be exposed to the material 5 days a week, 8-Hours per day, 48 weeks per year over their 30-year working lifetime. If the soil concentrations are less than the industrial guidelines, then it means that there would be no undue risk those on the industrial property.

There are no applicable risk guidelines for roadside dust or rooftop material. There would be far less exposure to workers and the public to exposure to rooftop material. It is unlikely that warehouse workers would be on a roof at the rate of the industrial frequency. Therefore, if rooftop samples are below the industrial soil quality guidelines, it would equally ensure the protection of public health.

## 4.7 Environmental Media Testing Results

All environmental media testing analytical results are presented in Appendix B. ALS analyzed and reported thirty-five metals; however, only seventeen of these metals have Contaminated Sites Regulation standards. The remaining metals are not toxicologically relevant for human health exposure.

In order to be conservative and to determine relevant metals of potential concern all sample results were first screened against the Contaminated Sites Regulation residential high-density area guidelines to determine which metals required further evaluation. Only seven metals were found to exceed the residential high-density standard in any one sample. These metals are arsenic,

cadmium, chromium, cobalt, lead, molybdenum, and nickel and were carried forward for further assessment. The remaining 10 metals including barium, beryllium, copper, manganese, mercury, selenium, sodium, uranium, vanadium, and zinc are included in Appendix B. The Contaminated Sites Regulation industrial land use standards are included for each of the seven metals included in this assessment are in Table 5.

**Table 5. Seven metals carried forward in the assessment and their Contaminated Sites Regulation Industrial land use standard (expressed in mg/kg).**

Site Specific Factor	Arsenic	Cadmium	Chromium	Cobalt	Lead	Molybdenum	Nickel	dioxins and furans*
Industrial	400	3500	20000	2000	4000	35000	80000	0.015

\*Provided as TEQ

Figure 18, Figure 19, and Figure 20 show the results of the sampling with exceedances of the Contaminated Sites Regulation industrial standard (shown in red). Sample locations with brown pins indicate the results were not in exceedance of the Contaminated Sites Regulation industrial standard for any of the metals or dioxins and furans.

Figure 18 shows that all the samples surrounding the Waste-to-Energy Facility (including samples collected on the Garibaldi Glass roof and the Wigg roof) had concentrations of metals below the industrial standard.

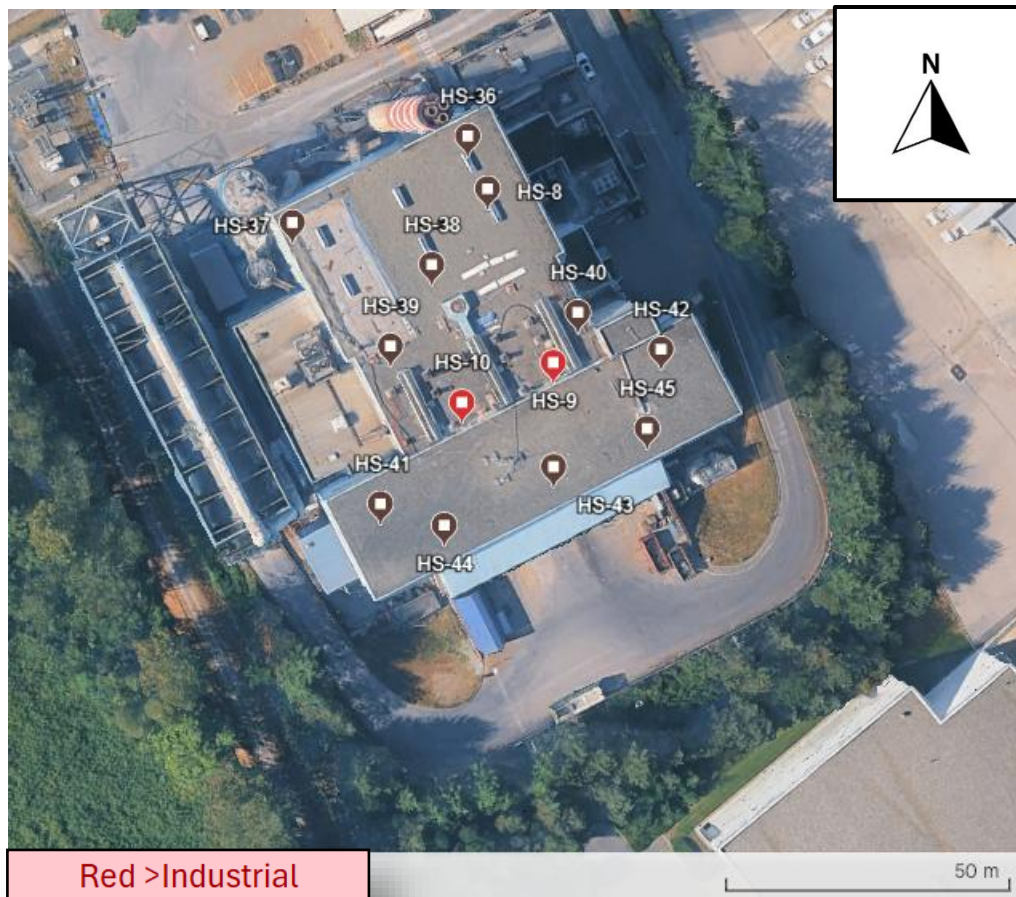
Figure 19 shows that, of the thirteen samples collected on the Waste-to-Energy Facility roof, only two samples had metal concentrations higher than the industrial standard for lead (HS-9 and HS-10). These two samples were in the material collected along edges as shown in Figure 16.

Figure 20 shows that the concentration of metals all samples from the Surrey Wigg are below the industrial standard.



Figure 18. Sample results for samples collected around the Waste-to-Energy Facility. Exceedances of one or more metals in the sample are shown in red.

*Note:* soil samples shown as a pin with a circle, roadside dust is shown as a pin with a diamond, and roof samples are shown as a pin with a square.



**Figure 19. Sample results for samples collected on the Waste-to-Energy Facility roof. Exceedances of the industrial standard for at least one metal are shown in red.**

*Note:* soil samples shown as a pin with a circle, roadside dust is shown as a pin with a diamond, and roof samples are shown as a pin with a square.



**Figure 20. Sample results for samples collected at the Wigg Surrey warehouse (25 km East of the Waste-to-Energy Facility). Exceedances of the industrial standard for at least one metal are shown in red.**

*Note:* soil samples shown as a pin with a circle, roadside dust is shown as a pin with a diamond, and roof samples are shown as a pin with a square.

#### 4.7.1 Metal Results

The 52 environmental media samples were separated by sample type into roof samples (Table 6), soil samples (Table 7), roadside dust samples (

Table 8), and fly ash samples (Table 9).

The only exceedance of the Contaminated Sites Regulation industrial standard was for lead in two of the Waste-to-Energy Facility rooftop samples. There were no other exceedances of the Contaminated Sites Regulation industrial standards in any of the other 50 samples, including on the Wigg roof.

**Table 6. Metal Results From Roof Samples (mg/kg).**

Location	Sample ID	Arsenic	Cadmium	Chromium	Cobalt	Lead	Molybdenum	Nickel
<b>Industrial standard</b>		<b>400</b>	<b>3500</b>	<b>20000</b>	<b>2000</b>	<b>4000</b>	<b>35000</b>	<b>80000</b>
	<b>mg/kg</b>							
Waste-to-Energy Facility Roof	HS-8	30.2	8.19	373	20.6	308	39	212
	HS-9	77.3	134	1350	28.5	6340	550	3690
	HS-10	67.8	116	1140	30.5	5140	396	2820
	HS-36	17.8	4.23	178	15.3	396	27.9	127
	HS-37	24.0	2.37	149	17.5	376	25.3	129
	HS-38	7.67	1.81	84.5	4.16	49.3	22.2	36.5
	HS-39	82.1	27.0	499	20.1	2320	132	882
	HS-40	16.7	0.99	109	11.9	233	22.8	105
	HS-41	27.7	0.81	195	13.7	303	46.4	241
	HS-42	19.0	0.72	147	11.7	200	37.1	202
	HS-43	39.1	1.86	120	12.5	1020	30.3	151
	HS-44	19.7	0.88	104	11.6	204	19.5	108
	HS-45	23.2	0.79	113	14.9	183	22.2	113
	<i>Average</i>	<i>34.8</i>	<i>23.1</i>	<i>351</i>	<i>16.4</i>	<i>1313</i>	<i>105.4</i>	<i>678.2</i>
	<i>Std Dev</i>	<i>24.7</i>	<i>45.9</i>	<i>416</i>	<i>7.2</i>	<i>2067</i>	<i>168.7</i>	<i>1176.3</i>
Wigg roof	HS-17	49.9	0.948	185	12	266	11.1	86.1
	HS-18	28.4	1.03	178	11.6	269	9.48	80.6
	HS-19	16.6	0.926	77.3	10.6	283	9.21	50.1
	<i>Average</i>	<i>31.6</i>	<i>1.0</i>	<i>146.8</i>	<i>11.4</i>	<i>272.7</i>	<i>9.9</i>	<i>72.3</i>
	<i>Std Dev</i>	<i>16.9</i>	<i>0.1</i>	<i>60.3</i>	<i>0.7</i>	<i>9.1</i>	<i>1.0</i>	<i>19.4</i>
Garibaldi Glass Roof	HS-23	7.29	0.358	48.4	15.7	46.2	3.53	42.7
	HS-24	9.25	0.64	57	14.4	70.2	5.61	44.3
	HS-25	10.7	0.599	59.4	19.8	100	6.52	44.7
	<i>Average</i>	<i>9.08</i>	<i>0.53</i>	<i>54.93</i>	<i>16.63</i>	<i>72.13</i>	<i>5.22</i>	<i>43.9</i>
	<i>Std Dev</i>	<i>1.71</i>	<i>0.15</i>	<i>5.78</i>	<i>2.82</i>	<i>26.95</i>	<i>1.53</i>	<i>1.06</i>
	HS-32	6.48	0.56	527	16.50	120	51.4	349

Location	Sample ID	Arsenic	Cadmium	Chromium	Cobalt	Lead	Molybdenum	Nickel
<b>Industrial standard</b>		<b>400</b>	<b>3500</b>	<b>20000</b>	<b>2000</b>	<b>4000</b>	<b>35000</b>	<b>80000</b>
	<b>mg/kg</b>							
Wigg Surrey roof	HS-33	6.41	0.67	523	15.50	120	54.9	346
	HS-34	8.76	1.15	556	16.40	364	55.6	444
	<i>Average</i>	<i>7.2</i>	<i>0.8</i>	<i>535.3</i>	<i>16.1</i>	<i>201.3</i>	<i>54.0</i>	<i>379.7</i>
	<i>Std Dev</i>	<i>1.3</i>	<i>0.3</i>	<i>18.0</i>	<i>0.6</i>	<i>140.9</i>	<i>2.3</i>	<i>55.7</i>

Metal levels on the Waste-to-Energy Facility roof are generally higher than the other roofs, but with the exception of the two samples with lead levels exceeding the industrial standard, all sample results as well the average of all samples are less than the industrial standard. Average metal levels on the Wigg roof were similar to those that were found on the Wigg Surrey roof. The results of statistical t-test between these samples are presented in Section 4.8. In addition, as discussed above, one would expect metal concentrations between the Garibaldi roof and the Wigg roof to be similar given their proximity to the Waste-to-Energy Facility if the Waste-to-Energy Facility was the source of observed metal concentrations. However, the levels of metals in the Garibaldi roof samples are considerably less than those found in the Wigg roof.

The concentrations of metals in soil samples are provided in Table 7. Soil sample results were highly variable and all below the industrial soil standard.

**Table 7. Metal Results From Soil Samples (mg/kg).**

Location	Sample ID	Arsenic	Cadmium	Chromium	Cobalt	Lead	Molybdenum	Nickel
<b>Industrial standard</b>		<b>400</b>	<b>3500</b>	<b>20000</b>	<b>2000</b>	<b>4000</b>	<b>35000</b>	<b>80000</b>
	<b>mg/kg</b>							
< 500 m from the Waste-to-Energy Facility	HS-1	8.04	4.22	52.30	12.1	121	4.90	52.50
	HS-2	3.74	1.24	33.1	7.43	18.1	1.19	30.1
	HS-3	12	8.66	81.8	15.8	249	8.26	70.6
	HS-4	9.55	3.48	54.8	9.92	90.3	3.31	47.1
	HS-5	35.9	36.7	198	31.5	483	15.6	129
	HS-12A	6.3	0.509	29.5	8.14	10.9	1.35	37.6
	HS-13A	2.85	0.18	27.6	6.95	7.22	0.76	27.2
	HS-14A	3.4	0.268	31.6	6.71	11.5	0.97	25.6
	HS-15A	3.22	0.164	31.2	7.84	5.66	0.65	32.9
	HS-16	2.99	0.131	26.3	7.84	4.2	0.46	30.4

Location	Sample ID	Arsenic	Cadmium	Chromium	Cobalt	Lead	Molybdenum	Nickel
<b>Industrial standard</b>		<b>400</b>	<b>3500</b>	<b>20000</b>	<b>2000</b>	<b>4000</b>	<b>35000</b>	<b>80000</b>
		<b>mg/kg</b>						
	HS-21A	18.1	0.141	19.9	7.26	17.5	1.06	14.2
	HS-22	92.7	0.232	20	10.2	69.9	3.94	14.1
	<i>Average</i>	<i>16.57</i>	<i>4.66</i>	<i>50.51</i>	<i>10.97</i>	<i>90.69</i>	<i>3.54</i>	<i>42.61</i>
	<i>Std Dev</i>	<i>25.78</i>	<i>10.41</i>	<i>49.73</i>	<i>6.98</i>	<i>143.10</i>	<i>4.46</i>	<i>31.53</i>
Near Wigg Warehouse	HS-21A	18.1	0.141	19.9	7.26	17.5	1.06	14.2
	HS-22	92.7	0.232	20	10.2	69.9	3.94	14.1
Far Field (>10 km from the Waste-to-Energy Facility)	HS-27A	6.74	0.78	36.10	8.63	131.00	6.64	23.00
	HS-28A	48.10	1.50	101.00	8.48	230.00	7.37	43.90
	HS-29A	3.67	0.31	141	6.67	39.7	17	104
	HS-30A	6.69	0.35	40.40	9.66	26.80	2.76	28.60
	HS-31A	6.08	0.31	44.70	12.70	21.10	0.98	43.30
	<i>Average</i>	<i>14.26</i>	<i>0.65</i>	<i>72.64</i>	<i>9.23</i>	<i>89.72</i>	<i>6.95</i>	<i>48.56</i>
	<i>Std Dev</i>	<i>18.96</i>	<i>0.51</i>	<i>46.46</i>	<i>2.22</i>	<i>90.21</i>	<i>6.21</i>	<i>32.31</i>
Near Wigg Surrey	HS-29A	3.67	0.31	141.00	6.67	39.70	17.00	104.00

**Table 8. Metal Results From Roadside Dust Samples (mg/kg).**

Location	Sample ID	Arsenic	Cadmium	Chromium	Cobalt	Lead	Molybdenum	Nickel
<b>Industrial standard</b>		<b>400</b>	<b>3500</b>	<b>20000</b>	<b>2000</b>	<b>4000</b>	<b>35000</b>	<b>80000</b>
		<b>mg/kg</b>						
< 500 m from the Waste-to-Energy Facility	HS-12B	2.81	0.413	31.3	6.66	19.9	2.6	17.9
	HS-13B	2.48	0.205	27.7	7.11	7.49	0.9	25.6
	HS-14B	3.84	0.756	64.5	7.29	23.8	6.67	38.9
	HS-15B	3.94	0.882	75.8	7.89	29.2	6.99	39
	HS-21B	26.1	0.782	48.1	9.1	29.6	5.73	25.9
	<i>Average</i>	<i>7.83</i>	<i>0.61</i>	<i>49.48</i>	<i>7.61</i>	<i>22.00</i>	<i>4.58</i>	<i>29.46</i>
	<i>Std Dev</i>	<i>10.23</i>	<i>0.29</i>	<i>20.77</i>	<i>0.94</i>	<i>9.05</i>	<i>2.69</i>	<i>9.24</i>
	HS-27B	5.65	0.57	42.00	9.24	45.70	3.43	23.10

Far Field (>10 km from the Waste-to-Energy Facility stack)	HS-28B	7.17	0.19	36.70	9.04	12.50	4.05	21.30
	HS-29B	4.34	0.28	308.00	7.53	18.20	39.00	139.00
	HS-30B	14.70	1.29	94.50	8.48	45.30	6.11	59.10
	HS-31B	6.25	0.47	40.40	6.75	36.50	2.21	22.80
	<i>Average</i>	7.6	0.6	104.3	8.2	31.6	11.0	53.1
	<i>Std Dev</i>	4.1	0.4	116.3	1.1	15.5	15.7	50.6

**Table 9. Metal Results From The Fly Ash Samples (mg/kg).**

Location	Sample ID	Arsenic	Cadmium	Chromium	Cobalt	Lead	Molybdenum	Nickel
<b>Industrial standard</b>		<b>400</b>	<b>3500</b>	<b>20000</b>	<b>2000</b>	<b>4000</b>	<b>35000</b>	<b>80000</b>
		<b>mg/kg</b>						
Fly ash Unit 1	HS-49	42.2	264	21.4	4.17	1210	8.01	14.0
Fly ash Unit 3	HS-50	48.5	163	40.7	8.57	1070	9.09	39.5
Fly Ash Composite (Unit 1, 2, and 3)	HS-51	132	115	22.6	3.17	908	4.96	13.5

The results of the fly ash sample testing indicate that the metal concentrations in fly ash are below the industrial standard for the 7 metals included in the assessment. Lead concentrations in the fly ash are less than 25% of the concentration of the two Waste-to-Energy Facility rooftop samples that exceeded the industrial standard suggesting that either the source of the lead in the two samples was something other than Waste-to-Energy Facility emissions or alternatively the concentrations are the result of historical emissions.

#### 4.7.2 Dioxins and Furans Results

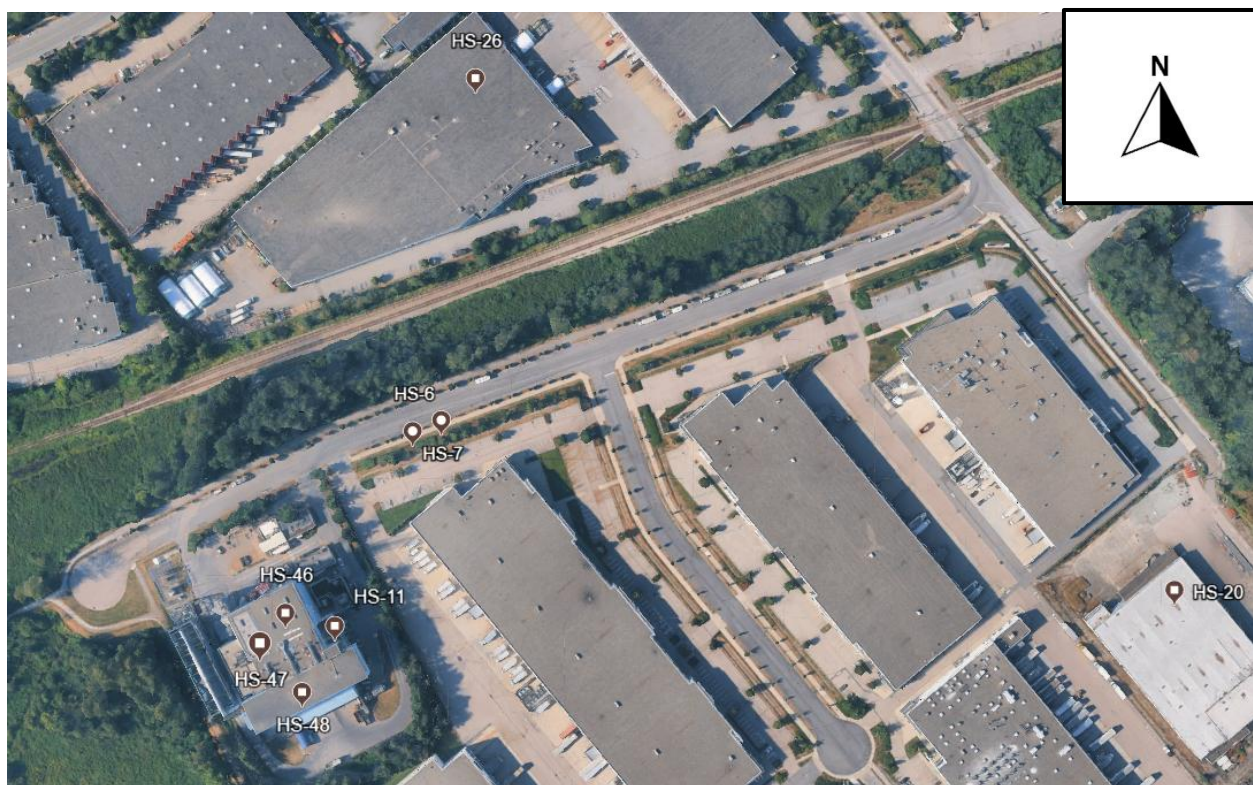
Polychlorinated dibenzo-p-dioxins and polychlorinated dibenzofurans (dioxins and furans) are expressed as 2,3,7,8-tetrachlorodibenzo-p-dioxin (2,3,7,8-TCDD) toxicity equivalent. A toxicity equivalency value is calculated by multiplying the concentration of each dioxin and furan compound by its toxicity equivalency factor and then summing the results. This allows for a single value to represent the total toxicity of a complex mixture (Van den Berg M, 2006).

The lab reports dioxin and furan toxicity equivalent as three options: non-detected individual congeners equal zero times the estimated detection limit (ND=0\*EDL), non-detected individual congeners equal 0.5 times the estimated detection limit (ND=0.5\*EDL), and non-detected individual congeners equal one time the estimated detection limit (ND=1\*EDL). ND=0.5\*EDL assumes the concentration of an undetected compound is half of its estimated detection limit. This is a widely accepted conservative approach to reporting dioxins and furans concentrations in environmental media and was used in this assessment.

A total of twelve samples were analyzed for dioxins and furans. Figure 21 shows the eight dioxin and furan samples collected at or around the Waste-to-Energy Facility. This includes the three additional samples (HS-46, HS-47, and HS-48) that were collected in January 2026 from the Waste-to-Energy Facility roof to further delineate dioxins and furans.

Far Field soil samples were sub-sampled (HS-27A, HS-28A, and HS-29A) to be analyzed for dioxins and furans to establish a baseline dioxin and furan concentration on similar industrial zoned sites and one dioxin and furan sample was collected from the Wigg Surrey roof.

The concentration of dioxins and furans in most of the samples were orders of magnitude below the Contaminated Sites Regulation Industrial standard of 1,500 pg/g (Table 10). The highest concentration of dioxins and furans was found in HS-11 on the Waste-to-Energy Facility rooftop material. Although below the industrial standard, the dioxins and furans concentration align with the same samples (HS-9 and HS-10) where elevated concentrations of lead and other metals were found. The results of these additional samples indicate dioxins and furans concentrations are lower on the Waste-to-Energy Facility roof than the results of HS-11 suggest.



**Figure 21. Location of dioxin and furan samples collected from the Wigg roof, Waste-to-Energy Facility roof, Garibaldi Glass roof, and soil nearby to the Waste-to-Energy.**

The level of dioxins and furans collected on the Wigg roof of 34.1 pg/g is almost 45 times lower than the industrial standard. The level of dioxins and furans on the Wigg roof was less than that found in the average of the Far Field soil samples and similar to that found on the Wigg Surrey roof. The results show no relationship between dioxin and furan concentration and distance from the Waste-to-Energy Facility with the Garibaldi roof having the lowest dioxin and furan concentration in spite of being the closest location to the Waste-to-Energy Facility indicating that the concentrations of dioxins and furans near the Waste-to-Energy Facility are not impacted by the facility.

**Table 10. Environmental Media Sampling Results for dioxins and furans.**

Location	Media Type	Sample ID PCDD/F	ID of nearest metal sample	PCDDs and PCDFs (reported as PCDD/PCDF TEQ ND=0.5*EDL) (mg/kg)	PCDDs and PCDFs (reported as PCDD/PCDF TEQ ND=0.5*EDL) (pg/g)
<b>Industrial Standard</b>				<b>0.015</b>	<b>1,500</b>
mg/kg					
<500 m from the Waste-to-Energy Facility	Soil	HS-6	HS-1	0.0000047	4.74
	Soil	HS-7	HS-1	0.0000028	2.84
Waste-to-Energy Facility roof	Roof	HS-11	HS-40	0.000748	748
	Roof	HS-46	HS-38	0.000182	182
	Roof	HS-47	HS-39	0.000426	426
	Roof	HS-48	HS-45	0.0000687	68.7
Wigg roof	Roof	HS-20	HS-19	0.0000341	34.1
Garibaldi Glass roof	Roof	HS-26	HS-25	0.0000076	7.62
Far Field (>10 km from the Waste-to-Energy Facility)	Soil	HS-27A	HS-27A	0.0000629	62.9
Far Field (>10 km from the Waste-to-Energy Facility)	Soil	HS-28A	HS-28A	0.0000268	26.8
Far Field (>10 km from the Waste-to-Energy Facility)	Soil	HS-29A	HS-29A	0.0000321	32.1
<i>Far Field (&gt;10 km from the Waste-to-Energy Facility) Average</i>		<i>N/A</i>		<i>0.0000406</i>	<i>40.6</i>
Wigg Surrey roof	Roof	HS-35	HS-29A	0.0000153	15.3

## 4.8 Statistical Analysis

### 4.8.1 T-Test Statistical Analysis of Comparison of the Wigg Roofs Samples

A t-test is an inferential statistical tool used to determine if there is a significant difference between the means (averages) of two groups, which may be related or independent. A t-test probability value (p value) less than 0.05 ( $p < 0.05$ ) indicates that there is a statistically significant difference between the two sample locations. Similarly,  $p > 0.05$  indicates that there is no statistical difference between the

two sample locations. All samples were log transformed prior to conducted the t-tests although the non-transformed analytical results are shown in the tables below.

Table 11 shows the results of t-tests that were conducted to compare the metal concentrations on the Wigg roof with those on the Wigg Surrey roof. Bold values with an asterisk indicate that there is a statistically significant difference between the two sample locations.

There was no statistical difference between the concentrations of arsenic, cadmium and lead between the Wigg roof (located 500 m from the Waste-to-Energy Facility) and the Wigg Surrey roof (located >25 km from the Waste-to-Energy Facility).

The concentrations of chromium, cobalt, molybdenum and nickel are significantly higher on the Wigg Surrey roof than on the Wigg roof. No concentrations of metals are significantly higher on the Wigg roof than the Wigg Surrey roof. All parameter values are lower than the industrial standard.

**Table 11. Statistical T-Test Results Between the Wigg Roof and the Wigg Surrey Roof**

Location	Sample ID	Arsenic	Cadmium	Chromium	Cobalt	Lead	Molybdenum	Nickel
Industrial standard		<b>400</b>	<b>3500</b>	<b>20000</b>	<b>2000</b>	<b>4000</b>	<b>35000</b>	<b>80000</b>
		mg/kg						
Wigg roof	HS-17	49.9	0.948	185	12	266	11.1	86.1
	HS-18	28.4	1.03	178	11.6	269	9.48	80.6
	HS-19	16.6	0.926	77.3	10.6	283	9.21	50.1
Wigg Surrey Roof	HS-32	6.48	0.56	527	16.5	120	51.4	349
	HS-33	6.41	0.67	523	15.5	120	54.9	346
	HS-34	8.76	1.15	556	16.4	364	55.6	444
t-test (p-value)		0.142	0.474	<b>0.013*</b>	<b>0.014*</b>	0.448	<b>0.002*</b>	<b>0.019*</b>

#### 4.8.2 T-Test Statistical Analysis of Comparison of the <500 m soil to > 10 km soil

Table 12 shows the results of t-tests that were conducted to compare the metal concentrations from soil samples <500 m from the Waste-to-Energy facility and soil samples >10 km from the Waste-to-Energy Facility. There was no statistical difference ( $p > 0.05$ ) between the concentrations of any metals in soil located <500 m from the Waste-to-Energy Facility and in soil located >10 km from the Waste-to-Energy Facility. This suggests that the Waste-to-Energy Facility is not significantly impacting soil metal concentrations within 500 m of the facility.

**Table 12. Statistical T-Test Results Between the Soil Samples <500 m from the Waste-to-Energy Facility and the Soil Samples >10 km from the Waste-to-Energy Facility**

Location	Sample ID	Arsenic	Cadmium	Chromium	Cobalt	Lead	Molybdenum	Nickel
<b>Industrial standard</b>		<b>400</b>	<b>3500</b>	<b>20000</b>	<b>2000</b>	<b>4000</b>	<b>35000</b>	<b>80000</b>
		<b>mg/kg</b>						
< 500 m from the Waste-to-Energy Facility		400	3500	20000	2000	4000	35000	80000
	HS-1	8.04	4.22	52.3	12.1	121	4.9	52.5
	HS-2	3.74	1.24	33.1	7.43	18.1	1.19	30.1
	HS-3	12	8.66	81.8	15.8	249	8.26	70.6
	HS-4	9.55	3.48	54.8	9.92	90.3	3.31	47.1
	HS-5	35.9	36.7	198	31.5	483	15.6	129
	HS-12A	6.3	0.509	29.5	8.14	10.9	1.35	37.6
	HS-13A	2.85	0.18	27.6	6.95	7.22	0.76	27.2
	HS-14A	3.4	0.268	31.6	6.71	11.5	0.97	25.6
	HS-15A	3.22	0.164	31.2	7.84	5.66	0.65	32.9
	HS-16	2.99	0.131	26.3	7.84	4.2	0.46	30.4
	HS-21A	18.1	0.141	19.9	7.26	17.5	1.06	14.2
Far Field (>10 km from the Waste-to-Energy Facility)	HS-27A	6.74	0.78	36.1	8.63	131	6.64	23
	HS-28A	48.1	1.5	101	8.48	230	7.37	43.9
	HS-30A	6.69	0.35	40.4	9.66	26.8	2.76	28.6
	HS-31A	6.08	0.31	44.7	12.7	21.1	0.98	43.3
	HS-29A	3.67	0.31	141	6.67	39.7	17	104
t-test (p-value) (log10 transformed)		0.96	0.61	0.20	0.71	0.41	0.16	0.60

### 4.8.3 T-Test Statistical Analysis of Comparison of the <500 m soil to > 10 km roadside dust

Table 13 shows the results of t-tests that were conducted to compare the metal concentrations from roadside dust samples <500 m from the Waste-to-Energy facility and roadside dust samples >10 km from the Waste-to-Energy Facility. There was no statistical difference ( $p > 0.05$ ) between the concentrations of any metals in roadside dust located <500 m from the Waste-to-Energy Facility and

in roadside dust located >10 km from the Waste-to-Energy Facility. This suggests that the Waste-to-Energy Facility is not significantly impacting soil metal concentrations within 500 m of the facility.

**Table 13. Statistical T-Test Results Between the Roadside Dust Samples <500 m from the Waste-to-Energy Facility and the Roadside Dust Samples >10 km from the Waste-to-Energy Facility**

Location	Sample ID	Arsenic	Cadmium	Chromium	Cobalt	Lead	Molybdenum	Nickel
Industrial standard		400	3500	20000	2000	4000	35000	80000
		mg/kg						
< 500 m from the Waste-to-Energy Facility	HS-12B	2.81	0.413	31.3	6.66	19.9	2.6	17.9
	HS-13B	2.48	0.205	27.7	7.11	7.49	0.9	25.6
	HS-14B	3.84	0.756	64.5	7.29	23.8	6.67	38.9
	HS-15B	3.94	0.882	75.8	7.89	29.2	6.99	39
	HS-21B	26.1	0.782	48.1	9.1	29.6	5.73	25.9
Far Field (>10 km from the Waste-to-Energy Facility)	HS-27B	5.65	0.57	42	9.24	45.7	3.43	23.1
	HS-28B	7.17	0.19	36.7	9.04	12.5	4.05	21.3
	HS-30B	14.7	1.29	94.5	8.48	45.3	6.11	59.1
	HS-31B	6.25	0.47	40.4	6.75	36.5	2.21	22.8
	HS-29B	4.34	0.28	308	7.53	18.2	39	139
<b>t-test (p-value) (log10 transformed)</b>		0.97	0.84	0.33	0.37	0.26	0.40	0.33

There is no statistically significant difference between the near and far metal concentrations for both soil and roadside dust. This suggests that the Waste-to-Energy Facility does not significantly contribute metals to soil or roadside dust surrounding the facility,

## 4.9 Principal Component Analysis

Principal Component Analysis is a statistical tool that can be used to reduce the number of dimensions in a large dataset into principal components that retain most of the original information conveyed by the variation in the data. The full report is included in Appendix G.

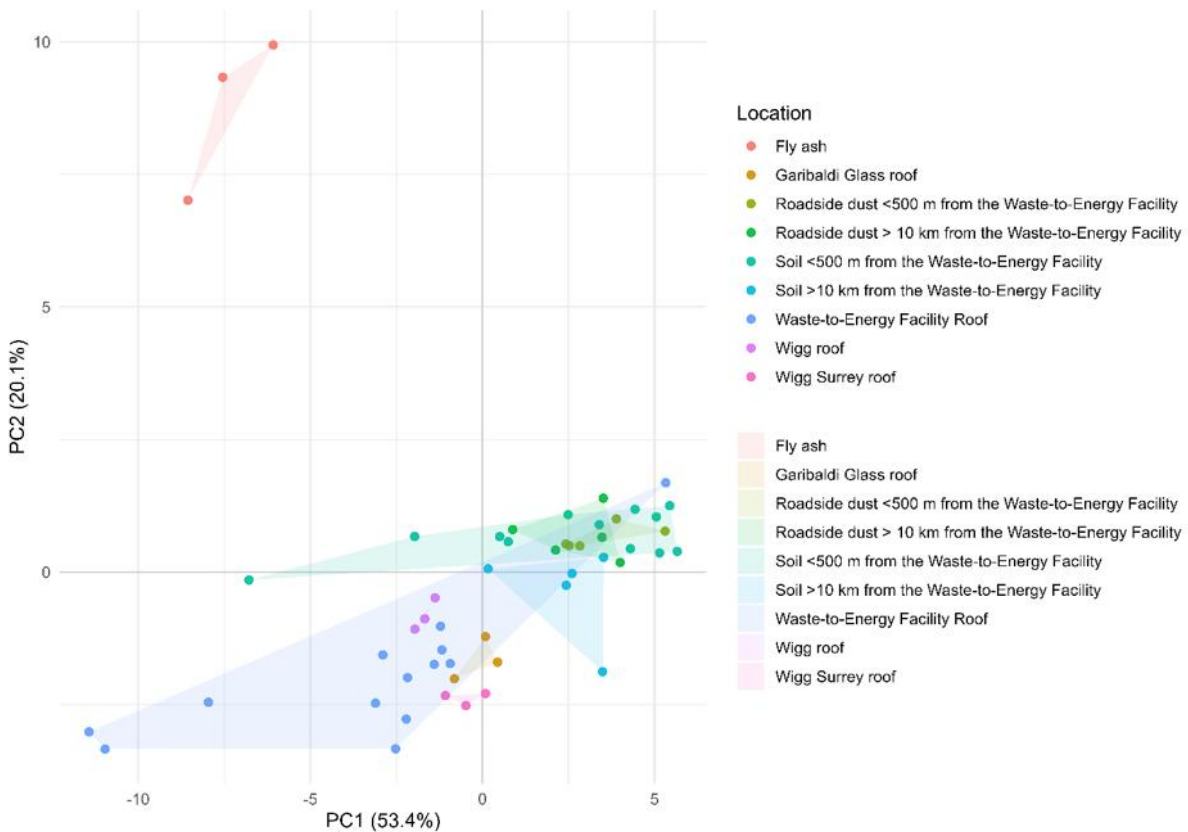
Principal Component Analysis was used to provide a succinct and visual aid to identify potential patterns of chemical concentrations in the individual environmental media samples.

Principal Component Analysis is accomplished by transforming a set of potentially correlated variables into a smaller set of variables called the principal components. As a typical step, the first two principal components can be plotted to reveal groups or clusters of samples which share similar features when considering the sources of variation extracted by the Principal Component Analysis.

In this analysis, Principal Component Analysis was used to extract the most informative features from the metal results from soil, roadside dust, and roof samples taken from near the Waste-to-Energy Facility and surrounding areas to assess the extent to which Wigg roof may be impacted by the Waste-to-Energy Facility particulate matter. To account for the fact that metal concentrations can span orders of magnitude, the concentration data was log-transformed prior to Principal Component Analysis to reduce the influence of high-abundance metals on the analysis.

Overall, the principal component analysis successfully decomposed the key sources of variation. The first two principal components account for 53.4% and 20.1% of the variation in the data set respectively.

Figure 22 plots the first two principal components, with sample colour coded by location and sample type. The sample locations are grouped using the convex hull that contains all the points associated with a location.



**Figure 22. Principal Component Analysis, Log-Transformed Concentrations**

The primary result of the Principal Component Analysis is that the fly ash samples (HS-49, HS-50, HS-51) differ from all other samples due to their high concentrations of calcium, potassium, sodium, strontium, lead, zinc, copper, and molybdenum. These concentrations are often an order of magnitude greater than environmental media samples. As a result, the fly ash samples have strongly negative PC1 scores, indicating high overall metal abundance, (reflecting their higher overall metal load) although several Waste-to-Energy Facility roof samples have negative PC1 scores, and the fly

ash samples have the most positive PC2 scores (driven by extreme enrichment in specific elements). Together, these features place all fly ash samples in a distinct cluster in Principal Component Analysis space, clearly separated other samples collected regardless of distance from the Waste-to-Energy Facility.

Overall, the results show that all locations sampled tended to have similar variation in terms of the overall abundance and pattern of metals sampled apart from the three fly ash samples, which were more negative in the first principal component and much more positive in the second principal component. In conclusion, the metal characteristics of all the samples are different than the metal characteristics of fly ash.

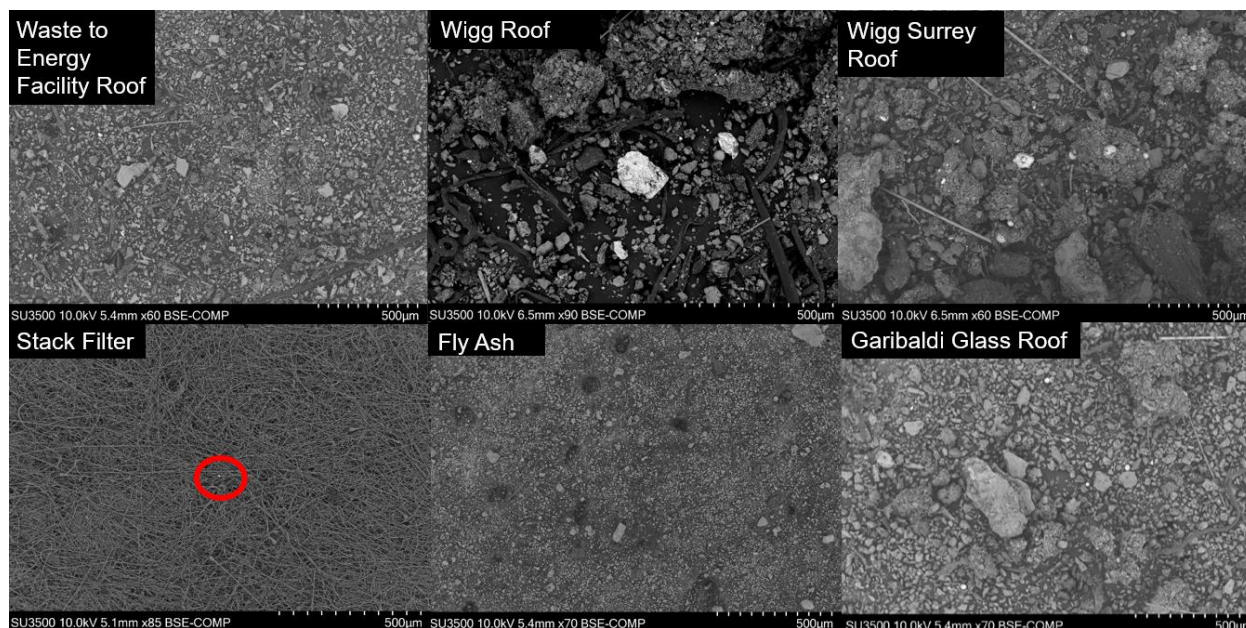
## 4.10 Results of UBC's Scanning Electron Microscope/Energy Dispersive X-ray Spectroscopy Analysis

Backscattered electrons are high energy electrons and the probability of backscattering increases with the atomic number,  $Z$ , of the sample material. This results in contrast differences in regions of the sample which differ significantly in atomic weight. From this imaging, it is possible to identify any materials in the sample which contain metal elements as they should be significantly higher in atomic mass and therefore appear light when compared to soil materials that are lower in atomic weight and that should appear dark (i.e. organic compounds composed of carbon and/or alumina-silicate minerals).

Specific element identification based on backscattered electron imaging contrast is not feasible, therefore EDX is used to assess the composition of any particles imaged. For this analysis, in addition to fly ash from the Waste-to-Energy Facility, roof samples, microscopic analysis of stack testing filters that capture particulates that have passed through the bag house filter system.

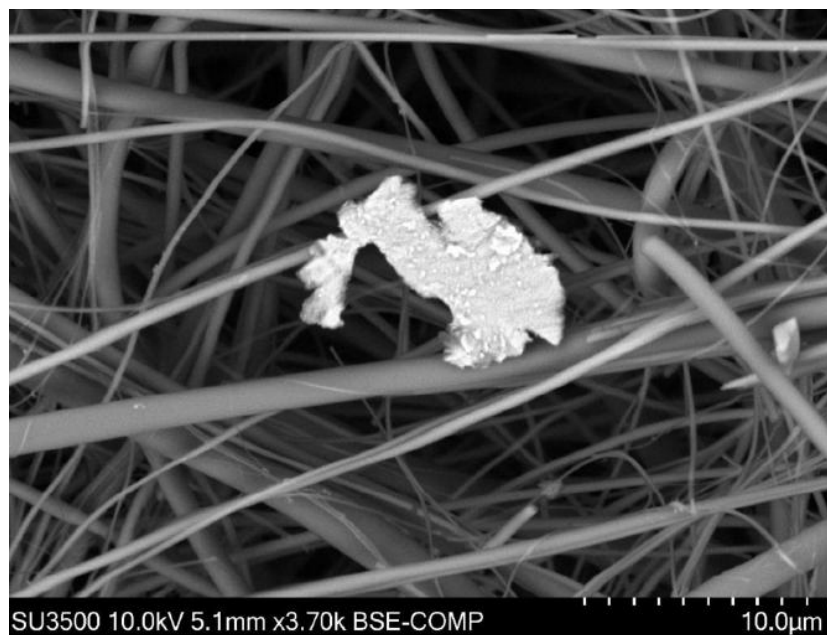
The results of the SEM/EDX analysis conducted at UBC indicate that the size of high atomic weight particles on the stack filter are considerably smaller than the size of high atomic weight particles on the Wigg roof. As shown in Figure 23, particles on the stack filter are almost invisible at a scale of  $500\ \mu\text{m}$  whereas the Wigg roof sample and the Garibaldi glass sample at the same scale ( $500\ \mu\text{m}$ ) have several visible large particles of high atomic weight element particles.

The elemental spectrum from the Wigg roof and the Wigg Surrey roof are very similar and do match the spectrum data from the filter material being emitted from the stack.

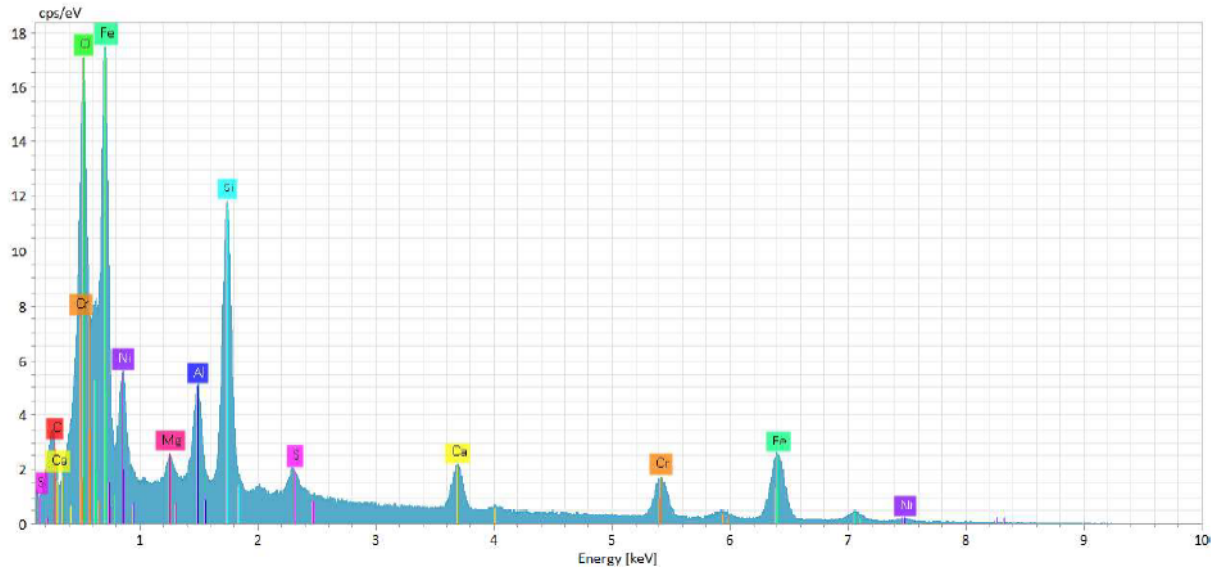


**Figure 23. Comparison of the particle size differences between the stack filter, fly ash particles, and the roof samples.**

The stack filter samples were almost completely devoid of high atomic weight particles, with the exception of one flake, as show in Figure 23 circled in red at scale of 500 µm. The same particle at a scale of 100 µm is shown in Figure 24. The corresponding EDX spectrum (shown in Figure 25) reveals the flake’s composition as iron oxide, or stainless steel, which is likely as a result of minor corrosion within the flue gas piping system.

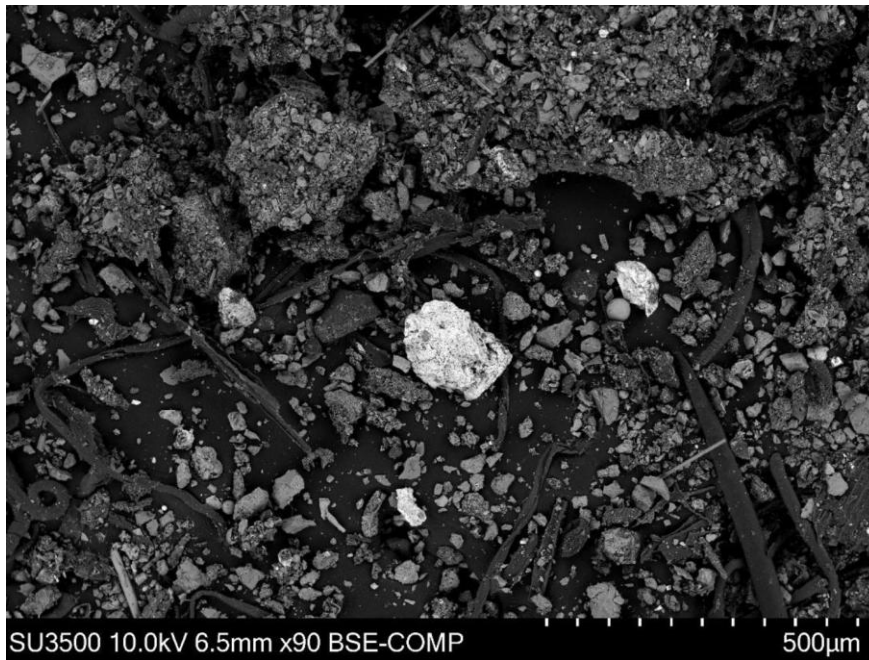


**Figure 24. SEM Image of HDR Stack Filter**

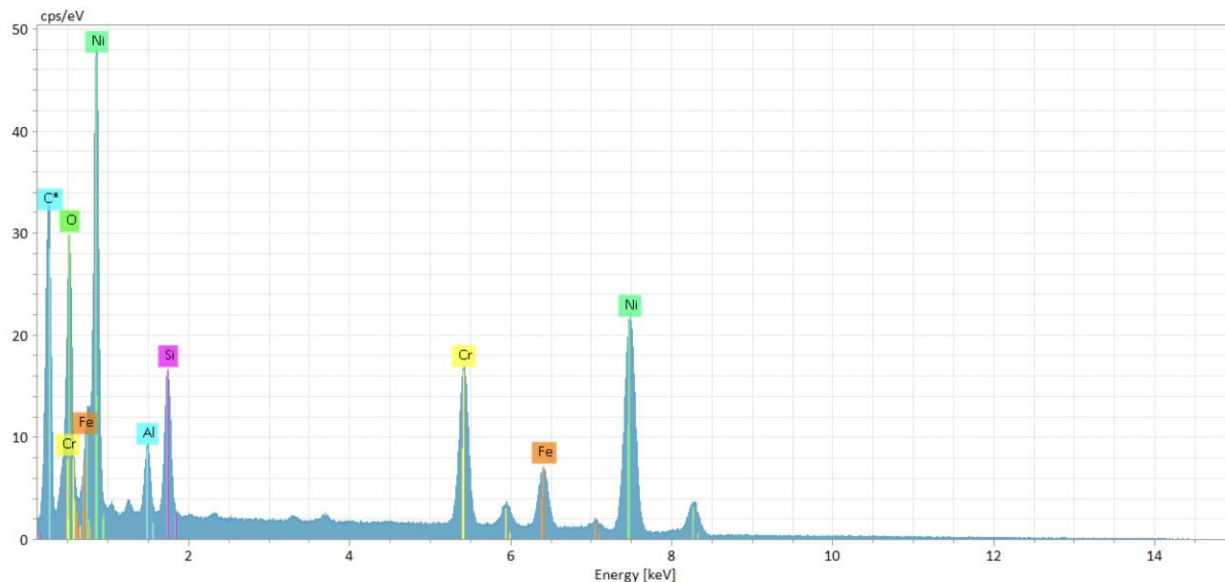


**Figure 25. EDX Spectrum of HDR Stack Filter**

The Wigg roof samples contained several large particles of high atomic weight elements, one of which is shown in Figure 26. The corresponding EDX spectrum (Figure 27) reveals this particle is a nickel chrome alloy.



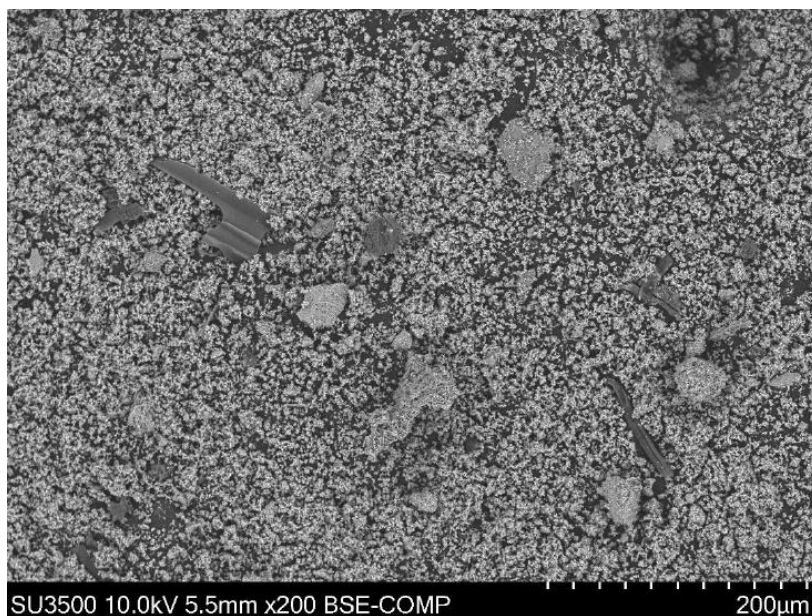
**Figure 26. SEM Image of Wigg roof**



**Figure 27: EDX spectrum of Wigg roof**

The size and shape between the particle on the stack filter sample and the Wigg roof sample indicate that the source of the Wigg roof sample particle is not from the Waste-to-Energy Facility.

Furthermore, the fly ash samples contained no high atomic weight particles present as shown in Figure 28 indicating that the fly ash is also not the source of the particles found on the Wigg roof.



**Figure 28. SEM image of Fly Ash**

The Wigg Surrey roof samples contained several high atomic weight particles, as shown in Figure 29. The corresponding EDX spectrum revealed these particles to be a stainless-steel chunk, dissimilar from the stainless-steel fleck observed in the stack filter sample.

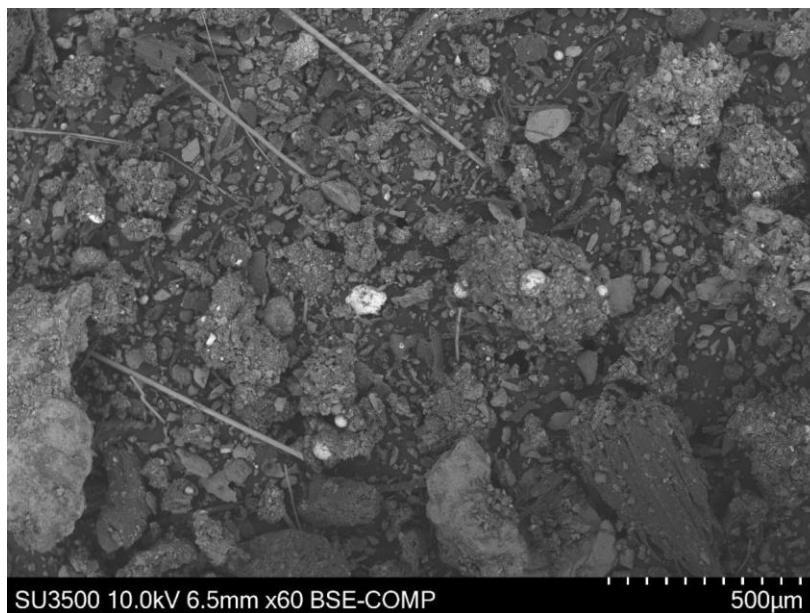


Figure 29. SEM image of Wigg Surrey roof

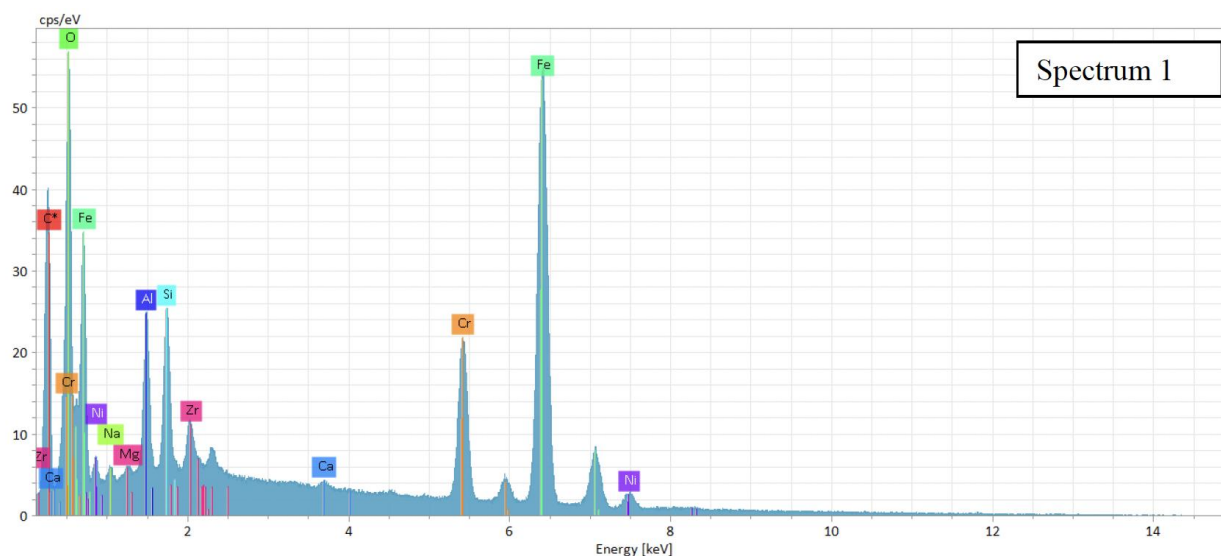


Figure 30. EDX spectrum of Wigg Surrey roof

#### 4.11 Results of MVA’s Scanning Electron Microscope/Energy Dispersive X-ray Spectroscopy Analysis

SEM-EDX analysis of material removed from Waste-to-Energy Facility stack filter sample #1 showed that it was a crystalline structure and was consistent with a mixture of fine calcium chloride (>50% by volume) with larger crystals of calcium sulfate. These findings are consistent with the composition of lime, which is added in the Waste-to-Energy Facility for neutralization of acidic gases formed during

incineration. Trace amounts (<1% by volume) of iron and/or zinc were present alongside the calcium salts, probably as metal chlorides/sulfates associated with corrosion.

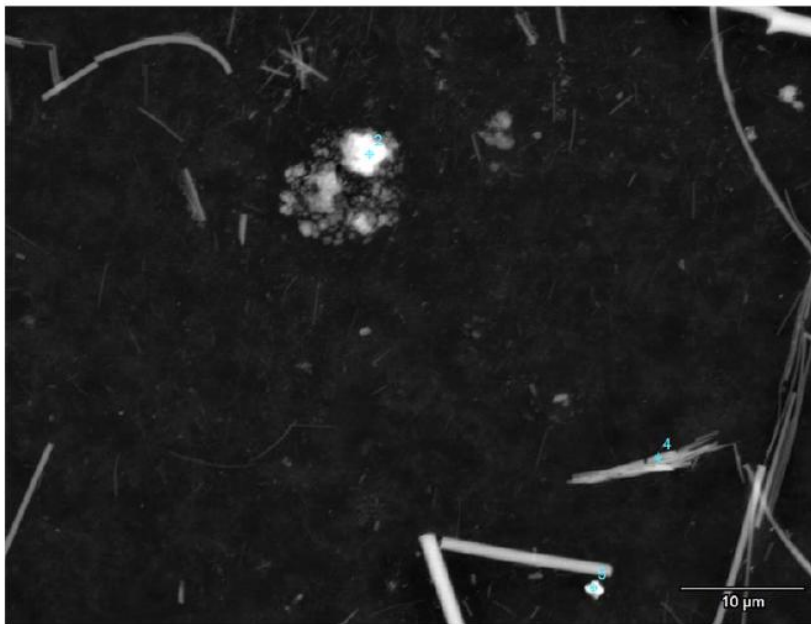


Figure 31. SEM Backscattered Electron Image of Stack Filter #1

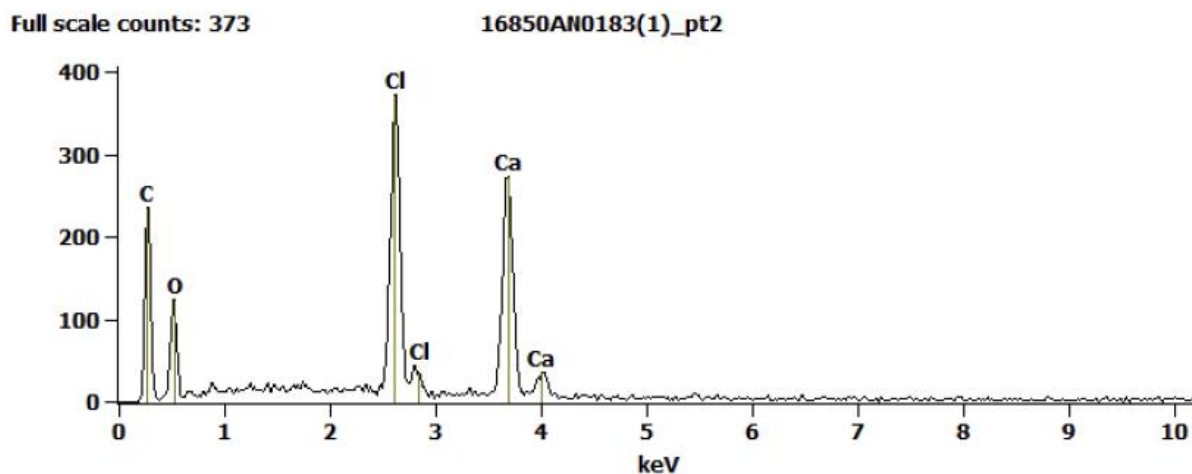


Figure 32. EDX Spectrum for Stack Filter Sample #1

SEM-EDX analysis of material removed from the Waste-to-Energy Facility stack filter #2 sample showed that it was crystalline and was consistent with fine calcium chloride (>50% by volume) with occasional small amounts of calcium sulfate. These findings are consistent with the composition of lime, which is added in the Waste-to-Energy Facility for neutralization of acidic gases formed during incineration. Lesser amounts of discrete sodium chloride crystals were present and trace amounts (<1% by volume) of discrete calcium sulfate crystals were present.

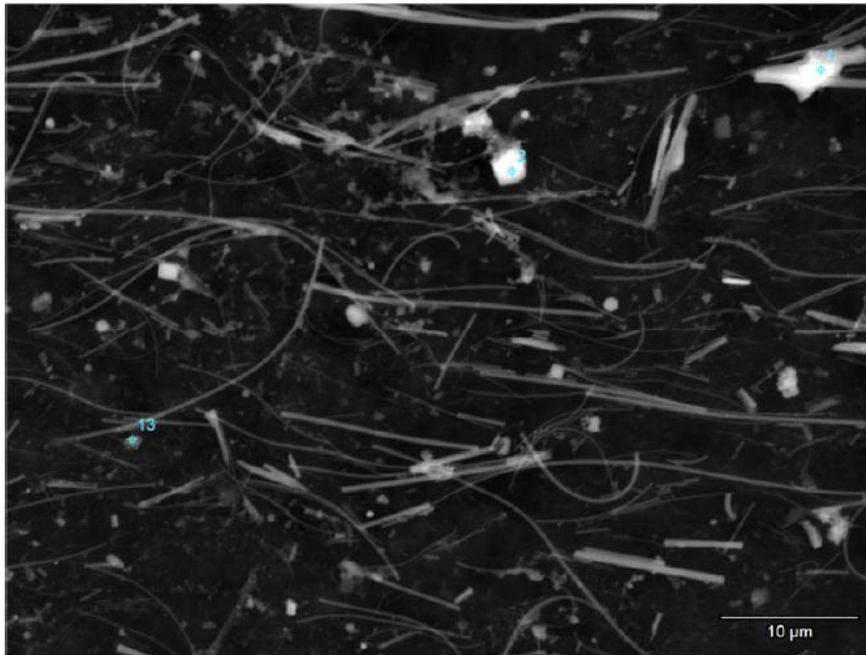


Figure 33. SEM Backscattered Electron Image of Stack Filter #2

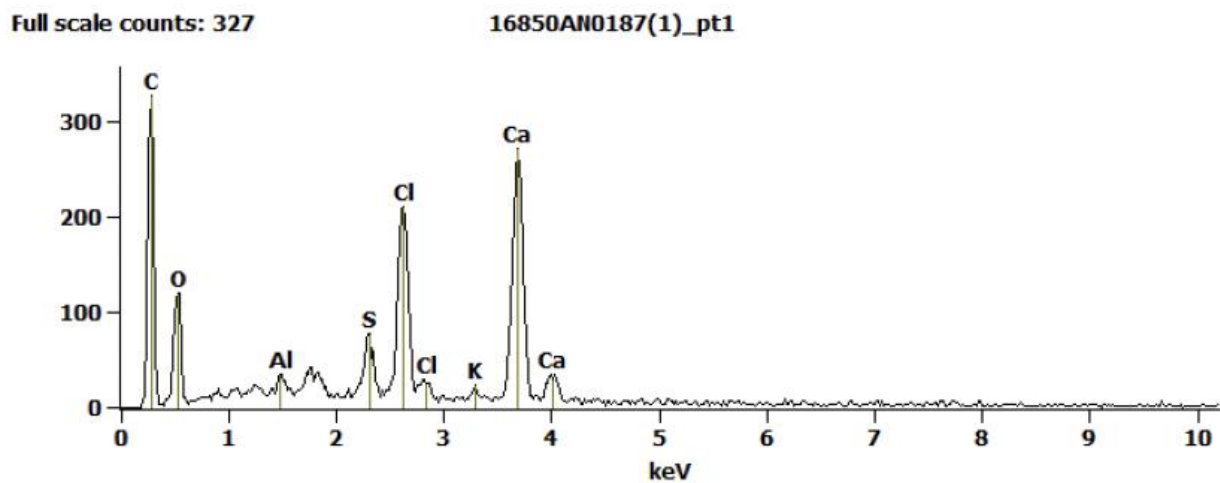


Figure 34. EDX Spectrum for Stack Filter Sample #2

The two filter samples underwent a particle size distribution analysis to classify the percentage of the sample that fell within size fractions. The particle size distribution, shown in Table 14, indicated that particles on the filters were primarily 0.5-1  $\mu\text{m}$  and >1-2.5  $\mu\text{m}$ .

**Table 14. Particle size distribution for two filter samples.**

Average Diameter Range (µm)	Stack Filter #1 (%)	Stack Filter #2 (%)
0.5-1	54.3	38.1
>1-2.5	38.1	48.0
2.5-5	6.4	12.1
5-7.5	1.0	1.7
7.5-10	0.1	0.2
10-75	0.1	nd
>75	nd	nd

The particle size distribution revealed that the majority of residue collected on stack filters were less than 2.5 µm. More specifically, 92.4% and 86.1% for stack filter #1 and #2, respectively were less than 2.5 µm.

## 4.12 Comparison of UBC and MVA Results

Generally, there was strong agreement between the conclusion of the MVA lab and the UBC lab in terms of the material characterization, both in particle size and particle composition. Both labs indicated that very few particles were found on the stack filters. MVA's EDX analysis measurement indicated that most of the particles were calcium chloride and calcium sulfate and UBC's EDX spectrum revealed that most of the particles were calcium and chloride. MVA measured trace amounts (<1%, by volume) of iron and zinc, whereas UBC measured a handful of small iron oxides particles.

## 4.13 Conclusions of the Environmental Media Sampling

The environmental media sampling program investigated the metal and dioxins and furans concentrations in rooftops, soil samples and roadside dust. In addition, statistical analysis was conducted through t-tests comparing two groups of samples and multivariate statistical analysis was conducted through Principal Component Analysis. Finally, the size, morphology, and metal composition of the environmental media was achieved through SEM/EDX analysis. The following conclusions were drawn:

- The level of metals in all roof samples were below the Contaminated Sites Regulation Industrial Land use standards, with the exception of lead in two of thirteen samples from the Waste-to-Energy Facility roof.
- The Garibaldi roof samples had the lowest metal levels of all the roofs sampled with all samples being below the industrial standard in spite of the Garibaldi roof being the closest roof to the Waste-to-Energy Facility.

- There is no statistically significant difference between the metal concentrations in samples located < 500 m from the Waste-to-Energy Facility compared to samples located > 10 km from the Waste-to-Energy Facility for both roadside dust and soil. This suggests that the Waste-to-Energy Facility does not contribute metals to soil or roadside dust surrounding the facility.
- The level of dioxins and furans in all samples was below the Contaminated Sites Regulation Industrial Land Use Standard. This includes the concentration on the Waste-to-Energy Facility Roof. The level of dioxins and furans collected on the Wigg roof of 34.1 p/g is almost 45 times lower than the industrial standard, is similar to the Wigg Surrey roof sample result, and lower than the average levels in the Far Field soil samples. The soil samples within 500 metres of the Waste-to-Energy Facility had the lowest dioxin and furan results of all samples.
- The statistical t-test shows that the concentrations of metals on the Wigg Surrey roof are the same, or in some cases statistically higher, than those found on the Wigg roof. No samples from the Wigg roof had statistically higher concentrations than the Wigg Surrey roof.
- The Principal Component Analysis concluded that the metal composition of all environmental media samples collected are different than the metal composition of fly ash.
- The UBC SEM/EDX results indicate that the size, morphology and metal composition of the particles on the stack filter do not match the size, morphology and metal composition of the particles on the Wigg roof or any of the other roofs. For example, the stack filter particles are considerably smaller than the particles on the Wigg roof.
- The MVA conclusions support the UBC conclusions for both size and composition of the stack filter samples.

## 5 Summary of Study Conclusions

Metro Vancouver owns the Waste-to-Energy Facility, a mass burn combustion facility designed to process 750 tonnes per day (tpd) (240,000 tonnes per year) of municipal solid waste in Burnaby. In 2025, Mr. Peter Harco approached Metro Vancouver with concerns that he believed the Waste-to-Energy Facility stack emission particulate, containing metals and dioxin and furans, were causing the accumulation of rooftop dust on his roof at 8355 Wiggins Street.

The purpose of this report was to investigate Mr. Harco's hypothesis that the Waste-to-Energy Facility stack emissions of particulate matter are unduly impacting the roof of his warehouse facility and on surrounding streets and parking lots. Mr. Harco's is concerned about Waste-to-Energy Facility stack emissions impacting the roof of his warehouse facility. This rooftop is located approximately 500 m east-south-east from the Waste-to-Energy Facility. Mr. Harco independently sampled the accumulated rooftop material, as well as roadside dust at sites along nearby streets and parking lots and sent those samples for laboratory analysis of a suite of metals and dioxins and furans.

There is no standard environmental investigation or sampling approach available to guide the undertaking of this type of assessment. Therefore, HDR evaluated multiple lines of evidence, including – review of the facility operations and handling of ash material, evaluation of metal and

dioxins and furans stack emissions from the Waste-to-Energy Facility and sampling, laboratory analysis and statical analysis of environmental media on rooftops, soils and roadside dust.

The following are the conclusions from the investigation.

### **Facility Operations Assessment**

The baghouses at the Waste-to-Energy Facility are performing as designed and meet or exceed the particulate matter removal efficiency performance standards for this type of equipment. For almost 40 years the Waste-to-Energy Facility has operated well below the regulatory standards for discharge of particulate matter, which indicates that the baghouses are operating as designed. In addition, the Waste-to-Energy Facility is adhering to its Bottom Ash and Fly Ash Management Plans, as well as generally accepted industry standards. During the site visit, there were no observed releases of fugitive dust either from normal operations or during the loadout operations for bottom ash or conditioned fly ash. The facility operations meet the Operational Certificate requirements, meets or exceeds industry standards, and is not a source of significant particulate release from any sources other than as measured through environmental monitoring of stack emissions. This analysis provides no information supporting the hypothesis that particulate emissions from the Waste-to-Energy Facility are resulting the accumulation of particulate matter on the Wigg roof.

### **Air Quality Emissions from Waste-to-Energy Facility**

Overall, after review of the Waste-to-Energy Facility stack emissions data and the deposition rates and benchmarking against the environmental media chemical results the following conclusions can be reached:

- Stack test data shows that the Waste-to-Energy Facility operates consistently within the allowable emission limits for particulate matter (particulate matter). Statistical analysis of the most recent 5-year stack test data indicates with a high probability (95% confidence level) that actual particulate matter emissions are consistently 16% of the Operating Certificate limits or less.
- Continuous opacity and operating parameter monitoring indicates that incidents of excessive stack particulate matter emissions did not occur. This is consistent with the quarterly stack test results for particulate matter from the Waste-to-Energy Facility. Therefore, particulate matter observed locally on rooftops cannot be attributed to a malfunction at the combustion units or emissions control systems at the Waste-to-Energy Facility that could conceivably result in excess particulate matter emissions.
- Based on dispersion modelling and actual particulate matter emission monitoring results, the calculated annual rate of deposition of particulate matter in the vicinity of the Wigg roof is 0.00226 g/m<sup>2</sup>/yr. Mr. Harco reported to Metro Vancouver an estimate of 10 g/m<sup>2</sup>/yr of particulate matter deposited on the roof corresponding to the amount of particulates he observed. On this basis, the calculated deposition rate is 4,400 times less in than the deposition rate reported by Mr. Harco.
- Based on dispersion modelling and Waste-to-Energy Facility emission monitoring results the expected concentrations of metals and dioxins and furans resulting from the Waste-to-Energy Facility emissions would not be detectable on the Wigg roof or any other surface. Therefore, any concentrations metals or dioxins and furans on the Wigg roof would not have

been influenced by the Waste-to-Energy Facility emissions and it is not a source of the levels of metals or dioxins and furans detected.

In summary, the measured stack emission rates, opacity and operating parameter monitoring and estimated deposition rates together indicate that it is not plausible that the Waste-to-Energy Facility is the source of the accumulated particulate matter or concentrations of metals and dioxins and furans material observed on the Wigg roof.

### **Environmental Media Sampling**

The environmental media sampling program sought to understand the characteristics of rooftops, soil sample and roadside dust with the goal of determining whether particulate emissions from the Waste-to-Energy Facility impacted the environmental media. Rooftop samples were collected from the Wigg warehouse, a second nearby warehouse and the Waste-to-Energy Facility. A second Wigg warehouse that is located in Surrey. Samples were also collected from that roof. Roadside dust samples and soil samples were collected within 500 metres of the Waste-to-Energy Facility. For comparison purposes roadside dust and soil samples were collected from five distant sites, near Metro Vancouver solid waste facilities, in similarly industrially zoned neighbourhoods. In total 52 environmental media samples were collected for analysis.

Primary analysis included sampling for metals and dioxins and furans. Statistical analysis was conducted through t-tests comparing two groups of samples and multivariate statistical analysis was conducted through Principal Component Analysis. Finally, the size, morphology (shape and form), and metal composition of the environmental media was achieved through Scanning Electron Microscopy/Energy-Dispersive X-Ray Spectroscopy (SEM/EDX) analysis. The following conclusions were drawn:

- The level of metals in all samples were below the British Columbia Contaminated Sites Regulation (Contaminated Sites Regulation) for Industrial Land use Standards, with the exception of lead in 2 of 13 samples on the Waste-to-Energy Facility roof. All results are below the Contaminated Sites Regulation health guidelines.
- The level of dioxins and furans in all samples was below the Contaminated Sites Regulation Industrial Land Use Standard, including concentrations on the Waste-to-Energy Facility Roof. The concentration of dioxins and furans (reported as toxicity equivalent) collected on the Wigg roof of 34.1 p/g is almost 45 times lower than the Contaminated Sites Regulation industrial standard.
- The statistical t-test shows that the concentrations of metals on the Wigg Surrey roof (~25 km from the Waste-to-Energy Facility) are the same, or in some cases significantly higher, than those found on the Wigg roof and on the second roof adjacent to the Waste-to-Energy Facility.
- Soil and roadside dust samples showed equal or lower concentrations in metals and dioxins and furans concentrations in the soil and dust samples near to the Waste-to-Energy Facility compared to the samples from the distant sites, and showed no correlation with distance to the Waste-to-Energy Facility for samples in the vicinity of the Waste-to-Energy Facility.
- The statistical t-test shows that there is no statistically significant difference between the metal concentrations in samples located < 500 m from the Waste-to-Energy Facility

compared to samples located > 10 km from the Waste-to-Energy Facility for both roadside dust and soil. The Waste-to-Energy Facility does not contribute significantly to the metal concentrations in soil or roadside dust surrounding the facility.

- The results of the statistical Principal Component Analysis showed no correlation between the metal concentrations in fly-ash to those in roof, roadside dust or soil samples.
- The University of British Columbia SEM/EDX results indicate that the size, morphology and metal composition of the particles on the stack testing filter nor the fly ash samples match the size, shape and metal composition the Wigg roof or other sampled roofs. In general the particulates emitted from the Waste-to-Energy Facility are far smaller than the particles from the Wigg roof, the fly-ash sample particles are homogeneous compared to highly variable shaped rooftop samples, and the metal composition of the fly ash is primarily products of lime compared to the environmental media samples that contained ferrous and other metals.
- The University of British Columbia results were confirmed by additional third party-validation work completed by MVA Scientific Consultants (MVA) that concluded the particles collected from stack testing filters were primarily calcium chloride with trace amounts of iron or zinc. The conclusion is that most particles originate from the hydrated lime and subsequent reaction with the trace particles of metallic nature coming from corrosion inside the stack. The particle size distribution analysis revealed that, on average, 89.1% of the particles were in the PM2.5 range.

### **Overall Conclusion**

Multiple lines of evidence were pursued to test Mr. Harco's hypothesis that particulates accumulating on the roof of the Wigg warehouse originated from the Waste-to-Energy Facility, and that the metal and dioxin and furan concentrations in samples he collected from the Wigg roof and surrounding streets and parking lots were caused by emissions from the Waste-to-Energy Facility.

Facility operations, air emissions and environmental media sampling and analysis were all investigated. No information from any of the lines of evidence support the hypothesis that particulates accumulating on the Wigg roof originate from the Waste-to-Energy Facility, and in addition no information from any of the lines of evidence support the hypothesis that concentrations of metals and dioxins in rooftop dust, roadside dust or soil samples near to the Waste-to-Energy Facility are the caused by metals and dioxins and furans emitted from the Waste-to-Energy Facility.

On this basis, this study concludes that the particulate matter accumulating on the Wigg roof is not the result of deposition from Waste-to-Energy Facility. Additionally, metal and dioxin and furan concentrations on the Wigg roof, other nearby roofs, in roadside dust, and in soils near the Waste-to-Energy Facility are not significantly impacted by emissions from the Waste-to-Energy Facility. Metals and dioxins and furans concentrations both near the Waste-to-Energy Facility and in the other locations sampled are within the appropriate levels for industrial activity, which is consistent with the uses of all of the locations sampled.

## 6 Closure

We trust that this report meets your requirements. Should you have any questions, or require further information, please contact the undersigned.

### HDR Corporation

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## Bibliography

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# Appendix A

## Stack Test Results

## Stack Test particulate matter and Select Metals Results (mg/Sm<sup>3</sup> @ 11% O<sub>2</sub>)<sup>1, 2</sup>

### Unit 1

	PM	Lead	Arsenic	Chromium	Cobalt	Cadmium	Nickel
20Q4	0.78	0.00347	0.00122	0.00117	0.00122	0.00108	0.00771
21Q1	2.11	0.00113	0.00036	0.00112	0.00015	0.00027	0.00110
21Q2	0.70	0.00139	0.00037	0.00383	0.00024	0.00007	0.00387
21Q3	1.11	0.00268	0.00043	0.00173	0.00008	0.00031	0.00383
21Q4	1.43	0.00316	0.00031	0.00120	0.00008	0.00022	0.00256
22Q1	1.94	0.00218	0.00036	0.00035	0.00012	0.00328	0.00094
22Q2	3.24	0.00554	0.00062	0.00060	0.00009	0.00074	0.00050
22Q3	0.22	0.00123	0.00033	0.00119	0.00013	0.00008	0.00208
22Q4	0.08	0.00357	0.00090	0.00120	0.00018	0.00007	0.00123
23Q1	0.56	0.00059	0.00040	0.00043	0.00013	0.00011	0.00127
23Q2	0.52	0.00095	0.00096	0.00219	0.00017	0.00010	0.00286
23Q3	1.05	0.00048	0.00032	0.00342	0.00014	0.00016	0.00251
23Q4	0.56	0.00126	0.00051	0.00072	0.00013	0.00008	0.00080
24Q1	1.37	0.00494	0.00039	0.00210	0.00010	0.00028	0.00238
24Q2	1.27	0.00247	0.00068	0.00055	0.00013	0.00044	0.00223
24Q3	1.22	0.00253	0.00097	0.00076	0.00010	0.00029	0.00181
24Q4	0.04	0.00237	0.00065	0.00089	0.00012	0.00015	0.00019
25Q1	1.32	0.00253	0.00153	0.00082	0.00015	0.00025	0.00084
25Q2	0.79	0.00091	0.00034	0.00031	0.00008	0.00011	0.00024
25Q3	1.20	0.00140	0.00104	0.00063	0.00009	0.00009	0.00079
5-Year Avg	1.076	0.00224	0.00063	0.00126	0.00018	0.00041	0.00199
Ratio to Lead	-	-	0.28	0.56	0.08	0.18	0.89

<sup>1</sup> S means standard conditions of 20 °C and 101.325 kPa.

<sup>2</sup> For most test runs the levels of arsenic, cadmium and cobalt are below or just above the analytical method detection limit. The concentration for runs with analytical results below the detection limits are based on the detection limit.

## Unit 2

	PM	Lead	Arsenic	Chromium	Cobalt	Cadmium	Nickel
20Q4	1.41	0.00067	0.00028	0.01216	0.00012	0.00009	0.01154
21Q1	0.43	0.00074	0.00038	0.00096	0.00008	0.00006	0.00098
21Q2	0.23	0.00085	0.00033	0.00082	0.00011	0.00008	0.00147
21Q3	0.04	0.00072	0.00027	0.00149	0.00014	0.00007	0.00239
21Q4	1.75	0.00140	0.00034	0.00038	0.00006	0.00009	0.00255
22Q1	0.40	0.00234	0.00031	0.00116	0.00050	0.00009	0.00032
22Q2	1.04	0.00129	0.00187	0.00011	0.00011	0.00009	0.00245
22Q3	0.23	0.00184	0.00138	0.00159	0.00009	0.00015	0.00202
22Q4	0.03	0.00091	0.00040	0.00046	0.00007	0.00007	0.00188
23Q1	1.17	0.00052	0.00063	0.00097	0.00009	0.00009	0.00062
23Q2	0.22	0.00088	0.00054	0.00152	0.00015	0.00009	0.00245
23Q3	0.47	0.00085	0.00061	0.00290	0.00012	0.00008	0.00131
23Q4	1.21	0.00349	0.00146	0.00166	0.00010	0.00018	0.00151
24Q1	0.59	0.00106	0.00065	0.00518	0.00014	0.00009	0.00467
24Q2	0.80	0.00039	0.00112	0.00355	0.00013	0.00007	0.00431
24Q3	1.12	0.00064	0.00038	0.00306	0.00013	0.00022	0.00368
24Q4	0.34	0.00056	0.00081	0.00157	0.00008	0.00009	0.00162
25Q1	3.59	0.00414	0.00159	0.00312	0.00014	0.00023	0.00169
25Q2	0.33	0.00213	0.00043	0.00088	0.00016	0.00016	0.00138
25Q3	2.06	0.00376	0.00099	0.00598	0.00010	0.00030	0.01482
5-Year Avg	0.873	0.00146	0.00074	0.00248	0.00013	0.00012	0.00318
Ratio to Lead	-	-	0.51	1.70	0.09	0.08	2.18

### Unit 3

	PM	Lead	Arsenic	Chromium	Cobalt	Cadmium	Nickel
20Q4	0.55	0.00092	0.00072	0.00079	0.00013	0.00010	0.00273
21Q1	0.38	0.00083	0.00024	0.00034	0.00019	0.00011	0.00060
21Q2	0.15	0.00115	0.00030	0.00043	0.00006	0.00010	0.00195
21Q3	0.21	0.00455	0.00041	0.00110	0.00013	0.00057	0.00381
21Q4	2.74	0.00295	0.00073	0.00066	0.00018	0.00033	0.00252
22Q1	2.57	0.01004	0.00063	0.00113	0.00009	0.00067	0.00031
22Q2	2.38	0.00261	0.00104	0.00060	0.00009	0.00023	0.00114
22Q3	1.83	0.00791	0.00046	0.01586	0.00058	0.00138	0.00897
22Q4	4.72	0.00565	0.00091	0.00120	0.00015	0.00062	0.00069
23Q1	2.42	0.00920	0.00072	0.00106	0.00009	0.00054	0.00131
23Q2	4.98	0.00397	0.00121	0.00045	0.00011	0.00054	0.00129
23Q3	2.60	0.00050	0.00043	0.00084	0.00011	0.00013	0.00181
23Q4	0.11	0.00091	0.00090	0.00097	0.00034	0.00011	0.00106
24Q1	0.05	0.00233	0.00034	0.00226	0.00008	0.00013	0.00333
24Q2	1.72	0.00152	0.00032	0.00086	0.00016	0.00022	0.00151
24Q3	0.41	0.00371	0.00039	0.00281	0.00018	0.00012	0.00473
24Q4	1.17	0.00270	0.00055	0.00225	0.00010	0.00010	0.00242
25Q1	0.91	0.00140	0.00036	0.00038	0.00024	0.00017	0.00052
25Q2	0.59	0.00326	0.00228	0.00159	0.00014	0.00010	0.00184
25Q3	1.18	0.00131	0.00090	0.001031	0.00013	0.00009	0.01362
0.5-Year Avg	0.56	0.00337	0.00069	0.00229	0.00016	0.00032	0.00281
Ratio to Lead	-	-	0.21	0.68	0.05	0.09	0.83

# Appendix B

## Sampling Locations and Results

## Sampling Locations and Results

Sample ID	Location	GPS	Sample Type	Depth	Analytes	Date and Time Collected
HS-1	<500 m from the Waste-to-Energy Facility	49°11'14"N 122°58'39"W	Soil	0-2 cm	Metals	10/21/2025 15:24
HS-2	<500 m from the Waste-to-Energy Facility	49°11'13"N 122°58'44"W	Soil	0-2 cm	Metals	10/21/2025 15:36
HS-3	<500 m from the Waste-to-Energy Facility	49°11'11"N 122°58'38"W	Soil	0-2 cm	Metals	10/21/2025 15:53
HS-4	<500 m from the Waste-to-Energy Facility	49°11'13"N 122°58'39"W	Soil	0-2 cm	Metals	10/21/2025 15:19
HS-5	<500 m from the Waste-to-Energy Facility	49°11'13"N 122°58'37"W	Soil	0-2 cm	Metals Duplicate	10/21/2025 15:28
HS-6	<500 m from the Waste-to-Energy Facility	49°11'15"N 122°58'36"W	Soil	0-2 cm	Dioxins/Furans	10/21/2025 15:05
HS-7	<500 m from the Waste-to-Energy Facility	49°11'15"N 122°58'36"W	Soil	Surface	Dioxins/Furans Duplicate	10/21/2025 15:25
HS-8	Waste-to-Energy Facility roof	49°11'11"N 122°58'40"W	Roof	Surface	Metals	10/21/2025 11:11
HS-9	Waste-to-Energy Facility roof	49°11'11"N 122°58'40"W	Roof	Surface	Metals	10/21/2025 11:20
HS-10	Waste-to-Energy Facility roof	49°11'11"N 122°58'39"W	Roof	Surface	Metals	10/21/2025 11:25
HS-11	Waste-to-Energy Facility roof	49°11'11"N 122°58'39"W	Roof	Surface	Dioxins/Furans	10/21/2025 11:33
HS-12A & HS-12 B	< 500 m from the Waste-to-Energy Facility	49°11'09"N 122°58'26"W	Soil and Roadside Dust	0-2 cm	Metals	10/21/2025 13:50
HS-13A & HS-13B	< 500 m from the Waste-to-Energy Facility	49°11'05"N 122°58'34"W	Soil and Roadside Dust	0-2 cm	Metals	10/21/2025 14:09
HS-14A & 14B	< 500 m from the Waste-to-Energy Facility	49°11'20"N 122°58'54"W	Soil and Roadside Dust	0-2 cm	Metals	10/21/2025 14:35
HS-15A & HS-15B	< 500 m from the Waste-to-Energy Facility	49°11'24"N 122°58'41"W	Soil and Roadside Dust	0-2 cm	Metals	10/21/2025 14:40
HS-16	< 500 m from the Waste-to-Energy Facility	49°11'24"N 122°58'41"W	Soil	0-2 cm	Metals Duplicate	10/21/2025 14:25
HS-17	Wigg roof	49°11'11"N 122°58'15"W	Roof	Surface	Metals	10/21/2025 9:01

Sample ID	Location	GPS	Sample Type	Depth	Analytes	Date and Time Collected
HS-18	Wigg roof	49°11'10"N 122°58'15"W	Roof	Surface	Metals	10/21/2025 9:24
HS-19	Wigg roof	49°11'11"N 122°58'17"W	Roof	Surface	Metals	10/21/2025 9:31
HS-20	Wigg roof	49°11'12"N 122°58'16"W	Roof	Surface	Dioxins/Furans	10/21/2025 9:35
HS-21A & HS-21 B	Near Wigg	49°11'14"N 122°58'15"W	Soil and Roadside Dust	0-2 cm	Metals	10/21/2025 10:09
HS-22	Near Wigg	49°11'14"N 122°58'15"W	Soil	0-2 cm	Metals	10/21/2025 10:14
HS-23	Garibaldi Glass roof	49°11'19"N 122°58'37"W	Roof	Surface	Metals	10/21/2025 12:28
HS-24	Garibaldi Glass roof	49°11'18"N 122°58'37"W	Roof	Surface	Metals	10/21/2025 12:32
HS-25	Garibaldi Glass roof	49°11'19"N 122°58'35"W	Roof	Surface	Metals	10/21/2025 12:39
HS-26	Garibaldi Glass roof	49°11'20"N 122°58'35"W	Roof	Surface	Dioxins/Furans	10/21/2025 12:47
HS-27A & HS-27B	Far field (>10km from the Waste- to-Energy Facility stack)	49°12'25"N 123°64'4"W	Soil and Roadside Dust	0-2 cm	Metals, subsampled for dioxins/furans	10/22/2025 13:12
HS-28A & HS-28B	Far field (>10km from the Waste- to-Energy Facility)	49°13'44"N 122°52'20"W	Soil and Roadside Dust	0-2 cm	Metals, subsampled for dioxins/furans	10/22/2025 11:53
HS-29A & HS-29B	Far field (>10km from the Waste- to-Energy Facility)	49°10'42"N 122°42'19"W	Soil and Roadside Dust	0-2 cm	Metals, subsampled for dioxins/furans	10/22/2025 10:26
HS-30A & HS-30B	Far field (>10km from the Waste- to-Energy Facility)	49°10'51"N 122°41'12"W	Soil and Roadside Dust	0-2 cm	Metals	10/22/2025 9:18
HS-31A & HS-31B	Far field (>10km from the Waste- to-Energy Facility)	49°11'8"N 122°34'10"W	Soil and Roadside Dust	0-2 cm	Metals	10/22/2025 8:32
HS-32	Wigg Surrey roof	49°10'43"N 122°42'21"W	Roof	Surface	Metals	10/22/2025 10:43
HS-33	Wigg Surrey roof	49°10'43"N 122°42'20"W	Roof	Surface	Metals	10/22/2025 10:50
HS-34	Wigg Surrey roof	49°10'44"N 122°42'19"W	Roof	Surface	Metals	10/22/2025 10:55
HS-35	Wigg Surrey roof	49°10'43"N 122°42'20"W	Roof	Surface	Dioxins/Furans	10/22/2025 11:03

Sample ID	Location	GPS	Sample Type	Depth	Analytes	Date and Time Collected
HS-36	Waste-to-Energy Facility roof	49°11'12"N 122°58'40"W	Roof	Surface	Metals	01/27/2026 9:48
HS-37	Waste-to-Energy Facility roof	49°11'11"N 122°58'41"W	Roof	Surface	Metals	01/27/2026 10:02
HS-38	Waste-to-Energy Facility roof	49°11'11"N 122°58'40"W	Roof	Surface	Metals	01/27/2026 9:53
HS-39	Waste-to-Energy Facility roof	49°11'11"N 122°58'40"W	Roof	Surface	Metals	01/27/2026 10:02
HS-40	Waste-to-Energy Facility roof	49°11'11"N 122°58'40"W	Roof	Surface	Metals	01/27/2026 10:11
HS-41	Waste-to-Energy Facility roof	49°11'10"N 122°58'40"W	Roof	Surface	Metals	01/27/2026 10:26
HS-42	Waste-to-Energy Facility roof	49°11'11"N 122°58'40"W	Roof	Surface	Metals	01/27/2026 10:41
HS-43	Waste-to-Energy Facility roof	49°11'11"N 122°58'39"W	Roof	Surface	Metals	01/27/2026 10:17
HS-44	Waste-to-Energy Facility roof	49°11'10"N 122°58'40"W	Roof	Surface	Metals	01/27/2026 10:32
HS-45	Waste-to-Energy Facility roof	49°11'10"N 122°58'39"W	Roof	Surface	Metals	01/27/2026 10:37
HS-46	Waste-to-Energy Facility roof	49°11'11"N 122°58'40"W	Roof	Surface	Dioxins/Furans	01/27/2026 10:51
HS-47	Waste-to-Energy Facility roof	49°11'11"N 122°58'40"W	Roof	Surface	Dioxins/Furans	01/27/2026 10:58
HS-48	Waste-to-Energy Facility roof	49°11'10"N 122°58'39"W	Roof	Surface	Dioxins/Furans	01/27/2026 11:06
HS-49	Fly Ash	Not recorded	Fly Ash	N/A	Metals	01/27/2026 9:29
HS-50	Fly Ash	Not recorded	Fly Ash	N/A	Metals	01/27/2026 11:25
HS-51	Fly Ash	Not recorded	Fly Ash	N/A	Metals	01/27/2026 9:31

Sample ID	Barium	Beryllium	Copper	Manganese	Mercury	Selenium	Sodium	Uranium	Vanadium	Zinc
HS-1	150.00	0.22	154.00	425.00	0.24	0.26	741.00	0.81	42.20	607.00
HS-2	78.7	0.21	45.1	356	0.0764	0.29	457	0.414	41.3	196
HS-3	223	0.22	418	467	0.393	0.41	1890	1.11	41	1790
HS-4	105	0.25	104	361	0.146	0.37	453	0.836	45.8	406
HS-5	629	0.34	767	693	0.974	0.74	4300	2.33	47.7	4510
HS-8	126	0.21	336	1280	0.355	0.37	347	0.527	71.3	1940
HS-9	1110	0.53	1760	1430	5.4	3.46	2080	2.18	68.9	9140
HS-10	2060	0.76	1450	1260	2.4	2.28	1660	2.84	67.7	9260
HS-12A	77.3	0.23	25.2	353	<0.0500	<0.20	782	0.739	44	89.1
HS-12B	85.8	0.21	47.8	330	<0.0500	<0.20	599	0.41	47.4	356
HS-13A	55.2	0.19	24.7	321	<0.0500	<0.20	1260	0.3	39	74.3
HS-13B	54.4	0.2	31.3	333	<0.0500	<0.20	357	0.332	44.4	144
HS-14A	66.2	0.19	28.6	349	<0.0500	<0.20	289	0.418	42.6	119
HS-14B	141	0.21	98	385	<0.0500	<0.20	583	0.377	49.1	530
HS-15A	56.3	0.2	40	378	<0.0500	<0.20	324	0.34	46.9	166
HS-15B	170	0.2	114	409	<0.0500	<0.20	616	0.381	46.6	724
HS-16	54.2	0.2	16.6	383	<0.0500	<0.20	324	0.315	48.3	56.6
HS-17	253	0.34	186	450	0.126	0.64	776	0.942	59.5	1010
HS-18	244	0.31	191	470	0.112	0.72	771	0.901	56.9	1210
HS-19	240	0.36	199	494	0.139	0.68	894	0.993	54.6	907
HS-21A	71.9	0.18	26	364	<0.0500	<0.20	533	0.4	49	125
HS-21B	116	0.19	144	345	<0.0500	<0.20	604	0.505	56.3	453
HS-22	90.1	0.22	62.8	380	<0.0500	<0.20	559	0.454	48.8	281
HS-23	159	0.31	94.2	750	<0.0500	0.4	526	0.676	70.9	442
HS-24	162	0.3	118	648	0.0806	0.51	678	0.604	65	510
HS-25	170	0.36	143	975	0.0978	0.72	717	0.744	71.3	540
HS-27A	128.00	0.21	66.10	669.00	0.09	<0.20	416.00	0.56	50.40	231.00
HS-27B	117.00	0.21	99.30	429.00	0.06	0.25	549.00	0.45	50.40	307.00

Sample ID	Barium	Beryllium	Copper	Manganese	Mercury	Selenium	Sodium	Uranium	Vanadium	Zinc
HS-28A	191.00	0.19	283.00	722.00	0.09	<0.20	1420.00	0.48	50.30	637.00
HS-28B	182.00	0.16	51.30	409.00	0.09	<0.20	512.00	0.33	47.30	176.00
HS-30A	111.00	0.27	60.50	455.00	0.06	0.29	422.00	0.51	53.60	1010.00
HS-30B	162.00	0.22	116.00	382.00	0.31	0.23	867.00	0.54	42.70	717.00
HS-31A	119.00	0.38	37.20	631.00	0.06	0.27	276.00	0.59	66.10	96.70
HS-31B	88.30	0.14	57.80	286.00	<0.0500	<0.20	577.00	0.34	46.30	293.00
HS-29A	197.00	0.15	59.90	521.00	0.07	0.23	152.00	0.34	33.20	1950.00
HS-29B	86.00	0.11	54.90	367.00	<0.0500	<0.20	306.00	0.22	32.60	279.00
HS-32	271.00	0.13	195.00	1030.00	<0.0500	0.28	324.00	0.66	54.60	427.00
HS-33	347.00	0.18	592.00	1000.00	0.05	0.44	390.00	0.64	56.10	720.00
HS-34	211.00	0.15	536.00	1040.00	0.06	0.44	365.00	0.51	49.30	584.00
HS-36	102	0.18	217	833	0.991	0.60	351	0.728	37.8	806
HS-37	98.3	0.29	185	904	1.45	0.68	557	0.787	82.9	789
HS-38	32.9	<0.10	50.8	544	0.0667	<0.20	78	0.355	14.7	259
HS-39	770	0.46	695	913	1.64	1.22	640	14.3	61.5	6570
HS-40	116	0.18	94.7	613	0.383	0.49	507	0.491	71.9	328
HS-41	168	0.22	121	996	0.444	1.11	619	0.710	84.2	255
HS-42	123	0.20	174	758	0.682	0.54	445	0.721	61.3	249
HS-43	140	0.22	251	768	0.414	0.63	576	0.849	67.5	933
HS-44	168	0.24	122	576	0.340	0.66	718	0.678	83.5	236
HS-45	174	0.30	323	926	0.604	0.64	526	1.03	73.6	244
HS-49	244	0.12	774	123	7.54	2.32	45100	1.67	23.8	12000
HS-50	328	0.13	685	198	17.7	2.97	37500	1.69	24.6	13300
HS-51	178	<0.10	470	125	5.21	1.27	29000	1.60	25.6	12800

# Appendix C

## Wigg Holding Suggestions

FROM: PETER HARCO

AUG. 15, 2025

TO: PAUL HENDERSON  
General Manager, Solid Waste Services  
Metro Vancouver

Hello PauL,

Here are my comments and suggestions point by point, plus added suggestions. Aside from the sampling and testing suggestions. I also suggest that perhaps a person from the Ministry of Environment, Parks and Lands be appraised of every step in this process as it proceeds.

1.

... In addition to taking samples from the Wigg roof...ALSO TAKE SAMPLES INSIDE THE WAREHOUSE OFF LEDGES AND BEAMS PLUS AT LEAST TWO OUTSIDE GROUND AREA SAMPLES.

.....Sample other areas nearby including streets and parking lots etc.....IN ADDITION SAMPLE AND TEST DEPOSITS ON OTHER NEARBY AREA ROOFS WHERE AVAILABLE.

.....If possible...conduct a stack test focused on particulate matter sampling and comparing to observed accumulated particulate matter...AND TEST BOTH FOR METALS CONTENT COMPARISON PLUS PHYSICAL MICROSCOPIC APPEARANCE.

2.

...Baghouse performance specifications...AND DESCRIBE HOW BAGHOUSE LEAKS ARE DETECTED AND HOW FILTER BAGS ARE REMOVED AND REPLACED..ARE THEY ABLE TO ISOLATE SECTIONS FOR BAG REPLACEMENTS.

...DO A METALS ANALYSIS OF THE BAGHOUSE FILTERED MATERIAL FOR COMPARISON PURPOSES TO ROOFTOP ACCUMULATIONS.

3. Analyse deposition rates...compared to amounts measured on owners rooftops....THE WIGG OWNER HAS DETERMINED A YEARLY RETAINED ROOFTOP DEPOSITION OF ABOUT 10 GRAMS PER SQ. M.TOTALLING ABOUT 60,000 GRAMS PER YEAR DEPOSITED AND RETAINED , BUT NOT INCLUDING WHAT ADDITIONAL PARTICULATE MIGHT HAVE BEEN CARRIED DOWN THE ROOF DRAINS.

THE WIGG OWNERS ESTIMATED TIME OF DEPOSITION ON THE WIGG ROOFTOP, BASED ON OBSERVED WIND DIRECTION, IS ESTIMATED TO BE BETWEEN 1 TO 2.0 FULL DAYS EQUIVALENT PER MONTH OF PLUME FALLOUT.

4. Evaluate data...DECIDE IF THE DATA SUPPORTS THAT THE ROOFTOP DEPOSITS ARE A HAZARDOUS WASTE AND MUST BE HANDLED AND DISPOSED AS SUCH.

DECIDE IF THE DATA SUPPORTS THAT GROUND LEVEL PARTICULATE DEPOSITS ADD TO AND EXCEED GOVERNMENT SOIL STANDARDS FOR ARSENIC OR OTHER METALS. The government permit does not specify how much hazardous material can be in the stack emitted particulates.

DETERMINE IF THE LEVELS OF METALS IN PARTICULATES FOUND ON LEDGES AND BEAMS AND FLOORS INSIDE WORKPLACES CONSTITUTE UNSAFE CONDITIONS FOR WORKERS. (assuming these particulates are not from sources inside the warehouse.)

ESTIMATE HOW LONG A PERIOD OF EMISSIONS FROM THE IDENTIFIED SOURCE IT WOULD TAKE TO CAUSE THE ACCUMULATION OF SETTLED PARTICULATES TO REACH AN UNHEALTHY LEVEL IN ANY PLACE WHERE SUCH ACCUMULATION CAN IMPACT PEOPLE IN THEIR DAILY ACTIVITIES, IN SCHOOL YARDS OR AT SHOPPING AREAS, OR AT THEIR WORK PLACE OR HOMES, ETC.

ALSO ANSWER THE QUESTION OF WHETHER SUCH PARTICULATES HAVE BY NOW REACHED UNSAFE LEVELS IN AREAS WHERE THEY HAVE SETTLED OVER MANY PAST YEARS.

If it is determined that the Metro incinerator is the main source of unhealthy particulates in the areas investigated, then what would be Metro's plan of action going forward.? Perhaps a new modern incinerator built in an unpopulated area. Can the present consultants make such a recommendation?

Best Regards,

Peter Harco, B A Sc.

President,  
Wigg Holdings Ltd.

P.S. Out of interest we did a calculation of the estimated particulate emission rate from the stack:

Based on the measured amount of 135 lb or 60,000 grams in 2024 accumulated on the 6000 sq. meter roof and assumptions as follows;

Estimated 30% loss to roof drains during accumulation would increase this amount by factor of 1.3.

Assumed total equivalent plume deposit area is 6x the roof area. ( assuming the deposition rate decreases over distance it travels)

Assumed 2.0 full days equivalent per month of deposition time on the roof based on observed wind history.

The calculation:  $1.3 \times 60,000 \times 6 = 468,000$  grams total deposited on roof and total plume footprint in 48 hrs.

$468,000$  divided by 48 hrs = 9750 g/hr. emitted

9750 divided by  $60 \times 60 = 2.7$  grams per sec.

$2.7$  g per sec  $\times 1000 = 2700$  mg per sec.

Operating Permit allows  $9 \text{ mg/ cu m} \times 27 \text{ cu m /sec} = 243 \text{ mg / sec}$

**THIS SHOWS THAT THE PARTICULATE EMISSION RATE WAS 10 TIMES THE PERMITTED RATE DURING 2024 BASED ON SEVERAL ASSUMPTIONS MADE.**

This analysis assumes that 100% of the rooftop deposits are from the incinerator stack. But if we assume 20% comes from other sources. then 80 % coming from the stack is still above its permitted level and above a safe level.

# Appendix D

## ALS Lab Reports

**CERTIFICATE OF ANALYSIS**

<b>Work Order</b>	: <b>VA25C8048</b>	<b>Laboratory</b>	: ALS Environmental - Vancouver
<b>Client</b>	: <b>HDR Corporation</b>	<b>Account Manager</b>	: Le Van Dalfsen
<b>Contact</b>	: Johanna Mason	<b>Address</b>	: 8081 Lougheed Highway
<b>Address</b>	: 500-1500 W. Georgia Street Vancouver British Columbia Canada V6G 2Z6		: Burnaby BC Canada V5A 1W9
<b>Telephone</b>	: ----	<b>E-mail</b>	: Le.VanDalfsen@ALSGlobal.com
<b>Project</b>	: VA25HDR100-001	<b>Telephone</b>	: +1 604 253 4188
<b>PO</b>	: ----	<b>Date Samples Received</b>	: 22-Oct-2025 06:43
<b>C-O-C number</b>	: 23-1162265, 23-1162264, 23-1162262	<b>Date Analysis Commenced</b>	: 24-Oct-2025
<b>Sampler</b>	: ----	<b>Issue Date</b>	: 20-Nov-2025 12:50
<b>Site</b>	: ----		
<b>Quote number</b>	: VA25-HDRI100-001		
<b>No. of samples received</b>	: 33		
<b>No. of samples analysed</b>	: 33		

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, QC Interpretive report to assist with Quality Review and Sample Receipt Notification (SRN).

**Signatories**

This document has been electronically signed by the authorized signatories below. Electronic signing is conducted in accordance with US FDA 21 CFR Part 11.

<i>Signatories</i>	<i>Position</i>	<i>Laboratory Department</i>
Brieanna Allen	Production/Validation Manager	Organics, Burnaby, British Columbia
Colin Jamieson	Analyst	Organics, Burlington, Ontario
Kim Jensen	Department Manager - Metals	Metals, Burnaby, British Columbia
Kim Jensen	Department Manager - Metals	Organics, Burnaby, British Columbia
Sabrina Jin	Analyst	Organics, Burlington, Ontario



## General Comments

The analytical methods used by ALS are developed using internationally recognized reference methods (where available), such as those published by US EPA, APHA Standard Methods, ASTM, ISO, Environment Canada, BC MOE, and Ontario MOE. Refer to the ALS Quality Control Interpretive report (QCI) for applicable references and methodology summaries. Reference methods may incorporate modifications to improve performance.

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.

Please refer to Quality Control Interpretive report (QCI) for information regarding Holding Time compliance.

Key: CAS Number: Chemical Abstracts Services number is a unique identifier assigned to discrete substances.  
LOR: Limit of Reporting (detection limit).

<i>Unit</i>	<i>Description</i>
-	no units
%	percent
g	grams
mg/kg	milligrams per kilogram
pg/g	picograms/gram
pH units	pH units

<: less than.

>: greater than.

Surrogate: An analyte that is similar in behavior to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.

Test results reported relate only to the samples as received by the laboratory.

UNLESS OTHERWISE STATED on SRN or QCI Report, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

## Qualifiers

<i>Qualifier</i>	<i>Description</i>
[E]	Estimated value. The reported concentration is above the calibration range of the instrument.
[J]	Estimated value. The reported concentration is below the calibrated range of the instrument but above the EDL.
M	Peak has been manually integrated.



## Analytical Results

Sub-Matrix: Soil/Solid  
 (Matrix: Soil/Solid)

					Client sample ID	HS-1 ----	HS-2A ----	HS-3A ----	HS-3B 1 ----	HS-4 ----
					Client sampling date / time	21-Oct-2025 03:24	21-Oct-2025 03:36	21-Oct-2025 03:53	21-Oct-2025 03:33	21-Oct-2025 03:19
Analyte	CAS Number	Method/Lab	LOR	Unit	VA25C8048-001	VA25C8048-002	VA25C8048-004	VA25C8048-005	VA25C8048-006	
					Result	Result	Result	Result	Result	
<b>Physical Tests</b>										
pH (1:2 soil:water)	----	E108/VA	0.10	pH units	6.85	7.84	7.74	7.59	6.90	
<b>Metals</b>										
Aluminum	7429-90-5	E440/VA	50	mg/kg	13600	10300	14300	20300	13700	
Antimony	7440-36-0	E440/VA	0.10	mg/kg	15.6	3.46	38.4	95.9	12.7	
Arsenic	7440-38-2	E440/VA	0.10	mg/kg	8.04	3.74	12.0	23.0	9.55	
Barium	7440-39-3	E440/VA	0.50	mg/kg	150	78.7	223	512	105	
Beryllium	7440-41-7	E440/VA	0.10	mg/kg	0.22	0.21	0.22	0.26	0.25	
Bismuth	7440-69-9	E440/VA	0.20	mg/kg	1.95	2.21	4.53	16.2	80.9	
Boron	7440-42-8	E440/VA	5.0	mg/kg	12.0	<5.0	23.3	65.9	8.1	
Cadmium	7440-43-9	E440/VA	0.020	mg/kg	4.22	1.24	8.66	24.0	3.48	
Calcium	7440-70-2	E440/VA	50	mg/kg	13000	7080	17400	53600	9750	
Chromium	7440-47-3	E440/VA	0.50	mg/kg	52.3	33.1	81.8	270	54.8	
Cobalt	7440-48-4	E440/VA	0.10	mg/kg	12.1	7.43	15.8	30.9	9.92	
Copper	7440-50-8	E440/VA	0.50	mg/kg	154	45.1	418	699	104	
Iron	7439-89-6	E440/VA	50	mg/kg	20300	20100	27000	47400	19800	
Lead	7439-92-1	E440/VA	0.50	mg/kg	121	18.1	249	372	90.3	
Lithium	7439-93-2	E440/VA	2.0	mg/kg	10.4	7.8	10.8	12.7	10.3	
Magnesium	7439-95-4	E440/VA	20	mg/kg	5630	6440	5780	6730	5870	
Manganese	7439-96-5	E440/VA	1.0	mg/kg	425	356	467	776	361	
Mercury	7439-97-6	E510/VA	0.0500	mg/kg	0.238	0.0764	0.393	0.447	0.146	
Molybdenum	7439-98-7	E440/VA	0.10	mg/kg	4.90	1.19	8.26	18.0	3.31	



**Analytical Results**

Sub-Matrix: Soil/Solid  
 (Matrix: Soil/Solid)

					Client sample ID	HS-1	HS-2A	HS-3A	HS-3B 1	HS-4
					Client sampling date / time	----	----	----	----	----
Analyte	CAS Number	Method/Lab	LOR	Unit	21-Oct-2025 03:24	21-Oct-2025 03:36	21-Oct-2025 03:53	21-Oct-2025 03:33	21-Oct-2025 03:19	
					VA25C8048-001	VA25C8048-002	VA25C8048-004	VA25C8048-005	VA25C8048-006	
					Result	Result	Result	Result	Result	
<b>Metals</b>										
Nickel	7440-02-0	E440/VA	0.50	mg/kg	52.5	30.1	70.6	143	47.1	
Phosphorus	7723-14-0	E440/VA	50	mg/kg	1100	1750	1640	5010	795	
Potassium	7440-09-7	E440/VA	100	mg/kg	930	1140	1110	2100	850	
Selenium	7782-49-2	E440/VA	0.20	mg/kg	0.26	0.29	0.41	0.74	0.37	
Silver	7440-22-4	E440.Ag/VA	0.10	mg/kg	----	----	----	----	0.48	
Silver	7440-22-4	E440/VA	0.10	mg/kg	0.94	0.25	1.95	6.38	----	
Sodium	7440-23-5	E440/VA	50	mg/kg	741	457	1890	3380	453	
Strontium	7440-24-6	E440/VA	0.50	mg/kg	54.9	32.6	85.0	148	43.4	
Sulfur	7704-34-9	E440/VA	1000	mg/kg	<1000	<1000	<1000	3800	<1000	
Thallium	7440-28-0	E440/VA	0.050	mg/kg	0.078	<0.050	0.092	0.126	0.072	
Tin	7440-31-5	E440/VA	2.0	mg/kg	15.3	4.4	41.6	90.5	8.9	
Titanium	7440-32-6	E440/VA	1.0	mg/kg	651	653	627	1020	800	
Tungsten	7440-33-7	E440/VA	0.50	mg/kg	0.61	<0.50	1.68	5.80	0.86	
Uranium	7440-61-1	E440/VA	0.050	mg/kg	0.808	0.414	1.11	1.04	0.836	
Vanadium	7440-62-2	E440/VA	0.20	mg/kg	42.2	41.3	41.0	46.2	45.8	
Zinc	7440-66-6	E440/VA	2.0	mg/kg	607	196	1790	3330	406	
Zirconium	7440-67-7	E440/VA	1.0	mg/kg	1.6	1.5	1.7	1.3	2.4	

Please refer to the General Comments section for an explanation of any qualifiers detected.



### Analytical Results

Sub-Matrix: Soil/Solid  
 (Matrix: Soil/Solid)

					Client sample ID	HS-5	HS-6	HS-7	HS-8	HS-9
					Client sampling date / time	21-Oct-2025 03:28	21-Oct-2025 03:05	21-Oct-2025 03:25	21-Oct-2025 11:11	21-Oct-2025 11:20
Analyte	CAS Number	Method/Lab	LOR	Unit	VA25C8048-007	VA25C8048-008	VA25C8048-009	VA25C8048-010	VA25C8048-011	
					Result	Result	Result	Result	Result	
<b>Sample Preparation</b>										
Weight, extraction (wet)	---	EP800/BU	0.0001	g	---	20.1008	20.1163	---	---	
<b>Physical Tests</b>										
Moisture	---	E144/VA	0.25	%	---	8.49	17.0	---	---	
pH (1:2 soil:water)	---	E108/VA	0.10	pH units	8.16	---	---	5.65	7.21	
<b>Metals</b>										
Aluminum	7429-90-5	E440/VA	50	mg/kg	24100	---	---	15900	23500	
Antimony	7440-36-0	E440/VA	0.10	mg/kg	80.6	---	---	56.6	195	
Arsenic	7440-38-2	E440/VA	0.10	mg/kg	35.9	---	---	30.2	77.3	
Barium	7440-39-3	E440/VA	0.50	mg/kg	629	---	---	126	1110	
Beryllium	7440-41-7	E440/VA	0.10	mg/kg	0.34	---	---	0.21	0.53	
Bismuth	7440-69-9	E440/VA	0.20	mg/kg	19.2	---	---	7.40	37.5	
Boron	7440-42-8	E440/VA	5.0	mg/kg	80.1	---	---	26.6	160	
Cadmium	7440-43-9	E440/VA	0.020	mg/kg	36.7	---	---	8.19	134	
Calcium	7440-70-2	E440/VA	50	mg/kg	62400	---	---	6290	91200	
Chromium	7440-47-3	E440/VA	0.50	mg/kg	198	---	---	373	1350	
Cobalt	7440-48-4	E440/VA	0.10	mg/kg	31.5	---	---	20.6	28.5	
Copper	7440-50-8	E440/VA	0.50	mg/kg	767	---	---	336	1760	
Iron	7439-89-6	E440/VA	50	mg/kg	44900	---	---	193000	72900	
Lead	7439-92-1	E440/VA	0.50	mg/kg	483	---	---	308	6340	
Lithium	7439-93-2	E440/VA	2.0	mg/kg	14.6	---	---	12.1	18.5	
Magnesium	7439-95-4	E440/VA	20	mg/kg	7480	---	---	8590	9730	



### Analytical Results

Sub-Matrix: Soil/Solid  
 (Matrix: Soil/Solid)

					Client sample ID	HS-5	HS-6	HS-7	HS-8	HS-9
					Client sampling date / time	21-Oct-2025 03:28	21-Oct-2025 03:05	21-Oct-2025 03:25	21-Oct-2025 11:11	21-Oct-2025 11:20
Analyte	CAS Number	Method/Lab	LOR	Unit	VA25C8048-007	VA25C8048-008	VA25C8048-009	VA25C8048-010	VA25C8048-011	
					Result	Result	Result	Result	Result	
<b>Metals</b>										
Manganese	7439-96-5	E440/VA	1.0	mg/kg	693	---	---	1280	1430	
Mercury	7439-97-6	E510/VA	0.0500	mg/kg	0.974	---	---	0.355	5.40	
Molybdenum	7439-98-7	E440/VA	0.10	mg/kg	15.6	---	---	39.0	550	
Nickel	7440-02-0	E440/VA	0.50	mg/kg	129	---	---	212	3690	
Phosphorus	7723-14-0	E440/VA	50	mg/kg	5960	---	---	1250	3870	
Potassium	7440-09-7	E440/VA	100	mg/kg	2360	---	---	1040	3430	
Selenium	7782-49-2	E440/VA	0.20	mg/kg	0.74	---	---	0.37	3.46	
Silver	7440-22-4	E440/VA	0.10	mg/kg	6.62	---	---	3.06	17.3	
Sodium	7440-23-5	E440/VA	50	mg/kg	4300	---	---	347	2080	
Strontium	7440-24-6	E440/VA	0.50	mg/kg	161	---	---	35.0	272	
Sulfur	7704-34-9	E440/VA	1000	mg/kg	4100	---	---	1100	14200	
Thallium	7440-28-0	E440/VA	0.050	mg/kg	0.142	---	---	0.102	0.942	
Tin	7440-31-5	E440/VA	2.0	mg/kg	116	---	---	35.3	191	
Titanium	7440-32-6	E440/VA	1.0	mg/kg	313	---	---	1140	1290	
Tungsten	7440-33-7	E440/VA	0.50	mg/kg	8.88	---	---	4.79	126	
Uranium	7440-61-1	E440/VA	0.050	mg/kg	2.33	---	---	0.527	2.18	
Vanadium	7440-62-2	E440/VA	0.20	mg/kg	47.7	---	---	71.3	68.9	
Zinc	7440-66-6	E440/VA	2.0	mg/kg	4510	---	---	1940	9140	
Zirconium	7440-67-7	E440/VA	1.0	mg/kg	8.2	---	---	1.8	4.4	
<b>Dioxins and Furans</b>										
TCDD, 2,3,7,8-	1746-01-6	XE766/BU	1	pg/g	---	0.310 <sup>[U]</sup> M	0.138 <sup>[U]</sup> M	---	---	



## Analytical Results

Sub-Matrix: Soil/Solid  
 (Matrix: Soil/Solid)

					Client sample ID	HS-5 ----	HS-6 ----	HS-7 ----	HS-8 ----	HS-9 ----
					Client sampling date / time	21-Oct-2025 03:28	21-Oct-2025 03:05	21-Oct-2025 03:25	21-Oct-2025 11:11	21-Oct-2025 11:20
Analyte	CAS Number	Method/Lab	LOR	Unit	VA25C8048-007	VA25C8048-008	VA25C8048-009	VA25C8048-010	VA25C8048-011	
					Result	Result	Result	Result	Result	
<b>Dioxins and Furans</b>										
PeCDD, 1,2,3,7,8-	40321-76-4	XE766/BU	1	pg/g	----	0.787	0.361 <sup>[J], M</sup>	----	----	
HxCDD, 1,2,3,4,7,8-	39227-28-6	XE766/BU	1	pg/g	----	0.839	0.425 <sup>[J]</sup>	----	----	
HxCDD, 1,2,3,6,7,8-	57653-85-7	XE766/BU	1	pg/g	----	3.48	2.73 <sup>M</sup>	----	----	
HxCDD, 1,2,3,7,8,9-	19408-74-3	XE766/BU	1	pg/g	----	1.95 <sup>M</sup>	1.14 <sup>M</sup>	----	----	
HpCDD, 1,2,3,4,6,7,8-	35822-46-9	XE766/BU	1	pg/g	----	108	95.9	----	----	
OCDD	3268-87-9	XE766/BU	2	pg/g	----	864	825	----	----	
Tetrachlorodibenzo-p-dioxins [TCDD], total	41903-57-5	XE766/BU	1	pg/g	----	6.43	3.20	----	----	
TCDD, total, # homologues detected	----	XE766/BU	0	-	----	9	8	----	----	
Pentachlorodibenzo-p-dioxins [PeCDD], total	----	XE766/BU	1	pg/g	----	12.0	5.41	----	----	
PeCDD, total, # homologues detected	----	XE766/BU	0	-	----	9	9	----	----	
Hexachlorodibenzo-p-dioxins [HxCDD], total	34465-46-8	XE766/BU	1	pg/g	----	39.1	26.0	----	----	
HxCDD, total, # homologues detected	----	XE766/BU	0	-	----	7	7	----	----	
Heptachlorodibenzo-p-dioxins [HpCDD], total	37871-00-4	XE766/BU	1	pg/g	----	219	192	----	----	
HpCDD, total, # homologues detected	----	XE766/BU	0	-	----	2	2	----	----	
TCDF, 2,3,7,8-	51207-31-9	XE766/BU	1	pg/g	----	1.04	0.573 <sup>[J]</sup>	----	----	
PeCDF, 1,2,3,7,8-	57117-41-6	XE766/BU	1	pg/g	----	1.51	0.713	----	----	
PeCDF, 2,3,4,7,8-	57117-31-4	XE766/BU	1	pg/g	----	1.93	0.858	----	----	
HxCDF, 1,2,3,4,7,8-	70648-26-9	XE766/BU	1	pg/g	----	2.11 <sup>M</sup>	0.816	----	----	
HxCDF, 1,2,3,6,7,8-	57117-44-9	XE766/BU	1	pg/g	----	2.05 <sup>M</sup>	0.669	----	----	
HxCDF, 1,2,3,7,8,9-	72918-21-9	XE766/BU	1	pg/g	----	0.656 <sup>M</sup>	0.265 <sup>[J], M</sup>	----	----	
HxCDF, 2,3,4,6,7,8-	60851-34-5	XE766/BU	1	pg/g	----	2.55	0.605 <sup>M</sup>	----	----	



## Analytical Results

Sub-Matrix: Soil/Solid  
 (Matrix: Soil/Solid)

					Client sample ID	HS-5	HS-6	HS-7	HS-8	HS-9
					Client sampling date / time	21-Oct-2025 03:28	21-Oct-2025 03:05	21-Oct-2025 03:25	21-Oct-2025 11:11	21-Oct-2025 11:20
Analyte	CAS Number	Method/Lab	LOR	Unit	VA25C8048-007	VA25C8048-008	VA25C8048-009	VA25C8048-010	VA25C8048-011	
					Result	Result	Result	Result	Result	
<b>Dioxins and Furans</b>										
HpCDF, 1,2,3,4,6,7,8-	67562-39-4	XE766/BU	2	pg/g	----	19.3	11.8	----	----	
HpCDF, 1,2,3,4,7,8,9-	55673-89-7	XE766/BU	1	pg/g	----	1.30	0.649	----	----	
OCDF	39001-02-0	XE766/BU	2	pg/g	----	30.1	25.8	----	----	
Tetrachlorodibenzofurans [TCDF], total	----	XE766/BU	1	pg/g	----	27.3	8.65	----	----	
TCDF, total, # homologues detected	----	XE766/BU	0	-	----	25	17	----	----	
Pentachlorodibenzofurans [PeCDF], total	----	XE766/BU	1	pg/g	----	19.1	5.36	----	----	
PeCDF, total, # homologues detected	----	XE766/BU	0	-	----	13	8	----	----	
Hexachlorodibenzofurans [HxCDF], total	55684-94-1	XE766/BU	1	pg/g	----	29.0	18.1	----	----	
HxCDF, total, # homologues detected	----	XE766/BU	0	-	----	10	12	----	----	
Heptachlorodibenzofurans [HpCDF], total	38998-75-3	XE766/BU	2	pg/g	----	40.9	32.3	----	----	
HpCDF, total, # homologues detected	----	XE766/BU	0	-	----	4	3	----	----	
<b>Dioxins and Furans Extraction Standards</b>										
TCDD-13C12, 2,3,7,8-	76523-40-5	XE766/BU	0.1	%	----	66.4	75.0	----	----	
PeCDD-13C12, 1,2,3,7,8-	109719-79-1	XE766/BU	0.1	%	----	59.0	70.0	----	----	
HxCDD-13C12, 1,2,3,4,7,8-	109719-80-4	XE766/BU	0.1	%	----	65.1	80.1	----	----	
HxCDD-13C12, 1,2,3,6,7,8-	109719-81-5	XE766/BU	0.1	%	----	73.3	88.8	----	----	
HpCDD-13C12, 1,2,3,4,6,7,8-	109719-83-7	XE766/BU	0.1	%	----	66.8	82.6	----	----	
OCDD-13C12	114423-97-1	XE766/BU	0.1	%	----	76.3	81.2	----	----	
TCDF-13C12, 2,3,7,8-	89059-46-1	XE766/BU	0.1	%	----	64.7	74.9	----	----	
PeCDF-13C12, 1,2,3,7,8-	109719-77-9	XE766/BU	0.1	%	----	63.1	72.4	----	----	
PeCDF-13C12, 2,3,4,7,8-	116843-02-8	XE766/BU	0.1	%	----	60.8	70.9	----	----	



### Analytical Results

Sub-Matrix: Soil/Solid (Matrix: Soil/Solid)					Client sample ID	HS-5 ----	HS-6 ----	HS-7 ----	HS-8 ----	HS-9 ----
					Client sampling date / time	21-Oct-2025 03:28	21-Oct-2025 03:05	21-Oct-2025 03:25	21-Oct-2025 11:11	21-Oct-2025 11:20
Analyte	CAS Number	Method/Lab	LOR	Unit	VA25C8048-007	VA25C8048-008	VA25C8048-009	VA25C8048-010	VA25C8048-011	
					Result	Result	Result	Result	Result	
<b>Dioxins and Furans Extraction Standards</b>										
HxCDF-13C12, 1,2,3,4,7,8-	114423-98-2	XE766/BU	0.1	%	----	67.4	85.9	----	----	
HxCDF-13C12, 1,2,3,6,7,8-	116843-03-9	XE766/BU	0.1	%	----	75.0	97.6	----	----	
HxCDF-13C12, 2,3,4,6,7,8-	116843-05-1	XE766/BU	0.1	%	----	67.5	84.4	----	----	
HxCDF-13C12, 1,2,3,7,8,9-	116843-04-0	XE766/BU	0.1	%	----	67.4	82.6	----	----	
HpCDF-13C12, 1,2,3,4,6,7,8-	67562-39-4	XE766/BU	0.1	%	----	66.7	82.5	----	----	
HpCDF-13C12, 1,2,3,4,7,8,9-	55673-89-7	XE766/BU	0.1	%	----	63.6	79.7	----	----	
TCDD-37Cl4, 2,3,7,8-	----	XE766/BU	0.1	%	----	59.7	65.2	----	----	
<b>Toxic Equivalency</b>										
PCDD/F TEQ - WHO 2005 (ND=0*EDL)	n/a	XE766/BU	0.0	pg/g	----	4.74	2.84	----	----	
PCDD/F TEQ - WHO 2005 (ND=0.5*EDL)	n/a	XE766/BU	0.0	pg/g	----	4.74	2.84	----	----	
PCDD/F TEQ - WHO 2005 (ND=1*EDL)	n/a	XE766/BU	0.0	pg/g	----	4.74	2.84	----	----	

Please refer to the General Comments section for an explanation of any qualifiers detected.

### Analytical Results

Sub-Matrix: Soil/Solid (Matrix: Soil/Solid)					Client sample ID	HS-10 ----	HS-11 ----	HS-12A ----	HS-12B ----	HS-13A ----
					Client sampling date / time	21-Oct-2025 11:25	21-Oct-2025 11:25	21-Oct-2025 01:50	21-Oct-2025 01:50	21-Oct-2025 02:09
Analyte	CAS Number	Method/Lab	LOR	Unit	VA25C8048-012	VA25C8048-013	VA25C8048-014	VA25C8048-015	VA25C8048-016	
					Result	Result	Result	Result	Result	
<b>Sample Preparation</b>										
Weight, extraction (wet)	----	EP800/BU	0.0001	g	----	20.0473	----	----	----	
<b>Physical Tests</b>										
Moisture	----	E144/VA	0.25	%	----	48.5	----	----	----	
pH (1:2 soil:water)	----	E108/VA	0.10	pH units	6.75	----	6.24	7.15	7.35	



**Analytical Results**

Sub-Matrix: Soil/Solid  
 (Matrix: Soil/Solid)

					Client sample ID	HS-10	HS-11	HS-12A	HS-12B	HS-13A
					Client sampling date / time	----	----	----	----	----
Analyte	CAS Number	Method/Lab	LOR	Unit	21-Oct-2025 11:25	21-Oct-2025 11:25	21-Oct-2025 01:50	21-Oct-2025 01:50	21-Oct-2025 02:09	
					VA25C8048-012	VA25C8048-013	VA25C8048-014	VA25C8048-015	VA25C8048-016	
					Result	Result	Result	Result	Result	
<b>Metals</b>										
Aluminum	7429-90-5	E440/VA	50	mg/kg	25900	----	10600	11400	9110	
Antimony	7440-36-0	E440/VA	0.10	mg/kg	223	----	1.38	3.84	0.39	
Arsenic	7440-38-2	E440/VA	0.10	mg/kg	67.8	----	6.30	2.81	2.85	
Barium	7440-39-3	E440/VA	0.50	mg/kg	2060	----	77.3	85.8	55.2	
Beryllium	7440-41-7	E440/VA	0.10	mg/kg	0.76	----	0.23	0.21	0.19	
Bismuth	7440-69-9	E440/VA	0.20	mg/kg	33.5	----	<0.20	0.54	<0.20	
Boron	7440-42-8	E440/VA	5.0	mg/kg	114	----	<5.0	5.5	<5.0	
Cadmium	7440-43-9	E440/VA	0.020	mg/kg	116	----	0.509	0.413	0.180	
Calcium	7440-70-2	E440/VA	50	mg/kg	62300	----	6110	8200	6170	
Chromium	7440-47-3	E440/VA	0.50	mg/kg	1140	----	29.5	31.3	27.6	
Cobalt	7440-48-4	E440/VA	0.10	mg/kg	30.5	----	8.14	6.66	6.95	
Copper	7440-50-8	E440/VA	0.50	mg/kg	1450	----	25.2	47.8	24.7	
Iron	7439-89-6	E440/VA	50	mg/kg	67400	----	20800	23400	16900	
Lead	7439-92-1	E440/VA	0.50	mg/kg	5140	----	10.9	19.9	7.22	
Lithium	7439-93-2	E440/VA	2.0	mg/kg	17.1	----	8.4	6.9	7.2	
Magnesium	7439-95-4	E440/VA	20	mg/kg	8680	----	6660	5390	6230	
Manganese	7439-96-5	E440/VA	1.0	mg/kg	1260	----	353	330	321	
Mercury	7439-97-6	E510/VA	0.0500	mg/kg	2.40	----	<0.0500	<0.0500	<0.0500	
Molybdenum	7439-98-7	E440/VA	0.10	mg/kg	396	----	1.35	2.60	0.76	
Nickel	7440-02-0	E440/VA	0.50	mg/kg	2820	----	37.6	17.9	27.2	
Phosphorus	7723-14-0	E440/VA	50	mg/kg	5570	----	1270	551	837	



## Analytical Results

Sub-Matrix: Soil/Solid  
 (Matrix: Soil/Solid)

					Client sample ID	HS-10	HS-11	HS-12A	HS-12B	HS-13A
					Client sampling date / time	----	----	----	----	----
Analyte	CAS Number	Method/Lab	LOR	Unit	21-Oct-2025 11:25	21-Oct-2025 11:25	21-Oct-2025 01:50	21-Oct-2025 01:50	21-Oct-2025 02:09	
					VA25C8048-012	VA25C8048-013	VA25C8048-014	VA25C8048-015	VA25C8048-016	
					Result	Result	Result	Result	Result	
<b>Metals</b>										
Potassium	7440-09-7	E440/VA	100	mg/kg	2700	----	750	680	620	
Selenium	7782-49-2	E440/VA	0.20	mg/kg	2.28	----	<0.20	<0.20	<0.20	
Silver	7440-22-4	E440/VA	0.10	mg/kg	17.3	----	<0.10	0.13	<0.10	
Sodium	7440-23-5	E440/VA	50	mg/kg	1660	----	782	599	1260	
Strontium	7440-24-6	E440/VA	0.50	mg/kg	226	----	35.8	39.3	32.1	
Sulfur	7704-34-9	E440/VA	1000	mg/kg	2500	----	<1000	<1000	<1000	
Thallium	7440-28-0	E440/VA	0.050	mg/kg	0.682	----	0.050	<0.050	<0.050	
Tin	7440-31-5	E440/VA	2.0	mg/kg	195	----	<2.0	4.4	<2.0	
Titanium	7440-32-6	E440/VA	1.0	mg/kg	1270	----	671	917	682	
Tungsten	7440-33-7	E440/VA	0.50	mg/kg	61.1	----	<0.50	0.81	<0.50	
Uranium	7440-61-1	E440/VA	0.050	mg/kg	2.84	----	0.739	0.410	0.300	
Vanadium	7440-62-2	E440/VA	0.20	mg/kg	67.7	----	44.0	47.4	39.0	
Zinc	7440-66-6	E440/VA	2.0	mg/kg	9260	----	89.1	356	74.3	
Zirconium	7440-67-7	E440/VA	1.0	mg/kg	<5.0	----	1.4	3.8	2.3	
<b>Dioxins and Furans</b>										
TCDD, 2,3,7,8-	1746-01-6	XE766/BU	1	pg/g	----	42.4	----	----	----	
PeCDD, 1,2,3,7,8-	40321-76-4	XE766/BU	1	pg/g	----	176	----	----	----	
HxCDD, 1,2,3,4,7,8-	39227-28-6	XE766/BU	1	pg/g	----	211	----	----	----	
HxCDD, 1,2,3,6,7,8-	57653-85-7	XE766/BU	1	pg/g	----	395	----	----	----	
HxCDD, 1,2,3,7,8,9-	19408-74-3	XE766/BU	1	pg/g	----	346	----	----	----	
HpCDD, 1,2,3,4,6,7,8-	35822-46-9	XE766/BU	1	pg/g	----	4370 <sup>[E]</sup>	----	----	----	



### Analytical Results

Sub-Matrix: Soil/Solid  
 (Matrix: Soil/Solid)

					Client sample ID	HS-10 ----	HS-11 ----	HS-12A ----	HS-12B ----	HS-13A ----
					Client sampling date / time	21-Oct-2025 11:25	21-Oct-2025 11:25	21-Oct-2025 01:50	21-Oct-2025 01:50	21-Oct-2025 02:09
Analyte	CAS Number	Method/Lab	LOR	Unit	VA25C8048-012	VA25C8048-013	VA25C8048-014	VA25C8048-015	VA25C8048-016	
					Result	Result	Result	Result	Result	
<b>Dioxins and Furans</b>										
OCDD	3268-87-9	XE766/BU	2	pg/g	----	13800 <sup>[E]</sup>	----	----	----	
Tetrachlorodibenzo-p-dioxins [TCDD], total	41903-57-5	XE766/BU	1	pg/g	----	2980	----	----	----	
TCDD, total, # homologues detected	----	XE766/BU	0	-	----	16	----	----	----	
Pentachlorodibenzo-p-dioxins [PeCDD], total	----	XE766/BU	1	pg/g	----	4130	----	----	----	
PeCDD, total, # homologues detected	----	XE766/BU	0	-	----	9	----	----	----	
Hexachlorodibenzo-p-dioxins [HxCDD], total	34465-46-8	XE766/BU	1	pg/g	----	6420	----	----	----	
HxCDD, total, # homologues detected	----	XE766/BU	0	-	----	8	----	----	----	
Heptachlorodibenzo-p-dioxins [HpCDD], total	37871-00-4	XE766/BU	1	pg/g	----	9160	----	----	----	
HpCDD, total, # homologues detected	----	XE766/BU	0	-	----	2	----	----	----	
TCDF, 2,3,7,8-	51207-31-9	XE766/BU	1	pg/g	----	154	----	----	----	
PeCDF, 1,2,3,7,8-	57117-41-6	XE766/BU	1	pg/g	----	238	----	----	----	
PeCDF, 2,3,4,7,8-	57117-31-4	XE766/BU	1	pg/g	----	426	----	----	----	
HxCDF, 1,2,3,4,7,8-	70648-26-9	XE766/BU	1	pg/g	----	531	----	----	----	
HxCDF, 1,2,3,6,7,8-	57117-44-9	XE766/BU	1	pg/g	----	482	----	----	----	
HxCDF, 1,2,3,7,8,9-	72918-21-9	XE766/BU	1	pg/g	----	179	----	----	----	
HxCDF, 2,3,4,6,7,8-	60851-34-5	XE766/BU	1	pg/g	----	722	----	----	----	
HpCDF, 1,2,3,4,6,7,8-	67562-39-4	XE766/BU	2	pg/g	----	4210 <sup>[E]</sup>	----	----	----	
HpCDF, 1,2,3,4,7,8,9-	55673-89-7	XE766/BU	1	pg/g	----	282	----	----	----	
OCDF	39001-02-0	XE766/BU	2	pg/g	----	2280	----	----	----	
Tetrachlorodibenzofurans [TCDF], total	----	XE766/BU	1	pg/g	----	6200	----	----	----	
TCDF, total, # homologues detected	----	XE766/BU	0	-	----	25	----	----	----	



**Analytical Results**

Sub-Matrix: Soil/Solid  
 (Matrix: Soil/Solid)

					Client sample ID	HS-10	HS-11	HS-12A	HS-12B	HS-13A
					Client sampling date / time	----	----	----	----	----
Analyte	CAS Number	Method/Lab	LOR	Unit	21-Oct-2025 11:25	21-Oct-2025 11:25	21-Oct-2025 01:50	21-Oct-2025 01:50	21-Oct-2025 02:09	
					VA25C8048-012	VA25C8048-013	VA25C8048-014	VA25C8048-015	VA25C8048-016	
					Result	Result	Result	Result	Result	
<b>Dioxins and Furans</b>										
Pentachlorodibenzofurans [PeCDF], total	----	XE766/BU	1	pg/g	----	5600	----	----	----	
PeCDF, total, # homologues detected	----	XE766/BU	0	-	----	18	----	----	----	
Hexachlorodibenzofurans [HxCDF], total	55684-94-1	XE766/BU	1	pg/g	----	5810	----	----	----	
HxCDF, total, # homologues detected	----	XE766/BU	0	-	----	12	----	----	----	
Heptachlorodibenzofurans [HpCDF], total	38998-75-3	XE766/BU	2	pg/g	----	5480	----	----	----	
HpCDF, total, # homologues detected	----	XE766/BU	0	-	----	4	----	----	----	
<b>Dioxins and Furans Extraction Standards</b>										
TCDD-13C12, 2,3,7,8-	76523-40-5	XE766/BU	0.1	%	----	59.8	----	----	----	
PeCDD-13C12, 1,2,3,7,8-	109719-79-1	XE766/BU	0.1	%	----	38.7	----	----	----	
HxCDD-13C12, 1,2,3,4,7,8-	109719-80-4	XE766/BU	0.1	%	----	54.8	----	----	----	
HxCDD-13C12, 1,2,3,6,7,8-	109719-81-5	XE766/BU	0.1	%	----	67.8	----	----	----	
HpCDD-13C12, 1,2,3,4,6,7,8-	109719-83-7	XE766/BU	0.1	%	----	39.6	----	----	----	
OCDD-13C12	114423-97-1	XE766/BU	0.1	%	----	32.7	----	----	----	
TCDF-13C12, 2,3,7,8-	89059-46-1	XE766/BU	0.1	%	----	58.0	----	----	----	
PeCDF-13C12, 1,2,3,7,8-	109719-77-9	XE766/BU	0.1	%	----	46.0	----	----	----	
PeCDF-13C12, 2,3,4,7,8-	116843-02-8	XE766/BU	0.1	%	----	40.5	----	----	----	
HxCDF-13C12, 1,2,3,4,7,8-	114423-98-2	XE766/BU	0.1	%	----	63.1	----	----	----	
HxCDF-13C12, 1,2,3,6,7,8-	116843-03-9	XE766/BU	0.1	%	----	71.5	----	----	----	
HxCDF-13C12, 2,3,4,6,7,8-	116843-05-1	XE766/BU	0.1	%	----	60.7	----	----	----	
HxCDF-13C12, 1,2,3,7,8,9-	116843-04-0	XE766/BU	0.1	%	----	57.3	----	----	----	
HpCDF-13C12, 1,2,3,4,6,7,8-	67562-39-4	XE766/BU	0.1	%	----	48.0	----	----	----	



### Analytical Results

Sub-Matrix: Soil/Solid  
 (Matrix: Soil/Solid)

					Client sample ID	HS-10 ----	HS-11 ----	HS-12A ----	HS-12B ----	HS-13A ----
					Client sampling date / time	21-Oct-2025 11:25	21-Oct-2025 11:25	21-Oct-2025 01:50	21-Oct-2025 01:50	21-Oct-2025 02:09
Analyte	CAS Number	Method/Lab	LOR	Unit	VA25C8048-012	VA25C8048-013	VA25C8048-014	VA25C8048-015	VA25C8048-016	
					Result	Result	Result	Result	Result	
<b>Dioxins and Furans Extraction Standards</b>										
HpCDF-13C12, 1,2,3,4,7,8,9-	55673-89-7	XE766/BU	0.1	%	----	36.8	----	----	----	
TCDD-37Cl4, 2,3,7,8-	----	XE766/BU	0.1	%	----	60.8	----	----	----	
<b>Toxic Equivalency</b>										
PCDD/F TEQ - WHO 2005 (ND=0*EDL)	n/a	XE766/BU	0.0	pg/g	----	748	----	----	----	
PCDD/F TEQ - WHO 2005 (ND=0.5*EDL)	n/a	XE766/BU	0.0	pg/g	----	748	----	----	----	
PCDD/F TEQ - WHO 2005 (ND=1*EDL)	n/a	XE766/BU	0.0	pg/g	----	748	----	----	----	

Please refer to the General Comments section for an explanation of any qualifiers detected.

### Analytical Results

Sub-Matrix: Soil/Solid  
 (Matrix: Soil/Solid)

					Client sample ID	HS-13B ----	HS-14A ----	HS-14B ----	HS-15A ----	HS-15B ----
					Client sampling date / time	21-Oct-2025 02:09	21-Oct-2025 02:35	21-Oct-2025 02:35	21-Oct-2025 02:20	21-Oct-2025 02:20
Analyte	CAS Number	Method/Lab	LOR	Unit	VA25C8048-017	VA25C8048-018	VA25C8048-019	VA25C8048-020	VA25C8048-021	
					Result	Result	Result	Result	Result	
<b>Physical Tests</b>										
pH (1:2 soil:water)	----	E108/VA	0.10	pH units	6.35	6.41	7.11	6.50	7.15	
<b>Metals</b>										
Aluminum	7429-90-5	E440/VA	50	mg/kg	10000	9840	10500	10600	11100	
Antimony	7440-36-0	E440/VA	0.10	mg/kg	0.72	0.88	7.61	0.61	7.00	
Arsenic	7440-38-2	E440/VA	0.10	mg/kg	2.48	3.40	3.84	3.22	3.94	
Barium	7440-39-3	E440/VA	0.50	mg/kg	54.4	66.2	141	56.3	170	
Beryllium	7440-41-7	E440/VA	0.10	mg/kg	0.20	0.19	0.21	0.20	0.20	
Bismuth	7440-69-9	E440/VA	0.20	mg/kg	<0.20	<0.20	0.67	<0.20	2.08	
Boron	7440-42-8	E440/VA	5.0	mg/kg	<5.0	<5.0	7.9	<5.0	7.1	



## Analytical Results

Sub-Matrix: Soil/Solid  
 (Matrix: Soil/Solid)

					Client sample ID	HS-13B ----	HS-14A ----	HS-14B ----	HS-15A ----	HS-15B ----
					Client sampling date / time	21-Oct-2025 02:09	21-Oct-2025 02:35	21-Oct-2025 02:35	21-Oct-2025 02:20	21-Oct-2025 02:20
Analyte	CAS Number	Method/Lab	LOR	Unit	VA25C8048-017	VA25C8048-018	VA25C8048-019	VA25C8048-020	VA25C8048-021	
					Result	Result	Result	Result	Result	
<b>Metals</b>										
Cadmium	7440-43-9	E440/VA	0.020	mg/kg	0.205	0.268	0.756	0.164	0.882	
Calcium	7440-70-2	E440/VA	50	mg/kg	6920	11600	9820	6220	9980	
Chromium	7440-47-3	E440/VA	0.50	mg/kg	27.7	31.6	64.5	31.2	75.8	
Cobalt	7440-48-4	E440/VA	0.10	mg/kg	7.11	6.71	7.29	7.84	7.89	
Copper	7440-50-8	E440/VA	0.50	mg/kg	31.3	28.6	98.0	40.0	114	
Iron	7439-89-6	E440/VA	50	mg/kg	17600	17300	29900	19000	28700	
Lead	7439-92-1	E440/VA	0.50	mg/kg	7.49	11.5	23.8	5.66	29.2	
Lithium	7439-93-2	E440/VA	2.0	mg/kg	6.6	6.9	6.0	8.0	6.5	
Magnesium	7439-95-4	E440/VA	20	mg/kg	6230	5690	4880	7210	5150	
Manganese	7439-96-5	E440/VA	1.0	mg/kg	333	349	385	378	409	
Mercury	7439-97-6	E510/VA	0.0500	mg/kg	<0.0500	<0.0500	<0.0500	<0.0500	<0.0500	
Molybdenum	7439-98-7	E440/VA	0.10	mg/kg	0.90	0.97	6.67	0.65	6.99	
Nickel	7440-02-0	E440/VA	0.50	mg/kg	25.6	25.6	38.9	32.9	39.0	
Phosphorus	7723-14-0	E440/VA	50	mg/kg	902	731	646	600	606	
Potassium	7440-09-7	E440/VA	100	mg/kg	600	920	730	820	760	
Selenium	7782-49-2	E440/VA	0.20	mg/kg	<0.20	<0.20	<0.20	<0.20	<0.20	
Silver	7440-22-4	E440/VA	0.10	mg/kg	<0.10	<0.10	0.21	<0.10	0.22	
Sodium	7440-23-5	E440/VA	50	mg/kg	357	289	583	324	616	
Strontium	7440-24-6	E440/VA	0.50	mg/kg	34.6	41.2	46.6	27.6	47.0	
Sulfur	7704-34-9	E440/VA	1000	mg/kg	<1000	<1000	<1000	<1000	<1000	
Thallium	7440-28-0	E440/VA	0.050	mg/kg	<0.050	<0.050	<0.050	<0.050	<0.050	



### Analytical Results

Sub-Matrix: Soil/Solid  
 (Matrix: Soil/Solid)

					Client sample ID	HS-13B ----	HS-14A ----	HS-14B ----	HS-15A ----	HS-15B ----
					Client sampling date / time	21-Oct-2025 02:09	21-Oct-2025 02:35	21-Oct-2025 02:35	21-Oct-2025 02:20	21-Oct-2025 02:20
Analyte	CAS Number	Method/Lab	LOR	Unit	VA25C8048-017	VA25C8048-018	VA25C8048-019	VA25C8048-020	VA25C8048-021	
					Result	Result	Result	Result	Result	
<b>Metals</b>										
Tin	7440-31-5	E440/VA	2.0	mg/kg	<2.0	<2.0	6.1	<2.0	6.3	
Titanium	7440-32-6	E440/VA	1.0	mg/kg	724	724	835	924	722	
Tungsten	7440-33-7	E440/VA	0.50	mg/kg	<0.50	<0.50	1.18	<0.50	0.88	
Uranium	7440-61-1	E440/VA	0.050	mg/kg	0.332	0.418	0.377	0.340	0.381	
Vanadium	7440-62-2	E440/VA	0.20	mg/kg	44.4	42.6	49.1	46.9	46.6	
Zinc	7440-66-6	E440/VA	2.0	mg/kg	144	119	530	166	724	
Zirconium	7440-67-7	E440/VA	1.0	mg/kg	2.1	1.6	2.6	2.3	2.7	

Please refer to the General Comments section for an explanation of any qualifiers detected.

### Analytical Results

Sub-Matrix: Soil/Solid  
 (Matrix: Soil/Solid)

					Client sample ID	HS-16 ----	HS-17 ----	HS-18 ----	HS-19 ----	HS-20 ----
					Client sampling date / time	21-Oct-2025 02:25	21-Oct-2025 09:01	21-Oct-2025 09:24	21-Oct-2025 09:31	21-Oct-2025 09:35
Analyte	CAS Number	Method/Lab	LOR	Unit	VA25C8048-022	VA25C8048-023	VA25C8048-024	VA25C8048-025	VA25C8048-026	
					Result	Result	Result	Result	Result	
<b>Sample Preparation</b>										
Weight, extraction (wet)	----	EP800/BU	0.0001	g	----	----	----	----	20.1283	
<b>Physical Tests</b>										
Moisture	----	E144/VA	0.25	%	----	----	----	----	62.5	
pH (1:2 soil:water)	----	E108/VA	0.10	pH units	6.57	5.49	5.46	6.25	----	
<b>Metals</b>										
Aluminum	7429-90-5	E440/VA	50	mg/kg	10500	19000	18300	20300	----	
Antimony	7440-36-0	E440/VA	0.10	mg/kg	0.40	41.3	23.4	20.5	----	
Arsenic	7440-38-2	E440/VA	0.10	mg/kg	2.99	49.9	28.4	16.6	----	



## Analytical Results

Sub-Matrix: Soil/Solid  
 (Matrix: Soil/Solid)

					Client sample ID	HS-16	HS-17	HS-18	HS-19	HS-20
					Client sampling date / time	----	----	----	----	----
Analyte	CAS Number	Method/Lab	LOR	Unit	21-Oct-2025 02:25	21-Oct-2025 09:01	21-Oct-2025 09:24	21-Oct-2025 09:31	21-Oct-2025 09:35	
					VA25C8048-022	VA25C8048-023	VA25C8048-024	VA25C8048-025	VA25C8048-026	
					Result	Result	Result	Result	Result	
<b>Metals</b>										
Barium	7440-39-3	E440/VA	0.50	mg/kg	54.2	253	244	240	----	
Beryllium	7440-41-7	E440/VA	0.10	mg/kg	0.20	0.34	0.31	0.36	----	
Bismuth	7440-69-9	E440/VA	0.20	mg/kg	<0.20	2.47	2.44	2.87	----	
Boron	7440-42-8	E440/VA	5.0	mg/kg	<5.0	18.7	17.8	22.7	----	
Cadmium	7440-43-9	E440/VA	0.020	mg/kg	0.131	0.948	1.03	0.926	----	
Calcium	7440-70-2	E440/VA	50	mg/kg	5780	10400	10300	11500	----	
Chromium	7440-47-3	E440/VA	0.50	mg/kg	26.3	185	178	77.3	----	
Cobalt	7440-48-4	E440/VA	0.10	mg/kg	7.84	12.0	11.6	10.6	----	
Copper	7440-50-8	E440/VA	0.50	mg/kg	16.6	186	191	199	----	
Iron	7439-89-6	E440/VA	50	mg/kg	18300	35000	33300	32900	----	
Lead	7439-92-1	E440/VA	0.50	mg/kg	4.20	266	269	283	----	
Lithium	7439-93-2	E440/VA	2.0	mg/kg	8.2	9.4	8.8	9.7	----	
Magnesium	7439-95-4	E440/VA	20	mg/kg	6980	8530	8380	5980	----	
Manganese	7439-96-5	E440/VA	1.0	mg/kg	383	450	470	494	----	
Mercury	7439-97-6	E510/VA	0.0500	mg/kg	<0.0500	0.126	0.112	0.139	----	
Molybdenum	7439-98-7	E440/VA	0.10	mg/kg	0.46	11.1	9.48	9.21	----	
Nickel	7440-02-0	E440/VA	0.50	mg/kg	30.4	86.1	80.6	50.1	----	
Phosphorus	7723-14-0	E440/VA	50	mg/kg	581	1540	1650	1520	----	
Potassium	7440-09-7	E440/VA	100	mg/kg	760	1220	1300	1380	----	
Selenium	7782-49-2	E440/VA	0.20	mg/kg	<0.20	0.64	0.72	0.68	----	
Silver	7440-22-4	E440/VA	0.10	mg/kg	<0.10	0.66	0.75	0.60	----	



## Analytical Results

Sub-Matrix: Soil/Solid  
 (Matrix: Soil/Solid)

					Client sample ID	HS-16	HS-17	HS-18	HS-19	HS-20
					Client sampling date / time	----	----	----	----	----
Analyte	CAS Number	Method/Lab	LOR	Unit	21-Oct-2025 02:25	21-Oct-2025 09:01	21-Oct-2025 09:24	21-Oct-2025 09:31	21-Oct-2025 09:35	
					VA25C8048-022	VA25C8048-023	VA25C8048-024	VA25C8048-025	VA25C8048-026	
					Result	Result	Result	Result	Result	
<b>Metals</b>										
Sodium	7440-23-5	E440/VA	50	mg/kg	324	776	771	894	----	
Strontium	7440-24-6	E440/VA	0.50	mg/kg	29.6	63.3	61.6	70.6	----	
Sulfur	7704-34-9	E440/VA	1000	mg/kg	<1000	1000	1400	<1000	----	
Thallium	7440-28-0	E440/VA	0.050	mg/kg	<0.050	0.202	0.182	0.196	----	
Tin	7440-31-5	E440/VA	2.0	mg/kg	<2.0	21.0	19.6	20.8	----	
Titanium	7440-32-6	E440/VA	1.0	mg/kg	973	847	713	842	----	
Tungsten	7440-33-7	E440/VA	0.50	mg/kg	<0.50	2.40	2.08	1.70	----	
Uranium	7440-61-1	E440/VA	0.050	mg/kg	0.315	0.942	0.901	0.993	----	
Vanadium	7440-62-2	E440/VA	0.20	mg/kg	48.3	59.5	56.9	54.6	----	
Zinc	7440-66-6	E440/VA	2.0	mg/kg	56.6	1010	1210	907	----	
Zirconium	7440-67-7	E440/VA	1.0	mg/kg	2.8	3.9	3.8	2.6	----	
<b>Dioxins and Furans</b>										
TCDD, 2,3,7,8-	1746-01-6	XE766/BU	1	pg/g	----	----	----	----	1.83 <sup>M</sup>	
PeCDD, 1,2,3,7,8-	40321-76-4	XE766/BU	1	pg/g	----	----	----	----	9.24 <sup>M</sup>	
HxCDD, 1,2,3,4,7,8-	39227-28-6	XE766/BU	1	pg/g	----	----	----	----	12.9	
HxCDD, 1,2,3,6,7,8-	57653-85-7	XE766/BU	1	pg/g	----	----	----	----	25.5	
HxCDD, 1,2,3,7,8,9-	19408-74-3	XE766/BU	1	pg/g	----	----	----	----	28.4	
HpCDD, 1,2,3,4,6,7,8-	35822-46-9	XE766/BU	1	pg/g	----	----	----	----	501	
OCDD	3268-87-9	XE766/BU	2	pg/g	----	----	----	----	2630	
Tetrachlorodibenzo-p-dioxins [TCDD], total	41903-57-5	XE766/BU	1	pg/g	----	----	----	----	58.7	
TCDD, total, # homologues detected	----	XE766/BU	0	-	----	----	----	----	11	



## Analytical Results

Sub-Matrix: Soil/Solid  
 (Matrix: Soil/Solid)

					Client sample ID	HS-16	HS-17	HS-18	HS-19	HS-20
					Client sampling date / time	----	----	----	----	----
Analyte	CAS Number	Method/Lab	LOR	Unit	21-Oct-2025 02:25	21-Oct-2025 09:01	21-Oct-2025 09:24	21-Oct-2025 09:31	21-Oct-2025 09:35	
					VA25C8048-022	VA25C8048-023	VA25C8048-024	VA25C8048-025	VA25C8048-026	
					Result	Result	Result	Result	Result	
<b>Dioxins and Furans</b>										
Pentachlorodibenzo-p-dioxins [PeCDD], total	----	XE766/BU	1	pg/g	----	----	----	----	121	
PeCDD, total, # homologues detected	----	XE766/BU	0	-	----	----	----	----	9	
Hexachlorodibenzo-p-dioxins [HxCDD], total	34465-46-8	XE766/BU	1	pg/g	----	----	----	----	368	
HxCDD, total, # homologues detected	----	XE766/BU	0	-	----	----	----	----	7	
Heptachlorodibenzo-p-dioxins [HpCDD], total	37871-00-4	XE766/BU	1	pg/g	----	----	----	----	1050	
HpCDD, total, # homologues detected	----	XE766/BU	0	-	----	----	----	----	2	
TCDF, 2,3,7,8-	51207-31-9	XE766/BU	1	pg/g	----	----	----	----	6.55	
PeCDF, 1,2,3,7,8-	57117-41-6	XE766/BU	1	pg/g	----	----	----	----	8.14 <sup>M</sup>	
PeCDF, 2,3,4,7,8-	57117-31-4	XE766/BU	1	pg/g	----	----	----	----	10.7	
HxCDF, 1,2,3,4,7,8-	70648-26-9	XE766/BU	1	pg/g	----	----	----	----	13.3	
HxCDF, 1,2,3,6,7,8-	57117-44-9	XE766/BU	1	pg/g	----	----	----	----	13.2	
HxCDF, 1,2,3,7,8,9-	72918-21-9	XE766/BU	1	pg/g	----	----	----	----	3.07	
HxCDF, 2,3,4,6,7,8-	60851-34-5	XE766/BU	1	pg/g	----	----	----	----	16.9	
HpCDF, 1,2,3,4,6,7,8-	67562-39-4	XE766/BU	2	pg/g	----	----	----	----	160	
HpCDF, 1,2,3,4,7,8,9-	55673-89-7	XE766/BU	1	pg/g	----	----	----	----	7.83	
OCDF	39001-02-0	XE766/BU	2	pg/g	----	----	----	----	170	
Tetrachlorodibenzofurans [TCDF], total	----	XE766/BU	1	pg/g	----	----	----	----	174	
TCDF, total, # homologues detected	----	XE766/BU	0	-	----	----	----	----	22	
Pentachlorodibenzofurans [PeCDF], total	----	XE766/BU	1	pg/g	----	----	----	----	158	
PeCDF, total, # homologues detected	----	XE766/BU	0	-	----	----	----	----	11	
Hexachlorodibenzofurans [HxCDF], total	55684-94-1	XE766/BU	1	pg/g	----	----	----	----	230	



## Analytical Results

Sub-Matrix: Soil/Solid  
 (Matrix: Soil/Solid)

					Client sample ID	HS-16	HS-17	HS-18	HS-19	HS-20
					Client sampling date / time	21-Oct-2025 02:25	21-Oct-2025 09:01	21-Oct-2025 09:24	21-Oct-2025 09:31	21-Oct-2025 09:35
Analyte	CAS Number	Method/Lab	LOR	Unit	VA25C8048-022	VA25C8048-023	VA25C8048-024	VA25C8048-025	VA25C8048-026	
					Result	Result	Result	Result	Result	
<b>Dioxins and Furans</b>										
HxCDF, total, # homologues detected	----	XE766/BU	0	-	----	----	----	----	----	13
Heptachlorodibenzofurans [HpCDF], total	38998-75-3	XE766/BU	2	pg/g	----	----	----	----	----	279
HpCDF, total, # homologues detected	----	XE766/BU	0	-	----	----	----	----	----	3
<b>Dioxins and Furans Extraction Standards</b>										
TCDD-13C12, 2,3,7,8-	76523-40-5	XE766/BU	0.1	%	----	----	----	----	----	57.1
PeCDD-13C12, 1,2,3,7,8-	109719-79-1	XE766/BU	0.1	%	----	----	----	----	----	55.2
HxCDD-13C12, 1,2,3,4,7,8-	109719-80-4	XE766/BU	0.1	%	----	----	----	----	----	49.9
HxCDD-13C12, 1,2,3,6,7,8-	109719-81-5	XE766/BU	0.1	%	----	----	----	----	----	61.2
HpCDD-13C12, 1,2,3,4,6,7,8-	109719-83-7	XE766/BU	0.1	%	----	----	----	----	----	50.2
OCDD-13C12	114423-97-1	XE766/BU	0.1	%	----	----	----	----	----	57.9
TCDF-13C12, 2,3,7,8-	89059-46-1	XE766/BU	0.1	%	----	----	----	----	----	58.4
PeCDF-13C12, 1,2,3,7,8-	109719-77-9	XE766/BU	0.1	%	----	----	----	----	----	59.4
PeCDF-13C12, 2,3,4,7,8-	116843-02-8	XE766/BU	0.1	%	----	----	----	----	----	58.9
HxCDF-13C12, 1,2,3,4,7,8-	114423-98-2	XE766/BU	0.1	%	----	----	----	----	----	55.1
HxCDF-13C12, 1,2,3,6,7,8-	116843-03-9	XE766/BU	0.1	%	----	----	----	----	----	68.4
HxCDF-13C12, 2,3,4,6,7,8-	116843-05-1	XE766/BU	0.1	%	----	----	----	----	----	59.3
HxCDF-13C12, 1,2,3,7,8,9-	116843-04-0	XE766/BU	0.1	%	----	----	----	----	----	59.8
HpCDF-13C12, 1,2,3,4,6,7,8-	67562-39-4	XE766/BU	0.1	%	----	----	----	----	----	53.3
HpCDF-13C12, 1,2,3,4,7,8,9-	55673-89-7	XE766/BU	0.1	%	----	----	----	----	----	41.1
TCDD-37Cl4, 2,3,7,8-	----	XE766/BU	0.1	%	----	----	----	----	----	54.2



### Analytical Results

Sub-Matrix: Soil/Solid  
 (Matrix: Soil/Solid)

					Client sample ID	HS-16 ----	HS-17 ----	HS-18 ----	HS-19 ----	HS-20 ----
					Client sampling date / time	21-Oct-2025 02:25	21-Oct-2025 09:01	21-Oct-2025 09:24	21-Oct-2025 09:31	21-Oct-2025 09:35
Analyte	CAS Number	Method/Lab	LOR	Unit	VA25C8048-022	VA25C8048-023	VA25C8048-024	VA25C8048-025	VA25C8048-026	
					Result	Result	Result	Result	Result	
<b>Toxic Equivalency</b>										
PCDD/F TEQ - WHO 2005 (ND=0*EDL)	n/a	XE766/BU	0.0	pg/g	----	----	----	----	34.1	
PCDD/F TEQ - WHO 2005 (ND=0.5*EDL)	n/a	XE766/BU	0.0	pg/g	----	----	----	----	34.1	
PCDD/F TEQ - WHO 2005 (ND=1*EDL)	n/a	XE766/BU	0.0	pg/g	----	----	----	----	34.1	

Please refer to the General Comments section for an explanation of any qualifiers detected.

### Analytical Results

Sub-Matrix: Soil/Solid  
 (Matrix: Soil/Solid)

					Client sample ID	HS-21A ----	HS-21B ----	HS-22 ----	HS-23 ----	HS-24 ----
					Client sampling date / time	21-Oct-2025 10:09	21-Oct-2025 10:09	21-Oct-2025 10:14	21-Oct-2025 12:20	21-Oct-2025 12:32
Analyte	CAS Number	Method/Lab	LOR	Unit	VA25C8048-027	VA25C8048-028	VA25C8048-029	VA25C8048-030	VA25C8048-031	
					Result	Result	Result	Result	Result	
<b>Physical Tests</b>										
pH (1:2 soil:water)	----	E108/VA	0.10	pH units	8.33	7.50	8.77	5.82	5.95	
<b>Metals</b>										
Aluminum	7429-90-5	E440/VA	50	mg/kg	13900	11100	13600	19800	17600	
Antimony	7440-36-0	E440/VA	0.10	mg/kg	11.5	15.7	62.8	4.29	8.06	
Arsenic	7440-38-2	E440/VA	0.10	mg/kg	18.1	26.1	92.7	7.29	9.25	
Barium	7440-39-3	E440/VA	0.50	mg/kg	71.9	116	90.1	159	162	
Beryllium	7440-41-7	E440/VA	0.10	mg/kg	0.18	0.19	0.22	0.31	0.30	
Bismuth	7440-69-9	E440/VA	0.20	mg/kg	<0.20	0.68	<0.20	3.15	6.73	
Boron	7440-42-8	E440/VA	5.0	mg/kg	<5.0	5.1	<5.0	6.5	8.6	
Cadmium	7440-43-9	E440/VA	0.020	mg/kg	0.141	0.782	0.232	0.358	0.640	
Calcium	7440-70-2	E440/VA	50	mg/kg	11100	10300	18500	5330	6550	



**Analytical Results**

Sub-Matrix: Soil/Solid  
 (Matrix: Soil/Solid)

					Client sample ID	HS-21A	HS-21B	HS-22	HS-23	HS-24
					Client sampling date / time	----	----	----	----	----
Analyte	CAS Number	Method/Lab	LOR	Unit	21-Oct-2025 10:09	21-Oct-2025 10:09	21-Oct-2025 10:14	21-Oct-2025 12:20	21-Oct-2025 12:32	
					VA25C8048-027	VA25C8048-028	VA25C8048-029	VA25C8048-030	VA25C8048-031	
					Result	Result	Result	Result	Result	
<b>Metals</b>										
Chromium	7440-47-3	E440/VA	0.50	mg/kg	19.9	48.1	20.0	48.4	57.0	
Cobalt	7440-48-4	E440/VA	0.10	mg/kg	7.26	9.10	10.2	15.7	14.4	
Copper	7440-50-8	E440/VA	0.50	mg/kg	26.0	144	62.8	94.2	118	
Iron	7439-89-6	E440/VA	50	mg/kg	20200	25900	21300	32200	31200	
Lead	7439-92-1	E440/VA	0.50	mg/kg	17.5	29.6	69.9	46.2	70.2	
Lithium	7439-93-2	E440/VA	2.0	mg/kg	6.0	5.8	6.3	15.0	13.2	
Magnesium	7439-95-4	E440/VA	20	mg/kg	5470	5600	5900	9040	7450	
Manganese	7439-96-5	E440/VA	1.0	mg/kg	364	345	380	750	648	
Mercury	7439-97-6	E510/VA	0.0500	mg/kg	<0.0500	<0.0500	<0.0500	<0.0500	0.0806	
Molybdenum	7439-98-7	E440/VA	0.10	mg/kg	1.06	5.73	3.94	3.53	5.61	
Nickel	7440-02-0	E440/VA	0.50	mg/kg	14.2	25.9	14.1	42.7	44.3	
Phosphorus	7723-14-0	E440/VA	50	mg/kg	495	657	441	761	1180	
Potassium	7440-09-7	E440/VA	100	mg/kg	970	830	940	4280	1720	
Selenium	7782-49-2	E440/VA	0.20	mg/kg	<0.20	<0.20	<0.20	0.40	0.51	
Silver	7440-22-4	E440/VA	0.10	mg/kg	<0.10	0.22	0.15	0.42	0.71	
Sodium	7440-23-5	E440/VA	50	mg/kg	533	604	559	526	678	
Strontium	7440-24-6	E440/VA	0.50	mg/kg	52.9	43.2	63.7	31.5	39.6	
Sulfur	7704-34-9	E440/VA	1000	mg/kg	<1000	<1000	<1000	<1000	<1000	
Thallium	7440-28-0	E440/VA	0.050	mg/kg	<0.050	<0.050	0.080	0.372	0.185	
Tin	7440-31-5	E440/VA	2.0	mg/kg	<2.0	8.9	7.9	6.0	10.4	
Titanium	7440-32-6	E440/VA	1.0	mg/kg	840	832	814	1440	954	



### Analytical Results

Sub-Matrix: Soil/Solid  
 (Matrix: Soil/Solid)

					Client sample ID	HS-21A ----	HS-21B ----	HS-22 ----	HS-23 ----	HS-24 ----
					Client sampling date / time	21-Oct-2025 10:09	21-Oct-2025 10:09	21-Oct-2025 10:14	21-Oct-2025 12:20	21-Oct-2025 12:32
Analyte	CAS Number	Method/Lab	LOR	Unit	VA25C8048-027	VA25C8048-028	VA25C8048-029	VA25C8048-030	VA25C8048-031	
					Result	Result	Result	Result	Result	
<b>Metals</b>										
Tungsten	7440-33-7	E440/VA	0.50	mg/kg	<0.50	0.93	<0.50	1.10	1.20	
Uranium	7440-61-1	E440/VA	0.050	mg/kg	0.400	0.505	0.454	0.676	0.604	
Vanadium	7440-62-2	E440/VA	0.20	mg/kg	49.0	56.3	48.8	70.9	65.0	
Zinc	7440-66-6	E440/VA	2.0	mg/kg	125	453	281	442	510	
Zirconium	7440-67-7	E440/VA	1.0	mg/kg	2.8	2.1	3.8	2.5	1.9	

Please refer to the General Comments section for an explanation of any qualifiers detected.

### Analytical Results

Sub-Matrix: Soil/Solid  
 (Matrix: Soil/Solid)

					Client sample ID	HS-25 ----	HS-26 ----	HS-3B 2 ----	----	----
					Client sampling date / time	21-Oct-2025 12:39	21-Oct-2025 12:47	21-Oct-2025 03:33	----	----
Analyte	CAS Number	Method/Lab	LOR	Unit	VA25C8048-032	VA25C8048-033	VA25C8048-034	----	----	
					Result	Result	Result	----	----	
<b>Sample Preparation</b>										
Weight, extraction (wet)	----	EP800/BU	0.0001	g	----	20.1195	----	----	----	
<b>Physical Tests</b>										
Moisture	----	E144/VA	0.25	%	----	40.3	----	----	----	
pH (1:2 soil:water)	----	E108/VA	0.10	pH units	5.83	----	7.71	----	----	
<b>Metals</b>										
Aluminum	7429-90-5	E440/VA	50	mg/kg	19900	----	12000	----	----	
Antimony	7440-36-0	E440/VA	0.10	mg/kg	9.77	----	43.8	----	----	
Arsenic	7440-38-2	E440/VA	0.10	mg/kg	10.7	----	8.16	----	----	
Barium	7440-39-3	E440/VA	0.50	mg/kg	170	----	222	----	----	
Beryllium	7440-41-7	E440/VA	0.10	mg/kg	0.36	----	0.19	----	----	



**Analytical Results**

Sub-Matrix: Soil/Solid  
 (Matrix: Soil/Solid)

					Client sample ID	HS-25	HS-26	HS-3B 2	----	----
					Client sampling date / time	21-Oct-2025 12:39	21-Oct-2025 12:47	21-Oct-2025 03:33	----	----
Analyte	CAS Number	Method/Lab	LOR	Unit	VA25C8048-032	VA25C8048-033	VA25C8048-034	----	----	
					Result	Result	Result	----	----	
<b>Metals</b>										
Bismuth	7440-69-9	E440/VA	0.20	mg/kg	5.99	----	14.5	----	----	
Boron	7440-42-8	E440/VA	5.0	mg/kg	10.9	----	18.1	----	----	
Cadmium	7440-43-9	E440/VA	0.020	mg/kg	0.599	----	7.63	----	----	
Calcium	7440-70-2	E440/VA	50	mg/kg	6780	----	19500	----	----	
Chromium	7440-47-3	E440/VA	0.50	mg/kg	59.4	----	74.2	----	----	
Cobalt	7440-48-4	E440/VA	0.10	mg/kg	19.8	----	11.5	----	----	
Copper	7440-50-8	E440/VA	0.50	mg/kg	143	----	199	----	----	
Iron	7439-89-6	E440/VA	50	mg/kg	35700	----	37900	----	----	
Lead	7439-92-1	E440/VA	0.50	mg/kg	100	----	123	----	----	
Lithium	7439-93-2	E440/VA	2.0	mg/kg	13.2	----	5.6	----	----	
Magnesium	7439-95-4	E440/VA	20	mg/kg	7830	----	4920	----	----	
Manganese	7439-96-5	E440/VA	1.0	mg/kg	975	----	463	----	----	
Mercury	7439-97-6	E510/VA	0.0500	mg/kg	0.0978	----	0.253	----	----	
Molybdenum	7439-98-7	E440/VA	0.10	mg/kg	6.52	----	7.18	----	----	
Nickel	7440-02-0	E440/VA	0.50	mg/kg	44.7	----	51.4	----	----	
Phosphorus	7723-14-0	E440/VA	50	mg/kg	1360	----	2370	----	----	
Potassium	7440-09-7	E440/VA	100	mg/kg	1920	----	1070	----	----	
Selenium	7782-49-2	E440/VA	0.20	mg/kg	0.72	----	0.33	----	----	
Silver	7440-22-4	E440/VA	0.10	mg/kg	0.73	----	1.45	----	----	
Sodium	7440-23-5	E440/VA	50	mg/kg	717	----	1120	----	----	
Strontium	7440-24-6	E440/VA	0.50	mg/kg	42.9	----	66.1	----	----	



## Analytical Results

Sub-Matrix: Soil/Solid  
 (Matrix: Soil/Solid)

					Client sample ID	HS-25	HS-26	HS-3B 2	----	----
					Client sampling date / time	21-Oct-2025 12:39	21-Oct-2025 12:47	21-Oct-2025 03:33	----	----
Analyte	CAS Number	Method/Lab	LOR	Unit	VA25C8048-032	VA25C8048-033	VA25C8048-034	----	----	
					Result	Result	Result	----	----	
<b>Metals</b>										
Sulfur	7704-34-9	E440/VA	1000	mg/kg	<1000	----	<1000	----	----	
Thallium	7440-28-0	E440/VA	0.050	mg/kg	0.234	----	0.071	----	----	
Tin	7440-31-5	E440/VA	2.0	mg/kg	12.6	----	29.9	----	----	
Titanium	7440-32-6	E440/VA	1.0	mg/kg	1100	----	945	----	----	
Tungsten	7440-33-7	E440/VA	0.50	mg/kg	1.78	----	3.28	----	----	
Uranium	7440-61-1	E440/VA	0.050	mg/kg	0.744	----	0.607	----	----	
Vanadium	7440-62-2	E440/VA	0.20	mg/kg	71.3	----	37.9	----	----	
Zinc	7440-66-6	E440/VA	2.0	mg/kg	540	----	1240	----	----	
Zirconium	7440-67-7	E440/VA	1.0	mg/kg	2.0	----	2.0	----	----	
<b>Dioxins and Furans</b>										
TCDD, 2,3,7,8-	1746-01-6	XE766/BU	1	pg/g	----	0.439 <sup>[J], M</sup>	----	----	----	
PeCDD, 1,2,3,7,8-	40321-76-4	XE766/BU	1	pg/g	----	1.77 <sup>M</sup>	----	----	----	
HxCDD, 1,2,3,4,7,8-	39227-28-6	XE766/BU	1	pg/g	----	2.82 <sup>M</sup>	----	----	----	
HxCDD, 1,2,3,6,7,8-	57653-85-7	XE766/BU	1	pg/g	----	6.12	----	----	----	
HxCDD, 1,2,3,7,8,9-	19408-74-3	XE766/BU	1	pg/g	----	5.35	----	----	----	
HpCDD, 1,2,3,4,6,7,8-	35822-46-9	XE766/BU	1	pg/g	----	115	----	----	----	
OCDD	3268-87-9	XE766/BU	2	pg/g	----	704	----	----	----	
Tetrachlorodibenzo-p-dioxins [TCDD], total	41903-57-5	XE766/BU	1	pg/g	----	15.8	----	----	----	
TCDD, total, # homologues detected	----	XE766/BU	0	-	----	10	----	----	----	
Pentachlorodibenzo-p-dioxins [PeCDD], total	----	XE766/BU	1	pg/g	----	28.9	----	----	----	
PeCDD, total, # homologues detected	----	XE766/BU	0	-	----	7	----	----	----	



### Analytical Results

Sub-Matrix: Soil/Solid  
 (Matrix: Soil/Solid)

					Client sample ID	HS-25 ----	HS-26 ----	HS-3B 2 ----	----	----
					Client sampling date / time	21-Oct-2025 12:39	21-Oct-2025 12:47	21-Oct-2025 03:33	----	----
Analyte	CAS Number	Method/Lab	LOR	Unit	VA25C8048-032	VA25C8048-033	VA25C8048-034	----	----	
					Result	Result	Result	----	----	
<b>Dioxins and Furans</b>										
Hexachlorodibenzo-p-dioxins [HxCDD], total	34465-46-8	XE766/BU	1	pg/g	----	86.7	----	----	----	
HxCDD, total, # homologues detected	----	XE766/BU	0	-	----	6	----	----	----	
Heptachlorodibenzo-p-dioxins [HpCDD], total	37871-00-4	XE766/BU	1	pg/g	----	248	----	----	----	
HpCDD, total, # homologues detected	----	XE766/BU	0	-	----	2	----	----	----	
TCDF, 2,3,7,8-	51207-31-9	XE766/BU	1	pg/g	----	1.92	----	----	----	
PeCDF, 1,2,3,7,8-	57117-41-6	XE766/BU	1	pg/g	----	2.40 <sup>M</sup>	----	----	----	
PeCDF, 2,3,4,7,8-	57117-31-4	XE766/BU	1	pg/g	----	3.04 <sup>M</sup>	----	----	----	
HxCDF, 1,2,3,4,7,8-	70648-26-9	XE766/BU	1	pg/g	----	3.09	----	----	----	
HxCDF, 1,2,3,6,7,8-	57117-44-9	XE766/BU	1	pg/g	----	3.13	----	----	----	
HxCDF, 1,2,3,7,8,9-	72918-21-9	XE766/BU	1	pg/g	----	0.991	----	----	----	
HxCDF, 2,3,4,6,7,8-	60851-34-5	XE766/BU	1	pg/g	----	4.04	----	----	----	
HpCDF, 1,2,3,4,6,7,8-	67562-39-4	XE766/BU	2	pg/g	----	27.9	----	----	----	
HpCDF, 1,2,3,4,7,8,9-	55673-89-7	XE766/BU	1	pg/g	----	2.37	----	----	----	
OCDF	39001-02-0	XE766/BU	2	pg/g	----	54.9	----	----	----	
Tetrachlorodibenzofurans [TCDF], total	----	XE766/BU	1	pg/g	----	52.3	----	----	----	
TCDF, total, # homologues detected	----	XE766/BU	0	-	----	24	----	----	----	
Pentachlorodibenzofurans [PeCDF], total	----	XE766/BU	1	pg/g	----	37.1	----	----	----	
PeCDF, total, # homologues detected	----	XE766/BU	0	-	----	11	----	----	----	
Hexachlorodibenzofurans [HxCDF], total	55684-94-1	XE766/BU	1	pg/g	----	41.1	----	----	----	
HxCDF, total, # homologues detected	----	XE766/BU	0	-	----	12	----	----	----	
Heptachlorodibenzofurans [HpCDF], total	38998-75-3	XE766/BU	2	pg/g	----	55.8	----	----	----	



### Analytical Results

Sub-Matrix: Soil/Solid  
 (Matrix: Soil/Solid)

					Client sample ID	HS-25 ----	HS-26 ----	HS-3B 2 ----	----	----
					Client sampling date / time	21-Oct-2025 12:39	21-Oct-2025 12:47	21-Oct-2025 03:33	----	----
Analyte	CAS Number	Method/Lab	LOR	Unit	VA25C8048-032	VA25C8048-033	VA25C8048-034	----	----	
					Result	Result	Result	----	----	
<b>Dioxins and Furans</b>										
<b>HpCDF, total, # homologues detected</b>	----	XE766/BU	0	-	----	4	----	----	----	
<b>Dioxins and Furans Extraction Standards</b>										
<b>TCDD-13C12, 2,3,7,8-</b>	76523-40-5	XE766/BU	0.1	%	----	64.7	----	----	----	
<b>PeCDD-13C12, 1,2,3,7,8-</b>	109719-79-1	XE766/BU	0.1	%	----	57.3	----	----	----	
<b>HxCDD-13C12, 1,2,3,4,7,8-</b>	109719-80-4	XE766/BU	0.1	%	----	65.8	----	----	----	
<b>HxCDD-13C12, 1,2,3,6,7,8-</b>	109719-81-5	XE766/BU	0.1	%	----	75.5	----	----	----	
<b>HpCDD-13C12, 1,2,3,4,6,7,8-</b>	109719-83-7	XE766/BU	0.1	%	----	68.4	----	----	----	
<b>OCDD-13C12</b>	114423-97-1	XE766/BU	0.1	%	----	64.8	----	----	----	
<b>TCDF-13C12, 2,3,7,8-</b>	89059-46-1	XE766/BU	0.1	%	----	64.3	----	----	----	
<b>PeCDF-13C12, 1,2,3,7,8-</b>	109719-77-9	XE766/BU	0.1	%	----	60.3	----	----	----	
<b>PeCDF-13C12, 2,3,4,7,8-</b>	116843-02-8	XE766/BU	0.1	%	----	58.4	----	----	----	
<b>HxCDF-13C12, 1,2,3,4,7,8-</b>	114423-98-2	XE766/BU	0.1	%	----	74.0	----	----	----	
<b>HxCDF-13C12, 1,2,3,6,7,8-</b>	116843-03-9	XE766/BU	0.1	%	----	83.8	----	----	----	
<b>HxCDF-13C12, 2,3,4,6,7,8-</b>	116843-05-1	XE766/BU	0.1	%	----	72.7	----	----	----	
<b>HxCDF-13C12, 1,2,3,7,8,9-</b>	116843-04-0	XE766/BU	0.1	%	----	70.3	----	----	----	
<b>HpCDF-13C12, 1,2,3,4,6,7,8-</b>	67562-39-4	XE766/BU	0.1	%	----	69.5	----	----	----	
<b>HpCDF-13C12, 1,2,3,4,7,8,9-</b>	55673-89-7	XE766/BU	0.1	%	----	62.4	----	----	----	
<b>TCDD-37Cl4, 2,3,7,8-</b>	----	XE766/BU	0.1	%	----	61.0	----	----	----	
<b>Toxic Equivalency</b>										
<b>PCDD/F TEQ - WHO 2005 (ND=0*EDL)</b>	n/a	XE766/BU	0.0	pg/g	----	7.62	----	----	----	
<b>PCDD/F TEQ - WHO 2005 (ND=0.5*EDL)</b>	n/a	XE766/BU	0.0	pg/g	----	7.62	----	----	----	



**Analytical Results**

**Sub-Matrix: Soil/Solid**  
**(Matrix: Soil/Solid)**

					Client sample ID	HS-25 ----	HS-26 ----	HS-3B 2 ----	----	----
					Client sampling date / time	21-Oct-2025 12:39	21-Oct-2025 12:47	21-Oct-2025 03:33	----	----
Analyte	CAS Number	Method/Lab	LOR	Unit	VA25C8048-032	VA25C8048-033	VA25C8048-034	----	----	
					Result	Result	Result	----	----	
<b>Toxic Equivalency</b>										
<b>PCDD/F TEQ - WHO 2005 (ND=1*EDL)</b>	n/a	XE766/BU	0.0	pg/g	----	7.62	----	----	----	

Please refer to the General Comments section for an explanation of any qualifiers detected.



## QUALITY CONTROL INTERPRETIVE REPORT

<p><b>Work Order</b> : <b>VA25C8048</b></p> <p><b>Client</b> : <b>HDR Corporation</b></p> <p><b>Contact</b> : Johanna Mason</p> <p><b>Address</b> : 500-1500 W. Georgia Street Vancouver BC Canada V6G 2Z6</p> <p><b>Telephone</b> : ----</p> <p><b>Project</b> : VA25HDR100-001</p> <p><b>PO</b> : ----</p> <p><b>C-O-C number</b> : 23-1162265, 23-1162264, 23-1162262</p> <p><b>Sampler</b> : ----</p> <p><b>Site</b> : ----</p> <p><b>Quote number</b> : VA25-HDR1100-001</p> <p><b>No. of samples received</b> : 33</p> <p><b>No. of samples analysed</b> : 33</p>	<p><b>Page</b> : 1 of 18</p> <p><b>Laboratory</b> : ALS Environmental - Vancouver</p> <p><b>Account Manager</b> : Le Van Dalfsen</p> <p><b>Address</b> : 8081 Lougheed Highway Burnaby, British Columbia Canada V5A 1W9</p> <p><b>Telephone</b> : +1 604 253 4188</p> <p><b>Date Samples Received</b> : 22-Oct-2025 06:43</p> <p><b>Issue Date</b> : 20-Nov-2025 12:49</p>
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This report is automatically generated by the ALS LIMS (Laboratory Information Management System) through evaluation of Quality Control (QC) results and other QA parameters associated with this submission, and is intended to facilitate rapid data validation by auditors or reviewers. The report highlights any exceptions and outliers to ALS Data Quality Objectives, provides holding time details and exceptions, summarizes QC sample frequencies, and lists applicable methodology references and summaries.

**Key**

- Anonymous: Refers to samples which are not part of this work order, but which formed part of the QC process lot.
- CAS Number: Chemical Abstracts Service number is a unique identifier assigned to discrete substances.
- DQO: Data Quality Objective.
- LOR: Limit of Reporting (detection limit).
- RPD: Relative Percent Difference.

### ***Workorder Comments***

Holding times are displayed as "----" if no guidance exists from CCME, Canadian provinces, or broadly recognized international references.

### ***Summary of Outliers***

#### ***Outliers : Quality Control Samples***

- No Method Blank value outliers occur.
- No Laboratory Control Sample (LCS) outliers occur
- Duplicate outliers occur - please see following pages for full details.
- No Test sample Surrogate recovery outliers exist.

#### ***Outliers: Reference Material (RM) Samples***

- No Reference Material (RM) Sample outliers occur.

#### ***Outliers : Analysis Holding Time Compliance (Breaches)***

- No Analysis Holding Time Outliers exist.

## ***Outliers : Frequency of Quality Control Samples***

- No Quality Control Sample Frequency Outliers occur.



**Outliers : Quality Control Samples**

*Duplicates, Method Blanks, Laboratory Control Samples and Matrix Spikes*

Matrix: **Soil/Solid**

Analyte Group	Laboratory sample ID	Client/Ref Sample ID	Analyte	CAS Number	Method	Result	Limits	Comment
<b>Duplicate (DUP) RPDs</b>								
Dioxins and Furans	Anonymous	Anonymous	HpCDD, 1,2,3,4,6,7,8-	35822-46-9	XE766	33.8 % DUP-H	25%	Duplicate RPD does not meet the DQO for this test.
Dioxins and Furans	Anonymous	Anonymous	OCDD	3268-87-9	XE766	47.3 % DUP-H	25%	Duplicate RPD does not meet the DQO for this test.
Dioxins and Furans	Anonymous	Anonymous	PeCDF, 2,3,4,7,8-	57117-31-4	XE766	32.6 % DUP-H	25%	Duplicate RPD does not meet the DQO for this test.
Dioxins and Furans	Anonymous	Anonymous	HxCDF, 1,2,3,4,7,8-	70648-26-9	XE766	29.4 % DUP-H	25%	Duplicate RPD does not meet the DQO for this test.
Dioxins and Furans	Anonymous	Anonymous	HxCDF, 1,2,3,7,8,9-	72918-21-9	XE766	25.9 % [J]	25%	Duplicate RPD does not meet the DQO for this test.
Dioxins and Furans	Anonymous	Anonymous	HpCDF, 1,2,3,4,6,7,8-	67562-39-4	XE766	35.1 % DUP-H	25%	Duplicate RPD does not meet the DQO for this test.
Dioxins and Furans	Anonymous	Anonymous	HpCDF, 1,2,3,4,7,8,9-	55673-89-7	XE766	41.2 % DUP-H	25%	Duplicate RPD does not meet the DQO for this test.
Dioxins and Furans	Anonymous	Anonymous	OCDF	39001-02-0	XE766	55.2 % DUP-H	25%	Duplicate RPD does not meet the DQO for this test.

**Result Qualifiers**

Qualifier	Description
[J]	Estimated value. The reported concentration is below the calibrated range of the instrument but above the EDL.
DUP-H	Duplicate results outside ALS DQO, due to sample heterogeneity.



## Analysis Holding Time Compliance

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times, which are selected to meet known provincial and /or federal requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by organizations such as CCME, US EPA, APHA Standard Methods, ASTM, or Environment Canada (where available). Dates and holding times reported below represent the first dates of extraction or analysis. If subsequent tests or dilutions exceeded holding times, qualifiers are added (refer to COA).

If samples are identified below as having been analyzed or extracted outside of recommended holding times, measurement uncertainties may be increased, and this should be taken into consideration when interpreting results.

Where actual sampling date is not provided on the chain of custody, the date of receipt with time at 00:00 is used for calculation purposes.

Where only the sample date without time is provided on the chain of custody, the sampling date at 00:00 is used for calculation purposes.

Matrix: **Soil/Solid**

Evaluation: ✖ = Holding time exceedance ; ✔ = Within Holding Time

Analyte Group : Analytical Method Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times		Eval	Analysis Date	Holding Times		Eval
				Rec	Actual			Rec	Actual	
<b>Dioxins and Furans : Dioxins and Furans in Soil/Solid by GC-HRMS</b>										
Glass soil jar/Teflon lined cap HS-11	XE766	21-Oct-2025	24-Oct-2025	365 days	3 days	✔	06-Nov-2025	365 days	13 days	✔
<b>Dioxins and Furans : Dioxins and Furans in Soil/Solid by GC-HRMS</b>										
Glass soil jar/Teflon lined cap HS-20	XE766	21-Oct-2025	24-Oct-2025	365 days	3 days	✔	06-Nov-2025	365 days	13 days	✔
<b>Dioxins and Furans : Dioxins and Furans in Soil/Solid by GC-HRMS</b>										
Glass soil jar/Teflon lined cap HS-26	XE766	21-Oct-2025	24-Oct-2025	365 days	3 days	✔	06-Nov-2025	365 days	13 days	✔
<b>Dioxins and Furans : Dioxins and Furans in Soil/Solid by GC-HRMS</b>										
Glass soil jar/Teflon lined cap HS-6	XE766	21-Oct-2025	24-Oct-2025	365 days	3 days	✔	06-Nov-2025	365 days	13 days	✔
<b>Dioxins and Furans : Dioxins and Furans in Soil/Solid by GC-HRMS</b>										
Glass soil jar/Teflon lined cap HS-7	XE766	21-Oct-2025	24-Oct-2025	365 days	3 days	✔	06-Nov-2025	365 days	13 days	✔
<b>Metals : High Silver in Soil/Solid by CRC ICPMS</b>										
Glass soil jar/Teflon lined cap HS-4	E440.Ag	21-Oct-2025	27-Oct-2025	180 days	7 days	✔	30-Oct-2025	180 days	7 days	✔
<b>Metals : Mercury in Soil/Solid by CVAAS</b>										
Glass soil jar/Teflon lined cap HS-1	E510	21-Oct-2025	28-Oct-2025	28 days	7 days	✔	28-Oct-2025	28 days	1 days	✔



Matrix: Soil/Solid

Evaluation: ✖ = Holding time exceedance ; ✔ = Within Holding Time

Analyte Group : Analytical Method Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times		Eval	Analysis Date	Holding Times		Eval
				Rec	Actual			Rec	Actual	
<b>Metals : Mercury in Soil/Solid by CVAAS</b>										
Glass soil jar/Teflon lined cap HS-10	E510	21-Oct-2025	28-Oct-2025	28 days	7 days	✔	28-Oct-2025	28 days	1 days	✔
<b>Metals : Mercury in Soil/Solid by CVAAS</b>										
Glass soil jar/Teflon lined cap HS-12A	E510	21-Oct-2025	28-Oct-2025	28 days	7 days	✔	28-Oct-2025	28 days	1 days	✔
<b>Metals : Mercury in Soil/Solid by CVAAS</b>										
Glass soil jar/Teflon lined cap HS-12B	E510	21-Oct-2025	28-Oct-2025	28 days	7 days	✔	28-Oct-2025	28 days	1 days	✔
<b>Metals : Mercury in Soil/Solid by CVAAS</b>										
Glass soil jar/Teflon lined cap HS-13A	E510	21-Oct-2025	28-Oct-2025	28 days	7 days	✔	28-Oct-2025	28 days	1 days	✔
<b>Metals : Mercury in Soil/Solid by CVAAS</b>										
Glass soil jar/Teflon lined cap HS-13B	E510	21-Oct-2025	28-Oct-2025	28 days	7 days	✔	28-Oct-2025	28 days	1 days	✔
<b>Metals : Mercury in Soil/Solid by CVAAS</b>										
Glass soil jar/Teflon lined cap HS-14A	E510	21-Oct-2025	28-Oct-2025	28 days	7 days	✔	28-Oct-2025	28 days	1 days	✔
<b>Metals : Mercury in Soil/Solid by CVAAS</b>										
Glass soil jar/Teflon lined cap HS-14B	E510	21-Oct-2025	28-Oct-2025	28 days	7 days	✔	28-Oct-2025	28 days	1 days	✔
<b>Metals : Mercury in Soil/Solid by CVAAS</b>										
Glass soil jar/Teflon lined cap HS-15A	E510	21-Oct-2025	28-Oct-2025	28 days	7 days	✔	28-Oct-2025	28 days	1 days	✔
<b>Metals : Mercury in Soil/Solid by CVAAS</b>										
Glass soil jar/Teflon lined cap HS-15B	E510	21-Oct-2025	28-Oct-2025	28 days	7 days	✔	28-Oct-2025	28 days	1 days	✔



Matrix: Soil/Solid

Evaluation: ✖ = Holding time exceedance ; ✔ = Within Holding Time

Analyte Group : Analytical Method Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times		Eval	Analysis Date	Holding Times		Eval
				Rec	Actual			Rec	Actual	
<b>Metals : Mercury in Soil/Solid by CVAAS</b>										
Glass soil jar/Teflon lined cap HS-16	E510	21-Oct-2025	28-Oct-2025	28 days	7 days	✔	28-Oct-2025	28 days	1 days	✔
<b>Metals : Mercury in Soil/Solid by CVAAS</b>										
Glass soil jar/Teflon lined cap HS-17	E510	21-Oct-2025	28-Oct-2025	28 days	7 days	✔	28-Oct-2025	28 days	1 days	✔
<b>Metals : Mercury in Soil/Solid by CVAAS</b>										
Glass soil jar/Teflon lined cap HS-18	E510	21-Oct-2025	28-Oct-2025	28 days	7 days	✔	28-Oct-2025	28 days	1 days	✔
<b>Metals : Mercury in Soil/Solid by CVAAS</b>										
Glass soil jar/Teflon lined cap HS-2A	E510	21-Oct-2025	28-Oct-2025	28 days	7 days	✔	28-Oct-2025	28 days	1 days	✔
<b>Metals : Mercury in Soil/Solid by CVAAS</b>										
Glass soil jar/Teflon lined cap HS-3A	E510	21-Oct-2025	28-Oct-2025	28 days	7 days	✔	28-Oct-2025	28 days	1 days	✔
<b>Metals : Mercury in Soil/Solid by CVAAS</b>										
Glass soil jar/Teflon lined cap HS-3B 1	E510	21-Oct-2025	28-Oct-2025	28 days	7 days	✔	28-Oct-2025	28 days	1 days	✔
<b>Metals : Mercury in Soil/Solid by CVAAS</b>										
Glass soil jar/Teflon lined cap HS-4	E510	21-Oct-2025	28-Oct-2025	28 days	7 days	✔	28-Oct-2025	28 days	1 days	✔
<b>Metals : Mercury in Soil/Solid by CVAAS</b>										
Glass soil jar/Teflon lined cap HS-5	E510	21-Oct-2025	28-Oct-2025	28 days	7 days	✔	28-Oct-2025	28 days	1 days	✔
<b>Metals : Mercury in Soil/Solid by CVAAS</b>										
Glass soil jar/Teflon lined cap HS-8	E510	21-Oct-2025	28-Oct-2025	28 days	7 days	✔	28-Oct-2025	28 days	1 days	✔



Matrix: Soil/Solid

Evaluation: ✖ = Holding time exceedance ; ✔ = Within Holding Time

Analyte Group : Analytical Method Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times		Eval	Analysis Date	Holding Times		Eval
				Rec	Actual			Rec	Actual	
<b>Metals : Mercury in Soil/Solid by CVAAS</b>										
Glass soil jar/Teflon lined cap HS-9	E510	21-Oct-2025	28-Oct-2025	28 days	7 days	✔	28-Oct-2025	28 days	1 days	✔
<b>Metals : Mercury in Soil/Solid by CVAAS</b>										
Glass soil jar/Teflon lined cap HS-19	E510	21-Oct-2025	29-Oct-2025	28 days	8 days	✔	29-Oct-2025	28 days	0 days	✔
<b>Metals : Mercury in Soil/Solid by CVAAS</b>										
Glass soil jar/Teflon lined cap HS-21A	E510	21-Oct-2025	29-Oct-2025	28 days	8 days	✔	29-Oct-2025	28 days	0 days	✔
<b>Metals : Mercury in Soil/Solid by CVAAS</b>										
Glass soil jar/Teflon lined cap HS-21B	E510	21-Oct-2025	29-Oct-2025	28 days	8 days	✔	29-Oct-2025	28 days	0 days	✔
<b>Metals : Mercury in Soil/Solid by CVAAS</b>										
Glass soil jar/Teflon lined cap HS-22	E510	21-Oct-2025	29-Oct-2025	28 days	8 days	✔	29-Oct-2025	28 days	0 days	✔
<b>Metals : Mercury in Soil/Solid by CVAAS</b>										
Glass soil jar/Teflon lined cap HS-23	E510	21-Oct-2025	29-Oct-2025	28 days	8 days	✔	29-Oct-2025	28 days	0 days	✔
<b>Metals : Mercury in Soil/Solid by CVAAS</b>										
Glass soil jar/Teflon lined cap HS-24	E510	21-Oct-2025	29-Oct-2025	28 days	8 days	✔	29-Oct-2025	28 days	0 days	✔
<b>Metals : Mercury in Soil/Solid by CVAAS</b>										
Glass soil jar/Teflon lined cap HS-25	E510	21-Oct-2025	29-Oct-2025	28 days	8 days	✔	29-Oct-2025	28 days	0 days	✔
<b>Metals : Mercury in Soil/Solid by CVAAS</b>										
Glass soil jar/Teflon lined cap HS-3B 2	E510	21-Oct-2025	29-Oct-2025	28 days	8 days	✔	29-Oct-2025	28 days	0 days	✔



Matrix: Soil/Solid

Evaluation: ✖ = Holding time exceedance ; ✔ = Within Holding Time

Analyte Group : Analytical Method Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis				
			Preparation Date	Holding Times		Eval	Analysis Date	Holding Times		Eval	
				Rec	Actual			Rec	Actual		
<b>Metals : Metals in Soil/Solid by CRC ICPMS</b>											
Glass soil jar/Teflon lined cap HS-1	E440	21-Oct-2025	28-Oct-2025	180 days	7 days	✔	29-Oct-2025	180 days	7 days	✔	
<b>Metals : Metals in Soil/Solid by CRC ICPMS</b>											
Glass soil jar/Teflon lined cap HS-10	E440	21-Oct-2025	28-Oct-2025	180 days	7 days	✔	29-Oct-2025	180 days	7 days	✔	
<b>Metals : Metals in Soil/Solid by CRC ICPMS</b>											
Glass soil jar/Teflon lined cap HS-12A	E440	21-Oct-2025	28-Oct-2025	180 days	7 days	✔	29-Oct-2025	180 days	7 days	✔	
<b>Metals : Metals in Soil/Solid by CRC ICPMS</b>											
Glass soil jar/Teflon lined cap HS-12B	E440	21-Oct-2025	28-Oct-2025	180 days	7 days	✔	29-Oct-2025	180 days	7 days	✔	
<b>Metals : Metals in Soil/Solid by CRC ICPMS</b>											
Glass soil jar/Teflon lined cap HS-13A	E440	21-Oct-2025	28-Oct-2025	180 days	7 days	✔	29-Oct-2025	180 days	7 days	✔	
<b>Metals : Metals in Soil/Solid by CRC ICPMS</b>											
Glass soil jar/Teflon lined cap HS-13B	E440	21-Oct-2025	28-Oct-2025	180 days	7 days	✔	29-Oct-2025	180 days	7 days	✔	
<b>Metals : Metals in Soil/Solid by CRC ICPMS</b>											
Glass soil jar/Teflon lined cap HS-14A	E440	21-Oct-2025	28-Oct-2025	180 days	7 days	✔	29-Oct-2025	180 days	7 days	✔	
<b>Metals : Metals in Soil/Solid by CRC ICPMS</b>											
Glass soil jar/Teflon lined cap HS-14B	E440	21-Oct-2025	28-Oct-2025	180 days	7 days	✔	29-Oct-2025	180 days	7 days	✔	
<b>Metals : Metals in Soil/Solid by CRC ICPMS</b>											
Glass soil jar/Teflon lined cap HS-15A	E440	21-Oct-2025	28-Oct-2025	180 days	7 days	✔	29-Oct-2025	180 days	7 days	✔	



Matrix: Soil/Solid

Evaluation: ✖ = Holding time exceedance ; ✔ = Within Holding Time

Analyte Group : Analytical Method Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis				
			Preparation Date	Holding Times		Eval	Analysis Date	Holding Times		Eval	
				Rec	Actual			Rec	Actual		
<b>Metals : Metals in Soil/Solid by CRC ICPMS</b>											
Glass soil jar/Teflon lined cap HS-15B	E440	21-Oct-2025	28-Oct-2025	180 days	7 days	✔	29-Oct-2025	180 days	7 days	✔	
<b>Metals : Metals in Soil/Solid by CRC ICPMS</b>											
Glass soil jar/Teflon lined cap HS-16	E440	21-Oct-2025	28-Oct-2025	180 days	7 days	✔	29-Oct-2025	180 days	7 days	✔	
<b>Metals : Metals in Soil/Solid by CRC ICPMS</b>											
Glass soil jar/Teflon lined cap HS-17	E440	21-Oct-2025	28-Oct-2025	180 days	7 days	✔	29-Oct-2025	180 days	7 days	✔	
<b>Metals : Metals in Soil/Solid by CRC ICPMS</b>											
Glass soil jar/Teflon lined cap HS-18	E440	21-Oct-2025	28-Oct-2025	180 days	7 days	✔	29-Oct-2025	180 days	7 days	✔	
<b>Metals : Metals in Soil/Solid by CRC ICPMS</b>											
Glass soil jar/Teflon lined cap HS-2A	E440	21-Oct-2025	28-Oct-2025	180 days	7 days	✔	29-Oct-2025	180 days	7 days	✔	
<b>Metals : Metals in Soil/Solid by CRC ICPMS</b>											
Glass soil jar/Teflon lined cap HS-3A	E440	21-Oct-2025	28-Oct-2025	180 days	7 days	✔	29-Oct-2025	180 days	7 days	✔	
<b>Metals : Metals in Soil/Solid by CRC ICPMS</b>											
Glass soil jar/Teflon lined cap HS-3B 1	E440	21-Oct-2025	28-Oct-2025	180 days	7 days	✔	29-Oct-2025	180 days	7 days	✔	
<b>Metals : Metals in Soil/Solid by CRC ICPMS</b>											
Glass soil jar/Teflon lined cap HS-4	E440	21-Oct-2025	28-Oct-2025	180 days	7 days	✔	29-Oct-2025	180 days	7 days	✔	
<b>Metals : Metals in Soil/Solid by CRC ICPMS</b>											
Glass soil jar/Teflon lined cap HS-5	E440	21-Oct-2025	28-Oct-2025	180 days	7 days	✔	29-Oct-2025	180 days	7 days	✔	



Matrix: Soil/Solid

Evaluation: ✖ = Holding time exceedance ; ✔ = Within Holding Time

Analyte Group : Analytical Method Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis				
			Preparation Date	Holding Times		Eval	Analysis Date	Holding Times		Eval	
				Rec	Actual			Rec	Actual		
<b>Metals : Metals in Soil/Solid by CRC ICPMS</b>											
Glass soil jar/Teflon lined cap HS-8	E440	21-Oct-2025	28-Oct-2025	180 days	7 days	✔	29-Oct-2025	180 days	7 days	✔	
<b>Metals : Metals in Soil/Solid by CRC ICPMS</b>											
Glass soil jar/Teflon lined cap HS-9	E440	21-Oct-2025	28-Oct-2025	180 days	7 days	✔	29-Oct-2025	180 days	7 days	✔	
<b>Metals : Metals in Soil/Solid by CRC ICPMS</b>											
Glass soil jar/Teflon lined cap HS-19	E440	21-Oct-2025	29-Oct-2025	180 days	8 days	✔	29-Oct-2025	180 days	8 days	✔	
<b>Metals : Metals in Soil/Solid by CRC ICPMS</b>											
Glass soil jar/Teflon lined cap HS-21A	E440	21-Oct-2025	29-Oct-2025	180 days	8 days	✔	29-Oct-2025	180 days	8 days	✔	
<b>Metals : Metals in Soil/Solid by CRC ICPMS</b>											
Glass soil jar/Teflon lined cap HS-21B	E440	21-Oct-2025	29-Oct-2025	180 days	8 days	✔	29-Oct-2025	180 days	8 days	✔	
<b>Metals : Metals in Soil/Solid by CRC ICPMS</b>											
Glass soil jar/Teflon lined cap HS-22	E440	21-Oct-2025	29-Oct-2025	180 days	8 days	✔	29-Oct-2025	180 days	8 days	✔	
<b>Metals : Metals in Soil/Solid by CRC ICPMS</b>											
Glass soil jar/Teflon lined cap HS-23	E440	21-Oct-2025	29-Oct-2025	180 days	8 days	✔	29-Oct-2025	180 days	8 days	✔	
<b>Metals : Metals in Soil/Solid by CRC ICPMS</b>											
Glass soil jar/Teflon lined cap HS-24	E440	21-Oct-2025	29-Oct-2025	180 days	8 days	✔	29-Oct-2025	180 days	8 days	✔	
<b>Metals : Metals in Soil/Solid by CRC ICPMS</b>											
Glass soil jar/Teflon lined cap HS-25	E440	21-Oct-2025	29-Oct-2025	180 days	8 days	✔	29-Oct-2025	180 days	8 days	✔	



Matrix: Soil/Solid

Evaluation: ✖ = Holding time exceedance ; ✔ = Within Holding Time

Analyte Group : Analytical Method Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis				
			Preparation Date	Holding Times		Eval	Analysis Date	Holding Times		Eval	
				Rec	Actual			Rec	Actual		
<b>Metals : Metals in Soil/Solid by CRC ICPMS</b>											
Glass soil jar/Teflon lined cap HS-3B 2	E440	21-Oct-2025	29-Oct-2025	180 days	8 days	✔	29-Oct-2025	180 days	8 days	✔	
<b>Physical Tests : Moisture Content by Gravimetry</b>											
Glass soil jar/Teflon lined cap HS-11	E144	21-Oct-2025	----	----	----		18-Nov-2025	----	----		
<b>Physical Tests : Moisture Content by Gravimetry</b>											
Glass soil jar/Teflon lined cap HS-20	E144	21-Oct-2025	----	----	----		18-Nov-2025	----	----		
<b>Physical Tests : Moisture Content by Gravimetry</b>											
Glass soil jar/Teflon lined cap HS-26	E144	21-Oct-2025	----	----	----		18-Nov-2025	----	----		
<b>Physical Tests : Moisture Content by Gravimetry</b>											
Glass soil jar/Teflon lined cap HS-6	E144	21-Oct-2025	----	----	----		18-Nov-2025	----	----		
<b>Physical Tests : Moisture Content by Gravimetry</b>											
Glass soil jar/Teflon lined cap HS-7	E144	21-Oct-2025	----	----	----		18-Nov-2025	----	----		
<b>Physical Tests : pH by Meter (1:2 Soil:Water Extraction)</b>											
Glass soil jar/Teflon lined cap HS-1	E108	21-Oct-2025	28-Oct-2025	30 days	7 days	✔	28-Oct-2025	30 days	7 days	✔	
<b>Physical Tests : pH by Meter (1:2 Soil:Water Extraction)</b>											
Glass soil jar/Teflon lined cap HS-10	E108	21-Oct-2025	28-Oct-2025	30 days	7 days	✔	28-Oct-2025	30 days	7 days	✔	
<b>Physical Tests : pH by Meter (1:2 Soil:Water Extraction)</b>											
Glass soil jar/Teflon lined cap HS-12A	E108	21-Oct-2025	28-Oct-2025	30 days	7 days	✔	28-Oct-2025	30 days	7 days	✔	



Matrix: Soil/Solid

Evaluation: ✖ = Holding time exceedance ; ✔ = Within Holding Time

Analyte Group : Analytical Method Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times		Eval	Analysis Date	Holding Times		Eval
				Rec	Actual			Rec	Actual	
<b>Physical Tests : pH by Meter (1:2 Soil:Water Extraction)</b>										
Glass soil jar/Teflon lined cap HS-12B	E108	21-Oct-2025	28-Oct-2025	30 days	7 days	✔	28-Oct-2025	30 days	7 days	✔
<b>Physical Tests : pH by Meter (1:2 Soil:Water Extraction)</b>										
Glass soil jar/Teflon lined cap HS-13A	E108	21-Oct-2025	28-Oct-2025	30 days	7 days	✔	28-Oct-2025	30 days	7 days	✔
<b>Physical Tests : pH by Meter (1:2 Soil:Water Extraction)</b>										
Glass soil jar/Teflon lined cap HS-13B	E108	21-Oct-2025	28-Oct-2025	30 days	7 days	✔	28-Oct-2025	30 days	7 days	✔
<b>Physical Tests : pH by Meter (1:2 Soil:Water Extraction)</b>										
Glass soil jar/Teflon lined cap HS-14A	E108	21-Oct-2025	28-Oct-2025	30 days	7 days	✔	28-Oct-2025	30 days	7 days	✔
<b>Physical Tests : pH by Meter (1:2 Soil:Water Extraction)</b>										
Glass soil jar/Teflon lined cap HS-14B	E108	21-Oct-2025	28-Oct-2025	30 days	7 days	✔	28-Oct-2025	30 days	7 days	✔
<b>Physical Tests : pH by Meter (1:2 Soil:Water Extraction)</b>										
Glass soil jar/Teflon lined cap HS-15A	E108	21-Oct-2025	28-Oct-2025	30 days	7 days	✔	28-Oct-2025	30 days	7 days	✔
<b>Physical Tests : pH by Meter (1:2 Soil:Water Extraction)</b>										
Glass soil jar/Teflon lined cap HS-15B	E108	21-Oct-2025	28-Oct-2025	30 days	7 days	✔	28-Oct-2025	30 days	7 days	✔
<b>Physical Tests : pH by Meter (1:2 Soil:Water Extraction)</b>										
Glass soil jar/Teflon lined cap HS-16	E108	21-Oct-2025	28-Oct-2025	30 days	7 days	✔	28-Oct-2025	30 days	7 days	✔
<b>Physical Tests : pH by Meter (1:2 Soil:Water Extraction)</b>										
Glass soil jar/Teflon lined cap HS-17	E108	21-Oct-2025	28-Oct-2025	30 days	7 days	✔	28-Oct-2025	30 days	7 days	✔



Matrix: Soil/Solid

Evaluation: ✖ = Holding time exceedance ; ✔ = Within Holding Time

Analyte Group : Analytical Method Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times		Eval	Analysis Date	Holding Times		Eval
				Rec	Actual			Rec	Actual	
<b>Physical Tests : pH by Meter (1:2 Soil:Water Extraction)</b>										
Glass soil jar/Teflon lined cap HS-18	E108	21-Oct-2025	28-Oct-2025	30 days	7 days	✔	28-Oct-2025	30 days	7 days	✔
<b>Physical Tests : pH by Meter (1:2 Soil:Water Extraction)</b>										
Glass soil jar/Teflon lined cap HS-2A	E108	21-Oct-2025	28-Oct-2025	30 days	7 days	✔	28-Oct-2025	30 days	7 days	✔
<b>Physical Tests : pH by Meter (1:2 Soil:Water Extraction)</b>										
Glass soil jar/Teflon lined cap HS-3A	E108	21-Oct-2025	28-Oct-2025	30 days	7 days	✔	28-Oct-2025	30 days	7 days	✔
<b>Physical Tests : pH by Meter (1:2 Soil:Water Extraction)</b>										
Glass soil jar/Teflon lined cap HS-3B 1	E108	21-Oct-2025	28-Oct-2025	30 days	7 days	✔	28-Oct-2025	30 days	7 days	✔
<b>Physical Tests : pH by Meter (1:2 Soil:Water Extraction)</b>										
Glass soil jar/Teflon lined cap HS-4	E108	21-Oct-2025	28-Oct-2025	30 days	7 days	✔	28-Oct-2025	30 days	7 days	✔
<b>Physical Tests : pH by Meter (1:2 Soil:Water Extraction)</b>										
Glass soil jar/Teflon lined cap HS-5	E108	21-Oct-2025	28-Oct-2025	30 days	7 days	✔	28-Oct-2025	30 days	7 days	✔
<b>Physical Tests : pH by Meter (1:2 Soil:Water Extraction)</b>										
Glass soil jar/Teflon lined cap HS-8	E108	21-Oct-2025	28-Oct-2025	30 days	7 days	✔	28-Oct-2025	30 days	7 days	✔
<b>Physical Tests : pH by Meter (1:2 Soil:Water Extraction)</b>										
Glass soil jar/Teflon lined cap HS-9	E108	21-Oct-2025	28-Oct-2025	30 days	7 days	✔	28-Oct-2025	30 days	7 days	✔
<b>Physical Tests : pH by Meter (1:2 Soil:Water Extraction)</b>										
Glass soil jar/Teflon lined cap HS-19	E108	21-Oct-2025	29-Oct-2025	30 days	8 days	✔	29-Oct-2025	30 days	8 days	✔



Matrix: Soil/Solid

Evaluation: ✖ = Holding time exceedance ; ✔ = Within Holding Time

Analyte Group : Analytical Method Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times		Eval	Analysis Date	Holding Times		Eval
				Rec	Actual			Rec	Actual	
<b>Physical Tests : pH by Meter (1:2 Soil:Water Extraction)</b>										
Glass soil jar/Teflon lined cap HS-21A	E108	21-Oct-2025	29-Oct-2025	30 days	8 days	✔	29-Oct-2025	30 days	8 days	✔
<b>Physical Tests : pH by Meter (1:2 Soil:Water Extraction)</b>										
Glass soil jar/Teflon lined cap HS-21B	E108	21-Oct-2025	29-Oct-2025	30 days	8 days	✔	29-Oct-2025	30 days	8 days	✔
<b>Physical Tests : pH by Meter (1:2 Soil:Water Extraction)</b>										
Glass soil jar/Teflon lined cap HS-22	E108	21-Oct-2025	29-Oct-2025	30 days	8 days	✔	29-Oct-2025	30 days	8 days	✔
<b>Physical Tests : pH by Meter (1:2 Soil:Water Extraction)</b>										
Glass soil jar/Teflon lined cap HS-23	E108	21-Oct-2025	29-Oct-2025	30 days	8 days	✔	29-Oct-2025	30 days	8 days	✔
<b>Physical Tests : pH by Meter (1:2 Soil:Water Extraction)</b>										
Glass soil jar/Teflon lined cap HS-24	E108	21-Oct-2025	29-Oct-2025	30 days	8 days	✔	29-Oct-2025	30 days	8 days	✔
<b>Physical Tests : pH by Meter (1:2 Soil:Water Extraction)</b>										
Glass soil jar/Teflon lined cap HS-25	E108	21-Oct-2025	29-Oct-2025	30 days	8 days	✔	29-Oct-2025	30 days	8 days	✔
<b>Physical Tests : pH by Meter (1:2 Soil:Water Extraction)</b>										
Glass soil jar/Teflon lined cap HS-3B 2	E108	21-Oct-2025	29-Oct-2025	30 days	8 days	✔	29-Oct-2025	30 days	8 days	✔
<b>Toxic Equivalency : Dioxins and Furans in Soil/Solid by GC-HRMS</b>										
Glass soil jar/Teflon lined cap HS-11	XE766	21-Oct-2025	24-Oct-2025	365 days	3 days	✔	06-Nov-2025	365 days	13 days	✔
<b>Toxic Equivalency : Dioxins and Furans in Soil/Solid by GC-HRMS</b>										
Glass soil jar/Teflon lined cap HS-20	XE766	21-Oct-2025	24-Oct-2025	365 days	3 days	✔	06-Nov-2025	365 days	13 days	✔



Matrix: **Soil/Solid**

Evaluation: ✖ = Holding time exceedance ; ✔ = Within Holding Time

Analyte Group : Analytical Method Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times		Eval	Analysis Date	Holding Times		Eval
				Rec	Actual			Rec	Actual	
<b>Toxic Equivalency : Dioxins and Furans in Soil/Solid by GC-HRMS</b>										
Glass soil jar/Teflon lined cap HS-26	XE766	21-Oct-2025	24-Oct-2025	365 days	3 days	✔	06-Nov-2025	365 days	13 days	✔
<b>Toxic Equivalency : Dioxins and Furans in Soil/Solid by GC-HRMS</b>										
Glass soil jar/Teflon lined cap HS-6	XE766	21-Oct-2025	24-Oct-2025	365 days	3 days	✔	06-Nov-2025	365 days	13 days	✔
<b>Toxic Equivalency : Dioxins and Furans in Soil/Solid by GC-HRMS</b>										
Glass soil jar/Teflon lined cap HS-7	XE766	21-Oct-2025	24-Oct-2025	365 days	3 days	✔	06-Nov-2025	365 days	13 days	✔

Legend & Qualifier Definitions

Rec. HT: ALS recommended hold time (see units).



## Quality Control Parameter Frequency Compliance

The following report summarizes the frequency of laboratory QC samples analyzed within the analytical batches (QC lots) in which the submitted samples were processed. The actual frequency should be greater than or equal to the expected frequency.

Matrix: **Soil/Solid**

Evaluation: ✖ = QC frequency outside specification; ✔ = QC frequency within specification.

Quality Control Sample Type	Method	QC Lot #	Count		Frequency (%)		
			QC	Regular	Actual	Expected	Evaluation
<b>Analytical Methods</b>							
<b>Laboratory Duplicates (DUP)</b>							
pH by Meter (1:2 Soil:Water Extraction)	E108	2303956	2	39	5.1	5.0	✔
Moisture Content by Gravimetry	E144	2342421	1	19	5.2	5.0	✔
Metals in Soil/Solid by CRC ICPMS	E440	2303954	2	39	5.1	5.0	✔
Mercury in Soil/Solid by CVAAS	E510	2303953	2	39	5.1	5.0	✔
Dioxins and Furans in Soil/Solid by GC-HRMS	XE766	2295081	1	10	10.0	5.0	✔
<b>Laboratory Control Samples (LCS)</b>							
pH by Meter (1:2 Soil:Water Extraction)	E108	2303956	2	39	5.1	5.0	✔
Moisture Content by Gravimetry	E144	2342421	1	19	5.2	5.0	✔
High Silver in Soil/Solid by CRC ICPMS	E440.Ag	2306806	2	1	200.0	10.0	✔
Metals in Soil/Solid by CRC ICPMS	E440	2303954	4	39	10.2	10.0	✔
Mercury in Soil/Solid by CVAAS	E510	2303953	4	39	10.2	10.0	✔
Dioxins and Furans in Soil/Solid by GC-HRMS	XE766	2295081	1	10	10.0	5.0	✔
<b>Method Blanks (MB)</b>							
Moisture Content by Gravimetry	E144	2342421	1	19	5.2	5.0	✔
High Silver in Soil/Solid by CRC ICPMS	E440.Ag	2306806	1	1	100.0	5.0	✔
Metals in Soil/Solid by CRC ICPMS	E440	2303954	2	39	5.1	5.0	✔
Mercury in Soil/Solid by CVAAS	E510	2303953	2	39	5.1	5.0	✔
Dioxins and Furans in Soil/Solid by GC-HRMS	XE766	2295081	1	10	10.0	5.0	✔



## Methodology References and Summaries

The analytical methods used by ALS are developed using internationally recognized reference methods (where available), such as those published by US EPA, APHA Standard Methods, ASTM, ISO, Environment Canada, BC MOE, and Ontario MOE. Reference methods may incorporate modifications to improve performance (indicated by "mod").

Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
pH by Meter (1:2 Soil:Water Extraction)	E108 ALS Environmental - Vancouver	Soil/Solid	BC Lab Manual	pH is determined by potentiometric measurement with a pH electrode at ambient laboratory temperature (normally 20 ± 5°C), and is carried out in accordance with procedures described in the BC Lab Manual (prescriptive method). The procedure involves mixing the dried (at <60 °C) and sieved (10mesh/2mm) sample with ultra pure water at a 1:2 ratio of sediment to water. The pH is then measured by a standard pH probe.
Moisture Content by Gravimetry	E144 ALS Environmental - Vancouver	Soil/Solid	CCME PHC in Soil - Tier 1	Moisture is measured gravimetrically by drying the sample at 105°C. Moisture content is calculated as the weight loss (due to water) divided by the wet weight of the sample, expressed as a percentage.
Metals in Soil/Solid by CRC ICPMS	E440 ALS Environmental - Vancouver	Soil/Solid	EPA 6020B (mod)	This method is intended to liberate metals that may be environmentally available. Samples are dried, then sieved through a 2 mm sieve, and digested with HNO <sub>3</sub> and HCl.  Dependent on sample matrix, some metals may be only partially recovered, including Al, Ba, Be, Cr, Sr, Ti, Tl, V, W, and Zr. Silicate minerals are not solubilized. Volatile forms of sulfur (including sulfide) may not be captured, as they may be lost during sampling, storage, or digestion. This method does not adequately recover elemental sulfur, and is unsuitable for assessment of elemental sulfur standards or guidelines.  Analysis is by Collision/Reaction Cell ICPMS.
High Silver in Soil/Solid by CRC ICPMS	E440.Ag ALS Environmental - Vancouver	Soil/Solid	EPA 6020B (mod)	Samples are sieved through a 2 mm sieve, and digested with HNO <sub>3</sub> and HCl. This method is intended to liberate metals that may be environmentally available. Silicate minerals are not solubilized. Dependent on sample matrix, some metals may be only partially recovered, including Al, Ba, Be, Cr, Sr, Ti, Tl, V, W, and Zr. Volatile forms of sulfur (including sulfide) may not be captured, as they may be lost during sampling, storage, or digestion. Analysis is by Collision/Reaction Cell ICPMS.
Mercury in Soil/Solid by CVAAS	E510 ALS Environmental - Vancouver	Soil/Solid	EPA 200.2/1631 Appendix (mod)	Samples are dried, then sieved through a 2 mm sieve, and digested with HNO <sub>3</sub> and HCl, followed by CVAAS analysis.
Dioxins and Furans in Soil/Solid by GC-HRMS	XE766 ALS Environmental - Burlington	Soil/Solid	USEPA 1613B	The sample is extracted by Soxhlet extraction. Extracts are prepared using column chromatography, reduced in volume and analyzed by isotope-dilution GC-HRMS Reported on a dry-weight basis.
Preparation Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Leach 1:2 Soil:Water for pH/EC	EP108 ALS Environmental - Vancouver	Soil/Solid	BC WLAP METHOD: PH, ELECTROMETRIC, SOIL	The procedure involves mixing the dried (at <60°C) and sieved (No. 10 / 2mm) sample with deionized/distilled water at a 1:2 ratio of sediment to water.



<i>Preparation Methods</i>	<i>Method / Lab</i>	<i>Matrix</i>	<i>Method Reference</i>	<i>Method Descriptions</i>
Digestion for Metals and Mercury	EP440 ALS Environmental - Vancouver	Soil/Solid	EPA 200.2 (mod)	Samples are dried, then sieved through a 2 mm sieve, and digested with HNO <sub>3</sub> and HCl. This method is intended to liberate metals that may be environmentally available.
Digestion for Silver	EP440.Ag ALS Environmental - Vancouver	Soil/Solid	EPA 200.2 (mod)	Samples are dried, then sieved through a 2 mm sieve, and digested with HNO <sub>3</sub> and HCl. This method is intended to liberate metals that may be environmentally available.
Soxhlet extraction of solids for DX/Fs, PCBs, PCNs, and/or HFRs	EP800 ALS Environmental - Burlington	Soil/Solid	EPA Method 3540C (preparation)	Solid samples are homogenized and sub-sampled, then extracted using Soxhlet apparatus.

## QUALITY CONTROL REPORT

<b>Work Order</b>	<b>: VA25C8048</b>	<b>Page</b>	: 1 of 15
<b>Client</b>	: HDR Corporation	<b>Laboratory</b>	: ALS Environmental - Vancouver
<b>Contact</b>	: Johanna Mason	<b>Account Manager</b>	: Le Van Dalfsen
<b>Address</b>	: 500-1500 W. Georgia Street Vancouver BC Canada V6G 2Z6	<b>Address</b>	: 8081 Lougheed Highway Burnaby, British Columbia Canada V5A 1W9
<b>Telephone</b>	: ----	<b>Telephone</b>	: +1 604 253 4188
<b>Project</b>	: VA25HDR100-001	<b>Date Samples Received</b>	: 22-Oct-2025 06:43
<b>PO</b>	: ----	<b>Date Analysis Commenced</b>	: 24-Oct-2025
<b>C-O-C number</b>	: 23-1162265, 23-1162264, 23-1162262	<b>Issue Date</b>	: 20-Nov-2025 12:50
<b>Sampler</b>	: ----		
<b>Site</b>	: ----		
<b>Quote number</b>	: VA25-HDRI100-001		
<b>No. of samples received</b>	: 33		
<b>No. of samples analysed</b>	: 33		

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 Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percent Difference (RPD) and Data Quality Objectives
- Reference Material (RM) Report; Recovery and Data Quality Objectives
- Method Blank (MB) Report; Recovery and Data Quality Objectives
- Laboratory Control Sample (LCS) Report; Recovery and Data Quality Objectives

### Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is conducted in accordance with US FDA 21 CFR Part 11.

<i>Signatories</i>	<i>Position</i>	<i>Laboratory Department</i>
Brianna Allen	Production/Validation Manager	Vancouver Organics, Burnaby, British Columbia
Colin Jamieson	Analyst	Burlington Organics, Burlington, Ontario
Kim Jensen	Department Manager - Metals	Vancouver Metals, Burnaby, British Columbia
Kim Jensen	Department Manager - Metals	Vancouver Organics, Burnaby, British Columbia
Sabrina Jin	Analyst	Burlington Organics, Burlington, Ontario

Page : 2 of 15  
Work Order : VA25C8048  
Client : HDR Corporation  
Project : VA25HDR100-001



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## General Comments

The ALS Quality Control (QC) report is optionally provided to ALS clients upon request. ALS test methods include comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against predetermined Data Quality Objectives (DQOs) to provide confidence in the accuracy of associated test results. This report contains detailed results for all QC results applicable to this sample submission. Please refer to the ALS Quality Control Interpretation report (QCI) for applicable method references and methodology summaries.

Key :

Anonymous = Refers to samples which are not part of this work order, but which formed part of the QC process lot.

CAS Number = Chemical Abstracts Service number is a unique identifier assigned to discrete substances.

DQO = Data Quality Objective.

LOR = Limit of Reporting (detection limit).

RPD = Relative Percent Difference

# = Indicates a QC result that did not meet the ALS DQO.

## Workorder Comments

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Holding times are displayed as "---" if no guidance exists from CCME, Canadian provinces, or broadly recognized international references.

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### Laboratory Duplicate (DUP) Report

A Laboratory Duplicate (DUP) is a randomly selected intralaboratory replicate sample. Laboratory Duplicates provide information regarding method precision and sample heterogeneity. ALS DQOs for Laboratory Duplicates are expressed as test-specific limits for Relative Percent Difference (RPD), or as an absolute difference limit of 2 times the LOR for low concentration duplicates within ~ 4-10 times the LOR (cut-off is test-specific).

Sub-Matrix: **Soil/Solid**

					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	LOR	Unit	Original Result	Duplicate Result	RPD(%) or Difference	Duplicate Limits	Qualifier
<b>Sample Preparation (QC Lot: 2295081)</b>											
BU2502921-001	Anonymous	Weight, extraction (wet)	----	EP800	0.0001	g	20.1407	20.0745		Diff <2x LOR	----
<b>Physical Tests (QC Lot: 2302286)</b>											
VA25C8048-001	HS-1	pH (1:2 soil:water)	----	E108	0.10	pH units	6.85	6.95	1.4%	5%	----
<b>Physical Tests (QC Lot: 2303956)</b>											
VA25C8329-003	Anonymous	pH (1:2 soil:water)	----	E108	0.10	pH units	8.28	8.21	0.8%	5%	----
<b>Physical Tests (QC Lot: 2342421)</b>											
FJ2503518-001	Anonymous	Moisture	----	E144	0.25	%	4.48	4.58	2.26%	20%	----
<b>Metals (QC Lot: 2302284)</b>											
VA25C8048-001	HS-1	Mercury	7439-97-6	E510	0.0500	mg/kg	0.238	0.232	0.0061	Diff <2x LOR	----
<b>Metals (QC Lot: 2302285)</b>											
VA25C8048-001	HS-1	Aluminum	7429-90-5	E440	50	mg/kg	13600	13400	1.37%	40%	----
		Antimony	7440-36-0	E440	0.10	mg/kg	15.6	16.3	4.18%	30%	----
		Arsenic	7440-38-2	E440	0.10	mg/kg	8.04	7.91	1.58%	30%	----
		Barium	7440-39-3	E440	0.50	mg/kg	150	139	7.01%	40%	----
		Beryllium	7440-41-7	E440	0.10	mg/kg	0.22	0.22	0.003	Diff <2x LOR	----
		Bismuth	7440-69-9	E440	0.20	mg/kg	1.95	1.92	1.69%	30%	----
		Boron	7440-42-8	E440	5.0	mg/kg	12.0	11.6	0.4	Diff <2x LOR	----
		Cadmium	7440-43-9	E440	0.020	mg/kg	4.22	4.26	0.952%	30%	----
		Calcium	7440-70-2	E440	50	mg/kg	13000	12500	4.01%	30%	----
		Chromium	7440-47-3	E440	0.50	mg/kg	52.3	64.6	21.0%	30%	----
		Cobalt	7440-48-4	E440	0.10	mg/kg	12.1	11.9	2.30%	30%	----
		Copper	7440-50-8	E440	0.50	mg/kg	154	133	15.0%	30%	----
		Iron	7439-89-6	E440	50	mg/kg	20300	20000	1.88%	30%	----
		Lead	7439-92-1	E440	0.50	mg/kg	121	123	1.54%	40%	----
		Lithium	7439-93-2	E440	2.0	mg/kg	10.4	10.4	0.004	Diff <2x LOR	----
		Magnesium	7439-95-4	E440	20	mg/kg	5630	5840	3.76%	30%	----
		Manganese	7439-96-5	E440	1.0	mg/kg	425	409	3.93%	30%	----
		Molybdenum	7439-98-7	E440	0.10	mg/kg	4.90	4.39	11.0%	40%	----
		Nickel	7440-02-0	E440	0.50	mg/kg	52.5	52.1	0.765%	30%	----
		Phosphorus	7723-14-0	E440	50	mg/kg	1100	1030	5.80%	30%	----



Sub-Matrix: Soil/Solid					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	LOR	Unit	Original Result	Duplicate Result	RPD(%) or Difference	Duplicate Limits	Qualifier
<b>Metals (QC Lot: 2302285) - continued</b>											
VA25C8048-001	HS-1	Potassium	7440-09-7	E440	100	mg/kg	930	940	1.40%	40%	----
		Selenium	7782-49-2	E440	0.20	mg/kg	0.26	0.32	0.07	Diff <2x LOR	----
		Silver	7440-22-4	E440	0.10	mg/kg	0.94	0.88	5.74%	40%	----
		Sodium	7440-23-5	E440	50	mg/kg	741	608	19.7%	40%	----
		Strontium	7440-24-6	E440	0.50	mg/kg	54.9	51.2	7.04%	40%	----
		Sulfur	7704-34-9	E440	1000	mg/kg	<1000	<1000	0	Diff <2x LOR	----
		Thallium	7440-28-0	E440	0.050	mg/kg	0.078	0.078	0.0005	Diff <2x LOR	----
		Tin	7440-31-5	E440	2.0	mg/kg	15.3	14.4	6.18%	40%	----
		Titanium	7440-32-6	E440	1.0	mg/kg	651	728	11.2%	40%	----
		Tungsten	7440-33-7	E440	0.50	mg/kg	0.61	0.79	0.18	Diff <2x LOR	----
		Uranium	7440-61-1	E440	0.050	mg/kg	0.808	0.809	0.130%	30%	----
		Vanadium	7440-62-2	E440	0.20	mg/kg	42.2	44.5	5.23%	30%	----
		Zinc	7440-66-6	E440	2.0	mg/kg	607	592	2.45%	30%	----
		Zirconium	7440-67-7	E440	1.0	mg/kg	1.6	1.8	0.2	Diff <2x LOR	----
<b>Metals (QC Lot: 2303953)</b>											
VA25C8329-003	Anonymous	Mercury	7439-97-6	E510	0.0500	mg/kg	<0.0500	<0.0500	0	Diff <2x LOR	----
<b>Metals (QC Lot: 2303954)</b>											
VA25C8329-003	Anonymous	Aluminum	7429-90-5	E440	50	mg/kg	10900	10800	0.879%	40%	----
		Antimony	7440-36-0	E440	0.10	mg/kg	0.17	0.20	0.03	Diff <2x LOR	----
		Arsenic	7440-38-2	E440	0.10	mg/kg	1.81	1.77	2.60%	30%	----
		Barium	7440-39-3	E440	0.50	mg/kg	54.7	54.5	0.270%	40%	----
		Beryllium	7440-41-7	E440	0.10	mg/kg	0.14	0.14	0.002	Diff <2x LOR	----
		Bismuth	7440-69-9	E440	0.20	mg/kg	<0.20	<0.20	0	Diff <2x LOR	----
		Boron	7440-42-8	E440	5.0	mg/kg	<5.0	<5.0	0	Diff <2x LOR	----
		Cadmium	7440-43-9	E440	0.020	mg/kg	0.063	0.064	0.002	Diff <2x LOR	----
		Calcium	7440-70-2	E440	50	mg/kg	5710	5850	2.48%	30%	----
		Chromium	7440-47-3	E440	0.50	mg/kg	18.2	17.5	4.11%	30%	----
		Cobalt	7440-48-4	E440	0.10	mg/kg	5.18	5.33	2.74%	30%	----
		Copper	7440-50-8	E440	0.50	mg/kg	12.4	12.4	0.226%	30%	----
		Iron	7439-89-6	E440	50	mg/kg	16200	16600	2.28%	30%	----
		Lead	7439-92-1	E440	0.50	mg/kg	2.73	3.18	15.0%	40%	----
		Lithium	7439-93-2	E440	2.0	mg/kg	4.7	4.8	0.1	Diff <2x LOR	----
		Magnesium	7439-95-4	E440	20	mg/kg	3950	3960	0.254%	30%	----
		Manganese	7439-96-5	E440	1.0	mg/kg	292	292	0.0250%	30%	----



Sub-Matrix: Soil/Solid					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	LOR	Unit	Original Result	Duplicate Result	RPD(%) or Difference	Duplicate Limits	Qualifier
<b>Metals (QC Lot: 2303954) - continued</b>											
VA25C8329-003	Anonymous	Molybdenum	7439-98-7	E440	0.10	mg/kg	0.24	0.22	0.03	Diff <2x LOR	----
		Nickel	7440-02-0	E440	0.50	mg/kg	11.5	11.6	0.968%	30%	----
		Phosphorus	7723-14-0	E440	50	mg/kg	445	432	3.03%	30%	----
		Potassium	7440-09-7	E440	100	mg/kg	730	740	1.53%	40%	----
		Selenium	7782-49-2	E440	0.20	mg/kg	<0.20	<0.20	0	Diff <2x LOR	----
		Silver	7440-22-4	E440	0.10	mg/kg	<0.10	<0.10	0	Diff <2x LOR	----
		Sodium	7440-23-5	E440	50	mg/kg	546	563	3.02%	40%	----
		Strontium	7440-24-6	E440	0.50	mg/kg	47.3	46.3	2.05%	40%	----
		Sulfur	7704-34-9	E440	1000	mg/kg	<1000	<1000	0	Diff <2x LOR	----
		Thallium	7440-28-0	E440	0.050	mg/kg	<0.050	<0.050	0	Diff <2x LOR	----
		Tin	7440-31-5	E440	2.0	mg/kg	<2.0	<2.0	0	Diff <2x LOR	----
		Titanium	7440-32-6	E440	1.0	mg/kg	914	975	6.43%	40%	----
		Tungsten	7440-33-7	E440	0.50	mg/kg	<0.50	<0.50	0	Diff <2x LOR	----
		Uranium	7440-61-1	E440	0.050	mg/kg	0.311	0.344	0.033	Diff <2x LOR	----
		Vanadium	7440-62-2	E440	0.20	mg/kg	45.9	48.7	5.79%	30%	----
		Zinc	7440-66-6	E440	2.0	mg/kg	28.3	30.5	7.33%	30%	----
		Zirconium	7440-67-7	E440	1.0	mg/kg	3.8	3.9	0.1	Diff <2x LOR	----
<b>Dioxins and Furans (QC Lot: 2295081)</b>											
BU2502921-001	Anonymous	HpCDD, 1,2,3,4,6,7,8-	35822-46-9	XE766	13	pg/g	5790	4120	33.8%	25%	DUP-H
		HpCDF, 1,2,3,4,6,7,8-	67562-39-4	XE766	3.6	pg/g	1010	706	35.1%	25%	DUP-H
		HpCDF, 1,2,3,4,7,8,9-	55673-89-7	XE766	4.9	pg/g	56.6	37.3	41.2%	25%	DUP-H
		HxCDD, 1,2,3,4,7,8-	39227-28-6	XE766	2.0	pg/g	20.0	21.2	5.74%	25%	[J]
		HxCDD, 1,2,3,6,7,8-	57653-85-7	XE766	2.2	pg/g	119	110	8.41%	25%	----
		HxCDD, 1,2,3,7,8,9-	19408-74-3	XE766	2.0	pg/g	49.2	47.5	3.33%	25%	----
		HxCDF, 1,2,3,4,7,8-	70648-26-9	XE766	1.6	pg/g	77.4	57.6	29.4%	25%	DUP-H
		HxCDF, 1,2,3,6,7,8-	57117-44-9	XE766	1.7	pg/g	28.4	23.0	21.1%	25%	[J]
		HxCDF, 1,2,3,7,8,9-	72918-21-9	XE766	2.2	pg/g	15.7	12.1	25.9%	25%	[J]
		HxCDF, 2,3,4,6,7,8-	60851-34-5	XE766	16	pg/g	15.6	<16	0.81	Diff <2x LOR	[U],F,M
		OCDD	3268-87-9	XE766	7.7	pg/g	77600	47900	47.3%	25%	DUP-H
		OCDF	39001-02-0	XE766	3.2	pg/g	7470	4240	55.2%	25%	DUP-H
		PeCDD, 1,2,3,7,8-	40321-76-4	XE766	1.4	pg/g	13.5	15.4	13.5%	25%	[J],M
		PeCDF, 1,2,3,7,8-	57117-41-6	XE766	149	pg/g	<116	<149	116	Diff <2x LOR	[U],P
		PeCDF, 2,3,4,7,8-	57117-31-4	XE766	2.8	pg/g	45.4	32.7	32.6%	25%	DUP-H
		TCDD, 2,3,7,8-	1746-01-6	XE766	1.5	pg/g	12.6	12.5	0.332%	25%	[J],M



Sub-Matrix: Soil/Solid					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	LOR	Unit	Original Result	Duplicate Result	RPD(%) or Difference	Duplicate Limits	Qualifier
<b>Dioxins and Furans (QC Lot: 2295081) - continued</b>											
BU2502921-001	Anonymous	TCDF, 2,3,7,8-	51207-31-9	XE766	2.7	pg/g	10.1	12.3	2.21	Diff <2x LOR	[J]

## Qualifiers

Qualifier	Description
[J]	Estimated value. The reported concentration is below the calibrated range of the instrument but above the EDL.
[U]	The analyte was not detected above the EDL (or LOR where applicable).
DUP-H	Duplicate results outside ALS DQO, due to sample heterogeneity.
F	The ion abundance ratio(s) did not meet the acceptance criteria. Estimated Detection Limit for that compound has been elevated to the level of the EMPC.
M	Peak has been manually integrated.
P	Chlorodiphenyl interference was present at the retention time of the target analyte. EDL has been raised to the level of the EMPC value.



## Method Blank (MB) Report

A Method Blank is an analyte-free matrix that undergoes sample processing identical to that carried out for test samples. Method Blank results are used to monitor and control for potential contamination from the laboratory environment and reagents. For most tests, the DQO for Method Blanks is for the result to be < LOR.

Sub-Matrix: Soil/Solid

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
<b>Sample Preparation (QCLot: 2295081)</b>						
Weight, extraction (wet)	---	EP800	0.0001	g	20.0438	---
<b>Physical Tests (QCLot: 2342421)</b>						
Moisture	---	E144	0.25	%	<0.25	---
<b>Metals (QCLot: 2302284)</b>						
Mercury	7439-97-6	E510	0.005	mg/kg	<0.0050	---
<b>Metals (QCLot: 2302285)</b>						
Aluminum	7429-90-5	E440	50	mg/kg	<50	---
Antimony	7440-36-0	E440	0.1	mg/kg	<0.10	---
Arsenic	7440-38-2	E440	0.1	mg/kg	<0.10	---
Barium	7440-39-3	E440	0.5	mg/kg	<0.50	---
Beryllium	7440-41-7	E440	0.1	mg/kg	<0.10	---
Bismuth	7440-69-9	E440	0.2	mg/kg	<0.20	---
Boron	7440-42-8	E440	5	mg/kg	<5.0	---
Cadmium	7440-43-9	E440	0.02	mg/kg	<0.020	---
Calcium	7440-70-2	E440	50	mg/kg	<50	---
Chromium	7440-47-3	E440	0.5	mg/kg	<0.50	---
Cobalt	7440-48-4	E440	0.1	mg/kg	<0.10	---
Copper	7440-50-8	E440	0.5	mg/kg	<0.50	---
Iron	7439-89-6	E440	50	mg/kg	<50	---
Lead	7439-92-1	E440	0.5	mg/kg	<0.50	---
Lithium	7439-93-2	E440	2	mg/kg	<2.0	---
Magnesium	7439-95-4	E440	20	mg/kg	<20	---
Manganese	7439-96-5	E440	1	mg/kg	<1.0	---
Molybdenum	7439-98-7	E440	0.1	mg/kg	<0.10	---
Nickel	7440-02-0	E440	0.5	mg/kg	<0.50	---
Phosphorus	7723-14-0	E440	50	mg/kg	<50	---
Potassium	7440-09-7	E440	100	mg/kg	<100	---
Selenium	7782-49-2	E440	0.2	mg/kg	<0.20	---
Silver	7440-22-4	E440	0.1	mg/kg	<0.10	---
Sodium	7440-23-5	E440	50	mg/kg	<50	---
Strontium	7440-24-6	E440	0.5	mg/kg	<0.50	---
Sulfur	7704-34-9	E440	1000	mg/kg	<1000	---



Sub-Matrix: **Soil/Solid**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
<b>Metals (QCLot: 2302285) - continued</b>						
Thallium	7440-28-0	E440	0.05	mg/kg	<0.050	----
Tin	7440-31-5	E440	2	mg/kg	<2.0	----
Titanium	7440-32-6	E440	1	mg/kg	<1.0	----
Tungsten	7440-33-7	E440	0.5	mg/kg	<0.50	----
Uranium	7440-61-1	E440	0.05	mg/kg	<0.050	----
Vanadium	7440-62-2	E440	0.2	mg/kg	<0.20	----
Zinc	7440-66-6	E440	2	mg/kg	<2.0	----
Zirconium	7440-67-7	E440	1	mg/kg	<1.0	----
<b>Metals (QCLot: 2303953)</b>						
Mercury	7439-97-6	E510	0.005	mg/kg	<0.0050	----
<b>Metals (QCLot: 2303954)</b>						
Aluminum	7429-90-5	E440	50	mg/kg	<50	----
Antimony	7440-36-0	E440	0.1	mg/kg	<0.10	----
Arsenic	7440-38-2	E440	0.1	mg/kg	<0.10	----
Barium	7440-39-3	E440	0.5	mg/kg	<0.50	----
Beryllium	7440-41-7	E440	0.1	mg/kg	<0.10	----
Bismuth	7440-69-9	E440	0.2	mg/kg	<0.20	----
Boron	7440-42-8	E440	5	mg/kg	<5.0	----
Cadmium	7440-43-9	E440	0.02	mg/kg	<0.020	----
Calcium	7440-70-2	E440	50	mg/kg	<50	----
Chromium	7440-47-3	E440	0.5	mg/kg	<0.50	----
Cobalt	7440-48-4	E440	0.1	mg/kg	<0.10	----
Copper	7440-50-8	E440	0.5	mg/kg	<0.50	----
Iron	7439-89-6	E440	50	mg/kg	<50	----
Lead	7439-92-1	E440	0.5	mg/kg	<0.50	----
Lithium	7439-93-2	E440	2	mg/kg	<2.0	----
Magnesium	7439-95-4	E440	20	mg/kg	<20	----
Manganese	7439-96-5	E440	1	mg/kg	<1.0	----
Molybdenum	7439-98-7	E440	0.1	mg/kg	<0.10	----
Nickel	7440-02-0	E440	0.5	mg/kg	<0.50	----
Phosphorus	7723-14-0	E440	50	mg/kg	<50	----
Potassium	7440-09-7	E440	100	mg/kg	<100	----
Selenium	7782-49-2	E440	0.2	mg/kg	<0.20	----
Silver	7440-22-4	E440	0.1	mg/kg	<0.10	----
Sodium	7440-23-5	E440	50	mg/kg	<50	----



Sub-Matrix: Soil/Solid

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
<b>Metals (QCLot: 2303954) - continued</b>						
Strontium	7440-24-6	E440	0.5	mg/kg	<0.50	----
Sulfur	7704-34-9	E440	1000	mg/kg	<1000	----
Thallium	7440-28-0	E440	0.05	mg/kg	<0.050	----
Tin	7440-31-5	E440	2	mg/kg	<2.0	----
Titanium	7440-32-6	E440	1	mg/kg	<1.0	----
Tungsten	7440-33-7	E440	0.5	mg/kg	<0.50	----
Uranium	7440-61-1	E440	0.05	mg/kg	<0.050	----
Vanadium	7440-62-2	E440	0.2	mg/kg	<0.20	----
Zinc	7440-66-6	E440	2	mg/kg	<2.0	----
Zirconium	7440-67-7	E440	1	mg/kg	<1.0	----
<b>Metals (QCLot: 2306806)</b>						
Silver	7440-22-4	E440.Ag	0.1	mg/kg	<0.10	----
<b>Dioxins and Furans (QCLot: 2295081)</b>						
HpCDD, 1,2,3,4,6,7,8-	35822-46-9	XE766	1	pg/g	<1.0	[U],F,M
HpCDF, 1,2,3,4,6,7,8-	67562-39-4	XE766	2	pg/g	<2.0	[J],F,M
HpCDF, 1,2,3,4,7,8,9-	55673-89-7	XE766	1	pg/g	<1.0	[U]
HxCDD, 1,2,3,4,7,8-	39227-28-6	XE766	1	pg/g	<1.0	[U]
HxCDD, 1,2,3,6,7,8-	57653-85-7	XE766	1	pg/g	<1.0	[U]
HxCDD, 1,2,3,7,8,9-	19408-74-3	XE766	1	pg/g	<1.0	[U]
HxCDF, 1,2,3,4,7,8-	70648-26-9	XE766	1	pg/g	<1.0	[J],M
HxCDF, 1,2,3,6,7,8-	57117-44-9	XE766	1	pg/g	<1.0	[U]
HxCDF, 1,2,3,7,8,9-	72918-21-9	XE766	1	pg/g	<1.0	[U]
HxCDF, 2,3,4,6,7,8-	60851-34-5	XE766	1	pg/g	<1.0	[U]
OCDD	3268-87-9	XE766	2	pg/g	<2.0	[J],M
OCDF	39001-02-0	XE766	2	pg/g	<2.0	[J],F,M
PeCDD, 1,2,3,7,8-	40321-76-4	XE766	1	pg/g	<1.0	[U]
PeCDF, 1,2,3,7,8-	57117-41-6	XE766	1	pg/g	<1	[J],F,M
PeCDF, 2,3,4,7,8-	57117-31-4	XE766	1	pg/g	<1.0	[U]
TCDD, 2,3,7,8-	1746-01-6	XE766	1	pg/g	<1.0	[U]
TCDF, 2,3,7,8-	51207-31-9	XE766	1	pg/g	<1.0	[U]



## Laboratory Control Sample (LCS) Report

A Laboratory Control Sample (LCS) is an analyte-free matrix that has been fortified (spiked) with test analytes at known concentration and processed in an identical manner to test samples. LCS results are expressed as percent recovery, and are used to monitor and control test method accuracy and precision, independent of test sample matrix.

Sub-Matrix: Soil/Solid

					Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
Analyte	CAS Number	Method	LOR	Unit	Target Concentration	LCS	Low	High	Qualifier
<b>Physical Tests (QCLot: 2302286)</b>									
pH (1:2 soil:water)	---	E108	---	pH units	6 pH units	100	95.0	105	---
<b>Physical Tests (QCLot: 2303956)</b>									
pH (1:2 soil:water)	---	E108	---	pH units	6 pH units	100	95.0	105	---
<b>Physical Tests (QCLot: 2342421)</b>									
Moisture	---	E144	0.25	%	50 %	99.4	90.0	110	---
<b>Metals (QCLot: 2302284)</b>									
Mercury	7439-97-6	E510	0.005	mg/kg	0.1 mg/kg	95.6	80.0	120	---
<b>Metals (QCLot: 2302285)</b>									
Aluminum	7429-90-5	E440	50	mg/kg	200 mg/kg	105	80.0	120	---
Antimony	7440-36-0	E440	0.1	mg/kg	100 mg/kg	105	80.0	120	---
Arsenic	7440-38-2	E440	0.1	mg/kg	100 mg/kg	102	80.0	120	---
Barium	7440-39-3	E440	0.5	mg/kg	25 mg/kg	100	80.0	120	---
Beryllium	7440-41-7	E440	0.1	mg/kg	10 mg/kg	101	80.0	120	---
Bismuth	7440-69-9	E440	0.2	mg/kg	100 mg/kg	95.4	80.0	120	---
Boron	7440-42-8	E440	5	mg/kg	100 mg/kg	100	80.0	120	---
Cadmium	7440-43-9	E440	0.02	mg/kg	10 mg/kg	99.8	80.0	120	---
Calcium	7440-70-2	E440	50	mg/kg	5000 mg/kg	97.3	80.0	120	---
Chromium	7440-47-3	E440	0.5	mg/kg	25 mg/kg	100	80.0	120	---
Cobalt	7440-48-4	E440	0.1	mg/kg	25 mg/kg	97.9	80.0	120	---
Copper	7440-50-8	E440	0.5	mg/kg	25 mg/kg	99.5	80.0	120	---
Iron	7439-89-6	E440	50	mg/kg	100 mg/kg	103	80.0	120	---
Lead	7439-92-1	E440	0.5	mg/kg	50 mg/kg	99.1	80.0	120	---
Lithium	7439-93-2	E440	2	mg/kg	25 mg/kg	101	80.0	120	---
Magnesium	7439-95-4	E440	20	mg/kg	5000 mg/kg	106	80.0	120	---
Manganese	7439-96-5	E440	1	mg/kg	25 mg/kg	101	80.0	120	---
Molybdenum	7439-98-7	E440	0.1	mg/kg	25 mg/kg	101	80.0	120	---
Nickel	7440-02-0	E440	0.5	mg/kg	50 mg/kg	100	80.0	120	---
Phosphorus	7723-14-0	E440	50	mg/kg	1000 mg/kg	102	80.0	120	---
Potassium	7440-09-7	E440	100	mg/kg	5000 mg/kg	101	80.0	120	---
Selenium	7782-49-2	E440	0.2	mg/kg	100 mg/kg	101	80.0	120	---
Silver	7440-22-4	E440	0.1	mg/kg	10 mg/kg	92.3	80.0	120	---
Sodium	7440-23-5	E440	50	mg/kg	5000 mg/kg	101	80.0	120	---



Sub-Matrix: Soil/Solid

					Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
Analyte	CAS Number	Method	LOR	Unit	Target Concentration	LCS	Low	High	Qualifier
<b>Metals (QCLot: 2302285) - continued</b>									
Strontium	7440-24-6	E440	0.5	mg/kg	25 mg/kg	104	80.0	120	----
Sulfur	7704-34-9	E440	1000	mg/kg	5000 mg/kg	99.6	80.0	120	----
Thallium	7440-28-0	E440	0.05	mg/kg	100 mg/kg	99.2	80.0	120	----
Tin	7440-31-5	E440	2	mg/kg	50 mg/kg	101	80.0	120	----
Titanium	7440-32-6	E440	1	mg/kg	25 mg/kg	100	80.0	120	----
Tungsten	7440-33-7	E440	0.5	mg/kg	10 mg/kg	99.4	80.0	120	----
Uranium	7440-61-1	E440	0.05	mg/kg	0.5 mg/kg	102	80.0	120	----
Vanadium	7440-62-2	E440	0.2	mg/kg	50 mg/kg	102	80.0	120	----
Zinc	7440-66-6	E440	2	mg/kg	50 mg/kg	97.1	80.0	120	----
Zirconium	7440-67-7	E440	1	mg/kg	10 mg/kg	104	80.0	120	----
<b>Metals (QCLot: 2303953)</b>									
Mercury	7439-97-6	E510	0.005	mg/kg	0.1 mg/kg	94.6	80.0	120	----
<b>Metals (QCLot: 2303954)</b>									
Aluminum	7429-90-5	E440	50	mg/kg	200 mg/kg	105	80.0	120	----
Antimony	7440-36-0	E440	0.1	mg/kg	100 mg/kg	107	80.0	120	----
Arsenic	7440-38-2	E440	0.1	mg/kg	100 mg/kg	106	80.0	120	----
Barium	7440-39-3	E440	0.5	mg/kg	25 mg/kg	111	80.0	120	----
Beryllium	7440-41-7	E440	0.1	mg/kg	10 mg/kg	104	80.0	120	----
Bismuth	7440-69-9	E440	0.2	mg/kg	100 mg/kg	96.5	80.0	120	----
Boron	7440-42-8	E440	5	mg/kg	100 mg/kg	103	80.0	120	----
Cadmium	7440-43-9	E440	0.02	mg/kg	10 mg/kg	105	80.0	120	----
Calcium	7440-70-2	E440	50	mg/kg	5000 mg/kg	103	80.0	120	----
Chromium	7440-47-3	E440	0.5	mg/kg	25 mg/kg	105	80.0	120	----
Cobalt	7440-48-4	E440	0.1	mg/kg	25 mg/kg	104	80.0	120	----
Copper	7440-50-8	E440	0.5	mg/kg	25 mg/kg	103	80.0	120	----
Iron	7439-89-6	E440	50	mg/kg	100 mg/kg	107	80.0	120	----
Lead	7439-92-1	E440	0.5	mg/kg	50 mg/kg	102	80.0	120	----
Lithium	7439-93-2	E440	2	mg/kg	25 mg/kg	99.4	80.0	120	----
Magnesium	7439-95-4	E440	20	mg/kg	5000 mg/kg	107	80.0	120	----
Manganese	7439-96-5	E440	1	mg/kg	25 mg/kg	104	80.0	120	----
Molybdenum	7439-98-7	E440	0.1	mg/kg	25 mg/kg	104	80.0	120	----
Nickel	7440-02-0	E440	0.5	mg/kg	50 mg/kg	104	80.0	120	----
Phosphorus	7723-14-0	E440	50	mg/kg	1000 mg/kg	106	80.0	120	----
Potassium	7440-09-7	E440	100	mg/kg	5000 mg/kg	105	80.0	120	----
Selenium	7782-49-2	E440	0.2	mg/kg	100 mg/kg	105	80.0	120	----
Silver	7440-22-4	E440	0.1	mg/kg	10 mg/kg	98.5	80.0	120	----



Sub-Matrix: Soil/Solid

					Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
Analyte	CAS Number	Method	LOR	Unit	Target Concentration	LCS	Low	High	Qualifier
<b>Metals (QCLot: 2303954) - continued</b>									
Sodium	7440-23-5	E440	50	mg/kg	5000 mg/kg	105	80.0	120	----
Strontium	7440-24-6	E440	0.5	mg/kg	25 mg/kg	106	80.0	120	----
Sulfur	7704-34-9	E440	1000	mg/kg	5000 mg/kg	96.3	80.0	120	----
Thallium	7440-28-0	E440	0.05	mg/kg	100 mg/kg	99.6	80.0	120	----
Tin	7440-31-5	E440	2	mg/kg	50 mg/kg	103	80.0	120	----
Titanium	7440-32-6	E440	1	mg/kg	25 mg/kg	101	80.0	120	----
Tungsten	7440-33-7	E440	0.5	mg/kg	10 mg/kg	100	80.0	120	----
Uranium	7440-61-1	E440	0.05	mg/kg	0.5 mg/kg	103	80.0	120	----
Vanadium	7440-62-2	E440	0.2	mg/kg	50 mg/kg	106	80.0	120	----
Zinc	7440-66-6	E440	2	mg/kg	50 mg/kg	105	80.0	120	----
Zirconium	7440-67-7	E440	1	mg/kg	10 mg/kg	104	80.0	120	----
<b>Metals (QCLot: 2306806)</b>									
Silver	7440-22-4	E440.Ag	0.1	mg/kg	10 mg/kg	94.5	80.0	120	----
<b>Dioxins and Furans (QCLot: 2295081)</b>									
HpCDD, 1,2,3,4,6,7,8-	35822-46-9	XE766	1	pg/g	50 pg/g	95.1	70.0	140	----
HpCDF, 1,2,3,4,6,7,8-	67562-39-4	XE766	2	pg/g	50 pg/g	105	82.0	122	----
HpCDF, 1,2,3,4,7,8,9-	55673-89-7	XE766	1	pg/g	50 pg/g	96.4	78.0	138	----
HxCDD, 1,2,3,4,7,8-	39227-28-6	XE766	1	pg/g	50 pg/g	93.3	70.0	164	----
HxCDD, 1,2,3,6,7,8-	57653-85-7	XE766	1	pg/g	50 pg/g	90.7	76.0	134	----
HxCDD, 1,2,3,7,8,9-	19408-74-3	XE766	1	pg/g	50 pg/g	98.9	64.0	162	----
HxCDF, 1,2,3,4,7,8-	70648-26-9	XE766	1	pg/g	50 pg/g	93.1	72.0	134	----
HxCDF, 1,2,3,6,7,8-	57117-44-9	XE766	1	pg/g	50 pg/g	96.7	84.0	130	----
HxCDF, 1,2,3,7,8,9-	72918-21-9	XE766	1	pg/g	50 pg/g	100	78.0	130	----
HxCDF, 2,3,4,6,7,8-	60851-34-5	XE766	1	pg/g	50 pg/g	96.0	70.0	156	----
OCDD	3268-87-9	XE766	2	pg/g	99.9 pg/g	87.0	78.0	144	----
OCDF	39001-02-0	XE766	2	pg/g	99.9 pg/g	97.0	63.0	170	----
PeCDD, 1,2,3,7,8-	40321-76-4	XE766	1	pg/g	50 pg/g	97.5	70.0	142	----
PeCDF, 1,2,3,7,8-	57117-41-6	XE766	1	pg/g	50 pg/g	98.4	80.0	134	----
PeCDF, 2,3,4,7,8-	57117-31-4	XE766	1	pg/g	50 pg/g	90.4	68.0	160	----
TCDD, 2,3,7,8-	1746-01-6	XE766	1	pg/g	9.99 pg/g	81.5	67.0	158	----
TCDF, 2,3,7,8-	51207-31-9	XE766	1	pg/g	9.99 pg/g	94.5	75.0	158	----



## Reference Material (RM) Report

A Reference Material (RM) is a homogenous material with known and well-established analyte concentrations. RMs are processed in an identical manner to test samples, and are used to monitor and control the accuracy and precision of a test method for a typical sample matrix. RM results are expressed as percent recovery of the target analyte concentration. RM targets may be certified target concentrations provided by the RM supplier, or may be ALS long-term mean values (for empirical test methods).

Sub-Matrix:

Laboratory sample ID	Reference Material ID	Analyte	CAS Number	Method	Reference Material (RM) Report				
					RM Target Concentration	Recovery (%) RM	Recovery Limits (%)		Qualifier
							Low	High	
<b>Metals (QCLot: 2302284)</b>									
QC-2302284-003	MRCA-21	Mercury	7439-97-6	E510	0.068 mg/kg	97.3	70.0	130	----
<b>Metals (QCLot: 2302285)</b>									
QC-2302285-003	MRCA-21	Aluminum	7429-90-5	E440	22500 mg/kg	111	70.0	130	----
QC-2302285-003	MRCA-21	Antimony	7440-36-0	E440	24.8 mg/kg	106	70.0	130	----
QC-2302285-003	MRCA-21	Arsenic	7440-38-2	E440	21.2 mg/kg	99.7	70.0	130	----
QC-2302285-003	MRCA-21	Barium	7440-39-3	E440	788 mg/kg	104	70.0	130	----
QC-2302285-003	MRCA-21	Beryllium	7440-41-7	E440	1.82 mg/kg	112	70.0	130	----
QC-2302285-003	MRCA-21	Bismuth	7440-69-9	E440	1.78 mg/kg	93.6	70.0	130	----
QC-2302285-003	MRCA-21	Cadmium	7440-43-9	E440	2.15 mg/kg	106	70.0	130	----
QC-2302285-003	MRCA-21	Calcium	7440-70-2	E440	4900 mg/kg	105	70.0	130	----
QC-2302285-003	MRCA-21	Chromium	7440-47-3	E440	56.9 mg/kg	103	70.0	130	----
QC-2302285-003	MRCA-21	Cobalt	7440-48-4	E440	32 mg/kg	103	70.0	130	----
QC-2302285-003	MRCA-21	Copper	7440-50-8	E440	969 mg/kg	104	70.0	130	----
QC-2302285-003	MRCA-21	Iron	7439-89-6	E440	32700 mg/kg	103	70.0	130	----
QC-2302285-003	MRCA-21	Lead	7439-92-1	E440	919 mg/kg	94.4	70.0	130	----
QC-2302285-003	MRCA-21	Lithium	7439-93-2	E440	47.3 mg/kg	112	70.0	130	----
QC-2302285-003	MRCA-21	Magnesium	7439-95-4	E440	7780 mg/kg	105	70.0	130	----
QC-2302285-003	MRCA-21	Manganese	7439-96-5	E440	8640 mg/kg	101	70.0	130	----
QC-2302285-003	MRCA-21	Molybdenum	7439-98-7	E440	25.1 mg/kg	102	70.0	130	----
QC-2302285-003	MRCA-21	Nickel	7440-02-0	E440	1000 mg/kg	104	70.0	130	----
QC-2302285-003	MRCA-21	Phosphorus	7723-14-0	E440	660 mg/kg	100	70.0	130	----
QC-2302285-003	MRCA-21	Potassium	7440-09-7	E440	10800 mg/kg	104	70.0	130	----
QC-2302285-003	MRCA-21	Selenium	7782-49-2	E440	1.04 mg/kg	110	60.0	140	----
QC-2302285-003	MRCA-21	Silver	7440-22-4	E440	8.98 mg/kg	98.2	70.0	130	----
QC-2302285-003	MRCA-21	Sodium	7440-23-5	E440	1770 mg/kg	124	70.0	130	----
QC-2302285-003	MRCA-21	Strontium	7440-24-6	E440	41 mg/kg	104	70.0	130	----
QC-2302285-003	MRCA-21	Sulfur	7704-34-9	E440	3940 mg/kg	94.9	50.0	150	----
QC-2302285-003	MRCA-21	Thallium	7440-28-0	E440	0.907 mg/kg	100	70.0	130	----
QC-2302285-003	MRCA-21	Tin	7440-31-5	E440	3.79 mg/kg	102	40.0	160	----
QC-2302285-003	MRCA-21	Titanium	7440-32-6	E440	2790 mg/kg	108	70.0	130	----
QC-2302285-003	MRCA-21	Tungsten	7440-33-7	E440	6.99 mg/kg	96.6	70.0	130	----
QC-2302285-003	MRCA-21	Uranium	7440-61-1	E440	3.97 mg/kg	99.8	70.0	130	----
QC-2302285-003	MRCA-21	Vanadium	7440-62-2	E440	66.2 mg/kg	105	70.0	130	----



Sub-Matrix:

Laboratory sample ID	Reference Material ID	Analyte	CAS Number	Method	Reference Material (RM) Report				
					RM Target Concentration	Recovery (%) RM	Recovery Limits (%)		Qualifier
							Low	High	
<b>Metals (QCLot: 2302285) - continued</b>									
QC-2302285-003	MRCA-21	Zinc	7440-66-6	E440	828 mg/kg	101	70.0	130	----
QC-2302285-003	MRCA-21	Zirconium	7440-67-7	E440	6.91 mg/kg	109	70.0	130	----
<b>Metals (QCLot: 2303953)</b>									
QC-2303953-003	MRCA-21	Mercury	7439-97-6	E510	0.068 mg/kg	92.5	70.0	130	----
<b>Metals (QCLot: 2303954)</b>									
QC-2303954-003	MRCA-21	Aluminum	7429-90-5	E440	22500 mg/kg	101	70.0	130	----
QC-2303954-003	MRCA-21	Antimony	7440-36-0	E440	24.8 mg/kg	98.6	70.0	130	----
QC-2303954-003	MRCA-21	Arsenic	7440-38-2	E440	21.2 mg/kg	96.1	70.0	130	----
QC-2303954-003	MRCA-21	Barium	7440-39-3	E440	788 mg/kg	99.5	70.0	130	----
QC-2303954-003	MRCA-21	Beryllium	7440-41-7	E440	1.82 mg/kg	103	70.0	130	----
QC-2303954-003	MRCA-21	Bismuth	7440-69-9	E440	1.78 mg/kg	83.9	70.0	130	----
QC-2303954-003	MRCA-21	Cadmium	7440-43-9	E440	2.15 mg/kg	95.7	70.0	130	----
QC-2303954-003	MRCA-21	Calcium	7440-70-2	E440	4900 mg/kg	104	70.0	130	----
QC-2303954-003	MRCA-21	Chromium	7440-47-3	E440	56.9 mg/kg	100	70.0	130	----
QC-2303954-003	MRCA-21	Cobalt	7440-48-4	E440	32 mg/kg	97.8	70.0	130	----
QC-2303954-003	MRCA-21	Copper	7440-50-8	E440	969 mg/kg	97.6	70.0	130	----
QC-2303954-003	MRCA-21	Iron	7439-89-6	E440	32700 mg/kg	100	70.0	130	----
QC-2303954-003	MRCA-21	Lead	7439-92-1	E440	919 mg/kg	91.9	70.0	130	----
QC-2303954-003	MRCA-21	Lithium	7439-93-2	E440	47.3 mg/kg	100	70.0	130	----
QC-2303954-003	MRCA-21	Magnesium	7439-95-4	E440	7780 mg/kg	101	70.0	130	----
QC-2303954-003	MRCA-21	Manganese	7439-96-5	E440	8640 mg/kg	96.0	70.0	130	----
QC-2303954-003	MRCA-21	Molybdenum	7439-98-7	E440	25.1 mg/kg	95.2	70.0	130	----
QC-2303954-003	MRCA-21	Nickel	7440-02-0	E440	1000 mg/kg	97.9	70.0	130	----
QC-2303954-003	MRCA-21	Phosphorus	7723-14-0	E440	660 mg/kg	97.1	70.0	130	----
QC-2303954-003	MRCA-21	Potassium	7440-09-7	E440	10800 mg/kg	99.9	70.0	130	----
QC-2303954-003	MRCA-21	Selenium	7782-49-2	E440	1.04 mg/kg	104	60.0	140	----
QC-2303954-003	MRCA-21	Silver	7440-22-4	E440	8.98 mg/kg	96.3	70.0	130	----
QC-2303954-003	MRCA-21	Sodium	7440-23-5	E440	1770 mg/kg	108	70.0	130	----
QC-2303954-003	MRCA-21	Strontium	7440-24-6	E440	41 mg/kg	99.5	70.0	130	----
QC-2303954-003	MRCA-21	Sulfur	7704-34-9	E440	3940 mg/kg	65.6	50.0	150	----
QC-2303954-003	MRCA-21	Thallium	7440-28-0	E440	0.907 mg/kg	94.5	70.0	130	----
QC-2303954-003	MRCA-21	Tin	7440-31-5	E440	3.79 mg/kg	94.8	40.0	160	----
QC-2303954-003	MRCA-21	Titanium	7440-32-6	E440	2790 mg/kg	99.8	70.0	130	----
QC-2303954-003	MRCA-21	Tungsten	7440-33-7	E440	6.99 mg/kg	98.0	70.0	130	----
QC-2303954-003	MRCA-21	Uranium	7440-61-1	E440	3.97 mg/kg	103	70.0	130	----
QC-2303954-003	MRCA-21	Vanadium	7440-62-2	E440	66.2 mg/kg	97.9	70.0	130	----
QC-2303954-003	MRCA-21	Zinc	7440-66-6	E440	828 mg/kg	97.2	70.0	130	----



Sub-Matrix:

Laboratory sample ID	Reference Material ID	Analyte	CAS Number	Method	Reference Material (RM) Report				
					RM Target Concentration	Recovery (%) RM	Recovery Limits (%)		Qualifier
							Low	High	
<b>Metals (QCLot: 2303954) - continued</b>									
QC-2303954-003	MRCA-21	Zirconium	7440-67-7	E440	6.91 mg/kg	109	70.0	130	----
<b>Metals (QCLot: 2306806)</b>									
QC-2306806-003	MRCA-21	Silver	7440-22-4	E440.Ag	8.98 mg/kg	98.4	70.0	130	----



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Canada Toll Free: 1 800 668 9878

COC Number: 23 - 1162265

Page 1 of 3

Environmental Division
Vancouver
Work Order Reference
VA25C8048



Telephone: +1 604 253 4188

Report To: HDR, Contact: Johanna Mason, Phone: 604-202-4559, Street: 601 W Hastings St Suite 1500, City/Province: Vancouver BC, Postal Code: V6B1M8. Reports / Recipients: Select Report Format: EXCEL, Merge QC/QCI Reports with COA: YES, Compare Results to Criteria on Report: provide details below if box checked, Select Distribution: EMAIL. Turnaround Time (TAT) Requested: Routine [R] if received by 3pm M-F - no surcharges apply. Analysis Required: Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below. Project Information: Oil and Gas Required Fields (client use). ALS Client Code / QUOTE #: HDR100, Job / Project #: VA25HDR100-001. ALS Lab Work Order #: (ALS use only). Sample Table with columns: ALS Sample #, Sample Identification and/or Coordinates, Date, Time, Sample Type, NUMBER OF CONTAINERS, Metals, Mercury, Pioninst Fuans, SAMPLES ON HOLD, EXTENDED STORAGE REQUIRED, SUSPECTED HAZARD. Drinking Water (DW) Samples: (client use). Notes / Specify Limits for result evaluation by selecting from drop-down below (Excel COC only). SHIPMENT RELEASE (client use) and INITIAL / FINAL SHIPMENT RECEPTION (ALS use only).

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy

1. If any water samples are taken from a Regulated Drinking Water (DW) System, please submit using an Authorized DW COC form.

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Coc pages 1-3
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COC Number: 23 - 1162264

Page 2 of 3

<b>Report To</b> Contact and company name below will appear on the final report		<b>Reports / Recipients</b>			<b>Turnaround Time (TAT) Requested</b>			<b>AFFIX ALS BARCODE LABEL HERE (ALS use only)</b>											
Company: HDR Contact: Johanna Mason Phone: 604-202-4559 Company address below will appear on the final report Street: 601 W Hastings St Suite 1500 City/Province: Vancouver BC Postal Code: V6B1M8		Select Report Format: <input type="checkbox"/> PDF <input checked="" type="checkbox"/> EXCEL <input type="checkbox"/> EDD (DIGITAL) Merge QC/QCI Reports with COA <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO <input type="checkbox"/> N/A <input type="checkbox"/> Compare Results to Criteria on Report - provide details below if box checked Select Distribution: <input checked="" type="checkbox"/> EMAIL <input type="checkbox"/> MAIL <input type="checkbox"/> FAX Email 1 or Fax: johanna.mason@hdrinc.com Email 2: Email 3:			<input checked="" type="checkbox"/> Routine [R] if received by 3pm M-F - no surcharges apply <input type="checkbox"/> 4 day [P4] if received by 3pm M-F - 20% rush surcharge minimum <input type="checkbox"/> 3 day [P3] if received by 3pm M-F - 25% rush surcharge minimum <input type="checkbox"/> 2 day [P2] if received by 3pm M-F - 50% rush surcharge minimum <input type="checkbox"/> 1 day [E] if received by 3pm M-F - 100% rush surcharge minimum <input type="checkbox"/> Same day [E2] if received by 10am M-S - 200% rush surcharge. Additional fees may apply to rush requests on weekends, statutory holidays and for non-routine tests.														
Invoice To: Same as Report To <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO Copy of Invoice with Report <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO		<b>Invoice Recipients</b> Select Invoice Distribution: <input type="checkbox"/> EMAIL <input type="checkbox"/> MAIL <input type="checkbox"/> FAX Email 1 or Fax: johanna.mason@hdrinc.com Email 2:			<b>Date and Time Required for all E&amp;P TATs:</b> dd-mm-yy hh:mm am/pm			For all tests with rush TATs requested, please contact your AM to confirm availability.											
<b>Project Information</b> ALS Client Code / QUOTE #: HDR100 Job / Project #: VARS HDR 100-001 PO / AFE: LSD: ALS Lab Work Order # (ALS use only):		<b>Oil and Gas Required Fields (client use)</b> AFE/Cost Center: PO# Major/Minor Code: Routing Code: Requisitioner: Location: ALS Contact: Sampler:			<b>Analysis Request</b> Indicate Filtered (F), Preserved (P) or Filtered and Preserved (FP) below			<b>SAMPLES ON HOLD</b> <b>EXTENDED STORAGE REQUIRED</b> <b>SUSPECTED HAZARD (see notes)</b>											
ALS Sample # (ALS use only)		Sample Identification and/or Coordinates (This description will appear on the report)		Date (dd-mm-yy)	Time (hh:mm)	Sample Type	<b>NUMBER OF CONTAINERS</b> Metals Mercury Dioxin/Furans												
		HS-11		21-10-25	11:25am	Soil	2												
		HS-12A		21-10-25	1:50pm	soil	2												
		HS-12B		21-10-25	1:50pm	soil	2												
		HS-13A		21-10-25	2:07pm	soil	2												
		HS-13B		21-10-25	2:07pm	soil	2												
		HS-14A		21-10-25	2:35pm	soil	2												
		HS-14B		21-10-25	2:35pm	soil	2												
		HS-15A		21-10-25	2:20pm	soil	2												
		HS-15B		21-10-25	2:20pm	soil	2												
		HS-16		21-10-25	2:25pm	soil	2												
		HS-17		21-10-25	7:01am	soil	2												
		HS-18		21-10-25	7:24am	soil	2												
<b>Drinking Water (DW) Samples (client use)</b>		<b>Notes / Specify Limits for result evaluation by selecting from drop-down below (Excel COC only)</b>			<b>SAMPLE RECEIPT DETAILS (ALS use only)</b>														
Are samples taken from a Regulated DW System? <input type="checkbox"/> YES <input type="checkbox"/> NO					Cooling Method: <input type="checkbox"/> NONE <input type="checkbox"/> ICE <input type="checkbox"/> ICE PACKS <input type="checkbox"/> FROZEN <input type="checkbox"/> COOLING INITIATED														
Are samples for human consumption/ use? <input type="checkbox"/> YES <input type="checkbox"/> NO					Cooler Custody Seals Intact: <input type="checkbox"/> YES <input type="checkbox"/> N/A Sample Custody Seals Intact: <input type="checkbox"/> YES <input type="checkbox"/> N/A														
					INITIAL COOLER TEMPERATURES °C			FINAL COOLER TEMPERATURES °C											
<b>SHIPMENT RELEASE (client use)</b>		<b>INITIAL SHIPMENT RECEPTION (ALS use only)</b>			<b>FINAL SHIPMENT RECEPTION (ALS use only)</b>														
Released by: Date: Time:		Received by: Date: Time:			Received by: Date: Time:														

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

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1. If any water samples are taken from a Regulated Drinking Water (DW) System, please submit using an Authorized DW COC form.



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COC Number: 23 - 1162262

Page 3 of 3

<b>Report To</b> Contact and company name below will appear on the final report		<b>Reports / Recipients</b>			<b>Turnaround Time (TAT) Requested</b>			<b>AFFIX ALS BARCODE LABEL HERE (ALS use only)</b>		
Company: <b>HDR</b>		Select Report Format: <input type="checkbox"/> PDF <input checked="" type="checkbox"/> EXCEL <input type="checkbox"/> EDD (DIGITAL)			<input checked="" type="checkbox"/> Routine [R] if received by 3pm M-F - no surcharges apply <input type="checkbox"/> 4 day [P4] if received by 3pm M-F - 20% rush surcharge minimum <input type="checkbox"/> 3 day [P3] if received by 3pm M-F - 25% rush surcharge minimum <input type="checkbox"/> 2 day [P2] if received by 3pm M-F - 50% rush surcharge minimum <input type="checkbox"/> 1 day [E] if received by 3pm M-F - 100% rush surcharge minimum <input type="checkbox"/> Same day [E2] if received by 10am M-S - 200% rush surcharge.					
Contact: <b>Johanna Mason</b>		Merge QC/QCI Reports with COA <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO <input type="checkbox"/> N/A								
Phone: <b>604-202-4559</b>		<input type="checkbox"/> Compare Results to Criteria on Report - provide details below if box checked			Additional fees may apply to rush requests on weekends, statutory holidays and for non-routine tests.					
Street: <b>601 W Massey St Suite 1500</b>		Select Distribution: <input checked="" type="checkbox"/> EMAIL <input type="checkbox"/> MAIL <input type="checkbox"/> FAX			Date and Time Required for all E&P TATs:			dd-mmm-yy hh:mm am/pm		
City/Province: <b>Vancouver BC</b>		Email 1 or Fax: <b>johanna.mason@hdrinc.com</b>			For all tests with rush TATs requested, please contact your AM to confirm availability.			<b>Analysis Request</b>		
Postal Code: <b>V6B 1M8</b>		Email 2			Indicate Filtered (F), Preserved (P) or Filtered and Preserved (FP) below			<b>NUMBER OF CONTAINERS</b> Metals Mercury Dioxin/Furan		
Invoice To: Same as Report To <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO		Invoice Recipients			SAMPLES ON HOLD					
Copy of Invoice with Report <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO		Select Invoice Distribution: <input type="checkbox"/> EMAIL <input type="checkbox"/> MAIL <input type="checkbox"/> FAX			SUSPECTED HAZARD (see notes)					
Company:		Email 1 or Fax: <b>johanna.mason@hdrinc.com</b>								
Contact:		Email 2								
<b>Project Information</b>		<b>Oil and Gas Required Fields (client use)</b>								
ALS Client Code / QUOTE #: <b>HDR 100</b>		AFE/Cost Center: _____ PO#: _____								
Job / Project #: <b>VA25 HDR 100-001</b>		Major/Minor Code: _____ Routing Code: _____								
PO / AFE: _____		Requisitioner: _____								
LSD: _____		Location: _____								
ALS Lab Work Order # (ALS use only): _____		ALS Contact: _____			Sampler: _____					
ALS Sample # (ALS use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type						
	HS-19	21-10-25	9:21am	SOIL	2	✓				
	HS-20	21-10-25	9:35am	SOIL	2	✓				
	HS-21A	21-10-25	10:09am	SOIL	2	✓				
	HS-21B	21-10-25	10:09am	SOIL	2	✓				
	HS-22	21-10-25	10:14am	SOIL	2	✓				
	HS-23	21-10-25	12:20pm	SOIL	2	✓				
	HS-24	21-10-25	12:32pm	SOIL	2	✓				
	HS-25	21-10-25	12:39pm	SOIL	2	✓				
	HS-26	21-10-25	12:47pm	SOIL	2	✓				
	ROOF sample JM	21-10-25	2:00pm	SOIL	1	✓				
		21-10-25		SOIL						
		21-10-25		SOIL						
<b>Drinking Water (DW) Samples<sup>1</sup> (client use)</b>		<b>Notes / Specify Limits for result evaluation by selecting from drop-down below (Excel COC only)</b>			<b>SAMPLE RECEIPT DETAILS (ALS use only)</b>					
Are samples taken from a Regulated DW System? <input type="checkbox"/> YES <input type="checkbox"/> NO					Cooling Method: <input type="checkbox"/> NONE <input type="checkbox"/> ICE <input type="checkbox"/> ICE PACKS <input type="checkbox"/> FROZEN <input type="checkbox"/> COOLING INITIATED					
Are samples for human consumption/ use? <input type="checkbox"/> YES <input type="checkbox"/> NO					Cooler Custody Seals Intact: <input type="checkbox"/> YES <input type="checkbox"/> N/A Sample Custody Seals Intact: <input type="checkbox"/> YES <input type="checkbox"/> N/A					
					INITIAL COOLER TEMPERATURES °C			FINAL COOLER TEMPERATURES °C		
<b>SHIPMENT RELEASE (client use)</b>		<b>INITIAL SHIPMENT RECEPTION (ALS use only)</b>			<b>FINAL SHIPMENT RECEPTION (ALS use only)</b>					
Released by:	Date:	Time:	Received by:	Date:	Time:	Received by:	Date:	Time:		

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

JAN 2023 1-COCT

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

1. If any water samples are taken from a Regulated Drinking Water (DW) System, please submit using an Authorized DW COC form.



**CERTIFICATE OF ANALYSIS**

<b>Work Order</b>	: <b>VA25C8186</b>	<b>Laboratory</b>	: ALS Environmental - Vancouver
<b>Amendment</b>	: <b>1</b>	<b>Account Manager</b>	: Le Van Dalfsen
<b>Client</b>	: <b>HDR Corporation</b>	<b>Address</b>	: 8081 Lougheed Highway Burnaby BC Canada V5A 1W9
<b>Contact</b>	: Johanna Mason	<b>E-mail</b>	: Le.VanDalfsen@ALSGlobal.com
<b>Address</b>	: 500-1500 W. Georgia Street Vancouver British Columbia Canada V6G 2Z6	<b>Telephone</b>	: +1 604 253 4188
<b>Telephone</b>	: ----	<b>Date Samples Received</b>	: 22-Oct-2025 14:10
<b>Project</b>	: VA25HDR100-001	<b>Date Analysis Commenced</b>	: 28-Oct-2025
<b>PO</b>	: ----	<b>Issue Date</b>	: 05-Dec-2025 10:08
<b>C-O-C number</b>	: 23-1162263/1162261		
<b>Sampler</b>	: ----		
<b>Site</b>	: ----		
<b>Quote number</b>	: VA25-HDRI100-001		
<b>No. of samples received</b>	: 16		
<b>No. of samples analysed</b>	: 16		

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, QC Interpretive report to assist with Quality Review and Sample Receipt Notification (SRN).

**Signatories**

This document has been electronically signed by the authorized signatories below. Electronic signing is conducted in accordance with US FDA 21 CFR Part 11.

<i>Signatories</i>	<i>Position</i>	<i>Laboratory Department</i>
Colin Jamieson	Analyst	Organics, Burlington, Ontario
Hyunduck Suk	Analyst- General	Organics, Burnaby, British Columbia
Kevin Duarte	Supervisor - Metals ICP Instrumentation	Metals, Burnaby, British Columbia
Kim Jensen	Department Manager - Metals	Metals, Burnaby, British Columbia
Mark McHugh	Organic Prep Lab Supervisor	Organics, Burlington, Ontario
Ophelia Chiu	Department Manager - Organics	Organics, Burnaby, British Columbia
Robin Weeks	Supervisor - Organics Extractions	Organics, Burnaby, British Columbia
Sabrina Jin	Analyst	Organics, Burlington, Ontario
Savannah Somers	Analyst	Organics, Burlington, Ontario
Twinkle Patel	Analyst	Organics, Burlington, Ontario



## General Comments

The analytical methods used by ALS are developed using internationally recognized reference methods (where available), such as those published by US EPA, APHA Standard Methods, ASTM, ISO, Environment Canada, BC MOE, and Ontario MOE. Refer to the ALS Quality Control Interpretive report (QCI) for applicable references and methodology summaries. Reference methods may incorporate modifications to improve performance.

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.

Please refer to Quality Control Interpretive report (QCI) for information regarding Holding Time compliance.

Key: CAS Number: Chemical Abstracts Services number is a unique identifier assigned to discrete substances.  
LOR: Limit of Reporting (detection limit).

<i>Unit</i>	<i>Description</i>
-	no units
%	percent
g	grams
mg/kg	milligrams per kilogram
pg/g	picograms/gram
pg/g wwt	picograms per gram wet weight
pH units	pH units

<: less than.

>: greater than.

Surrogate: An analyte that is similar in behavior to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.

Test results reported relate only to the samples as received by the laboratory.

UNLESS OTHERWISE STATED on SRN or QCI Report, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

## Workorder Comments

**HS-36 sample containers not received at laboratory, but requested on Chain of Custody / analytical request form; subsample cannot be obtained from other containers to meet request. The requested analysis cannot be performed.**

For PCDD/F analysis: The recoveries of 13C12-OCDD were below the method control limit. Target analytes results, calculated via isotope dilutions are not expected to be biased. The relative percent difference between the duplicate and its parent sample are above the method control limit for a few targets.



## Qualifiers

<u>Qualifier</u>	<u>Description</u>
[J]	Estimated value. The reported concentration is below the calibrated range of the instrument but above the EDL.
[U]	The analyte was not detected above the EDL (or LOR where applicable).
EMPC	Estimated Maximum Possible Concentration. The EDL (or LOR where applicable) for the analyte was raised to the level of the EMPC.
F	The ion abundance ratio(s) did not meet the acceptance criteria. Estimated Detection Limit for that compound has been elevated to the level of the EMPC.
M	Peak has been manually integrated.
P	Chlorodiphenyl interference was present at the retention time of the target analyte. EDL has been raised to the level of the EMPC value.
RRR	Refer to report comments for issues regarding this analysis.



**Analytical Results**

Sub-Matrix: Soil  
 (Matrix: Soil/Solid)

					Client sample ID	HS-27A	HS-27B	HS-28A	HS-28B	HS-29A
					Client sampling date / time	----	----	----	----	----
Analyte	CAS Number	Method/Lab	LOR	Unit	22-Oct-2025 13:12	22-Oct-2025 13:12	22-Oct-2025 11:53	22-Oct-2025 11:53	22-Oct-2025 10:26	
					VA25C8186-001	VA25C8186-002	VA25C8186-003	VA25C8186-004	VA25C8186-005	
					Result	Result	Result	Result	Result	
<b>Sample Preparation</b>										
Weight, extraction (wet)	----	EP800/BU	0.0001	g	20.0134	----	20.0159	----	20.0253	
<b>Physical Tests</b>										
Moisture	----	E144/VA	0.25	%	30.3	----	19.2	----	50.8	
pH (1:2 soil:water)	----	E108/VA	0.10	pH units	6.52	7.33	7.61	7.43	4.98	
<b>Metals</b>										
Aluminum	7429-90-5	E440/VA	50	mg/kg	14200	14600	14100	10900	11300	
Antimony	7440-36-0	E440/VA	0.10	mg/kg	3.29	3.71	8.62	2.10	1.37	
Arsenic	7440-38-2	E440/VA	0.10	mg/kg	6.74	5.65	48.1	7.17	3.67	
Barium	7440-39-3	E440/VA	0.50	mg/kg	128	117	191	182	197	
Beryllium	7440-41-7	E440/VA	0.10	mg/kg	0.21	0.21	0.19	0.16	0.15	
Bismuth	7440-69-9	E440/VA	0.20	mg/kg	0.29	0.72	1.04	2.22	0.57	
Boron	7440-42-8	E440/VA	5.0	mg/kg	6.7	23.6	19.0	15.1	<5.0	
Cadmium	7440-43-9	E440/VA	0.020	mg/kg	0.779	0.567	1.50	0.189	0.314	
Calcium	7440-70-2	E440/VA	50	mg/kg	7600	16800	12300	14600	7090	
Chromium	7440-47-3	E440/VA	0.50	mg/kg	36.1	42.0	101	36.7	141	
Cobalt	7440-48-4	E440/VA	0.10	mg/kg	8.63	9.24	8.48	9.04	6.67	
Copper	7440-50-8	E440/VA	0.50	mg/kg	66.1	99.3	283	51.3	59.9	
Iron	7439-89-6	E440/VA	50	mg/kg	21800	22400	30400	28500	25600	
Lead	7439-92-1	E440/VA	0.50	mg/kg	131	45.7	230	12.5	39.7	
Lithium	7439-93-2	E440/VA	2.0	mg/kg	9.3	8.5	6.7	5.9	5.3	
Magnesium	7439-95-4	E440/VA	20	mg/kg	5700	7360	5420	5800	3210	



### Analytical Results

Sub-Matrix: Soil  
 (Matrix: Soil/Solid)

					Client sample ID	HS-27A	HS-27B	HS-28A	HS-28B	HS-29A
					Client sampling date / time	----	----	----	----	----
Analyte	CAS Number	Method/Lab	LOR	Unit	22-Oct-2025 13:12	22-Oct-2025 13:12	22-Oct-2025 11:53	22-Oct-2025 11:53	22-Oct-2025 10:26	
					VA25C8186-001	VA25C8186-002	VA25C8186-003	VA25C8186-004	VA25C8186-005	
					Result	Result	Result	Result	Result	
<b>Metals</b>										
Manganese	7439-96-5	E440/VA	1.0	mg/kg	669	429	722	409	521	
Mercury	7439-97-6	E510/VA	0.0500	mg/kg	0.0871	0.0614	0.0874	0.0906	0.0700	
Molybdenum	7439-98-7	E440/VA	0.10	mg/kg	6.64	3.43	7.37	4.05	17.0	
Nickel	7440-02-0	E440/VA	0.50	mg/kg	23.0	23.1	43.9	21.3	104	
Phosphorus	7723-14-0	E440/VA	50	mg/kg	983	1040	1450	454	711	
Potassium	7440-09-7	E440/VA	100	mg/kg	1320	1050	1110	610	410	
Selenium	7782-49-2	E440/VA	0.20	mg/kg	<0.20	0.25	<0.20	<0.20	0.23	
Silver	7440-22-4	E440/VA	0.10	mg/kg	0.19	0.15	0.95	<0.10	<0.10	
Sodium	7440-23-5	E440/VA	50	mg/kg	416	549	1420	512	152	
Strontium	7440-24-6	E440/VA	0.50	mg/kg	50.5	63.5	70.9	64.1	49.9	
Sulfur	7704-34-9	E440/VA	1000	mg/kg	<1000	1200	<1000	<1000	<1000	
Thallium	7440-28-0	E440/VA	0.050	mg/kg	0.061	<0.050	<0.050	<0.050	0.051	
Tin	7440-31-5	E440/VA	2.0	mg/kg	4.6	5.6	13.4	3.0	4.7	
Titanium	7440-32-6	E440/VA	1.0	mg/kg	677	901	901	888	442	
Tungsten	7440-33-7	E440/VA	0.50	mg/kg	0.72	0.62	1.79	0.71	0.85	
Uranium	7440-61-1	E440/VA	0.050	mg/kg	0.564	0.453	0.475	0.327	0.335	
Vanadium	7440-62-2	E440/VA	0.20	mg/kg	50.4	50.4	50.3	47.3	33.2	
Zinc	7440-66-6	E440/VA	2.0	mg/kg	231	307	637	176	1950	
Zirconium	7440-67-7	E440/VA	1.0	mg/kg	1.6	2.4	1.6	2.2	2.4	
<b>Dioxins and Furans</b>										
TCDD, 2,3,7,8-	1746-01-6	XE766/BU	1	pg/g	1.13 <sup>M</sup>	----	<0.31 <sup>[U], F</sup>	----	<0.95 <sup>[U], F</sup>	



### Analytical Results

Sub-Matrix: Soil  
 (Matrix: Soil/Solid)

					Client sample ID	HS-27A	HS-27B	HS-28A	HS-28B	HS-29A
					Client sampling date / time	22-Oct-2025 13:12	22-Oct-2025 13:12	22-Oct-2025 11:53	22-Oct-2025 11:53	22-Oct-2025 10:26
Analyte	CAS Number	Method/Lab	LOR	Unit	VA25C8186-001	VA25C8186-002	VA25C8186-003	VA25C8186-004	VA25C8186-005	
					Result	Result	Result	Result	Result	
<b>Dioxins and Furans</b>										
PeCDD, 1,2,3,7,8-	40321-76-4	XE766/BU	1	pg/g	12.0 <sup>M</sup>	----	2.36 <sup>M</sup>	----	9.06 <sup>M</sup>	
HxCDD, 1,2,3,4,7,8-	39227-28-6	XE766/BU	1	pg/g	21.3	----	4.02	----	12.7	
HxCDD, 1,2,3,6,7,8-	57653-85-7	XE766/BU	1	pg/g	101	----	49.5	----	39.5	
HxCDD, 1,2,3,7,8,9-	19408-74-3	XE766/BU	1	pg/g	41.4	----	16.5	----	29.3	
HpCDD, 1,2,3,4,6,7,8-	35822-46-9	XE766/BU	1	pg/g	1670	----	837	----	614	
OCDD	3268-87-9	XE766/BU	2	pg/g	9540	----	4310	----	3980	
Tetrachlorodibenzo-p-dioxins [TCDD], total	41903-57-5	XE766/BU	1	pg/g	30.9	----	4.24	----	24.1	
TCDD, total, # homologues detected	----	XE766/BU	0	-	11	----	5	----	8	
Pentachlorodibenzo-p-dioxins [PeCDD], total	----	XE766/BU	1	pg/g	81.6	----	18.7	----	80.4	
PeCDD, total, # homologues detected	----	XE766/BU	0	-	9	----	5	----	10	
Hexachlorodibenzo-p-dioxins [HxCDD], total	34465-46-8	XE766/BU	1	pg/g	625	----	432	----	366	
HxCDD, total, # homologues detected	----	XE766/BU	0	-	8	----	9	----	9	
Heptachlorodibenzo-p-dioxins [HpCDD], total	37871-00-4	XE766/BU	1	pg/g	2690	----	1800	----	1080	
HpCDD, total, # homologues detected	----	XE766/BU	0	-	2	----	2	----	2	
TCDF, 2,3,7,8-	51207-31-9	XE766/BU	1	pg/g	3.89	----	1.31	----	<1.5 <sup>F</sup>	
PeCDF, 1,2,3,7,8-	57117-41-6	XE766/BU	1	pg/g	<14 <sup>[U], M, EMPC</sup>	----	<17 <sup>[U], M, EMPC</sup>	----	<5 <sup>[U], M, EMPC</sup>	
PeCDF, 2,3,4,7,8-	57117-31-4	XE766/BU	1	pg/g	12.0 <sup>M</sup>	----	3.05	----	3.78	
HxCDF, 1,2,3,4,7,8-	70648-26-9	XE766/BU	1	pg/g	12.6	----	10.3 <sup>M</sup>	----	7.36	
HxCDF, 1,2,3,6,7,8-	57117-44-9	XE766/BU	1	pg/g	17.6	----	7.30	----	10.4	
HxCDF, 1,2,3,7,8,9-	72918-21-9	XE766/BU	1	pg/g	3.52 <sup>M</sup>	----	2.23 <sup>M</sup>	----	1.27	
HxCDF, 2,3,4,6,7,8-	60851-34-5	XE766/BU	1	pg/g	<29 <sup>[U], M, EMPC</sup>	----	<12 <sup>[U], M, EMPC</sup>	----	14.8	



**Analytical Results**

Sub-Matrix: Soil  
 (Matrix: Soil/Solid)

					Client sample ID	HS-27A	HS-27B	HS-28A	HS-28B	HS-29A
					Client sampling date / time	22-Oct-2025 13:12	22-Oct-2025 13:12	22-Oct-2025 11:53	22-Oct-2025 11:53	22-Oct-2025 10:26
Analyte	CAS Number	Method/Lab	LOR	Unit	VA25C8186-001	VA25C8186-002	VA25C8186-003	VA25C8186-004	VA25C8186-005	
					Result	Result	Result	Result	Result	
<b>Dioxins and Furans</b>										
HpCDF, 1,2,3,4,6,7,8-	67562-39-4	XE766/BU	2	pg/g	437	----	322	----	219	
HpCDF, 1,2,3,4,7,8,9-	55673-89-7	XE766/BU	1	pg/g	17.3	----	15.3	----	8.14	
OCDF	39001-02-0	XE766/BU	2	pg/g	724	----	1360	----	413	
Tetrachlorodibenzofurans [TCDF], total	----	XE766/BU	1	pg/g	69.6	----	29.7	----	42.5	
TCDF, total, # homologues detected	----	XE766/BU	0	-	19	----	19	----	15	
Pentachlorodibenzofurans [PeCDF], total	----	XE766/BU	1	pg/g	243	----	80.9	----	103	
PeCDF, total, # homologues detected	----	XE766/BU	0	-	12	----	9	----	9	
Hexachlorodibenzofurans [HxCDF], total	55684-94-1	XE766/BU	1	pg/g	621	----	293	----	266	
HxCDF, total, # homologues detected	----	XE766/BU	0	-	10	----	9	----	8	
Heptachlorodibenzofurans [HpCDF], total	38998-75-3	XE766/BU	2	pg/g	1130	----	924	----	469	
HpCDF, total, # homologues detected	----	XE766/BU	0	-	4	----	3	----	3	
<b>Dioxins and Furans Extraction Standards</b>										
TCDD-13C12, 2,3,7,8-	76523-40-5	XE766/BU	0.1	%	81.9	----	69.8	----	81.5	
PeCDD-13C12, 1,2,3,7,8-	109719-79-1	XE766/BU	0.1	%	72.4	----	54.8	----	67.2	
HxCDD-13C12, 1,2,3,4,7,8-	109719-80-4	XE766/BU	0.1	%	89.6	----	72.3	----	88.7	
HxCDD-13C12, 1,2,3,6,7,8-	109719-81-5	XE766/BU	0.1	%	86.4	----	73.6	----	91.1	
HpCDD-13C12, 1,2,3,4,6,7,8-	109719-83-7	XE766/BU	0.1	%	60.4	----	44.7	----	58.1	
OCDD-13C12	114423-97-1	XE766/BU	0.1	%	22.1	----	15.6 <sup>RRR</sup>	----	14.3 <sup>RRR</sup>	
TCDF-13C12, 2,3,7,8-	89059-46-1	XE766/BU	0.1	%	89.3	----	70.9	----	88.0	
PeCDF-13C12, 1,2,3,7,8-	109719-77-9	XE766/BU	0.1	%	81.5	----	57.3	----	67.1	
PeCDF-13C12, 2,3,4,7,8-	116843-02-8	XE766/BU	0.1	%	79.7	----	54.7	----	69.4	



### Analytical Results

Sub-Matrix: Soil (Matrix: Soil/Solid)					Client sample ID				
					HS-27A ----	HS-27B ----	HS-28A ----	HS-28B ----	HS-29A ----
Client sampling date / time					22-Oct-2025 13:12	22-Oct-2025 13:12	22-Oct-2025 11:53	22-Oct-2025 11:53	22-Oct-2025 10:26
Analyte	CAS Number	Method/Lab	LOR	Unit	VA25C8186-001	VA25C8186-002	VA25C8186-003	VA25C8186-004	VA25C8186-005
					Result	Result	Result	Result	Result
<b>Dioxins and Furans Extraction Standards</b>									
HxCDF-13C12, 1,2,3,4,7,8-	114423-98-2	XE766/BU	0.1	%	103	----	75.1	----	101
HxCDF-13C12, 1,2,3,6,7,8-	116843-03-9	XE766/BU	0.1	%	110	----	71.1	----	97.9
HxCDF-13C12, 2,3,4,6,7,8-	116843-05-1	XE766/BU	0.1	%	94.7	----	64.5	----	89.0
HxCDF-13C12, 1,2,3,7,8,9-	116843-04-0	XE766/BU	0.1	%	91.0	----	63.6	----	87.0
HpCDF-13C12, 1,2,3,4,6,7,8-	67562-39-4	XE766/BU	0.1	%	55.7	----	36.1	----	49.2
HpCDF-13C12, 1,2,3,4,7,8,9-	55673-89-7	XE766/BU	0.1	%	68.2	----	44.2	----	61.1
<b>Dioxins and Furans Cleanup Standards</b>									
TCDD-37Cl4, 2,3,7,8-	----	XE766/BU	0.1	%	81.1	----	71.3	----	74.4
<b>Dioxins/Furans/PCBs Toxic Equivalency</b>									
PCDD/F TEQ - WHO 2005 (ND=0*EDL)	n/a	XE766/BU	0.0	pg/g	61.2	----	25.8	----	31.4
PCDD/F TEQ - WHO 2005 (ND=0.5*EDL)	n/a	XE766/BU	0.0	pg/g	62.9	----	26.8	----	32.1
PCDD/F TEQ - WHO 2005 (ND=1*EDL)	n/a	XE766/BU	0.0	pg/g	64.5	----	27.8	----	32.7

Please refer to the General Comments section for an explanation of any qualifiers detected.

### Analytical Results

Sub-Matrix: Soil (Matrix: Soil/Solid)					Client sample ID				
					HS-29B ----	HS-30A ----	HS-30B ----	HS-31A ----	HS-31B ----
Client sampling date / time					22-Oct-2025 10:26	22-Oct-2025 09:18	22-Oct-2025 09:18	22-Oct-2025 08:32	22-Oct-2025 08:32
Analyte	CAS Number	Method/Lab	LOR	Unit	VA25C8186-006	VA25C8186-007	VA25C8186-008	VA25C8186-009	VA25C8186-010
					Result	Result	Result	Result	Result
<b>Physical Tests</b>									
pH (1:2 soil:water)	----	E108/VA	0.10	pH units	7.04	6.74	6.68	5.65	6.83
<b>Metals</b>									
Aluminum	7429-90-5	E440/VA	50	mg/kg	7310	17800	11100	19500	10800



### Analytical Results

Sub-Matrix: Soil  
 (Matrix: Soil/Solid)

					Client sample ID	HS-29B ----	HS-30A ----	HS-30B ----	HS-31A ----	HS-31B ----
					Client sampling date / time	22-Oct-2025 10:26	22-Oct-2025 09:18	22-Oct-2025 09:18	22-Oct-2025 08:32	22-Oct-2025 08:32
Analyte	CAS Number	Method/Lab	LOR	Unit	VA25C8186-006	VA25C8186-007	VA25C8186-008	VA25C8186-009	VA25C8186-010	
					Result	Result	Result	Result	Result	
<b>Metals</b>										
Antimony	7440-36-0	E440/VA	0.10	mg/kg	1.57	1.87	4.54	0.75	2.65	
Arsenic	7440-38-2	E440/VA	0.10	mg/kg	4.34	6.69	14.7	6.08	6.25	
Barium	7440-39-3	E440/VA	0.50	mg/kg	86.0	111	162	119	88.3	
Beryllium	7440-41-7	E440/VA	0.10	mg/kg	0.11	0.27	0.22	0.38	0.14	
Bismuth	7440-69-9	E440/VA	0.20	mg/kg	0.32	0.41	2.10	<0.20	0.37	
Boron	7440-42-8	E440/VA	5.0	mg/kg	<5.0	8.2	17.1	<5.0	16.8	
Cadmium	7440-43-9	E440/VA	0.020	mg/kg	0.280	0.354	1.29	0.309	0.467	
Calcium	7440-70-2	E440/VA	50	mg/kg	4320	9850	16300	4920	9970	
Chromium	7440-47-3	E440/VA	0.50	mg/kg	308	40.4	94.5	44.7	40.4	
Cobalt	7440-48-4	E440/VA	0.10	mg/kg	7.53	9.66	8.48	12.7	6.75	
Copper	7440-50-8	E440/VA	0.50	mg/kg	54.9	60.5	116	37.2	57.8	
Iron	7439-89-6	E440/VA	50	mg/kg	23700	27900	28800	29300	23400	
Lead	7439-92-1	E440/VA	0.50	mg/kg	18.2	26.8	45.3	21.1	36.5	
Lithium	7439-93-2	E440/VA	2.0	mg/kg	4.8	11.1	6.8	13.3	6.2	
Magnesium	7439-95-4	E440/VA	20	mg/kg	5320	6550	5170	7520	4430	
Manganese	7439-96-5	E440/VA	1.0	mg/kg	367	455	382	631	286	
Mercury	7439-97-6	E510/VA	0.0500	mg/kg	<0.0500	0.0630	0.311	0.0585	<0.0500	
Molybdenum	7439-98-7	E440/VA	0.10	mg/kg	39.0	2.76	6.11	0.98	2.21	
Nickel	7440-02-0	E440/VA	0.50	mg/kg	139	28.6	59.1	43.3	22.8	
Phosphorus	7723-14-0	E440/VA	50	mg/kg	345	907	1570	788	850	
Potassium	7440-09-7	E440/VA	100	mg/kg	460	1310	1500	830	1010	



### Analytical Results

Sub-Matrix: Soil (Matrix: Soil/Solid)					Client sample ID				
					HS-29B ----	HS-30A ----	HS-30B ----	HS-31A ----	HS-31B ----
					Client sampling date / time				
					22-Oct-2025 10:26	22-Oct-2025 09:18	22-Oct-2025 09:18	22-Oct-2025 08:32	22-Oct-2025 08:32
Analyte	CAS Number	Method/Lab	LOR	Unit	VA25C8186-006	VA25C8186-007	VA25C8186-008	VA25C8186-009	VA25C8186-010
					Result	Result	Result	Result	Result
<b>Metals</b>									
Selenium	7782-49-2	E440/VA	0.20	mg/kg	<0.20	0.29	0.23	0.27	<0.20
Silver	7440-22-4	E440/VA	0.10	mg/kg	<0.10	0.20	0.95	0.14	1.14
Sodium	7440-23-5	E440/VA	50	mg/kg	306	422	867	276	577
Strontium	7440-24-6	E440/VA	0.50	mg/kg	22.9	62.0	51.8	34.3	42.2
Sulfur	7704-34-9	E440/VA	1000	mg/kg	<1000	<1000	1000	<1000	<1000
Thallium	7440-28-0	E440/VA	0.050	mg/kg	<0.050	0.061	<0.050	0.083	<0.050
Tin	7440-31-5	E440/VA	2.0	mg/kg	3.0	4.2	9.7	<2.0	4.4
Titanium	7440-32-6	E440/VA	1.0	mg/kg	575	776	511	818	617
Tungsten	7440-33-7	E440/VA	0.50	mg/kg	5.72	1.04	1.75	<0.50	1.04
Uranium	7440-61-1	E440/VA	0.050	mg/kg	0.224	0.511	0.538	0.593	0.337
Vanadium	7440-62-2	E440/VA	0.20	mg/kg	32.6	53.6	42.7	66.1	46.3
Zinc	7440-66-6	E440/VA	2.0	mg/kg	279	1010	717	96.7	293
Zirconium	7440-67-7	E440/VA	1.0	mg/kg	5.8	1.3	1.2	1.4	<1.0

Please refer to the General Comments section for an explanation of any qualifiers detected.

### Analytical Results

Sub-Matrix: Soil (Matrix: Soil/Solid)					Client sample ID				
					HS-32 ----	HS-33 ----	HS-34 ----	HS-35 ----	----
					Client sampling date / time				
					22-Oct-2025 10:43	22-Oct-2025 10:50	22-Oct-2025 10:55	22-Oct-2025 11:00	----
Analyte	CAS Number	Method/Lab	LOR	Unit	VA25C8186-011	VA25C8186-012	VA25C8186-013	VA25C8186-014	----
					Result	Result	Result	Result	----
<b>Sample Preparation</b>									
Weight, extraction (wet)	----	EP800/BU	0.0001	g	----	----	----	20.0658	----



### Analytical Results

Sub-Matrix: Soil  
 (Matrix: Soil/Solid)

					Client sample ID	HS-32	HS-33	HS-34	HS-35	----
					Client sampling date / time	22-Oct-2025 10:43	22-Oct-2025 10:50	22-Oct-2025 10:55	22-Oct-2025 11:00	----
Analyte	CAS Number	Method/Lab	LOR	Unit	VA25C8186-011	VA25C8186-012	VA25C8186-013	VA25C8186-014	----	----
					Result	Result	Result	Result	----	----
<b>Physical Tests</b>										
Moisture	----	E144/BU	0.25	%	----	----	----	51.5	----	----
pH (1:2 soil:water)	----	E108/VA	0.10	pH units	6.22	6.26	6.01	----	----	----
<b>Metals</b>										
Aluminum	7429-90-5	E440/VA	50	mg/kg	8670	11100	11500	----	----	----
Antimony	7440-36-0	E440/VA	0.10	mg/kg	4.52	6.31	5.57	----	----	----
Arsenic	7440-38-2	E440/VA	0.10	mg/kg	6.48	6.41	8.76	----	----	----
Barium	7440-39-3	E440/VA	0.50	mg/kg	271	347	211	----	----	----
Beryllium	7440-41-7	E440/VA	0.10	mg/kg	0.13	0.18	0.15	----	----	----
Bismuth	7440-69-9	E440/VA	0.20	mg/kg	1.35	1.77	1.64	----	----	----
Boron	7440-42-8	E440/VA	5.0	mg/kg	14.9	12.1	11.5	----	----	----
Cadmium	7440-43-9	E440/VA	0.020	mg/kg	0.555	0.665	1.15	----	----	----
Calcium	7440-70-2	E440/VA	50	mg/kg	5110	6150	6590	----	----	----
Chromium	7440-47-3	E440/VA	0.50	mg/kg	527	523	556	----	----	----
Cobalt	7440-48-4	E440/VA	0.10	mg/kg	16.5	15.5	16.4	----	----	----
Copper	7440-50-8	E440/VA	0.50	mg/kg	195	592	536	----	----	----
Iron	7439-89-6	E440/VA	50	mg/kg	68400	64500	63900	----	----	----
Lead	7439-92-1	E440/VA	0.50	mg/kg	120	120	364	----	----	----
Lithium	7439-93-2	E440/VA	2.0	mg/kg	6.8	7.9	5.7	----	----	----
Magnesium	7439-95-4	E440/VA	20	mg/kg	7910	6870	7830	----	----	----
Manganese	7439-96-5	E440/VA	1.0	mg/kg	1030	1000	1040	----	----	----
Mercury	7439-97-6	E510/VA	0.0500	mg/kg	<0.0500	0.0544	0.0585	----	----	----



## Analytical Results

Sub-Matrix: Soil  
 (Matrix: Soil/Solid)

					Client sample ID	HS-32	HS-33	HS-34	HS-35	----
					Client sampling date / time	22-Oct-2025 10:43	22-Oct-2025 10:50	22-Oct-2025 10:55	22-Oct-2025 11:00	----
Analyte	CAS Number	Method/Lab	LOR	Unit	VA25C8186-011	VA25C8186-012	VA25C8186-013	VA25C8186-014	----	----
					Result	Result	Result	Result	----	----
<b>Metals</b>										
Molybdenum	7439-98-7	E440/VA	0.10	mg/kg	51.4	54.9	55.6	----	----	----
Nickel	7440-02-0	E440/VA	0.50	mg/kg	349	346	444	----	----	----
Phosphorus	7723-14-0	E440/VA	50	mg/kg	825	1580	2020	----	----	----
Potassium	7440-09-7	E440/VA	100	mg/kg	1090	1050	810	----	----	----
Selenium	7782-49-2	E440/VA	0.20	mg/kg	0.28	0.44	0.44	----	----	----
Silver	7440-22-4	E440/VA	0.10	mg/kg	0.22	0.29	0.32	----	----	----
Sodium	7440-23-5	E440/VA	50	mg/kg	324	390	365	----	----	----
Strontium	7440-24-6	E440/VA	0.50	mg/kg	31.6	53.5	40.2	----	----	----
Sulfur	7704-34-9	E440/VA	1000	mg/kg	1300	1500	2000	----	----	----
Thallium	7440-28-0	E440/VA	0.050	mg/kg	0.152	0.151	0.067	----	----	----
Tin	7440-31-5	E440/VA	2.0	mg/kg	12.4	17.1	19.3	----	----	----
Titanium	7440-32-6	E440/VA	1.0	mg/kg	537	634	415	----	----	----
Tungsten	7440-33-7	E440/VA	0.50	mg/kg	3.79	5.11	4.95	----	----	----
Uranium	7440-61-1	E440/VA	0.050	mg/kg	0.658	0.642	0.508	----	----	----
Vanadium	7440-62-2	E440/VA	0.20	mg/kg	54.6	56.1	49.3	----	----	----
Zinc	7440-66-6	E440/VA	2.0	mg/kg	427	720	584	----	----	----
Zirconium	7440-67-7	E440/VA	1.0	mg/kg	5.3	6.0	2.3	----	----	----
<b>Dioxins and Furans</b>										
TCDD, 2,3,7,8-	1746-01-6	XE766/BU	1	pg/g	----	----	----	<0.49 <sup>[U]</sup> M	----	----
PeCDD, 1,2,3,7,8-	40321-76-4	XE766/BU	1	pg/g	----	----	----	5.48 <sup>M</sup>	----	----
HxCDD, 1,2,3,4,7,8-	39227-28-6	XE766/BU	1	pg/g	----	----	----	6.99 <sup>M</sup>	----	----



### Analytical Results

Sub-Matrix: Soil  
 (Matrix: Soil/Solid)

					Client sample ID	HS-32	HS-33	HS-34	HS-35	----
					Client sampling date / time	22-Oct-2025 10:43	22-Oct-2025 10:50	22-Oct-2025 10:55	22-Oct-2025 11:00	----
Analyte	CAS Number	Method/Lab	LOR	Unit	VA25C8186-011	VA25C8186-012	VA25C8186-013	VA25C8186-014	----	
					Result	Result	Result	Result	----	
<b>Dioxins and Furans</b>										
HxCDD, 1,2,3,6,7,8-	57653-85-7	XE766/BU	1	pg/g	----	----	----	14.4	----	
HxCDD, 1,2,3,7,8,9-	19408-74-3	XE766/BU	1	pg/g	----	----	----	<11 <sup>F</sup>	----	
HpCDD, 1,2,3,4,6,7,8-	35822-46-9	XE766/BU	1	pg/g	----	----	----	314	----	
OCDD	3268-87-9	XE766/BU	2	pg/g	----	----	----	2690	----	
Tetrachlorodibenzo-p-dioxins [TCDD], total	41903-57-5	XE766/BU	1	pg/g	----	----	----	10.2	----	
TCDD, total, # homologues detected	----	XE766/BU	0	-	----	----	----	5	----	
Pentachlorodibenzo-p-dioxins [PeCDD], total	----	XE766/BU	1	pg/g	----	----	----	17.2	----	
PeCDD, total, # homologues detected	----	XE766/BU	0	-	----	----	----	3	----	
Hexachlorodibenzo-p-dioxins [HxCDD], total	34465-46-8	XE766/BU	1	pg/g	----	----	----	129	----	
HxCDD, total, # homologues detected	----	XE766/BU	0	-	----	----	----	5	----	
Heptachlorodibenzo-p-dioxins [HpCDD], total	37871-00-4	XE766/BU	1	pg/g	----	----	----	605	----	
HpCDD, total, # homologues detected	----	XE766/BU	0	-	----	----	----	2	----	
TCDF, 2,3,7,8-	51207-31-9	XE766/BU	1	pg/g	----	----	----	1.15	----	
PeCDF, 1,2,3,7,8-	57117-41-6	XE766/BU	1	pg/g	----	----	----	<2 <sup>[U], M, P</sup>	----	
PeCDF, 2,3,4,7,8-	57117-31-4	XE766/BU	1	pg/g	----	----	----	1.90	----	
HxCDF, 1,2,3,4,7,8-	70648-26-9	XE766/BU	1	pg/g	----	----	----	3.89	----	
HxCDF, 1,2,3,6,7,8-	57117-44-9	XE766/BU	1	pg/g	----	----	----	4.51	----	
HxCDF, 1,2,3,7,8,9-	72918-21-9	XE766/BU	1	pg/g	----	----	----	1.56	----	
HxCDF, 2,3,4,6,7,8-	60851-34-5	XE766/BU	1	pg/g	----	----	----	<6.2 <sup>[U], M, EMPC</sup>	----	
HpCDF, 1,2,3,4,6,7,8-	67562-39-4	XE766/BU	2	pg/g	----	----	----	88.9	----	
HpCDF, 1,2,3,4,7,8,9-	55673-89-7	XE766/BU	1	pg/g	----	----	----	<3.1 <sup>F</sup>	----	



## Analytical Results

Sub-Matrix: Soil  
 (Matrix: Soil/Solid)

					Client sample ID	HS-32	HS-33	HS-34	HS-35	----
					Client sampling date / time	22-Oct-2025 10:43	22-Oct-2025 10:50	22-Oct-2025 10:55	22-Oct-2025 11:00	----
Analyte	CAS Number	Method/Lab	LOR	Unit	VA25C8186-011	VA25C8186-012	VA25C8186-013	VA25C8186-014	----	----
					Result	Result	Result	Result	----	----
<b>Dioxins and Furans</b>										
OCDF	39001-02-0	XE766/BU	2	pg/g	----	----	----	150 <sup>M</sup>	----	----
Tetrachlorodibenzofurans [TCDF], total	----	XE766/BU	1	pg/g	----	----	----	12.6	----	----
TCDF, total, # homologues detected	----	XE766/BU	0	-	----	----	----	8	----	----
Pentachlorodibenzofurans [PeCDF], total	----	XE766/BU	1	pg/g	----	----	----	39.3	----	----
PeCDF, total, # homologues detected	----	XE766/BU	0	-	----	----	----	6	----	----
Hexachlorodibenzofurans [HxCDF], total	55684-94-1	XE766/BU	1	pg/g	----	----	----	94.5	----	----
HxCDF, total, # homologues detected	----	XE766/BU	0	-	----	----	----	8	----	----
Heptachlorodibenzofurans [HpCDF], total	38998-75-3	XE766/BU	2	pg/g	----	----	----	173	----	----
HpCDF, total, # homologues detected	----	XE766/BU	0	-	----	----	----	2	----	----
<b>Dioxins and Furans Extraction Standards</b>										
TCDD-13C12, 2,3,7,8-	76523-40-5	XE766/BU	0.1	%	----	----	----	63.9	----	----
PeCDD-13C12, 1,2,3,7,8-	109719-79-1	XE766/BU	0.1	%	----	----	----	37.4	----	----
HxCDD-13C12, 1,2,3,4,7,8-	109719-80-4	XE766/BU	0.1	%	----	----	----	72.5	----	----
HxCDD-13C12, 1,2,3,6,7,8-	109719-81-5	XE766/BU	0.1	%	----	----	----	75.2	----	----
HpCDD-13C12, 1,2,3,4,6,7,8-	109719-83-7	XE766/BU	0.1	%	----	----	----	74.3	----	----
OCDD-13C12	114423-97-1	XE766/BU	0.1	%	----	----	----	77.0	----	----
TCDF-13C12, 2,3,7,8-	89059-46-1	XE766/BU	0.1	%	----	----	----	64.9	----	----
PeCDF-13C12, 1,2,3,7,8-	109719-77-9	XE766/BU	0.1	%	----	----	----	48.1	----	----
PeCDF-13C12, 2,3,4,7,8-	116843-02-8	XE766/BU	0.1	%	----	----	----	44.5	----	----
HxCDF-13C12, 1,2,3,4,7,8-	114423-98-2	XE766/BU	0.1	%	----	----	----	76.6	----	----
HxCDF-13C12, 1,2,3,6,7,8-	116843-03-9	XE766/BU	0.1	%	----	----	----	75.4	----	----



### Analytical Results

Sub-Matrix: Soil (Matrix: Soil/Solid)					Client sample ID	HS-32 ----	HS-33 ----	HS-34 ----	HS-35 ----	----
					Client sampling date / time	22-Oct-2025 10:43	22-Oct-2025 10:50	22-Oct-2025 10:55	22-Oct-2025 11:00	----
Analyte	CAS Number	Method/Lab	LOR	Unit	VA25C8186-011	VA25C8186-012	VA25C8186-013	VA25C8186-014	----	----
					Result	Result	Result	Result	----	----
<b>Dioxins and Furans Extraction Standards</b>										
HxCDF-13C12, 2,3,4,6,7,8-	116843-05-1	XE766/BU	0.1	%	----	----	----	68.3	----	----
HxCDF-13C12, 1,2,3,7,8,9-	116843-04-0	XE766/BU	0.1	%	----	----	----	70.7	----	----
HpCDF-13C12, 1,2,3,4,6,7,8-	67562-39-4	XE766/BU	0.1	%	----	----	----	64.7	----	----
HpCDF-13C12, 1,2,3,4,7,8,9-	55673-89-7	XE766/BU	0.1	%	----	----	----	69.2	----	----
TCDD-37Cl4, 2,3,7,8-	----	XE766/BU	0.1	%	----	----	----	62.5	----	----
<b>Dioxins/Furans/PCBs Toxic Equivalency</b>										
PCDD/F TEQ - WHO 2005 (ND=0*EDL)	n/a	XE766/BU	0.0	pg/g	----	----	----	14.2	----	----
PCDD/F TEQ - WHO 2005 (ND=0.5*EDL)	n/a	XE766/BU	0.0	pg/g	----	----	----	15.3	----	----
PCDD/F TEQ - WHO 2005 (ND=1*EDL)	n/a	XE766/BU	0.0	pg/g	----	----	----	16.5	----	----

Please refer to the General Comments section for an explanation of any qualifiers detected.

### Analytical Results

Sub-Matrix: Bulk Material (Matrix: Soil/Solid)					Client sample ID	HS-37 (roof for metals) ----	HS-38 (roof for dioxins + furans) ----	----	----	----
					Client sampling date / time	22-Oct-2025 10:26	22-Oct-2025 10:26	----	----	----
Analyte	CAS Number	Method/Lab	LOR	Unit	VA25C8186-016	VA25C8186-017	----	----	----	----
					Result	Result	----	----	----	----
<b>Sample Preparation</b>										
Weight, extraction (wet)	----	EP800/BU	0.0001	g	----	1.3786	----	----	----	----
<b>Physical Tests</b>										
pH (1:2 soil:water)	----	E108/VA	0.10	pH units	6.06	----	----	----	----	----
<b>Metals</b>										
Aluminum	7429-90-5	E440/VA	50	mg/kg	25100	----	----	----	----	----



### Analytical Results

Sub-Matrix: Bulk Material  
 (Matrix: Soil/Solid)

					Client sample ID	HS-37 (roof for metals)	HS-38 (roof for dioxins + furans)	----	----	----
					Client sampling date / time	22-Oct-2025 10:26	22-Oct-2025 10:26	----	----	----
Analyte	CAS Number	Method/Lab	LOR	Unit	VA25C8186-016	VA25C8186-017	----	----	----	----
					Result	Result	----	----	----	----
<b>Metals</b>										
Antimony	7440-36-0	E440/VA	0.10	mg/kg	0.15	----	----	----	----	----
Arsenic	7440-38-2	E440/VA	0.10	mg/kg	0.16	----	----	----	----	----
Barium	7440-39-3	E440/VA	0.50	mg/kg	<0.50	----	----	----	----	----
Beryllium	7440-41-7	E440/VA	0.10	mg/kg	<0.10	----	----	----	----	----
Bismuth	7440-69-9	E440/VA	0.20	mg/kg	<0.20	----	----	----	----	----
Boron	7440-42-8	E440/VA	5.0	mg/kg	<5.0	----	----	----	----	----
Cadmium	7440-43-9	E440/VA	0.020	mg/kg	<0.020	----	----	----	----	----
Calcium	7440-70-2	E440/VA	50	mg/kg	24400	----	----	----	----	----
Chromium	7440-47-3	E440/VA	0.50	mg/kg	0.87	----	----	----	----	----
Cobalt	7440-48-4	E440/VA	0.10	mg/kg	0.21	----	----	----	----	----
Copper	7440-50-8	E440/VA	0.50	mg/kg	3.25	----	----	----	----	----
Iron	7439-89-6	E440/VA	50	mg/kg	175	----	----	----	----	----
Lead	7439-92-1	E440/VA	0.50	mg/kg	<0.50	----	----	----	----	----
Lithium	7439-93-2	E440/VA	2.0	mg/kg	<2.0	----	----	----	----	----
Magnesium	7439-95-4	E440/VA	20	mg/kg	244	----	----	----	----	----
Manganese	7439-96-5	E440/VA	1.0	mg/kg	5.3	----	----	----	----	----
Mercury	7439-97-6	E510/VA	0.0500	mg/kg	<0.0500	----	----	----	----	----
Molybdenum	7439-98-7	E440/VA	0.10	mg/kg	0.25	----	----	----	----	----
Nickel	7440-02-0	E440/VA	0.50	mg/kg	2.30	----	----	----	----	----
Phosphorus	7723-14-0	E440/VA	50	mg/kg	<50	----	----	----	----	----
Potassium	7440-09-7	E440/VA	100	mg/kg	<100	----	----	----	----	----



## Analytical Results

Sub-Matrix: Bulk Material  
 (Matrix: Soil/Solid)

					Client sample ID	HS-37 (roof for metals)	HS-38 (roof for dioxins + furans)	----	----	----
					Client sampling date / time	22-Oct-2025 10:26	22-Oct-2025 10:26	----	----	----
Analyte	CAS Number	Method/Lab	LOR	Unit	VA25C8186-016	VA25C8186-017	----	----	----	----
					Result	Result	----	----	----	----
<b>Metals</b>										
Selenium	7782-49-2	E440/VA	0.20	mg/kg	<0.20	----	----	----	----	----
Silver	7440-22-4	E440/VA	0.10	mg/kg	<0.10	----	----	----	----	----
Sodium	7440-23-5	E440/VA	50	mg/kg	<50	----	----	----	----	----
Strontium	7440-24-6	E440/VA	0.50	mg/kg	77.3	----	----	----	----	----
Sulfur	7704-34-9	E440/VA	1000	mg/kg	<1000	----	----	----	----	----
Thallium	7440-28-0	E440/VA	0.050	mg/kg	<0.050	----	----	----	----	----
Tin	7440-31-5	E440/VA	2.0	mg/kg	<2.0	----	----	----	----	----
Titanium	7440-32-6	E440/VA	1.0	mg/kg	3.1	----	----	----	----	----
Tungsten	7440-33-7	E440/VA	0.50	mg/kg	<0.50	----	----	----	----	----
Uranium	7440-61-1	E440/VA	0.050	mg/kg	0.055	----	----	----	----	----
Vanadium	7440-62-2	E440/VA	0.20	mg/kg	7.13	----	----	----	----	----
Zinc	7440-66-6	E440/VA	2.0	mg/kg	49.1	----	----	----	----	----
Zirconium	7440-67-7	E440/VA	1.0	mg/kg	<1.0	----	----	----	----	----
<b>Dioxins and Furans</b>										
TCDD, 2,3,7,8-	1746-01-6	XE766A/BU	0.1	pg/g wwt	----	<1.1 <sup>[U]</sup>	----	----	----	----
PeCDD, 1,2,3,7,8-	40321-76-4	XE766A/BU	0.1	pg/g wwt	----	<1.2 <sup>[U]</sup>	----	----	----	----
HxCDD, 1,2,3,4,7,8-	39227-28-6	XE766A/BU	0.1	pg/g wwt	----	<1.7 <sup>[U]</sup>	----	----	----	----
HxCDD, 1,2,3,6,7,8-	57653-85-7	XE766A/BU	0.1	pg/g wwt	----	6.43 <sup>[J], M</sup>	----	----	----	----
HxCDD, 1,2,3,7,8,9-	19408-74-3	XE766A/BU	0.1	pg/g wwt	----	<2.4 <sup>[U], F</sup>	----	----	----	----
HpCDD, 1,2,3,4,6,7,8-	35822-46-9	XE766A/BU	0.1	pg/g wwt	----	69.5	----	----	----	----
OCDD	3268-87-9	XE766A/BU	0.1	pg/g wwt	----	550	----	----	----	----



## Analytical Results

Sub-Matrix: Bulk Material  
 (Matrix: Soil/Solid)

					Client sample ID	HS-37 (roof for metals)	HS-38 (roof for dioxins + furans)	----	----	----
					Client sampling date / time	22-Oct-2025 10:26	22-Oct-2025 10:26	----	----	----
Analyte	CAS Number	Method/Lab	LOR	Unit	VA25C8186-016	VA25C8186-017	----	----	----	----
					Result	Result	----	----	----	----
<b>Dioxins and Furans</b>										
Tetrachlorodibenzo-p-dioxins [TCDD], total	41903-57-5	XE766A/BU	0.1	pg/g wwt	----	<1.1 <sup>[U]</sup>	----	----	----	----
TCDD, total, # homologues detected	----	XE766A/BU	0.1	-	----	0	----	----	----	----
Pentachlorodibenzo-p-dioxins [PeCDD], total	----	XE766A/BU	0.1	pg/g wwt	----	<1.2 <sup>[U]</sup>	----	----	----	----
PeCDD, total, # homologues detected	----	XE766A/BU	0.1	-	----	0	----	----	----	----
Hexachlorodibenzo-p-dioxins [HxCDD], total	34465-46-8	XE766A/BU	0.1	pg/g wwt	----	38.3	----	----	----	----
HxCDD, total, # homologues detected	----	XE766A/BU	0.1	-	----	3	----	----	----	----
Heptachlorodibenzo-p-dioxins [HpCDD], total	37871-00-4	XE766A/BU	0.1	pg/g wwt	----	69.5	----	----	----	----
HpCDD, total, # homologues detected	----	XE766A/BU	0.1	-	----	1	----	----	----	----
TCDF, 2,3,7,8-	51207-31-9	XE766A/BU	0.1	pg/g wwt	----	<1.7 <sup>[U]</sup>	----	----	----	----
PeCDF, 1,2,3,7,8-	57117-41-6	XE766A/BU	0.1	pg/g wwt	----	<0.9 <sup>[U], M, F</sup>	----	----	----	----
PeCDF, 2,3,4,7,8-	57117-31-4	XE766A/BU	0.1	pg/g wwt	----	<0.96 <sup>[U]</sup>	----	----	----	----
HxCDF, 1,2,3,4,7,8-	70648-26-9	XE766A/BU	0.1	pg/g wwt	----	<1.1 <sup>[U]</sup>	----	----	----	----
HxCDF, 1,2,3,6,7,8-	57117-44-9	XE766A/BU	0.1	pg/g wwt	----	<1.1 <sup>[U], M, F</sup>	----	----	----	----
HxCDF, 1,2,3,7,8,9-	72918-21-9	XE766A/BU	0.1	pg/g wwt	----	<1.9 <sup>[U]</sup>	----	----	----	----
HxCDF, 2,3,4,6,7,8-	60851-34-5	XE766A/BU	0.1	pg/g wwt	----	<1.5 <sup>[U]</sup>	----	----	----	----
HpCDF, 1,2,3,4,6,7,8-	67562-39-4	XE766A/BU	0.1	pg/g wwt	----	<5.5 <sup>[U], F</sup>	----	----	----	----
HpCDF, 1,2,3,4,7,8,9-	55673-89-7	XE766A/BU	0.1	pg/g wwt	----	<2.4 <sup>[U]</sup>	----	----	----	----
OCDF	39001-02-0	XE766A/BU	0.1	pg/g wwt	----	41.0 <sup>M</sup>	----	----	----	----
Tetrachlorodibenzofurans [TCDF], total	----	XE766A/BU	0.1	pg/g wwt	----	4.51 <sup>[U]</sup>	----	----	----	----
TCDF, total, # homologues detected	----	XE766A/BU	0.1	-	----	4	----	----	----	----
Pentachlorodibenzofurans [PeCDF], total	----	XE766A/BU	0.1	pg/g wwt	----	13.9	----	----	----	----



**Analytical Results**

Sub-Matrix: Bulk Material  
 (Matrix: Soil/Solid)

					Client sample ID	HS-37 (roof for metals)	HS-38 (roof for dioxins + furans)	----	----	----
					Client sampling date / time	22-Oct-2025 10:26	22-Oct-2025 10:26	----	----	----
Analyte	CAS Number	Method/Lab	LOR	Unit	VA25C8186-016	VA25C8186-017	----	----	----	
					Result	Result	----	----	----	
<b>Dioxins and Furans</b>										
PeCDF, total, # homologues detected	----	XE766A/BU	0.1	-	----	1	----	----	----	
Hexachlorodibenzofurans [HxCDF], total	55684-94-1	XE766A/BU	0.1	pg/g wwt	----	11.6	----	----	----	
HxCDF, total, # homologues detected	----	XE766A/BU	0.1	-	----	2	----	----	----	
Heptachlorodibenzofurans [HpCDF], total	38998-75-3	XE766A/BU	0.1	pg/g wwt	----	<5.5 <sup>[U]</sup>	----	----	----	
HpCDF, total, # homologues detected	----	XE766A/BU	0.1	-	----	0	----	----	----	
<b>Dioxins and Furans Extraction Standards</b>										
TCDD-13C12, 2,3,7,8-	76523-40-5	XE766A/BU	0.1	%	----	56.0	----	----	----	
PeCDD-13C12, 1,2,3,7,8-	109719-79-1	XE766A/BU	0.1	%	----	43.8	----	----	----	
HxCDD-13C12, 1,2,3,4,7,8-	109719-80-4	XE766A/BU	0.1	%	----	55.1	----	----	----	
HxCDD-13C12, 1,2,3,6,7,8-	109719-81-5	XE766A/BU	0.1	%	----	54.7	----	----	----	
HpCDD-13C12, 1,2,3,4,6,7,8-	109719-83-7	XE766A/BU	0.1	%	----	37.9	----	----	----	
OCDD-13C12	114423-97-1	XE766A/BU	0.1	%	----	23.9	----	----	----	
TCDF-13C12, 2,3,7,8-	89059-46-1	XE766A/BU	0.1	%	----	52.0	----	----	----	
PeCDF-13C12, 1,2,3,7,8-	109719-77-9	XE766A/BU	0.1	%	----	46.5	----	----	----	
PeCDF-13C12, 2,3,4,7,8-	116843-02-8	XE766A/BU	0.1	%	----	40.2	----	----	----	
HxCDF-13C12, 1,2,3,4,7,8-	114423-98-2	XE766A/BU	0.1	%	----	54.2	----	----	----	
HxCDF-13C12, 1,2,3,6,7,8-	116843-03-9	XE766A/BU	0.1	%	----	56.0	----	----	----	
HxCDF-13C12, 2,3,4,6,7,8-	116843-05-1	XE766A/BU	0.1	%	----	41.6	----	----	----	
HxCDF-13C12, 1,2,3,7,8,9-	116843-04-0	XE766A/BU	0.1	%	----	43.9	----	----	----	
HpCDF-13C12, 1,2,3,4,6,7,8-	67562-39-4	XE766A/BU	0.1	%	----	34.8	----	----	----	
HpCDF-13C12, 1,2,3,4,7,8,9-	55673-89-7	XE766A/BU	0.1	%	----	34.3	----	----	----	



### Analytical Results

Sub-Matrix: Bulk Material  
 (Matrix: Soil/Solid)

					Client sample ID	HS-37 (roof for metals)	HS-38 (roof for dioxins + furans)	----	----	----
					Client sampling date / time	22-Oct-2025 10:26	22-Oct-2025 10:26	----	----	----
Analyte	CAS Number	Method/Lab	LOR	Unit	VA25C8186-016	VA25C8186-017	----	----	----	----
					Result	Result	----	----	----	----
<b>Dioxins and Furans Extraction Standards</b>										
TCDD-37Cl <sub>4</sub> , 2,3,7,8-	----	XE766A/BU	0.1	%	----	54.0	----	----	----	----
<b>Dioxins/Furans/PCBs Toxic Equivalency</b>										
PCDD/F TEQ - WHO 2005 (ND=0*EDL)	n/a	XE766A/BU	0.1	pg/g	----	1.52	----	----	----	----
PCDD/F TEQ - WHO 2005 (ND=0.5*EDL)	n/a	XE766A/BU	0.1	pg/g	----	3.39	----	----	----	----
PCDD/F TEQ - WHO 2005 (ND=1*EDL)	n/a	XE766A/BU	0.1	pg/g	----	5.28	----	----	----	----

Please refer to the General Comments section for an explanation of any qualifiers detected.



## QUALITY CONTROL INTERPRETIVE REPORT

<p><b>Work Order</b> : <b>VA25C8186</b></p> <p><b>Amendment</b> : <b>1</b></p> <p><b>Client</b> : <b>HDR Corporation</b></p> <p><b>Contact</b> : Johanna Mason</p> <p><b>Address</b> : 500-1500 W. Georgia Street Vancouver BC Canada V6G 2Z6</p> <p><b>Telephone</b> : ----</p> <p><b>Project</b> : VA25HDR100-001</p> <p><b>PO</b> : ----</p> <p><b>C-O-C number</b> : 23-1162263/1162261</p> <p><b>Sampler</b> : ----</p> <p><b>Site</b> : ----</p> <p><b>Quote number</b> : VA25-HDR100-001</p> <p><b>No. of samples received</b> : 16</p> <p><b>No. of samples analysed</b> : 16</p>	<p style="text-align: right;">Page : 1 of 14</p> <p><b>Laboratory</b> : ALS Environmental - Vancouver</p> <p><b>Account Manager</b> : Le Van Dalfsen</p> <p><b>Address</b> : 8081 Lougheed Highway Burnaby, British Columbia Canada V5A 1W9</p> <p><b>Telephone</b> : +1 604 253 4188</p> <p><b>Date Samples Received</b> : 22-Oct-2025 14:10</p> <p><b>Issue Date</b> : 05-Dec-2025 10:07</p>
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This report is automatically generated by the ALS LIMS (Laboratory Information Management System) through evaluation of Quality Control (QC) results and other QA parameters associated with this submission, and is intended to facilitate rapid data validation by auditors or reviewers. The report highlights any exceptions and outliers to ALS Data Quality Objectives, provides holding time details and exceptions, summarizes QC sample frequencies, and lists applicable methodology references and summaries.

**Key**

- Anonymous: Refers to samples which are not part of this work order, but which formed part of the QC process lot.
- CAS Number: Chemical Abstracts Service number is a unique identifier assigned to discrete substances.
- DQO: Data Quality Objective.
- LOR: Limit of Reporting (detection limit).
- RPD: Relative Percent Difference.

### ***Workorder Comments***

Holding times are displayed as "----" if no guidance exists from CCME, Canadian provinces, or broadly recognized international references.

### ***Summary of Outliers***

#### ***Outliers : Quality Control Samples***

- No Method Blank value outliers occur.
- No Laboratory Control Sample (LCS) outliers occur
- Duplicate outliers occur - please see following pages for full details.
- Test sample Surrogate recovery outliers exist for all regular sample matrices - please see following pages for full details.

#### ***Outliers: Reference Material (RM) Samples***

- No Reference Material (RM) Sample outliers occur.

***Outliers : Analysis Holding Time Compliance (Breaches)***

- No Analysis Holding Time Outliers exist.

***Outliers : Frequency of Quality Control Samples***

- No Quality Control Sample Frequency Outliers occur.



**Outliers : Quality Control Samples**

*Duplicates, Method Blanks, Laboratory Control Samples and Matrix Spikes*

Matrix: Soil/Solid

Analyte Group	Laboratory sample ID	Client/Ref Sample ID	Analyte	CAS Number	Method	Result	Limits	Comment
<b>Duplicate (DUP) RPDs</b>								
Metals	VA25C8186-001	HS-27A	Molybdenum	7439-98-7	E440	72.4 % DUP-H	40%	Duplicate RPD does not meet the DQO for this test.
Dioxins and Furans	VA25C8186-001	HS-27A	HxCDD, 1,2,3,4,7,8-	39227-28-6	XE766	31.0 % RRQC	25%	Duplicate RPD does not meet the DQO for this test.
Dioxins and Furans	Anonymous	Anonymous	HpCDD, 1,2,3,4,6,7,8-	35822-46-9	XE766	1.20 % J,M	Diff <2x LOR	Low Level DUP DQO exceeded (difference > 2 LOR).
Dioxins and Furans	VA25C8186-001	HS-27A	PeCDF, 1,2,3,7,8-	57117-41-6	XE766	34.3 % J	Diff <2x LOR	Low Level DUP DQO exceeded (difference > 2 LOR).
Dioxins and Furans	VA25C8186-001	HS-27A	HxCDF, 1,2,3,4,7,8-	70648-26-9	XE766	37.3 % M,RRQC	25%	Duplicate RPD does not meet the DQO for this test.
Dioxins and Furans	VA25C8186-001	HS-27A	HxCDF, 2,3,4,6,7,8-	60851-34-5	XE766	33.8 % J,M	Diff <2x LOR	Low Level DUP DQO exceeded (difference > 2 LOR).
Dioxins and Furans	VA25C8186-001	HS-27A	HpCDF, 1,2,3,4,7,8,9-	55673-89-7	XE766	25.6 % RRQC	25%	Duplicate RPD does not meet the DQO for this test.
Dioxins and Furans	VA25C8186-017	HS-38 (roof for dioxins + furans)	HxCDD, 1,2,3,6,7,8-	57653-85-7	XE766A	6.4 % [J],DUP-H,F	Diff <2x LOR	Low Level DUP DQO exceeded (difference > 2 LOR).
Dioxins and Furans	VA25C8186-017	HS-38 (roof for dioxins + furans)	HpCDD, 1,2,3,4,6,7,8-	35822-46-9	XE766A	30.1 % DUP-H	25%	Duplicate RPD does not meet the DQO for this test.
Dioxins and Furans	VA25C8186-017	HS-38 (roof for dioxins + furans)	OCDD	3268-87-9	XE766A	39.5 % DUP-H	25%	Duplicate RPD does not meet the DQO for this test.
Dioxins and Furans	VA25C8186-017	HS-38 (roof for dioxins + furans)	OCDF	39001-02-0	XE766A	41 % DUP-H,F,M	Diff <2x LOR	Low Level DUP DQO exceeded (difference > 2 LOR).

**Result Qualifiers**

Qualifier	Description



**Matrix: Soil/Solid**

Analyte Group	Laboratory sample ID	Client/Ref Sample ID	Analyte	CAS Number	Method	Result	Limits	Comment
[J]			<i>Estimated value. The reported concentration is below the calibrated range of the instrument but above the EDL.</i>					
DUP-H			<i>Duplicate results outside ALS DQO, due to sample heterogeneity.</i>					
F			<i>The ion abundance ratio(s) did not meet the acceptance criteria. Estimated Detection Limit for that compound has been elevated to the level of the EMPC.</i>					
J			<i>Duplicate results and limits are expressed in terms of absolute difference.</i>					
M			<i>Peak has been manually integrated.</i>					
RRQC			<i>Refer to report comments for information regarding this QC result.</i>					

**Regular Sample Surrogates**

**Sub-Matrix: Soil**

Analyte Group	Laboratory sample ID	Client/Ref Sample ID	Analyte	CAS Number	Result	Limits	Comment
<b>Samples Submitted</b>							
Dioxins and Furans Extraction Standards	VA25C8186-003	HS-28A	OCDD-13C12	114423-97-1	15.6 %	17.0-157 %	Recovery less than lower data quality objective
Dioxins and Furans Extraction Standards	VA25C8186-005	HS-29A	OCDD-13C12	114423-97-1	14.3 %	17.0-157 %	Recovery less than lower data quality objective



## Analysis Holding Time Compliance

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times, which are selected to meet known provincial and /or federal requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by organizations such as CCME, US EPA, APHA Standard Methods, ASTM, or Environment Canada (where available). Dates and holding times reported below represent the first dates of extraction or analysis. If subsequent tests or dilutions exceeded holding times, qualifiers are added (refer to COA).

If samples are identified below as having been analyzed or extracted outside of recommended holding times, measurement uncertainties may be increased, and this should be taken into consideration when interpreting results.

Where actual sampling date is not provided on the chain of custody, the date of receipt with time at 00:00 is used for calculation purposes.

Where only the sample date without time is provided on the chain of custody, the sampling date at 00:00 is used for calculation purposes.

Matrix: **Soil/Solid**

Evaluation: ✖ = Holding time exceedance ; ✔ = Within Holding Time

Analyte Group : Analytical Method Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times		Eval	Analysis Date	Holding Times		Eval
				Rec	Actual			Rec	Actual	
<b>Dioxins and Furans : Dioxins and Furans in Soil/Solid by GC-HRMS (Wet Weight)</b>										
<b>Original packaging</b> HS-38 (roof for dioxins + furans)	XE766A	22-Oct-2025	30-Oct-2025	365 days	8 days	✔	07-Nov-2025	365 days	8 days	✔
<b>Dioxins and Furans : Dioxins and Furans in Soil/Solid by GC-HRMS</b>										
<b>Glass soil jar/Teflon lined cap</b> HS-27A	XE766	22-Oct-2025	26-Nov-2025	365 days	35 days	✔	02-Dec-2025	365 days	6 days	✔
<b>Dioxins and Furans : Dioxins and Furans in Soil/Solid by GC-HRMS</b>										
<b>Glass soil jar/Teflon lined cap</b> HS-28A	XE766	22-Oct-2025	26-Nov-2025	365 days	35 days	✔	02-Dec-2025	365 days	6 days	✔
<b>Dioxins and Furans : Dioxins and Furans in Soil/Solid by GC-HRMS</b>										
<b>Glass soil jar/Teflon lined cap</b> HS-29A	XE766	22-Oct-2025	26-Nov-2025	365 days	35 days	✔	02-Dec-2025	365 days	6 days	✔
<b>Dioxins and Furans : Dioxins and Furans in Soil/Solid by GC-HRMS</b>										
<b>Glass soil jar/Teflon lined cap</b> HS-35	XE766	22-Oct-2025	29-Oct-2025	365 days	7 days	✔	04-Nov-2025	365 days	7 days	✔
<b>Dioxins/Furans/PCBs Toxic Equivalency : Dioxins and Furans in Soil/Solid by GC-HRMS (Wet Weight)</b>										
<b>Original packaging</b> HS-38 (roof for dioxins + furans)	XE766A	22-Oct-2025	30-Oct-2025	365 days	8 days	✔	07-Nov-2025	365 days	8 days	✔
<b>Dioxins/Furans/PCBs Toxic Equivalency : Dioxins and Furans in Soil/Solid by GC-HRMS</b>										
<b>Glass soil jar/Teflon lined cap</b> HS-27A	XE766	22-Oct-2025	26-Nov-2025	365 days	35 days	✔	02-Dec-2025	365 days	6 days	✔



Matrix: Soil/Solid

Evaluation: ✖ = Holding time exceedance ; ✔ = Within Holding Time

Analyte Group : Analytical Method Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis				
			Preparation Date	Holding Times		Eval	Analysis Date	Holding Times		Eval	
				Rec	Actual			Rec	Actual		
<b>Dioxins/Furans/PCBs Toxic Equivalency : Dioxins and Furans in Soil/Solid by GC-HRMS</b>											
Glass soil jar/Teflon lined cap HS-28A	XE766	22-Oct-2025	26-Nov-2025	365 days	35 days	✔	02-Dec-2025	365 days	6 days	✔	
<b>Dioxins/Furans/PCBs Toxic Equivalency : Dioxins and Furans in Soil/Solid by GC-HRMS</b>											
Glass soil jar/Teflon lined cap HS-29A	XE766	22-Oct-2025	26-Nov-2025	365 days	35 days	✔	02-Dec-2025	365 days	6 days	✔	
<b>Dioxins/Furans/PCBs Toxic Equivalency : Dioxins and Furans in Soil/Solid by GC-HRMS</b>											
Glass soil jar/Teflon lined cap HS-35	XE766	22-Oct-2025	29-Oct-2025	365 days	7 days	✔	04-Nov-2025	365 days	7 days	✔	
<b>Metals : Mercury in Soil/Solid by CVAAS</b>											
Glass soil jar/Teflon lined cap HS-27A	E510	22-Oct-2025	28-Oct-2025	28 days	6 days	✔	28-Oct-2025	28 days	0 days	✔	
<b>Metals : Mercury in Soil/Solid by CVAAS</b>											
Glass soil jar/Teflon lined cap HS-27B	E510	22-Oct-2025	28-Oct-2025	28 days	6 days	✔	28-Oct-2025	28 days	0 days	✔	
<b>Metals : Mercury in Soil/Solid by CVAAS</b>											
Glass soil jar/Teflon lined cap HS-28A	E510	22-Oct-2025	28-Oct-2025	28 days	6 days	✔	28-Oct-2025	28 days	0 days	✔	
<b>Metals : Mercury in Soil/Solid by CVAAS</b>											
Glass soil jar/Teflon lined cap HS-28B	E510	22-Oct-2025	28-Oct-2025	28 days	6 days	✔	28-Oct-2025	28 days	0 days	✔	
<b>Metals : Mercury in Soil/Solid by CVAAS</b>											
Glass soil jar/Teflon lined cap HS-29A	E510	22-Oct-2025	28-Oct-2025	28 days	6 days	✔	28-Oct-2025	28 days	0 days	✔	
<b>Metals : Mercury in Soil/Solid by CVAAS</b>											
Glass soil jar/Teflon lined cap HS-29B	E510	22-Oct-2025	28-Oct-2025	28 days	6 days	✔	28-Oct-2025	28 days	0 days	✔	



Matrix: Soil/Solid

Evaluation: ✖ = Holding time exceedance ; ✔ = Within Holding Time

Analyte Group : Analytical Method Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis				
			Preparation Date	Holding Times		Eval	Analysis Date	Holding Times		Eval	
				Rec	Actual			Rec	Actual		
<b>Metals : Mercury in Soil/Solid by CVAAS</b>											
Glass soil jar/Teflon lined cap HS-30A	E510	22-Oct-2025	28-Oct-2025	28 days	6 days	✔	28-Oct-2025	28 days	0 days	✔	
<b>Metals : Mercury in Soil/Solid by CVAAS</b>											
Glass soil jar/Teflon lined cap HS-30B	E510	22-Oct-2025	28-Oct-2025	28 days	6 days	✔	28-Oct-2025	28 days	0 days	✔	
<b>Metals : Mercury in Soil/Solid by CVAAS</b>											
Glass soil jar/Teflon lined cap HS-31A	E510	22-Oct-2025	28-Oct-2025	28 days	6 days	✔	28-Oct-2025	28 days	0 days	✔	
<b>Metals : Mercury in Soil/Solid by CVAAS</b>											
Glass soil jar/Teflon lined cap HS-31B	E510	22-Oct-2025	28-Oct-2025	28 days	6 days	✔	28-Oct-2025	28 days	0 days	✔	
<b>Metals : Mercury in Soil/Solid by CVAAS</b>											
Glass soil jar/Teflon lined cap HS-32	E510	22-Oct-2025	28-Oct-2025	28 days	6 days	✔	28-Oct-2025	28 days	0 days	✔	
<b>Metals : Mercury in Soil/Solid by CVAAS</b>											
Glass soil jar/Teflon lined cap HS-33	E510	22-Oct-2025	28-Oct-2025	28 days	6 days	✔	28-Oct-2025	28 days	0 days	✔	
<b>Metals : Mercury in Soil/Solid by CVAAS</b>											
Glass soil jar/Teflon lined cap HS-34	E510	22-Oct-2025	28-Oct-2025	28 days	6 days	✔	28-Oct-2025	28 days	0 days	✔	
<b>Metals : Mercury in Soil/Solid by CVAAS</b>											
LDPE bag HS-37 (roof for metals)	E510	22-Oct-2025	30-Oct-2025	28 days	8 days	✔	30-Oct-2025	28 days	0 days	✔	
<b>Metals : Metals in Soil/Solid by CRC ICPMS</b>											
Glass soil jar/Teflon lined cap HS-27A	E440	22-Oct-2025	28-Oct-2025	180 days	6 days	✔	29-Oct-2025	180 days	6 days	✔	



Matrix: Soil/Solid

Evaluation: ✖ = Holding time exceedance ; ✔ = Within Holding Time

Analyte Group : Analytical Method Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis				
			Preparation Date	Holding Times		Eval	Analysis Date	Holding Times		Eval	
				Rec	Actual			Rec	Actual		
<b>Metals : Metals in Soil/Solid by CRC ICPMS</b>											
Glass soil jar/Teflon lined cap HS-27B	E440	22-Oct-2025	28-Oct-2025	180 days	6 days	✔	29-Oct-2025	180 days	6 days	✔	
<b>Metals : Metals in Soil/Solid by CRC ICPMS</b>											
Glass soil jar/Teflon lined cap HS-28A	E440	22-Oct-2025	28-Oct-2025	180 days	6 days	✔	29-Oct-2025	180 days	6 days	✔	
<b>Metals : Metals in Soil/Solid by CRC ICPMS</b>											
Glass soil jar/Teflon lined cap HS-28B	E440	22-Oct-2025	28-Oct-2025	180 days	6 days	✔	29-Oct-2025	180 days	6 days	✔	
<b>Metals : Metals in Soil/Solid by CRC ICPMS</b>											
Glass soil jar/Teflon lined cap HS-29A	E440	22-Oct-2025	28-Oct-2025	180 days	6 days	✔	29-Oct-2025	180 days	6 days	✔	
<b>Metals : Metals in Soil/Solid by CRC ICPMS</b>											
Glass soil jar/Teflon lined cap HS-29B	E440	22-Oct-2025	28-Oct-2025	180 days	6 days	✔	29-Oct-2025	180 days	6 days	✔	
<b>Metals : Metals in Soil/Solid by CRC ICPMS</b>											
Glass soil jar/Teflon lined cap HS-30A	E440	22-Oct-2025	28-Oct-2025	180 days	6 days	✔	29-Oct-2025	180 days	6 days	✔	
<b>Metals : Metals in Soil/Solid by CRC ICPMS</b>											
Glass soil jar/Teflon lined cap HS-30B	E440	22-Oct-2025	28-Oct-2025	180 days	6 days	✔	29-Oct-2025	180 days	6 days	✔	
<b>Metals : Metals in Soil/Solid by CRC ICPMS</b>											
Glass soil jar/Teflon lined cap HS-31A	E440	22-Oct-2025	28-Oct-2025	180 days	6 days	✔	29-Oct-2025	180 days	6 days	✔	
<b>Metals : Metals in Soil/Solid by CRC ICPMS</b>											
Glass soil jar/Teflon lined cap HS-31B	E440	22-Oct-2025	28-Oct-2025	180 days	6 days	✔	29-Oct-2025	180 days	6 days	✔	



Matrix: Soil/Solid

Evaluation: ✖ = Holding time exceedance ; ✔ = Within Holding Time

Analyte Group : Analytical Method Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis				
			Preparation Date	Holding Times		Eval	Analysis Date	Holding Times		Eval	
				Rec	Actual			Rec	Actual		
<b>Metals : Metals in Soil/Solid by CRC ICPMS</b>											
Glass soil jar/Teflon lined cap HS-32	E440	22-Oct-2025	28-Oct-2025	180 days	6 days	✔	29-Oct-2025	180 days	6 days	✔	
<b>Metals : Metals in Soil/Solid by CRC ICPMS</b>											
Glass soil jar/Teflon lined cap HS-33	E440	22-Oct-2025	28-Oct-2025	180 days	6 days	✔	29-Oct-2025	180 days	6 days	✔	
<b>Metals : Metals in Soil/Solid by CRC ICPMS</b>											
Glass soil jar/Teflon lined cap HS-34	E440	22-Oct-2025	28-Oct-2025	180 days	6 days	✔	29-Oct-2025	180 days	6 days	✔	
<b>Metals : Metals in Soil/Solid by CRC ICPMS</b>											
LDPE bag HS-37 (roof for metals)	E440	22-Oct-2025	30-Oct-2025	180 days	8 days	✔	31-Oct-2025	180 days	8 days	✔	
<b>Physical Tests : Moisture Content by Gravimetry</b>											
Glass soil jar/Teflon lined cap HS-27A	E144	22-Oct-2025	----	----	----		03-Dec-2025	----	----		
<b>Physical Tests : Moisture Content by Gravimetry</b>											
Glass soil jar/Teflon lined cap HS-28A	E144	22-Oct-2025	----	----	----		03-Dec-2025	----	----		
<b>Physical Tests : Moisture Content by Gravimetry</b>											
Glass soil jar/Teflon lined cap HS-29A	E144	22-Oct-2025	----	----	----		03-Dec-2025	----	----		
<b>Physical Tests : Moisture Content by Gravimetry</b>											
Glass soil jar/Teflon lined cap HS-35	E144	22-Oct-2025	----	----	----		28-Oct-2025	----	----		
<b>Physical Tests : pH by Meter (1:2 Soil:Water Extraction)</b>											
Glass soil jar/Teflon lined cap HS-27A	E108	22-Oct-2025	28-Oct-2025	30 days	6 days	✔	28-Oct-2025	30 days	6 days	✔	



Matrix: Soil/Solid

Evaluation: ✖ = Holding time exceedance ; ✔ = Within Holding Time

Analyte Group : Analytical Method Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis				
			Preparation Date	Holding Times		Eval	Analysis Date	Holding Times		Eval	
				Rec	Actual			Rec	Actual		
<b>Physical Tests : pH by Meter (1:2 Soil:Water Extraction)</b>											
Glass soil jar/Teflon lined cap HS-27B	E108	22-Oct-2025	28-Oct-2025	30 days	6 days	✔	28-Oct-2025	30 days	6 days	✔	
<b>Physical Tests : pH by Meter (1:2 Soil:Water Extraction)</b>											
Glass soil jar/Teflon lined cap HS-28A	E108	22-Oct-2025	28-Oct-2025	30 days	6 days	✔	28-Oct-2025	30 days	6 days	✔	
<b>Physical Tests : pH by Meter (1:2 Soil:Water Extraction)</b>											
Glass soil jar/Teflon lined cap HS-28B	E108	22-Oct-2025	28-Oct-2025	30 days	6 days	✔	28-Oct-2025	30 days	6 days	✔	
<b>Physical Tests : pH by Meter (1:2 Soil:Water Extraction)</b>											
Glass soil jar/Teflon lined cap HS-29A	E108	22-Oct-2025	28-Oct-2025	30 days	6 days	✔	28-Oct-2025	30 days	6 days	✔	
<b>Physical Tests : pH by Meter (1:2 Soil:Water Extraction)</b>											
Glass soil jar/Teflon lined cap HS-29B	E108	22-Oct-2025	28-Oct-2025	30 days	6 days	✔	28-Oct-2025	30 days	6 days	✔	
<b>Physical Tests : pH by Meter (1:2 Soil:Water Extraction)</b>											
Glass soil jar/Teflon lined cap HS-30A	E108	22-Oct-2025	28-Oct-2025	30 days	6 days	✔	28-Oct-2025	30 days	6 days	✔	
<b>Physical Tests : pH by Meter (1:2 Soil:Water Extraction)</b>											
Glass soil jar/Teflon lined cap HS-30B	E108	22-Oct-2025	28-Oct-2025	30 days	6 days	✔	28-Oct-2025	30 days	6 days	✔	
<b>Physical Tests : pH by Meter (1:2 Soil:Water Extraction)</b>											
Glass soil jar/Teflon lined cap HS-31A	E108	22-Oct-2025	28-Oct-2025	30 days	6 days	✔	28-Oct-2025	30 days	6 days	✔	
<b>Physical Tests : pH by Meter (1:2 Soil:Water Extraction)</b>											
Glass soil jar/Teflon lined cap HS-31B	E108	22-Oct-2025	28-Oct-2025	30 days	6 days	✔	28-Oct-2025	30 days	6 days	✔	



Matrix: Soil/Solid

Evaluation: ✖ = Holding time exceedance ; ✔ = Within Holding Time

Analyte Group : Analytical Method Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times		Eval	Analysis Date	Holding Times		Eval
				Rec	Actual			Rec	Actual	
<b>Physical Tests : pH by Meter (1:2 Soil:Water Extraction)</b>										
Glass soil jar/Teflon lined cap HS-32	E108	22-Oct-2025	28-Oct-2025	30 days	6 days	✔	28-Oct-2025	30 days	6 days	✔
<b>Physical Tests : pH by Meter (1:2 Soil:Water Extraction)</b>										
Glass soil jar/Teflon lined cap HS-33	E108	22-Oct-2025	28-Oct-2025	30 days	6 days	✔	28-Oct-2025	30 days	6 days	✔
<b>Physical Tests : pH by Meter (1:2 Soil:Water Extraction)</b>										
Glass soil jar/Teflon lined cap HS-34	E108	22-Oct-2025	28-Oct-2025	30 days	6 days	✔	28-Oct-2025	30 days	6 days	✔
<b>Physical Tests : pH by Meter (1:2 Soil:Water Extraction)</b>										
LDPE bag HS-37 (roof for metals)	E108	22-Oct-2025	30-Oct-2025	30 days	8 days	✔	30-Oct-2025	30 days	8 days	✔

Legend & Qualifier Definitions

Rec. HT: ALS recommended hold time (see units).



## Quality Control Parameter Frequency Compliance

The following report summarizes the frequency of laboratory QC samples analyzed within the analytical batches (QC lots) in which the submitted samples were processed. The actual frequency should be greater than or equal to the expected frequency.

Matrix: **Soil/Solid**

Evaluation: ✖ = QC frequency outside specification; ✔ = QC frequency within specification.

Quality Control Sample Type	Method	QC Lot #	Count		Frequency (%)		
			QC	Regular	Actual	Expected	Evaluation
<b>Analytical Methods</b>							
<b>Laboratory Duplicates (DUP)</b>							
pH by Meter (1:2 Soil:Water Extraction)	E108	2308255	2	18	11.1	5.0	✔
Moisture Content by Gravimetry	E144	2304568	1	7	14.2	5.0	✔
Moisture Content by Gravimetry	E144	2368273	1	3	33.3	5.0	✔
Metals in Soil/Solid by CRC ICPMS	E440	2308253	2	18	11.1	5.0	✔
Mercury in Soil/Solid by CVAAS	E510	2302338	2	18	11.1	5.0	✔
Dioxins and Furans in Soil/Solid by GC-HRMS	XE766	2355357	2	23	8.7	5.0	✔
Dioxins and Furans in Soil/Solid by GC-HRMS (Wet Weight)	XE766A	2306219	1	1	100.0	5.0	✔
<b>Laboratory Control Samples (LCS)</b>							
pH by Meter (1:2 Soil:Water Extraction)	E108	2308255	2	18	11.1	5.0	✔
Moisture Content by Gravimetry	E144	2304568	1	7	14.2	5.0	✔
Moisture Content by Gravimetry	E144	2368273	1	3	33.3	5.0	✔
Metals in Soil/Solid by CRC ICPMS	E440	2308253	4	18	22.2	10.0	✔
Mercury in Soil/Solid by CVAAS	E510	2302338	4	18	22.2	10.0	✔
Dioxins and Furans in Soil/Solid by GC-HRMS	XE766	2355357	2	23	8.7	5.0	✔
Dioxins and Furans in Soil/Solid by GC-HRMS (Wet Weight)	XE766A	2306219	1	1	100.0	5.0	✔
<b>Method Blanks (MB)</b>							
Moisture Content by Gravimetry	E144	2304568	1	7	14.2	5.0	✔
Moisture Content by Gravimetry	E144	2368273	1	3	33.3	5.0	✔
Metals in Soil/Solid by CRC ICPMS	E440	2308253	2	18	11.1	5.0	✔
Mercury in Soil/Solid by CVAAS	E510	2302338	2	18	11.1	5.0	✔
Dioxins and Furans in Soil/Solid by GC-HRMS	XE766	2355357	2	23	8.7	5.0	✔
Dioxins and Furans in Soil/Solid by GC-HRMS (Wet Weight)	XE766A	2306219	1	1	100.0	5.0	✔



## Methodology References and Summaries

The analytical methods used by ALS are developed using internationally recognized reference methods (where available), such as those published by US EPA, APHA Standard Methods, ASTM, ISO, Environment Canada, BC MOE, and Ontario MOE. Reference methods may incorporate modifications to improve performance (indicated by "mod").

Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
pH by Meter (1:2 Soil:Water Extraction)	E108 ALS Environmental - Vancouver	Soil/Solid	BC Lab Manual	pH is determined by potentiometric measurement with a pH electrode at ambient laboratory temperature (normally $20 \pm 5^{\circ}\text{C}$ ), and is carried out in accordance with procedures described in the BC Lab Manual (prescriptive method). The procedure involves mixing the dried (at $<60^{\circ}\text{C}$ ) and sieved (10mesh/2mm) sample with ultra pure water at a 1:2 ratio of sediment to water. The pH is then measured by a standard pH probe.
Moisture Content by Gravimetry	E144 ALS Environmental - Vancouver	Soil/Solid	CCME PHC in Soil - Tier 1	Moisture is measured gravimetrically by drying the sample at $105^{\circ}\text{C}$ . Moisture content is calculated as the weight loss (due to water) divided by the wet weight of the sample, expressed as a percentage.
Metals in Soil/Solid by CRC ICPMS	E440 ALS Environmental - Vancouver	Soil/Solid	EPA 6020B (mod)	This method is intended to liberate metals that may be environmentally available. Samples are dried, then sieved through a 2 mm sieve, and digested with $\text{HNO}_3$ and $\text{HCl}$ .  Dependent on sample matrix, some metals may be only partially recovered, including Al, Ba, Be, Cr, Sr, Ti, V, W, and Zr. Silicate minerals are not solubilized. Volatile forms of sulfur (including sulfide) may not be captured, as they may be lost during sampling, storage, or digestion. This method does not adequately recover elemental sulfur, and is unsuitable for assessment of elemental sulfur standards or guidelines.  Analysis is by Collision/Reaction Cell ICPMS.
Mercury in Soil/Solid by CVAAS	E510 ALS Environmental - Vancouver	Soil/Solid	EPA 200.2/1631 Appendix (mod)	Samples are dried, then sieved through a 2 mm sieve, and digested with $\text{HNO}_3$ and $\text{HCl}$ , followed by CVAAS analysis.
Dioxins and Furans in Soil/Solid by GC-HRMS	XE766 ALS Environmental - Burlington	Soil/Solid	USEPA 1613B	The sample is extracted by Soxhlet extraction. Extracts are prepared using column chromatography, reduced in volume and analyzed by isotope-dilution GC-HRMS Reported on a dry-weight basis.
Dioxins and Furans in Soil/Solid by GC-HRMS (Wet Weight)	XE766A ALS Environmental - Burlington	Soil/Solid	USEPA 1613B	The sample is extracted by Soxhlet extraction. Extracts are prepared using column chromatography, reduced in volume and analyzed by isotope-dilution GC-HRMS Reported on a wet-weight basis.
Preparation Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Leach 1:2 Soil:Water for pH/EC	EP108 ALS Environmental - Vancouver	Soil/Solid	BC WLAP METHOD: PH, ELECTROMETRIC, SOIL	The procedure involves mixing the dried (at $<60^{\circ}\text{C}$ ) and sieved (No. 10 / 2mm) sample with deionized/distilled water at a 1:2 ratio of sediment to water.



<i>Preparation Methods</i>	<i>Method / Lab</i>	<i>Matrix</i>	<i>Method Reference</i>	<i>Method Descriptions</i>
Digestion for Metals and Mercury	EP440  ALS Environmental - Vancouver	Soil/Solid	EPA 200.2 (mod)	Samples are dried, then sieved through a 2 mm sieve, and digested with HNO <sub>3</sub> and HCl. This method is intended to liberate metals that may be environmentally available.
Soxhlet extraction of solids for DX/Fs, PCBs, PCNs, and/or HFRs	EP800  ALS Environmental - Burlington	Soil/Solid	EPA Method 3540C (preparation)	Solid samples are homogenized and sub-sampled, then extracted using Soxhlet apparatus.

## QUALITY CONTROL REPORT

<b>Work Order</b>	: <b>VA25C8186</b>	<b>Page</b>	: 1 of 19
<b>Amendment</b>	: <b>1</b>		
<b>Client</b>	: HDR Corporation	<b>Laboratory</b>	: ALS Environmental - Vancouver
<b>Contact</b>	: Johanna Mason	<b>Account Manager</b>	: Le Van Dalfsen
<b>Address</b>	: 500-1500 W. Georgia Street Vancouver BC Canada V6G 2Z6	<b>Address</b>	: 8081 Lougheed Highway Burnaby, British Columbia Canada V5A 1W9
<b>Telephone</b>	: ----	<b>Telephone</b>	: +1 604 253 4188
<b>Project</b>	: VA25HDR100-001	<b>Date Samples Received</b>	: 22-Oct-2025 14:10
<b>PO</b>	: ----	<b>Date Analysis Commenced</b>	: 28-Oct-2025
<b>C-O-C number</b>	: 23-1162263/1162261	<b>Issue Date</b>	: 05-Dec-2025 10:07
<b>Sampler</b>	: ----		
<b>Site</b>	: ----		
<b>Quote number</b>	: VA25-HDRI100-001		
<b>No. of samples received</b>	: 16		
<b>No. of samples analysed</b>	: 16		

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 Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percent Difference (RPD) and Data Quality Objectives
- Reference Material (RM) Report; Recovery and Data Quality Objectives
- Method Blank (MB) Report; Recovery and Data Quality Objectives
- Laboratory Control Sample (LCS) Report; Recovery and Data Quality Objectives

### Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is conducted in accordance with US FDA 21 CFR Part 11.

<i>Signatories</i>	<i>Position</i>	<i>Laboratory Department</i>
Colin Jamieson	Analyst	Burlington Organics, Burlington, Ontario
Hyunduck Suk	Analyst- General	Vancouver Organics, Burnaby, British Columbia
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Sabrina Jin	Analyst	Burlington Organics, Burlington, Ontario
Savannah Somers	Analyst	Burlington Organics, Burlington, Ontario
Twinkle Patel	Analyst	Burlington Organics, Burlington, Ontario



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## General Comments

The ALS Quality Control (QC) report is optionally provided to ALS clients upon request. ALS test methods include comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against predetermined Data Quality Objectives (DQOs) to provide confidence in the accuracy of associated test results. This report contains detailed results for all QC results applicable to this sample submission. Please refer to the ALS Quality Control Interpretation report (QCI) for applicable method references and methodology summaries.

### Key :

Anonymous = Refers to samples which are not part of this work order, but which formed part of the QC process lot.

CAS Number = Chemical Abstracts Service number is a unique identifier assigned to discrete substances.

DQO = Data Quality Objective.

LOR = Limit of Reporting (detection limit).

RPD = Relative Percent Difference

# = Indicates a QC result that did not meet the ALS DQO.

## Workorder Comments

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Holding times are displayed as "---" if no guidance exists from CCME, Canadian provinces, or broadly recognized international references.

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### Laboratory Duplicate (DUP) Report

A Laboratory Duplicate (DUP) is a randomly selected intralaboratory replicate sample. Laboratory Duplicates provide information regarding method precision and sample heterogeneity. ALS DQOs for Laboratory Duplicates are expressed as test-specific limits for Relative Percent Difference (RPD), or as an absolute difference limit of 2 times the LOR for low concentration duplicates within ~ 4-10 times the LOR (cut-off is test-specific).

Sub-Matrix: Soil/Solid

					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	LOR	Unit	Original Result	Duplicate Result	RPD(%) or Difference	Duplicate Limits	Qualifier
<b>Sample Preparation (QC Lot: 2303365)</b>											
EO2509685-006	Anonymous	Weight, extraction (wet)	----	EP800	0.0001	g	20.3348	20.3967		Diff <2x LOR	----
<b>Sample Preparation (QC Lot: 2306219)</b>											
VA25C8186-017	HS-38 (roof for dioxins + furans)	Weight, extraction (wet)	----	EP800	0.0001	g	1.3786	1.4249		Diff <2x LOR	----
<b>Sample Preparation (QC Lot: 2355357)</b>											
VA25C8186-001	HS-27A	Weight, extraction (wet)	----	EP800	0.0001	g	20.0134	20.0109		Diff <2x LOR	----
<b>Physical Tests (QC Lot: 2302340)</b>											
VA25C8186-001	HS-27A	pH (1:2 soil:water)	----	E108	0.10	pH units	6.52	6.46	0.9%	5%	----
<b>Physical Tests (QC Lot: 2304568)</b>											
VA25C8186-014	HS-35	Moisture	----	E144	0.25	%	51.5	53.0	3.03%	20%	----
<b>Physical Tests (QC Lot: 2308255)</b>											
VA25C8186-016	HS-37 (roof for metals)	pH (1:2 soil:water)	----	E108	0.10	pH units	6.06	6.06	0.0%	5%	----
<b>Physical Tests (QC Lot: 2368273)</b>											
VA25C8186-001	HS-27A	Moisture	----	E144	0.25	%	30.3	29.3	3.42%	20%	----
<b>Metals (QC Lot: 2302338)</b>											
VA25C8186-001	HS-27A	Mercury	7439-97-6	E510	0.0500	mg/kg	0.0871	0.0860	0.0011	Diff <2x LOR	----
<b>Metals (QC Lot: 2302339)</b>											
VA25C8186-001	HS-27A	Aluminum	7429-90-5	E440	50	mg/kg	14200	13300	6.64%	40%	----
		Antimony	7440-36-0	E440	0.10	mg/kg	3.29	2.92	11.9%	30%	----
		Arsenic	7440-38-2	E440	0.10	mg/kg	6.74	4.98	30.0%	30%	----
		Barium	7440-39-3	E440	0.50	mg/kg	128	114	11.8%	40%	----
		Beryllium	7440-41-7	E440	0.10	mg/kg	0.21	0.20	0.008	Diff <2x LOR	----
		Bismuth	7440-69-9	E440	0.20	mg/kg	0.29	0.35	0.06	Diff <2x LOR	----
		Boron	7440-42-8	E440	5.0	mg/kg	6.7	7.8	1.1	Diff <2x LOR	----
		Cadmium	7440-43-9	E440	0.020	mg/kg	0.779	0.714	8.71%	30%	----
		Calcium	7440-70-2	E440	50	mg/kg	7600	7090	6.88%	30%	----
		Chromium	7440-47-3	E440	0.50	mg/kg	36.1	36.2	0.198%	30%	----
		Cobalt	7440-48-4	E440	0.10	mg/kg	8.63	7.47	14.4%	30%	----
		Copper	7440-50-8	E440	0.50	mg/kg	66.1	59.3	10.8%	30%	----
		Iron	7439-89-6	E440	50	mg/kg	21800	20000	8.65%	30%	----
		Lead	7439-92-1	E440	0.50	mg/kg	131	114	13.8%	40%	----



Sub-Matrix: Soil/Solid					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	LOR	Unit	Original Result	Duplicate Result	RPD(%) or Difference	Duplicate Limits	Qualifier
<b>Metals (QC Lot: 2302339) - continued</b>											
VA25C8186-001	HS-27A	Lithium	7439-93-2	E440	2.0	mg/kg	9.3	8.9	0.5	Diff <2x LOR	----
		Magnesium	7439-95-4	E440	20	mg/kg	5700	4940	14.2%	30%	----
		Manganese	7439-96-5	E440	1.0	mg/kg	669	596	11.5%	30%	----
		Molybdenum	7439-98-7	E440	0.10	mg/kg	6.64	3.11	72.4%	40%	DUP-H
		Nickel	7440-02-0	E440	0.50	mg/kg	23.0	20.9	9.75%	30%	----
		Phosphorus	7723-14-0	E440	50	mg/kg	983	835	16.2%	30%	----
		Potassium	7440-09-7	E440	100	mg/kg	1320	1200	9.38%	40%	----
		Selenium	7782-49-2	E440	0.20	mg/kg	<0.20	<0.20	0	Diff <2x LOR	----
		Silver	7440-22-4	E440	0.10	mg/kg	0.19	0.18	0.01	Diff <2x LOR	----
		Sodium	7440-23-5	E440	50	mg/kg	416	408	2.00%	40%	----
		Strontium	7440-24-6	E440	0.50	mg/kg	50.5	46.7	7.75%	40%	----
		Sulfur	7704-34-9	E440	1000	mg/kg	<1000	<1000	0	Diff <2x LOR	----
		Thallium	7440-28-0	E440	0.050	mg/kg	0.061	0.057	0.004	Diff <2x LOR	----
		Tin	7440-31-5	E440	2.0	mg/kg	4.6	4.0	0.6	Diff <2x LOR	----
		Titanium	7440-32-6	E440	1.0	mg/kg	677	686	1.29%	40%	----
		Tungsten	7440-33-7	E440	0.50	mg/kg	0.72	0.55	0.17	Diff <2x LOR	----
		Uranium	7440-61-1	E440	0.050	mg/kg	0.564	0.525	7.01%	30%	----
		Vanadium	7440-62-2	E440	0.20	mg/kg	50.4	47.1	6.80%	30%	----
Zinc	7440-66-6	E440	2.0	mg/kg	231	202	13.5%	30%	----		
Zirconium	7440-67-7	E440	1.0	mg/kg	1.6	1.1	0.6	Diff <2x LOR	----		
<b>Metals (QC Lot: 2308253)</b>											
VA25C8186-016	HS-37 (roof for metals)	Aluminum	7429-90-5	E440	50	mg/kg	25100	27700	9.99%	40%	----
		Antimony	7440-36-0	E440	0.10	mg/kg	0.15	<0.10	0.05	Diff <2x LOR	----
		Arsenic	7440-38-2	E440	0.10	mg/kg	0.16	0.19	0.03	Diff <2x LOR	----
		Barium	7440-39-3	E440	0.50	mg/kg	<0.50	0.84	0.34	Diff <2x LOR	----
		Beryllium	7440-41-7	E440	0.10	mg/kg	<0.10	<0.10	0	Diff <2x LOR	----
		Bismuth	7440-69-9	E440	0.20	mg/kg	<0.20	<0.20	0	Diff <2x LOR	----
		Boron	7440-42-8	E440	5.0	mg/kg	<5.0	<5.0	0	Diff <2x LOR	----
		Cadmium	7440-43-9	E440	0.020	mg/kg	<0.020	<0.020	0	Diff <2x LOR	----
		Calcium	7440-70-2	E440	50	mg/kg	24400	30600	22.7%	30%	----
		Chromium	7440-47-3	E440	0.50	mg/kg	0.87	1.09	0.22	Diff <2x LOR	----
		Cobalt	7440-48-4	E440	0.10	mg/kg	0.21	0.20	0.006	Diff <2x LOR	----
		Copper	7440-50-8	E440	0.50	mg/kg	3.25	3.89	17.9%	30%	----
		Iron	7439-89-6	E440	50	mg/kg	175	225	49	Diff <2x LOR	----



Sub-Matrix: Soil/Solid					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	LOR	Unit	Original Result	Duplicate Result	RPD(%) or Difference	Duplicate Limits	Qualifier
<b>Metals (QC Lot: 2308253) - continued</b>											
VA25C8186-016	HS-37 (roof for metals)	Lead	7439-92-1	E440	0.50	mg/kg	<0.50	0.59	0.09	Diff <2x LOR	----
		Lithium	7439-93-2	E440	2.0	mg/kg	<2.0	<2.0	0	Diff <2x LOR	----
		Magnesium	7439-95-4	E440	20	mg/kg	244	327	29.1%	30%	----
		Manganese	7439-96-5	E440	1.0	mg/kg	5.3	6.9	1.5	Diff <2x LOR	----
		Molybdenum	7439-98-7	E440	0.10	mg/kg	0.25	0.30	0.05	Diff <2x LOR	----
		Nickel	7440-02-0	E440	0.50	mg/kg	2.30	2.82	0.53	Diff <2x LOR	----
		Phosphorus	7723-14-0	E440	50	mg/kg	<50	<50	0	Diff <2x LOR	----
		Potassium	7440-09-7	E440	100	mg/kg	<100	<100	0	Diff <2x LOR	----
		Selenium	7782-49-2	E440	0.20	mg/kg	<0.20	<0.20	0	Diff <2x LOR	----
		Silver	7440-22-4	E440	0.10	mg/kg	<0.10	<0.10	0	Diff <2x LOR	----
		Sodium	7440-23-5	E440	50	mg/kg	<50	<50	0	Diff <2x LOR	----
		Strontium	7440-24-6	E440	0.50	mg/kg	77.3	102	27.6%	40%	----
		Sulfur	7704-34-9	E440	1000	mg/kg	<1000	<1000	0	Diff <2x LOR	----
		Thallium	7440-28-0	E440	0.050	mg/kg	<0.050	<0.050	0	Diff <2x LOR	----
		Tin	7440-31-5	E440	2.0	mg/kg	<2.0	<2.0	0	Diff <2x LOR	----
		Titanium	7440-32-6	E440	1.0	mg/kg	3.1	3.9	0.8	Diff <2x LOR	----
		Tungsten	7440-33-7	E440	0.50	mg/kg	<0.50	<0.50	0	Diff <2x LOR	----
		Uranium	7440-61-1	E440	0.050	mg/kg	0.055	0.075	0.020	Diff <2x LOR	----
Vanadium	7440-62-2	E440	0.20	mg/kg	7.13	7.53	5.50%	30%	----		
Zinc	7440-66-6	E440	2.0	mg/kg	49.1	58.6	17.7%	30%	----		
Zirconium	7440-67-7	E440	1.0	mg/kg	<1.0	<1.0	0	Diff <2x LOR	----		
<b>Metals (QC Lot: 2308254)</b>											
VA25C8186-016	HS-37 (roof for metals)	Mercury	7439-97-6	E510	0.0500	mg/kg	<0.0500	<0.0500	0	Diff <2x LOR	----
<b>Dioxins and Furans (QC Lot: 2303365)</b>											
EO2509685-006	Anonymous	HpCDD, 1,2,3,4,6,7,8-	35822-46-9	XE766	0.055	pg/g	<0.99	# 1.20	1.20	Diff <2x LOR	J,M
		HpCDF, 1,2,3,4,6,7,8-	67562-39-4	XE766	0.048	pg/g	<0.12	0.109	0.0111	Diff <2x LOR	[B],[J],M
		HpCDF, 1,2,3,4,7,8,9-	55673-89-7	XE766	0.059	pg/g	<0.040	<0.059	0.019	Diff <2x LOR	[U]
		HxCDD, 1,2,3,4,7,8-	39227-28-6	XE766	0.031	pg/g	<0.052	<0.031	0.031	Diff <2x LOR	[U]
		HxCDD, 1,2,3,6,7,8-	57653-85-7	XE766	0.028	pg/g	0.514	0.559	8.39%	25%	[J],M
		HxCDD, 1,2,3,7,8,9-	19408-74-3	XE766	0.048	pg/g	<0.036	<0.048		Diff <2x LOR	[J],F,M
		HxCDF, 1,2,3,4,7,8-	70648-26-9	XE766	0.023	pg/g	<0.022	<0.023		Diff <2x LOR	[U]
		HxCDF, 1,2,3,6,7,8-	57117-44-9	XE766	0.022	pg/g	<0.021	<0.022	0.022	Diff <2x LOR	[U]
		HxCDF, 1,2,3,7,8,9-	72918-21-9	XE766	0.032	pg/g	<0.028	<0.032	0.032	Diff <2x LOR	[U]
		HxCDF, 2,3,4,6,7,8-	60851-34-5	XE766	0.024	pg/g	<0.023	<0.024	0.024	Diff <2x LOR	[U]



Sub-Matrix: Soil/Solid					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	LOR	Unit	Original Result	Duplicate Result	RPD(%) or Difference	Duplicate Limits	Qualifier
<b>Dioxins and Furans (QC Lot: 2303365) - continued</b>											
EO2509685-006	Anonymous	OCDD	3268-87-9	XE766	1.1	pg/g	<2.3	<1.1	2.3	Diff <2x LOR	[U],F,M
		OCDF	39001-02-0	XE766	0.70	pg/g	1.14	<0.70	0.44	Diff <2x LOR	[U],F,M
		PeCDD, 1,2,3,7,8-	40321-76-4	XE766	0.057	pg/g	<0.048	<0.057		Diff <2x LOR	[U]
		PeCDF, 1,2,3,7,8-	57117-41-6	XE766	0.03	pg/g	<0.03	<0.03	0.03	Diff <2x LOR	[U],M
		PeCDF, 2,3,4,7,8-	57117-31-4	XE766	0.030	pg/g	<0.030	<0.030	0.00015	Diff <2x LOR	[U]
		TCDD, 2,3,7,8-	1746-01-6	XE766	0.046	pg/g	<0.037	<0.046	0.037	Diff <2x LOR	[U]
		TCDF, 2,3,7,8-	51207-31-9	XE766	0.033	pg/g	<0.029	<0.033	0.033	Diff <2x LOR	[U]
<b>Dioxins and Furans (QC Lot: 2306219)</b>											
VA25C8186-017	HS-38 (roof for dioxins + furans)	HpCDD, 1,2,3,4,6,7,8-	35822-46-9	XE766A	4.4	pg/g wwt	69.5	51.4	30.1%	25%	DUP-H
		HpCDF, 1,2,3,4,6,7,8-	67562-39-4	XE766A	6.2	pg/g wwt	<5.5	<6.2		Diff <2x LOR	[J],F
		HpCDF, 1,2,3,4,7,8,9-	55673-89-7	XE766A	2.2	pg/g wwt	<2.4	<2.2	2.2	Diff <2x LOR	[U]
		HxCDD, 1,2,3,4,7,8-	39227-28-6	XE766A	2.0	pg/g wwt	<1.7	<2.0	0.29	Diff <2x LOR	[U]
		HxCDD, 1,2,3,6,7,8-	57653-85-7	XE766A	3.8	pg/g wwt	6.43	# <3.8	6.4	Diff <2x LOR	[J],DUP-H,F
		HxCDD, 1,2,3,7,8,9-	19408-74-3	XE766A	1.9	pg/g wwt	<2.4	<1.9	1.9	Diff <2x LOR	[U]
		HxCDF, 1,2,3,4,7,8-	70648-26-9	XE766A	1.3	pg/g wwt	<1.1	<1.3	1.3	Diff <2x LOR	[U]
		HxCDF, 1,2,3,6,7,8-	57117-44-9	XE766A	1.3	pg/g wwt	<1.1	<1.3	1.1	Diff <2x LOR	[U]
		HxCDF, 1,2,3,7,8,9-	72918-21-9	XE766A	2.4	pg/g wwt	<1.9	<2.4	0.50	Diff <2x LOR	[U]
		HxCDF, 2,3,4,6,7,8-	60851-34-5	XE766A	1.9	pg/g wwt	<1.5	<1.9		Diff <2x LOR	[U]
		OCDD	3268-87-9	XE766A	7.1	pg/g wwt	550	369	39.5%	25%	DUP-H
		OCDF	39001-02-0	XE766A	21	pg/g wwt	41.0	# <21	41	Diff <2x LOR	DUP-H,F,M
		PeCDD, 1,2,3,7,8-	40321-76-4	XE766A	1.5	pg/g wwt	<1.2	<1.5		Diff <2x LOR	[U]
		PeCDF, 1,2,3,7,8-	57117-41-6	XE766A	0.7	pg/g wwt	<0.9	<0.7	0.2	Diff <2x LOR	[U]
		PeCDF, 2,3,4,7,8-	57117-31-4	XE766A	0.73	pg/g wwt	<0.96	<0.73	0.96	Diff <2x LOR	[U]
TCDD, 2,3,7,8-	1746-01-6	XE766A	1.0	pg/g wwt	<1.1	<1.0	1.0	Diff <2x LOR	[U]		
TCDF, 2,3,7,8-	51207-31-9	XE766A	1.1	pg/g wwt	<1.7	<1.1	0.59	Diff <2x LOR	[U]		
<b>Dioxins and Furans (QC Lot: 2355357)</b>											
VA25C8186-001	HS-27A	HpCDD, 1,2,3,4,6,7,8-	35822-46-9	XE766	2.0	pg/g	1670	1980	16.8%	25%	----
		HpCDF, 1,2,3,4,6,7,8-	67562-39-4	XE766	0.97	pg/g	437	514	16.2%	25%	----
		HpCDF, 1,2,3,4,7,8,9-	55673-89-7	XE766	1.1	pg/g	17.3	22.4	25.6%	25%	RRQC
		HxCDD, 1,2,3,4,7,8-	39227-28-6	XE766	0.51	pg/g	21.3	29.1	31.0%	25%	RRQC
		HxCDD, 1,2,3,6,7,8-	57653-85-7	XE766	0.45	pg/g	101	117	13.8%	25%	----
		HxCDD, 1,2,3,7,8,9-	19408-74-3	XE766	0.46	pg/g	41.4	52.4	23.4%	25%	----
		HxCDF, 1,2,3,4,7,8-	70648-26-9	XE766	0.41	pg/g	12.6	18.4	37.3%	25%	M,RRQC
		HxCDF, 1,2,3,6,7,8-	57117-44-9	XE766	0.42	pg/g	17.6	21.4	19.5%	25%	----



Sub-Matrix: Soil/Solid					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	LOR	Unit	Original Result	Duplicate Result	RPD(%) or Difference	Duplicate Limits	Qualifier
<b>Dioxins and Furans (QC Lot: 2355357) - continued</b>											
VA25C8186-001	HS-27A	HxCDF, 1,2,3,7,8,9-	72918-21-9	XE766	0.59	pg/g	3.52	4.05	13.8%	25%	----
		HxCDF, 2,3,4,6,7,8-	60851-34-5	XE766	0.46	pg/g	<29	# 33.8	33.8	Diff <2x LOR	J,M
		OCDD	3268-87-9	XE766	2.2	pg/g	9540	11600	19.8%	25%	----
		OCDF	39001-02-0	XE766	0.96	pg/g	724	850	16.0%	25%	----
		PeCDD, 1,2,3,7,8-	40321-76-4	XE766	0.084	pg/g	12.0	14.7	20.7%	25%	M
		PeCDF, 1,2,3,7,8-	57117-41-6	XE766	0.3	pg/g	<14	# 34.3	34.3	Diff <2x LOR	J
		PeCDF, 2,3,4,7,8-	57117-31-4	XE766	0.33	pg/g	12.0	14.1	15.8%	25%	----
		TCDD, 2,3,7,8-	1746-01-6	XE766	0.11	pg/g	1.13	1.42	22.7%	25%	----
		TCDF, 2,3,7,8-	51207-31-9	XE766	0.10	pg/g	3.89	4.83	21.7%	25%	----

### Qualifiers

Qualifier	Description
[B]	The analyte was detected in the Method Blank at >10% of the sample concentration.
[J]	Estimated value. The reported concentration is below the calibrated range of the instrument but above the EDL.
[U]	The analyte was not detected above the EDL (or LOR where applicable).
DUP-H	Duplicate results outside ALS DQO, due to sample heterogeneity.
F	The ion abundance ratio(s) did not meet the acceptance criteria. Estimated Detection Limit for that compound has been elevated to the level of the EMPC.
J	Duplicate results and limits are expressed in terms of absolute difference.
M	Peak has been manually integrated.
RRQC	Refer to report comments for information regarding this QC result.



## Method Blank (MB) Report

A Method Blank is an analyte-free matrix that undergoes sample processing identical to that carried out for test samples. Method Blank results are used to monitor and control for potential contamination from the laboratory environment and reagents. For most tests, the DQO for Method Blanks is for the result to be < LOR.

Sub-Matrix: Soil/Solid

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
<b>Sample Preparation (QCLot: 2303365)</b>						
Weight, extraction (wet)	---	EP800	0.0001	g	20.1390	---
<b>Sample Preparation (QCLot: 2306219)</b>						
Weight, extraction (wet)	---	EP800	0.0001	g	1.3864	---
<b>Sample Preparation (QCLot: 2355357)</b>						
Weight, extraction (wet)	---	EP800	0.0001	g	20.0294	---
<b>Physical Tests (QCLot: 2304568)</b>						
Moisture	---	E144	0.25	%	<0.25	---
<b>Physical Tests (QCLot: 2368273)</b>						
Moisture	---	E144	0.25	%	<0.25	---
<b>Metals (QCLot: 2302338)</b>						
Mercury	7439-97-6	E510	0.005	mg/kg	<0.0050	---
<b>Metals (QCLot: 2302339)</b>						
Aluminum	7429-90-5	E440	50	mg/kg	<50	---
Antimony	7440-36-0	E440	0.1	mg/kg	<0.10	---
Arsenic	7440-38-2	E440	0.1	mg/kg	<0.10	---
Barium	7440-39-3	E440	0.5	mg/kg	<0.50	---
Beryllium	7440-41-7	E440	0.1	mg/kg	<0.10	---
Bismuth	7440-69-9	E440	0.2	mg/kg	<0.20	---
Boron	7440-42-8	E440	5	mg/kg	<5.0	---
Cadmium	7440-43-9	E440	0.02	mg/kg	<0.020	---
Calcium	7440-70-2	E440	50	mg/kg	<50	---
Chromium	7440-47-3	E440	0.5	mg/kg	<0.50	---
Cobalt	7440-48-4	E440	0.1	mg/kg	<0.10	---
Copper	7440-50-8	E440	0.5	mg/kg	<0.50	---
Iron	7439-89-6	E440	50	mg/kg	<50	---
Lead	7439-92-1	E440	0.5	mg/kg	<0.50	---
Lithium	7439-93-2	E440	2	mg/kg	<2.0	---
Magnesium	7439-95-4	E440	20	mg/kg	<20	---
Manganese	7439-96-5	E440	1	mg/kg	<1.0	---
Molybdenum	7439-98-7	E440	0.1	mg/kg	<0.10	---
Nickel	7440-02-0	E440	0.5	mg/kg	<0.50	---
Phosphorus	7723-14-0	E440	50	mg/kg	<50	---



Sub-Matrix: Soil/Solid

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
<b>Metals (QCLot: 2302339) - continued</b>						
Potassium	7440-09-7	E440	100	mg/kg	<100	---
Selenium	7782-49-2	E440	0.2	mg/kg	<0.20	---
Silver	7440-22-4	E440	0.1	mg/kg	<0.10	---
Sodium	7440-23-5	E440	50	mg/kg	<50	---
Strontium	7440-24-6	E440	0.5	mg/kg	<0.50	---
Sulfur	7704-34-9	E440	1000	mg/kg	<1000	---
Thallium	7440-28-0	E440	0.05	mg/kg	<0.050	---
Tin	7440-31-5	E440	2	mg/kg	<2.0	---
Titanium	7440-32-6	E440	1	mg/kg	<1.0	---
Tungsten	7440-33-7	E440	0.5	mg/kg	<0.50	---
Uranium	7440-61-1	E440	0.05	mg/kg	<0.050	---
Vanadium	7440-62-2	E440	0.2	mg/kg	<0.20	---
Zinc	7440-66-6	E440	2	mg/kg	<2.0	---
Zirconium	7440-67-7	E440	1	mg/kg	<1.0	---
<b>Metals (QCLot: 2308253)</b>						
Aluminum	7429-90-5	E440	50	mg/kg	<50	---
Antimony	7440-36-0	E440	0.1	mg/kg	<0.10	---
Arsenic	7440-38-2	E440	0.1	mg/kg	<0.10	---
Barium	7440-39-3	E440	0.5	mg/kg	<0.50	---
Beryllium	7440-41-7	E440	0.1	mg/kg	<0.10	---
Bismuth	7440-69-9	E440	0.2	mg/kg	<0.20	---
Boron	7440-42-8	E440	5	mg/kg	<5.0	---
Cadmium	7440-43-9	E440	0.02	mg/kg	<0.020	---
Calcium	7440-70-2	E440	50	mg/kg	<50	---
Chromium	7440-47-3	E440	0.5	mg/kg	<0.50	---
Cobalt	7440-48-4	E440	0.1	mg/kg	<0.10	---
Copper	7440-50-8	E440	0.5	mg/kg	<0.50	---
Iron	7439-89-6	E440	50	mg/kg	<50	---
Lead	7439-92-1	E440	0.5	mg/kg	<0.50	---
Lithium	7439-93-2	E440	2	mg/kg	<2.0	---
Magnesium	7439-95-4	E440	20	mg/kg	<20	---
Manganese	7439-96-5	E440	1	mg/kg	<1.0	---
Molybdenum	7439-98-7	E440	0.1	mg/kg	<0.10	---
Nickel	7440-02-0	E440	0.5	mg/kg	<0.50	---
Phosphorus	7723-14-0	E440	50	mg/kg	<50	---



Sub-Matrix: **Soil/Solid**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
<b>Metals (QCLot: 2308253) - continued</b>						
Potassium	7440-09-7	E440	100	mg/kg	<100	---
Selenium	7782-49-2	E440	0.2	mg/kg	<0.20	---
Silver	7440-22-4	E440	0.1	mg/kg	<0.10	---
Sodium	7440-23-5	E440	50	mg/kg	<50	---
Strontium	7440-24-6	E440	0.5	mg/kg	<0.50	---
Sulfur	7704-34-9	E440	1000	mg/kg	<1000	---
Thallium	7440-28-0	E440	0.05	mg/kg	<0.050	---
Tin	7440-31-5	E440	2	mg/kg	<2.0	---
Titanium	7440-32-6	E440	1	mg/kg	<1.0	---
Tungsten	7440-33-7	E440	0.5	mg/kg	<0.50	---
Uranium	7440-61-1	E440	0.05	mg/kg	<0.050	---
Vanadium	7440-62-2	E440	0.2	mg/kg	<0.20	---
Zinc	7440-66-6	E440	2	mg/kg	<2.0	---
Zirconium	7440-67-7	E440	1	mg/kg	<1.0	---
<b>Metals (QCLot: 2308254)</b>						
Mercury	7439-97-6	E510	0.005	mg/kg	<0.0050	---
<b>Dioxins and Furans (QCLot: 2303365)</b>						
HpCDD, 1,2,3,4,6,7,8-	35822-46-9	XE766	1	pg/g	<1.0	[J],F,M
HpCDF, 1,2,3,4,6,7,8-	67562-39-4	XE766	2	pg/g	<2.0	[J],M
HpCDF, 1,2,3,4,7,8,9-	55673-89-7	XE766	1	pg/g	<1.0	[U]
HxCDD, 1,2,3,4,7,8-	39227-28-6	XE766	1	pg/g	<1.0	[U]
HxCDD, 1,2,3,6,7,8-	57653-85-7	XE766	1	pg/g	<1.0	[U]
HxCDD, 1,2,3,7,8,9-	19408-74-3	XE766	1	pg/g	<1.0	[U],M
HxCDF, 1,2,3,4,7,8-	70648-26-9	XE766	1	pg/g	<1.0	[U]
HxCDF, 1,2,3,6,7,8-	57117-44-9	XE766	1	pg/g	<1.0	[U]
HxCDF, 1,2,3,7,8,9-	72918-21-9	XE766	1	pg/g	<1.0	[U],F,M
HxCDF, 2,3,4,6,7,8-	60851-34-5	XE766	1	pg/g	<1.0	[U]
OCDD	3268-87-9	XE766	2	pg/g	<2.0	[J],F,M
OCDF	39001-02-0	XE766	2	pg/g	<2.0	[J],F,M
PeCDD, 1,2,3,7,8-	40321-76-4	XE766	1	pg/g	<1.0	[U]
PeCDF, 1,2,3,7,8-	57117-41-6	XE766	1	pg/g	<1	[U]
PeCDF, 2,3,4,7,8-	57117-31-4	XE766	1	pg/g	<1.0	[U]
TCDD, 2,3,7,8-	1746-01-6	XE766	1	pg/g	<1.0	[U]
TCDF, 2,3,7,8-	51207-31-9	XE766	1	pg/g	<1.0	[U]
<b>Dioxins and Furans (QCLot: 2306219)</b>						



Sub-Matrix: Soil/Solid

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
<b>Dioxins and Furans (QCLot: 2306219) - continued</b>						
HpCDD, 1,2,3,4,6,7,8-	35822-46-9	XE766A	0.1	pg/g wwt	<1.2	[U],F
HpCDF, 1,2,3,4,6,7,8-	67562-39-4	XE766A	0.1	pg/g wwt	1.08	[J],M
HpCDF, 1,2,3,4,7,8,9-	55673-89-7	XE766A	0.1	pg/g wwt	<1.1	[U]
HxCDD, 1,2,3,4,7,8-	39227-28-6	XE766A	0.1	pg/g wwt	<1.2	[U]
HxCDD, 1,2,3,6,7,8-	57653-85-7	XE766A	0.1	pg/g wwt	<1.2	[U]
HxCDD, 1,2,3,7,8,9-	19408-74-3	XE766A	0.1	pg/g wwt	<1.2	[U]
HxCDF, 1,2,3,4,7,8-	70648-26-9	XE766A	0.1	pg/g wwt	<0.38	[U]
HxCDF, 1,2,3,6,7,8-	57117-44-9	XE766A	0.1	pg/g wwt	<0.35	[U]
HxCDF, 1,2,3,7,8,9-	72918-21-9	XE766A	0.1	pg/g wwt	<0.53	[U],F,M
HxCDF, 2,3,4,6,7,8-	60851-34-5	XE766A	0.1	pg/g wwt	<0.44	[U]
OCDD	3268-87-9	XE766A	0.1	pg/g wwt	<15	F
OCDF	39001-02-0	XE766A	0.1	pg/g wwt	<2.0	[U]
PeCDD, 1,2,3,7,8-	40321-76-4	XE766A	0.1	pg/g wwt	<0.42	[U]
PeCDF, 1,2,3,7,8-	57117-41-6	XE766A	0.1	pg/g wwt	<0.4	[U],F
PeCDF, 2,3,4,7,8-	57117-31-4	XE766A	0.1	pg/g wwt	<0.37	[U]
TCDD, 2,3,7,8-	1746-01-6	XE766A	0.1	pg/g wwt	<0.50	[U]
TCDF, 2,3,7,8-	51207-31-9	XE766A	0.1	pg/g wwt	<0.59	[U],M
<b>Dioxins and Furans (QCLot: 2355357)</b>						
HpCDD, 1,2,3,4,6,7,8-	35822-46-9	XE766	1	pg/g	<1.0	[U],M
HpCDF, 1,2,3,4,6,7,8-	67562-39-4	XE766	2	pg/g	<2.0	[U],M
HpCDF, 1,2,3,4,7,8,9-	55673-89-7	XE766	1	pg/g	<1.0	[U]
HxCDD, 1,2,3,4,7,8-	39227-28-6	XE766	1	pg/g	<1.0	[U]
HxCDD, 1,2,3,6,7,8-	57653-85-7	XE766	1	pg/g	<1.0	[U]
HxCDD, 1,2,3,7,8,9-	19408-74-3	XE766	1	pg/g	<1.0	[U]
HxCDF, 1,2,3,4,7,8-	70648-26-9	XE766	1	pg/g	<1.0	[U]
HxCDF, 1,2,3,6,7,8-	57117-44-9	XE766	1	pg/g	<1.0	[U],F,M
HxCDF, 1,2,3,7,8,9-	72918-21-9	XE766	1	pg/g	<1.0	[J],F
HxCDF, 2,3,4,6,7,8-	60851-34-5	XE766	1	pg/g	<1.0	[U]
OCDD	3268-87-9	XE766	2	pg/g	<2.0	[U],F,M
OCDF	39001-02-0	XE766	2	pg/g	<2.0	[J],F,M
PeCDD, 1,2,3,7,8-	40321-76-4	XE766	1	pg/g	<1.0	[U]
PeCDF, 1,2,3,7,8-	57117-41-6	XE766	1	pg/g	<1	[U]
PeCDF, 2,3,4,7,8-	57117-31-4	XE766	1	pg/g	<1.0	[U]
TCDD, 2,3,7,8-	1746-01-6	XE766	1	pg/g	<1.0	[U]
TCDF, 2,3,7,8-	51207-31-9	XE766	1	pg/g	<1.0	[U]





## Laboratory Control Sample (LCS) Report

A Laboratory Control Sample (LCS) is an analyte-free matrix that has been fortified (spiked) with test analytes at known concentration and processed in an identical manner to test samples. LCS results are expressed as percent recovery, and are used to monitor and control test method accuracy and precision, independent of test sample matrix.

Sub-Matrix: Soil/Solid

					Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
Analyte	CAS Number	Method	LOR	Unit	Target Concentration	LCS	Low	High	Qualifier
<b>Physical Tests (QCLot: 2302340)</b>									
pH (1:2 soil:water)	----	E108	----	pH units	6 pH units	100	95.0	105	----
<b>Physical Tests (QCLot: 2304568)</b>									
Moisture	----	E144	0.25	%	50 %	101	90.0	110	----
<b>Physical Tests (QCLot: 2308255)</b>									
pH (1:2 soil:water)	----	E108	----	pH units	6 pH units	101	95.0	105	----
<b>Physical Tests (QCLot: 2368273)</b>									
Moisture	----	E144	0.25	%	50 %	101	90.0	110	----
<b>Metals (QCLot: 2302338)</b>									
Mercury	7439-97-6	E510	0.005	mg/kg	0.1 mg/kg	88.1	80.0	120	----
<b>Metals (QCLot: 2302339)</b>									
Aluminum	7429-90-5	E440	50	mg/kg	200 mg/kg	108	80.0	120	----
Antimony	7440-36-0	E440	0.1	mg/kg	100 mg/kg	103	80.0	120	----
Arsenic	7440-38-2	E440	0.1	mg/kg	100 mg/kg	102	80.0	120	----
Barium	7440-39-3	E440	0.5	mg/kg	25 mg/kg	102	80.0	120	----
Beryllium	7440-41-7	E440	0.1	mg/kg	10 mg/kg	101	80.0	120	----
Bismuth	7440-69-9	E440	0.2	mg/kg	100 mg/kg	97.2	80.0	120	----
Boron	7440-42-8	E440	5	mg/kg	100 mg/kg	98.5	80.0	120	----
Cadmium	7440-43-9	E440	0.02	mg/kg	10 mg/kg	101	80.0	120	----
Calcium	7440-70-2	E440	50	mg/kg	5000 mg/kg	96.9	80.0	120	----
Chromium	7440-47-3	E440	0.5	mg/kg	25 mg/kg	102	80.0	120	----
Cobalt	7440-48-4	E440	0.1	mg/kg	25 mg/kg	99.1	80.0	120	----
Copper	7440-50-8	E440	0.5	mg/kg	25 mg/kg	101	80.0	120	----
Iron	7439-89-6	E440	50	mg/kg	100 mg/kg	112	80.0	120	----
Lead	7439-92-1	E440	0.5	mg/kg	50 mg/kg	104	80.0	120	----
Lithium	7439-93-2	E440	2	mg/kg	25 mg/kg	99.4	80.0	120	----
Magnesium	7439-95-4	E440	20	mg/kg	5000 mg/kg	107	80.0	120	----
Manganese	7439-96-5	E440	1	mg/kg	25 mg/kg	103	80.0	120	----
Molybdenum	7439-98-7	E440	0.1	mg/kg	25 mg/kg	100	80.0	120	----
Nickel	7440-02-0	E440	0.5	mg/kg	50 mg/kg	100	80.0	120	----
Phosphorus	7723-14-0	E440	50	mg/kg	1000 mg/kg	108	80.0	120	----
Potassium	7440-09-7	E440	100	mg/kg	5000 mg/kg	103	80.0	120	----



Sub-Matrix: Soil/Solid

					Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
Analyte	CAS Number	Method	LOR	Unit	Target Concentration	LCS	Low	High	Qualifier
<b>Metals (QCLot: 2302339) - continued</b>									
Selenium	7782-49-2	E440	0.2	mg/kg	100 mg/kg	100	80.0	120	----
Silver	7440-22-4	E440	0.1	mg/kg	10 mg/kg	93.6	80.0	120	----
Sodium	7440-23-5	E440	50	mg/kg	5000 mg/kg	102	80.0	120	----
Strontium	7440-24-6	E440	0.5	mg/kg	25 mg/kg	103	80.0	120	----
Sulfur	7704-34-9	E440	1000	mg/kg	5000 mg/kg	100	80.0	120	----
Thallium	7440-28-0	E440	0.05	mg/kg	100 mg/kg	102	80.0	120	----
Tin	7440-31-5	E440	2	mg/kg	50 mg/kg	99.0	80.0	120	----
Titanium	7440-32-6	E440	1	mg/kg	25 mg/kg	100	80.0	120	----
Tungsten	7440-33-7	E440	0.5	mg/kg	10 mg/kg	102	80.0	120	----
Uranium	7440-61-1	E440	0.05	mg/kg	0.5 mg/kg	104	80.0	120	----
Vanadium	7440-62-2	E440	0.2	mg/kg	50 mg/kg	104	80.0	120	----
Zinc	7440-66-6	E440	2	mg/kg	50 mg/kg	98.9	80.0	120	----
Zirconium	7440-67-7	E440	1	mg/kg	10 mg/kg	104	80.0	120	----
<b>Metals (QCLot: 2308253)</b>									
Aluminum	7429-90-5	E440	50	mg/kg	200 mg/kg	107	80.0	120	----
Antimony	7440-36-0	E440	0.1	mg/kg	100 mg/kg	103	80.0	120	----
Arsenic	7440-38-2	E440	0.1	mg/kg	100 mg/kg	106	80.0	120	----
Barium	7440-39-3	E440	0.5	mg/kg	25 mg/kg	107	80.0	120	----
Beryllium	7440-41-7	E440	0.1	mg/kg	10 mg/kg	106	80.0	120	----
Bismuth	7440-69-9	E440	0.2	mg/kg	100 mg/kg	100	80.0	120	----
Boron	7440-42-8	E440	5	mg/kg	100 mg/kg	104	80.0	120	----
Cadmium	7440-43-9	E440	0.02	mg/kg	10 mg/kg	103	80.0	120	----
Calcium	7440-70-2	E440	50	mg/kg	5000 mg/kg	106	80.0	120	----
Chromium	7440-47-3	E440	0.5	mg/kg	25 mg/kg	104	80.0	120	----
Cobalt	7440-48-4	E440	0.1	mg/kg	25 mg/kg	103	80.0	120	----
Copper	7440-50-8	E440	0.5	mg/kg	25 mg/kg	102	80.0	120	----
Iron	7439-89-6	E440	50	mg/kg	100 mg/kg	104	80.0	120	----
Lead	7439-92-1	E440	0.5	mg/kg	50 mg/kg	105	80.0	120	----
Lithium	7439-93-2	E440	2	mg/kg	25 mg/kg	108	80.0	120	----
Magnesium	7439-95-4	E440	20	mg/kg	5000 mg/kg	108	80.0	120	----
Manganese	7439-96-5	E440	1	mg/kg	25 mg/kg	104	80.0	120	----
Molybdenum	7439-98-7	E440	0.1	mg/kg	25 mg/kg	104	80.0	120	----
Nickel	7440-02-0	E440	0.5	mg/kg	50 mg/kg	104	80.0	120	----
Phosphorus	7723-14-0	E440	50	mg/kg	1000 mg/kg	118	80.0	120	----
Potassium	7440-09-7	E440	100	mg/kg	5000 mg/kg	104	80.0	120	----
Selenium	7782-49-2	E440	0.2	mg/kg	100 mg/kg	103	80.0	120	----



Sub-Matrix: Soil/Solid

					Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
Analyte	CAS Number	Method	LOR	Unit	Target Concentration	LCS	Low	High	Qualifier
<b>Metals (QCLot: 2308253) - continued</b>									
Silver	7440-22-4	E440	0.1	mg/kg	10 mg/kg	96.9	80.0	120	----
Sodium	7440-23-5	E440	50	mg/kg	5000 mg/kg	101	80.0	120	----
Strontium	7440-24-6	E440	0.5	mg/kg	25 mg/kg	105	80.0	120	----
Sulfur	7704-34-9	E440	1000	mg/kg	5000 mg/kg	101	80.0	120	----
Thallium	7440-28-0	E440	0.05	mg/kg	100 mg/kg	105	80.0	120	----
Tin	7440-31-5	E440	2	mg/kg	50 mg/kg	102	80.0	120	----
Titanium	7440-32-6	E440	1	mg/kg	25 mg/kg	102	80.0	120	----
Tungsten	7440-33-7	E440	0.5	mg/kg	10 mg/kg	103	80.0	120	----
Uranium	7440-61-1	E440	0.05	mg/kg	0.5 mg/kg	109	80.0	120	----
Vanadium	7440-62-2	E440	0.2	mg/kg	50 mg/kg	106	80.0	120	----
Zinc	7440-66-6	E440	2	mg/kg	50 mg/kg	102	80.0	120	----
Zirconium	7440-67-7	E440	1	mg/kg	10 mg/kg	103	80.0	120	----
<b>Metals (QCLot: 2308254)</b>									
Mercury	7439-97-6	E510	0.005	mg/kg	0.1 mg/kg	89.4	80.0	120	----
<b>Dioxins and Furans (QCLot: 2303365)</b>									
HpCDD, 1,2,3,4,6,7,8-	35822-46-9	XE766	1	pg/g	49.4 pg/g	99.3	70.0	140	----
HpCDF, 1,2,3,4,6,7,8-	67562-39-4	XE766	2	pg/g	49.4 pg/g	116	82.0	122	----
HpCDF, 1,2,3,4,7,8,9-	55673-89-7	XE766	1	pg/g	49.4 pg/g	105	78.0	138	----
HxCDD, 1,2,3,4,7,8-	39227-28-6	XE766	1	pg/g	49.4 pg/g	108	70.0	164	----
HxCDD, 1,2,3,6,7,8-	57653-85-7	XE766	1	pg/g	49.4 pg/g	102	76.0	134	----
HxCDD, 1,2,3,7,8,9-	19408-74-3	XE766	1	pg/g	49.4 pg/g	102	64.0	162	----
HxCDF, 1,2,3,4,7,8-	70648-26-9	XE766	1	pg/g	49.4 pg/g	103	72.0	134	----
HxCDF, 1,2,3,6,7,8-	57117-44-9	XE766	1	pg/g	49.4 pg/g	102	84.0	130	----
HxCDF, 1,2,3,7,8,9-	72918-21-9	XE766	1	pg/g	49.4 pg/g	108	78.0	130	----
HxCDF, 2,3,4,6,7,8-	60851-34-5	XE766	1	pg/g	49.4 pg/g	104	70.0	156	----
OCDD	3268-87-9	XE766	2	pg/g	98.8 pg/g	110	78.0	144	----
OCDF	39001-02-0	XE766	2	pg/g	98.8 pg/g	157	63.0	170	----
PeCDD, 1,2,3,7,8-	40321-76-4	XE766	1	pg/g	49.4 pg/g	113	70.0	142	----
PeCDF, 1,2,3,7,8-	57117-41-6	XE766	1	pg/g	49.4 pg/g	98.9	80.0	134	----
PeCDF, 2,3,4,7,8-	57117-31-4	XE766	1	pg/g	49.4 pg/g	93.7	68.0	160	----
TCDD, 2,3,7,8-	1746-01-6	XE766	1	pg/g	9.88 pg/g	107	67.0	158	----
TCDF, 2,3,7,8-	51207-31-9	XE766	1	pg/g	9.88 pg/g	98.3	75.0	158	----
<b>Dioxins and Furans (QCLot: 2306219)</b>									
HpCDD, 1,2,3,4,6,7,8-	35822-46-9	XE766A	0.1	pg/g wwt	696 pg/g wwt	92.1	70.0	140	----
HpCDF, 1,2,3,4,6,7,8-	67562-39-4	XE766A	0.1	pg/g wwt	696 pg/g wwt	108	82.0	122	----



Sub-Matrix: Soil/Solid

					Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
Analyte	CAS Number	Method	LOR	Unit	Target Concentration	LCS	Low	High	Qualifier
<b>Dioxins and Furans (QCLot: 2306219) - continued</b>									
HpCDF, 1,2,3,4,7,8,9-	55673-89-7	XE766A	0.1	pg/g wwt	696 pg/g wwt	96.4	78.0	138	----
HxCDD, 1,2,3,4,7,8-	39227-28-6	XE766A	0.1	pg/g wwt	696 pg/g wwt	97.7	70.0	164	----
HxCDD, 1,2,3,6,7,8-	57653-85-7	XE766A	0.1	pg/g wwt	696 pg/g wwt	95.6	76.0	134	----
HxCDD, 1,2,3,7,8,9-	19408-74-3	XE766A	0.1	pg/g wwt	696 pg/g wwt	95.2	64.0	162	----
HxCDF, 1,2,3,4,7,8-	70648-26-9	XE766A	0.1	pg/g wwt	696 pg/g wwt	93.8	72.0	134	----
HxCDF, 1,2,3,6,7,8-	57117-44-9	XE766A	0.1	pg/g wwt	696 pg/g wwt	96.0	84.0	130	----
HxCDF, 1,2,3,7,8,9-	72918-21-9	XE766A	0.1	pg/g wwt	696 pg/g wwt	96.2	78.0	130	----
HxCDF, 2,3,4,6,7,8-	60851-34-5	XE766A	0.1	pg/g wwt	696 pg/g wwt	93.7	70.0	156	----
OCDD	3268-87-9	XE766A	0.1	pg/g wwt	1390 pg/g wwt	102	78.0	144	----
OCDF	39001-02-0	XE766A	0.1	pg/g wwt	1390 pg/g wwt	92.9	63.0	170	----
PeCDD, 1,2,3,7,8-	40321-76-4	XE766A	0.1	pg/g wwt	696 pg/g wwt	106	70.0	142	----
PeCDF, 1,2,3,7,8-	57117-41-6	XE766A	0.1	pg/g wwt	696 pg/g wwt	95.1	80.0	134	----
PeCDF, 2,3,4,7,8-	57117-31-4	XE766A	0.1	pg/g wwt	696 pg/g wwt	87.6	68.0	160	----
TCDD, 2,3,7,8-	1746-01-6	XE766A	0.1	pg/g wwt	139 pg/g wwt	97.8	67.0	158	----
TCDF, 2,3,7,8-	51207-31-9	XE766A	0.1	pg/g wwt	139 pg/g wwt	95.3	75.0	158	----
<b>Dioxins and Furans (QCLot: 2355357)</b>									
HpCDD, 1,2,3,4,6,7,8-	35822-46-9	XE766	1	pg/g	49.9 pg/g	105	70.0	140	----
HpCDF, 1,2,3,4,6,7,8-	67562-39-4	XE766	2	pg/g	49.9 pg/g	105	82.0	122	----
HpCDF, 1,2,3,4,7,8,9-	55673-89-7	XE766	1	pg/g	49.9 pg/g	102	78.0	138	----
HxCDD, 1,2,3,4,7,8-	39227-28-6	XE766	1	pg/g	49.9 pg/g	96.1	70.0	164	----
HxCDD, 1,2,3,6,7,8-	57653-85-7	XE766	1	pg/g	49.9 pg/g	101	76.0	134	----
HxCDD, 1,2,3,7,8,9-	19408-74-3	XE766	1	pg/g	49.9 pg/g	95.6	64.0	162	----
HxCDF, 1,2,3,4,7,8-	70648-26-9	XE766	1	pg/g	49.9 pg/g	97.0	72.0	134	----
HxCDF, 1,2,3,6,7,8-	57117-44-9	XE766	1	pg/g	49.9 pg/g	96.9	84.0	130	----
HxCDF, 1,2,3,7,8,9-	72918-21-9	XE766	1	pg/g	49.9 pg/g	104	78.0	130	----
HxCDF, 2,3,4,6,7,8-	60851-34-5	XE766	1	pg/g	49.9 pg/g	97.4	70.0	156	----
OCDD	3268-87-9	XE766	2	pg/g	99.9 pg/g	97.0	78.0	144	----
OCDF	39001-02-0	XE766	2	pg/g	99.9 pg/g	139	63.0	170	----
PeCDD, 1,2,3,7,8-	40321-76-4	XE766	1	pg/g	49.9 pg/g	108	70.0	142	----
PeCDF, 1,2,3,7,8-	57117-41-6	XE766	1	pg/g	49.9 pg/g	103	80.0	134	----
PeCDF, 2,3,4,7,8-	57117-31-4	XE766	1	pg/g	49.9 pg/g	93.5	68.0	160	----
TCDD, 2,3,7,8-	1746-01-6	XE766	1	pg/g	9.99 pg/g	104	67.0	158	----
TCDF, 2,3,7,8-	51207-31-9	XE766	1	pg/g	9.99 pg/g	96.2	75.0	158	----



## Reference Material (RM) Report

A Reference Material (RM) is a homogenous material with known and well-established analyte concentrations. RMs are processed in an identical manner to test samples, and are used to monitor and control the accuracy and precision of a test method for a typical sample matrix. RM results are expressed as percent recovery of the target analyte concentration. RM targets may be certified target concentrations provided by the RM supplier, or may be ALS long-term mean values (for empirical test methods).

Sub-Matrix:

Laboratory sample ID	Reference Material ID	Analyte	CAS Number	Method	Reference Material (RM) Report				
					RM Target Concentration	Recovery (%) RM	Recovery Limits (%)		Qualifier
							Low	High	
<b>Metals (QCLot: 2302338)</b>									
QC-2302338-003	MRCA-21	Mercury	7439-97-6	E510	0.068 mg/kg	92.8	70.0	130	----
<b>Metals (QCLot: 2302339)</b>									
QC-2302339-003	MRCA-21	Aluminum	7429-90-5	E440	22500 mg/kg	109	70.0	130	----
QC-2302339-003	MRCA-21	Antimony	7440-36-0	E440	24.8 mg/kg	111	70.0	130	----
QC-2302339-003	MRCA-21	Arsenic	7440-38-2	E440	21.2 mg/kg	99.1	70.0	130	----
QC-2302339-003	MRCA-21	Barium	7440-39-3	E440	788 mg/kg	103	70.0	130	----
QC-2302339-003	MRCA-21	Beryllium	7440-41-7	E440	1.82 mg/kg	111	70.0	130	----
QC-2302339-003	MRCA-21	Bismuth	7440-69-9	E440	1.78 mg/kg	94.0	70.0	130	----
QC-2302339-003	MRCA-21	Cadmium	7440-43-9	E440	2.15 mg/kg	105	70.0	130	----
QC-2302339-003	MRCA-21	Calcium	7440-70-2	E440	4900 mg/kg	104	70.0	130	----
QC-2302339-003	MRCA-21	Chromium	7440-47-3	E440	56.9 mg/kg	103	70.0	130	----
QC-2302339-003	MRCA-21	Cobalt	7440-48-4	E440	32 mg/kg	99.4	70.0	130	----
QC-2302339-003	MRCA-21	Copper	7440-50-8	E440	969 mg/kg	101	70.0	130	----
QC-2302339-003	MRCA-21	Iron	7439-89-6	E440	32700 mg/kg	104	70.0	130	----
QC-2302339-003	MRCA-21	Lead	7439-92-1	E440	919 mg/kg	99.2	70.0	130	----
QC-2302339-003	MRCA-21	Lithium	7439-93-2	E440	47.3 mg/kg	108	70.0	130	----
QC-2302339-003	MRCA-21	Magnesium	7439-95-4	E440	7780 mg/kg	106	70.0	130	----
QC-2302339-003	MRCA-21	Manganese	7439-96-5	E440	8640 mg/kg	98.3	70.0	130	----
QC-2302339-003	MRCA-21	Molybdenum	7439-98-7	E440	25.1 mg/kg	105	70.0	130	----
QC-2302339-003	MRCA-21	Nickel	7440-02-0	E440	1000 mg/kg	98.6	70.0	130	----
QC-2302339-003	MRCA-21	Phosphorus	7723-14-0	E440	660 mg/kg	108	70.0	130	----
QC-2302339-003	MRCA-21	Potassium	7440-09-7	E440	10800 mg/kg	103	70.0	130	----
QC-2302339-003	MRCA-21	Selenium	7782-49-2	E440	1.04 mg/kg	111	60.0	140	----
QC-2302339-003	MRCA-21	Silver	7440-22-4	E440	8.98 mg/kg	101	70.0	130	----
QC-2302339-003	MRCA-21	Sodium	7440-23-5	E440	1770 mg/kg	116	70.0	130	----
QC-2302339-003	MRCA-21	Strontium	7440-24-6	E440	41 mg/kg	107	70.0	130	----
QC-2302339-003	MRCA-21	Sulfur	7704-34-9	E440	3940 mg/kg	104	50.0	150	----
QC-2302339-003	MRCA-21	Thallium	7440-28-0	E440	0.907 mg/kg	103	70.0	130	----
QC-2302339-003	MRCA-21	Tin	7440-31-5	E440	3.79 mg/kg	105	40.0	160	----
QC-2302339-003	MRCA-21	Titanium	7440-32-6	E440	2790 mg/kg	106	70.0	130	----
QC-2302339-003	MRCA-21	Tungsten	7440-33-7	E440	6.99 mg/kg	126	70.0	130	----
QC-2302339-003	MRCA-21	Uranium	7440-61-1	E440	3.97 mg/kg	120	70.0	130	----
QC-2302339-003	MRCA-21	Vanadium	7440-62-2	E440	66.2 mg/kg	102	70.0	130	----



Sub-Matrix:

Laboratory sample ID	Reference Material ID	Analyte	CAS Number	Method	Reference Material (RM) Report				
					RM Target Concentration	Recovery (%) RM	Recovery Limits (%)		Qualifier
							Low	High	
<b>Metals (QCLot: 2302339) - continued</b>									
QC-2302339-003	MRCA-21	Zinc	7440-66-6	E440	828 mg/kg	99.6	70.0	130	----
QC-2302339-003	MRCA-21	Zirconium	7440-67-7	E440	6.91 mg/kg	118	70.0	130	----
<b>Metals (QCLot: 2308253)</b>									
QC-2308253-003	MRCA-21	Aluminum	7429-90-5	E440	22500 mg/kg	111	70.0	130	----
QC-2308253-003	MRCA-21	Antimony	7440-36-0	E440	24.8 mg/kg	105	70.0	130	----
QC-2308253-003	MRCA-21	Arsenic	7440-38-2	E440	21.2 mg/kg	97.1	70.0	130	----
QC-2308253-003	MRCA-21	Barium	7440-39-3	E440	788 mg/kg	104	70.0	130	----
QC-2308253-003	MRCA-21	Beryllium	7440-41-7	E440	1.82 mg/kg	112	70.0	130	----
QC-2308253-003	MRCA-21	Bismuth	7440-69-9	E440	1.78 mg/kg	97.8	70.0	130	----
QC-2308253-003	MRCA-21	Cadmium	7440-43-9	E440	2.15 mg/kg	100	70.0	130	----
QC-2308253-003	MRCA-21	Calcium	7440-70-2	E440	4900 mg/kg	110	70.0	130	----
QC-2308253-003	MRCA-21	Chromium	7440-47-3	E440	56.9 mg/kg	102	70.0	130	----
QC-2308253-003	MRCA-21	Cobalt	7440-48-4	E440	32 mg/kg	101	70.0	130	----
QC-2308253-003	MRCA-21	Copper	7440-50-8	E440	969 mg/kg	98.5	70.0	130	----
QC-2308253-003	MRCA-21	Iron	7439-89-6	E440	32700 mg/kg	105	70.0	130	----
QC-2308253-003	MRCA-21	Lead	7439-92-1	E440	919 mg/kg	101	70.0	130	----
QC-2308253-003	MRCA-21	Lithium	7439-93-2	E440	47.3 mg/kg	115	70.0	130	----
QC-2308253-003	MRCA-21	Magnesium	7439-95-4	E440	7780 mg/kg	105	70.0	130	----
QC-2308253-003	MRCA-21	Manganese	7439-96-5	E440	8640 mg/kg	99.1	70.0	130	----
QC-2308253-003	MRCA-21	Molybdenum	7439-98-7	E440	25.1 mg/kg	103	70.0	130	----
QC-2308253-003	MRCA-21	Nickel	7440-02-0	E440	1000 mg/kg	101	70.0	130	----
QC-2308253-003	MRCA-21	Phosphorus	7723-14-0	E440	660 mg/kg	105	70.0	130	----
QC-2308253-003	MRCA-21	Potassium	7440-09-7	E440	10800 mg/kg	102	70.0	130	----
QC-2308253-003	MRCA-21	Selenium	7782-49-2	E440	1.04 mg/kg	113	60.0	140	----
QC-2308253-003	MRCA-21	Silver	7440-22-4	E440	8.98 mg/kg	100	70.0	130	----
QC-2308253-003	MRCA-21	Sodium	7440-23-5	E440	1770 mg/kg	109	70.0	130	----
QC-2308253-003	MRCA-21	Strontium	7440-24-6	E440	41 mg/kg	104	70.0	130	----
QC-2308253-003	MRCA-21	Sulfur	7704-34-9	E440	3940 mg/kg	90.8	50.0	150	----
QC-2308253-003	MRCA-21	Thallium	7440-28-0	E440	0.907 mg/kg	102	70.0	130	----
QC-2308253-003	MRCA-21	Tin	7440-31-5	E440	3.79 mg/kg	102	40.0	160	----
QC-2308253-003	MRCA-21	Titanium	7440-32-6	E440	2790 mg/kg	102	70.0	130	----
QC-2308253-003	MRCA-21	Tungsten	7440-33-7	E440	6.99 mg/kg	116	70.0	130	----
QC-2308253-003	MRCA-21	Uranium	7440-61-1	E440	3.97 mg/kg	104	70.0	130	----
QC-2308253-003	MRCA-21	Vanadium	7440-62-2	E440	66.2 mg/kg	100	70.0	130	----
QC-2308253-003	MRCA-21	Zinc	7440-66-6	E440	828 mg/kg	99.3	70.0	130	----
QC-2308253-003	MRCA-21	Zirconium	7440-67-7	E440	6.91 mg/kg	104	70.0	130	----
<b>Metals (QCLot: 2308254)</b>									



Sub-Matrix:

Laboratory sample ID	Reference Material ID	Analyte	CAS Number	Method	Reference Material (RM) Report				
					RM Target Concentration	Recovery (%) RM	Recovery Limits (%)		Qualifier
							Low	High	
<b>Metals (QCLot: 2308254) - continued</b>									
QC-2308254-003	MRCA-21	Mercury	7439-97-6	E510	0.068 mg/kg	92.7	70.0	130	----



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Chain of Custody (COC) / Analytical Request Form

COC Number: 23 - 1162263

Page 1 of 2

Canada Toll Free: 1 800 668 9878

Report To Contact and company name below will appear on the final report		Reports / Recipients		Turnaround Time (TAT) Requested		AFFIX ALS BARCODE LABEL HERE (ALS use only)	
Company: HPR Contact: Johanna Mason Phone: 604-202-4559 Company address below will appear on the final report		Select Report Format: <input type="checkbox"/> PDF <input checked="" type="checkbox"/> EXCEL <input type="checkbox"/> EDD (DIGITAL) Merge QC/QCI Reports with COA <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO <input type="checkbox"/> N/A <input type="checkbox"/> Compare Results to Criteria on Report - provide details below if box checked Select Distribution: <input checked="" type="checkbox"/> EMAIL <input type="checkbox"/> MAIL <input type="checkbox"/> FAX		<input checked="" type="checkbox"/> Routine (R) if received by 3pm M-F - no surcharges apply <input type="checkbox"/> 1 day (P1) if received by 3pm M-F - 20% rush surcharge minimum <input type="checkbox"/> 3 day (P3) if received by 3pm M-F - 25% rush surcharge minimum <input type="checkbox"/> 2 day (P2) if received by 3pm M-F - 50% rush surcharge minimum <input type="checkbox"/> 1 day (E) if received by 3pm M-F - 100% rush surcharge minimum <input type="checkbox"/> Same day (E2) if received by 10am M-S - 200% rush surcharge.			
Street: 601 W Hastings St Suite 1500 City/Province: Vancouver BC Postal Code: V6B 1M8		Email 1 or Fax: johanna.mason@hprinc.com Email 2: Email 3:		Additional fees may apply to rush requests on weekends, statutory holidays and for non-routine tests.		Date and Time Required for all E&P TATs: dd-mmm-yy hh:mm am/pm	
Invoice To: Same as Report To <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO Copy of Invoice with Report <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO		Invoice Recipients Select Invoice Distribution: <input checked="" type="checkbox"/> EMAIL <input type="checkbox"/> MAIL <input type="checkbox"/> FAX		For all tests with rush TATs requested, please contact your AM to confirm availability.		Analysis Request	
Company: HPR Contact: Johanna Mason		Email 1 or Fax: johanna.mason@hprinc.com Email 2:		Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below		SAMPLES ON HOLD EXTENDED STORAGE REQUIRED SUSPECTED HAZARD (see notes)	
Project Information ALS Client Code / QUOTE #: HPR-100 Job / Project #: VA 25 HPR-100-001 PO / AFE: LSD:		Oil and Gas Required Fields (client use): AFE/Cost Center: PO# Major/Minor Code: Routing Code: Requisitioner: Location:		NUMBER OF CONTAINERS Metals Mercury Distills / Fuels			
ALS Lab Work Order # (ALS use only): C8186		ALS Contact: Sampler:					
ALS Sample # (ALS use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type			
	HS-27A	22-10-25	1:12pm	soil	2	✓	
	HS-27B	22-10-25	1:12pm	soil	2	✓	
	HS-28A	22-10-25	11:53am	soil	2	✓	
	HS-28B	22-10-25	11:53am	soil	2	✓	
	HS-29A	22-10-25	10:26am	soil	2	✓	
	HS-29B	22-10-25	10:26am	soil	2	✓	
	HS-30A	22-10-25	9:18am	soil	2	✓	
	HS-30B	22-10-25	9:18am	soil	2	✓	
	HS-31A	22-10-25	8:32am	soil	2	✓	
	HS-31B	22-10-25	8:32am	soil	2	✓	
	HS-32	22-10-25	10:43am	soil	2	✓	
	HS-33	22-10-25	10:50am	soil	2	✓	
Drinking Water (DW) Samples <sup>1</sup> (client use)		Notes / Specify Limits for result evaluation by selecting from drop-down below (Excel COC only).		SAMPLE RECEIPT DETAILS (ALS use only)			
Are samples taken from a Regulated DW System? <input type="checkbox"/> YES <input type="checkbox"/> NO				Cooling Method: <input type="checkbox"/> NONE <input type="checkbox"/> ICE <input checked="" type="checkbox"/> ICE PACKS <input type="checkbox"/> FROZEN <input type="checkbox"/> COOLING INITIATED			
Are samples for human consumption/ use? <input type="checkbox"/> YES <input type="checkbox"/> NO				Cooler Custody Seals Intact: <input type="checkbox"/> YES <input type="checkbox"/> N/A Sample Custody Seals Intact: <input type="checkbox"/> YES <input type="checkbox"/> N/A			
				INITIAL COOLER TEMPERATURES °C: FINAL COOLER TEMPERATURES °C: 16			
SHIPMENT RELEASE (client use)		INITIAL SHIPMENT RECEPTION (ALS use only)		FINAL SHIPMENT RECEPTION (ALS use only)			
Released by:	Date:	Time:	Received by:	Date:	Time:	Received by:	Date:





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### Chain of Custody (COC) / Analytical Request Form

COC Number: 23 - 1162261

Page 2 of 2

Canada Toll Free: 1 800 668 9878

<b>Report To</b> Contact and company name below will appear on the final report		<b>Reports / Recipients</b>			<b>Turnaround Time (TAT) Requested</b>			AFFIX ALS BARCODE LABEL HERE (ALS use only)																																																																				
Company: <b>HDR</b>		Select Report Format: <input type="checkbox"/> PDF <input checked="" type="checkbox"/> EXCEL <input type="checkbox"/> EDD (DIGITAL)			<input checked="" type="checkbox"/> Routine [R] if received by 3pm M-F - no surcharges apply <input type="checkbox"/> 4 day [P4] if received by 3pm M-F - 20% rush surcharge minimum <input type="checkbox"/> 3 day [P3] if received by 3pm M-F - 25% rush surcharge minimum <input type="checkbox"/> 2 day [P2] if received by 3pm M-F - 50% rush surcharge minimum <input type="checkbox"/> 1 day [E] if received by 3pm M-F - 100% rush surcharge minimum <input type="checkbox"/> Same day [E2] if received by 10am M-S - 200% rush surcharge.																																																																							
Contact: <b>Johanna Mason</b>		Merge QC/QCI Reports with COA <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO <input type="checkbox"/> N/A			Additional fees may apply to rush requests on weekends, statutory holidays and for non-routine tests.																																																																							
Phone: <b>604-202-4559</b>		<input type="checkbox"/> Compare Results to Criteria on Report - provide details below if box checked			Date and Time Required for all E&P TATs: <input type="checkbox"/>																																																																							
Street: <b>601 W Hastings St Suite 1500</b>		Select Distribution: <input checked="" type="checkbox"/> EMAIL <input type="checkbox"/> MAIL <input type="checkbox"/> FAX			For all tests with rush TATs requested, please contact your AM to confirm availability.																																																																							
City/Province: <b>Vancouver BC</b>		Email 1 or Fax: <b>Johanna.Mason@hdrinc.com</b>			<b>Analysis Request</b>			Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below																																																																				
Postal Code: <b>V6B 1M8</b>		Email 2																																																																										
Invoice To: Same as Report To <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO		<b>Invoice Recipients</b>			<table border="1" style="width:100%; border-collapse: collapse;"> <tr> <th rowspan="2" style="writing-mode: vertical-rl; transform: rotate(180deg);">NUMBER OF CONTAINERS</th> <th colspan="3"></th> <th rowspan="2" style="writing-mode: vertical-rl; transform: rotate(180deg);">SAMPLES ON HOLD</th> <th rowspan="2" style="writing-mode: vertical-rl; transform: rotate(180deg);">EXTENDED STORAGE REQUIRED</th> <th rowspan="2" style="writing-mode: vertical-rl; transform: rotate(180deg);">SUSPECTED HAZARD (see notes)</th> </tr> <tr> <th>Metals</th> <th>Mercury</th> <th>Organics/PCBs</th> </tr> <tr> <td>2</td> <td style="text-align: center;">✓</td> <td style="text-align: center;">✓</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>2</td> <td style="text-align: center;">✓</td> <td style="text-align: center;">✓</td> <td style="text-align: center;">✓</td> <td></td> <td></td> <td></td> </tr> <tr> <td>2</td> <td style="text-align: center;">✓</td> <td style="text-align: center;">✓</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>1</td> <td style="text-align: center;">✓</td> <td style="text-align: center;">✓</td> <td style="text-align: center;">✓</td> <td></td> <td></td> <td></td> </tr> <tr> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> </table>						NUMBER OF CONTAINERS				SAMPLES ON HOLD	EXTENDED STORAGE REQUIRED	SUSPECTED HAZARD (see notes)	Metals	Mercury	Organics/PCBs	2	✓	✓					2	✓	✓	✓				2	✓	✓					1	✓	✓	✓																															
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Company: <b>HDR</b>		Email 1 or Fax: <b>Johanna.Mason@hdrinc.com</b>																																																																										
Contact: <b>Johanna Mason</b>		Email 2																																																																										
<b>Project Information</b>		<b>Oil and Gas Required Fields (Client use)</b>																																																																										
ALS Client Code / QUOTE #: <b>HDR-100</b>		AFE/Cost Center:																																																																										
Job / Project #: <b>VA 25 HDR-100-001</b>		Major/Minor Code:																																																																										
PO / AFE:		Requisitioner:																																																																										
LSD:		Location:																																																																										
ALS Lab Work Order # (ALS use only):		ALS Contact:																																																																										
Sampler:																																																																												
ALS Sample # (ALS use only)		Sample Identification and/or Coordinates (This description will appear on the report)			Date (dd-mmm-yy)			Time (hh:mm)			Sample Type																																																																	
		<b>HS-34</b>			<b>22-10-25</b>			<b>10:55am</b>			<b>soil</b>																																																																	
		<b>HS-35</b>			<b>22-10-25</b>			<b>11:00am</b>			<b>soil</b>																																																																	
		<b>HS-36</b>			<b>22-10-25</b>			<b>11:05am</b>			<b>soil</b>																																																																	
		<b>HS-37 (roof for metals)</b>			<b>22-10-25</b>			<b>10:26am</b>			<b>roof</b>																																																																	
		<b>HS-38 (roof for hexins + furans)</b>			<b>22-10-25</b>			<b>10:26am</b>			<b>roof</b>																																																																	

<b>Drinking Water (DW) Samples<sup>1</sup> (client use)</b>		<b>Notes / Specify Limits for result evaluation by selecting from drop-down below</b> (Excel COC only)			<b>SAMPLE RECEIPT DETAILS (ALS use only)</b>					
Are samples taken from a Regulated DW System? <input type="checkbox"/> YES <input type="checkbox"/> NO					Cooling Method: <input type="checkbox"/> NONE <input type="checkbox"/> ICE <input checked="" type="checkbox"/> ICE PACKS <input type="checkbox"/> FROZEN <input type="checkbox"/> COOLING INITIATED					
Are samples for human consumption/ use? <input type="checkbox"/> YES <input type="checkbox"/> NO					Cooler Custody Seals Intact: <input type="checkbox"/> YES <input type="checkbox"/> N/A Sample Custody Seals Intact: <input type="checkbox"/> YES <input type="checkbox"/> N/A					
		INITIAL COOLER TEMPERATURES °C			FINAL COOLER TEMPERATURES °C					
								<b>16</b>		
<b>SHIPMENT RELEASE (client use)</b>		<b>INITIAL SHIPMENT RECEPTION (ALS use only)</b>			<b>FINAL SHIPMENT RECEPTION (ALS use only)</b>					
Released by:		Date:			Received by:			Date:		
								<b>16</b>		

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION  
 Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.  
 1. If any water samples are taken from a Regulated Drinking Water (DW) System, please submit using an Authorized DW COC form.

WHITE - LABORATORY COPY    YELLOW - CLIENT COPY    JAN 2023 PROMT



**CERTIFICATE OF ANALYSIS**

<b>Work Order</b>	: <b>VA26A2119</b>	<b>Laboratory</b>	: ALS Environmental - Vancouver
<b>Client</b>	: <b>HDR Corporation</b>	<b>Account Manager</b>	: Le Van Dalfsen
<b>Contact</b>	: Johanna Mason	<b>Address</b>	: 8081 Lougheed Highway
<b>Address</b>	: 500-1500 W. Georgia Street Vancouver British Columbia Canada V6G 2Z6		: Burnaby BC Canada V5A 1W9
<b>Telephone</b>	: ----	<b>E-mail</b>	: Le.VanDalfsen@ALSGlobal.com
<b>Project</b>	: HDR-100	<b>Telephone</b>	: +1 604 253 4188
<b>PO</b>	: ----	<b>Date Samples Received</b>	: 27-Jan-2026 14:00
<b>C-O-C number</b>	: ----	<b>Date Analysis Commenced</b>	: 31-Jan-2026
<b>Sampler</b>	: ----	<b>Issue Date</b>	: 11-Mar-2026 15:43
<b>Site</b>	: ----		
<b>Quote number</b>	: VA25-HDRI100-001		
<b>No. of samples received</b>	: 16		
<b>No. of samples analysed</b>	: 16		

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, QC Interpretive report to assist with Quality Review and Sample Receipt Notification (SRN).

**Signatories**

This document has been electronically signed by the authorized signatories below. Electronic signing is conducted in accordance with US FDA 21 CFR Part 11.

<i>Signatories</i>	<i>Position</i>	<i>Laboratory Department</i>
Brieanna Allen	Production/Validation Manager	Organics, Burnaby, British Columbia
Kevin Duarte	Supervisor - Metals ICP Instrumentation	Metals, Burnaby, British Columbia
Ophelia Chiu	Department Manager - Organics	Organics, Burnaby, British Columbia
Robin Weeks	Supervisor - Organics Extractions	Organics, Burnaby, British Columbia
Stephen Kennedy	Technical Department Manager	Organics, Burlington, Ontario
Twinkle Patel	Analyst	Organics, Burlington, Ontario



## General Comments

The analytical methods used by ALS are developed using internationally recognized reference methods (where available), such as those published by US EPA, APHA Standard Methods, ASTM, ISO, Environment Canada, BC MOE, and Ontario MOE. Refer to the ALS Quality Control Interpretive report (QCI) for applicable references and methodology summaries. Reference methods may incorporate modifications to improve performance.

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.

Please refer to Quality Control Interpretive report (QCI) for information regarding Holding Time compliance.

Key: CAS Number: Chemical Abstracts Services number is a unique identifier assigned to discrete substances.  
LOR: Limit of Reporting (detection limit).

<i>Unit</i>	<i>Description</i>
-	no units
%	percent
g	grams
mg/kg	milligrams per kilogram
pg/g	picograms/gram
pH units	pH units

<: less than.

>: greater than.

Surrogate: An analyte that is similar in behavior to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.

Test results reported relate only to the samples as received by the laboratory.

UNLESS OTHERWISE STATED on SRN or QCI Report, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

## Qualifiers

<i>Qualifier</i>	<i>Description</i>
[U]	The analyte was not detected above the EDL (or LOR where applicable).
EMPC	Estimated Maximum Possible Concentration. The EDL (or LOR where applicable) for the analyte was raised to the level of the EMPC.
M	Peak has been manually integrated.



## Analytical Results

Sub-Matrix: Soil  
 (Matrix: Soil/Solid)

					Client sample ID	HS-36 ----	HS-37 ----	HS-38 ----	HS-39 ----	HS-40 ----
					Client sampling date / time	27-Jan-2026 09:48	27-Jan-2026 10:02	27-Jan-2026 09:53	27-Jan-2026 10:08	27-Jan-2026 10:11
Analyte	CAS Number	Method/Lab	LOR	Unit	VA26A2119-001	VA26A2119-002	VA26A2119-003	VA26A2119-004	VA26A2119-005	
					Result	Result	Result	Result	Result	
<b>Physical Tests</b>										
pH (1:2 soil:water)	----	E108/VA	0.10	pH units	5.29	4.99	6.34	6.56	4.74	
<b>Metals</b>										
Aluminum	7429-90-5	E440/VA	50	mg/kg	11700	22200	4320	19000	17800	
Antimony	7440-36-0	E440/VA	0.10	mg/kg	99.6	116	35.7	103	26.5	
Arsenic	7440-38-2	E440/VA	0.10	mg/kg	17.8	24.0	7.67	82.1	16.7	
Barium	7440-39-3	E440/VA	0.50	mg/kg	102	98.3	32.9	770	116	
Beryllium	7440-41-7	E440/VA	0.10	mg/kg	0.18	0.29	<0.10	0.46	0.18	
Bismuth	7440-69-9	E440/VA	0.20	mg/kg	16.6	10.9	5.84	14.4	3.36	
Boron	7440-42-8	E440/VA	5.0	mg/kg	14.6	16.9	5.3	44.7	12.2	
Cadmium	7440-43-9	E440/VA	0.020	mg/kg	4.23	2.37	1.81	27.0	0.990	
Calcium	7440-70-2	E440/VA	50	mg/kg	5340	10300	2260	30500	4620	
Chromium	7440-47-3	E440/VA	0.50	mg/kg	178	149	84.5	499	109	
Cobalt	7440-48-4	E440/VA	0.10	mg/kg	15.3	17.5	4.16	20.1	11.9	
Copper	7440-50-8	E440/VA	0.50	mg/kg	217	185	50.8	695	94.7	
Iron	7439-89-6	E440/VA	50	mg/kg	71100	66400	55200	85900	51500	
Lead	7439-92-1	E440/VA	0.50	mg/kg	396	376	49.3	2320	233	
Lithium	7439-93-2	E440/VA	2.0	mg/kg	6.1	14.3	<2.0	11.2	13.4	
Magnesium	7439-95-4	E440/VA	20	mg/kg	4540	9760	2000	7340	9190	
Manganese	7439-96-5	E440/VA	1.0	mg/kg	833	904	544	913	613	
Mercury	7439-97-6	E510/VA	0.0500	mg/kg	0.991	1.45	0.0667	1.64	0.383	
Molybdenum	7439-98-7	E440/VA	0.10	mg/kg	27.9	25.3	22.2	132	22.8	



## Analytical Results

Sub-Matrix: Soil  
 (Matrix: Soil/Solid)

					Client sample ID	HS-36 ----	HS-37 ----	HS-38 ----	HS-39 ----	HS-40 ----
					Client sampling date / time	27-Jan-2026 09:48	27-Jan-2026 10:02	27-Jan-2026 09:53	27-Jan-2026 10:08	27-Jan-2026 10:11
Analyte	CAS Number	Method/Lab	LOR	Unit	VA26A2119-001	VA26A2119-002	VA26A2119-003	VA26A2119-004	VA26A2119-005	
					Result	Result	Result	Result	Result	
<b>Metals</b>										
Nickel	7440-02-0	E440/VA	0.50	mg/kg	127	129	36.5	882	105	
Phosphorus	7723-14-0	E440/VA	50	mg/kg	1340	1910	453	8170	1160	
Potassium	7440-09-7	E440/VA	100	mg/kg	750	1140	230	1310	2230	
Selenium	7782-49-2	E440/VA	0.20	mg/kg	0.60	0.68	<0.20	1.22	0.49	
Silver	7440-22-4	E440/VA	0.10	mg/kg	3.25	4.52	0.35	8.97	3.32	
Sodium	7440-23-5	E440/VA	50	mg/kg	351	557	78	640	507	
Strontium	7440-24-6	E440/VA	0.50	mg/kg	25.6	44.5	9.28	212	24.8	
Sulfur	7704-34-9	E440/VA	1000	mg/kg	1700	<1000	<1000	1100	<1000	
Thallium	7440-28-0	E440/VA	0.050	mg/kg	0.098	0.107	<0.050	0.282	0.182	
Tin	7440-31-5	E440/VA	2.0	mg/kg	54.5	80.2	8.3	99.9	21.3	
Titanium	7440-32-6	E440/VA	1.0	mg/kg	589	1540	299	501	1140	
Tungsten	7440-33-7	E440/VA	0.50	mg/kg	3.54	3.80	1.11	16.5	3.70	
Uranium	7440-61-1	E440/VA	0.050	mg/kg	0.728	0.787	0.355	14.3	0.491	
Vanadium	7440-62-2	E440/VA	0.20	mg/kg	37.8	82.9	14.7	61.5	71.9	
Zinc	7440-66-6	E440/VA	2.0	mg/kg	806	789	259	6570	328	
Zirconium	7440-67-7	E440/VA	1.0	mg/kg	1.3	3.0	<1.0	2.0	2.0	

Please refer to the General Comments section for an explanation of any qualifiers detected.



## Analytical Results

Sub-Matrix: Soil  
 (Matrix: Soil/Solid)

					Client sample ID	HS-41	HS-42	HS-43	HS-44	HS-45
					Client sampling date / time	27-Jan-2026 10:26	27-Jan-2026 10:41	27-Jan-2026 10:17	27-Jan-2026 10:32	27-Jan-2026 10:37
Analyte	CAS Number	Method/Lab	LOR	Unit	VA26A2119-006	VA26A2119-007	VA26A2119-008	VA26A2119-009	VA26A2119-010	
					Result	Result	Result	Result	Result	
<b>Physical Tests</b>										
pH (1:2 soil:water)	----	E108/VA	0.10	pH units	4.57	4.46	4.67	4.77	4.68	
<b>Metals</b>										
Aluminum	7429-90-5	E440/VA	50	mg/kg	20300	14900	18000	19800	18800	
Antimony	7440-36-0	E440/VA	0.10	mg/kg	28.6	28.9	147	24.6	26.8	
Arsenic	7440-38-2	E440/VA	0.10	mg/kg	27.7	19.0	39.1	19.7	23.2	
Barium	7440-39-3	E440/VA	0.50	mg/kg	168	123	140	168	174	
Beryllium	7440-41-7	E440/VA	0.10	mg/kg	0.22	0.20	0.22	0.24	0.30	
Bismuth	7440-69-9	E440/VA	0.20	mg/kg	3.93	4.89	7.57	3.39	3.77	
Boron	7440-42-8	E440/VA	5.0	mg/kg	10.1	12.9	10.5	12.1	17.2	
Cadmium	7440-43-9	E440/VA	0.020	mg/kg	0.805	0.720	1.86	0.876	0.788	
Calcium	7440-70-2	E440/VA	50	mg/kg	6590	9430	6740	6720	20300	
Chromium	7440-47-3	E440/VA	0.50	mg/kg	195	147	120	104	113	
Cobalt	7440-48-4	E440/VA	0.10	mg/kg	13.7	11.7	12.5	11.6	14.9	
Copper	7440-50-8	E440/VA	0.50	mg/kg	121	174	251	122	323	
Iron	7439-89-6	E440/VA	50	mg/kg	44400	52400	45300	40600	59700	
Lead	7439-92-1	E440/VA	0.50	mg/kg	303	200	1020	204	183	
Lithium	7439-93-2	E440/VA	2.0	mg/kg	14.6	10.4	13.5	13.8	13.3	
Magnesium	7439-95-4	E440/VA	20	mg/kg	10700	6670	7710	8540	8670	
Manganese	7439-96-5	E440/VA	1.0	mg/kg	996	758	768	576	926	
Mercury	7439-97-6	E510/VA	0.0500	mg/kg	0.444	0.682	0.414	0.340	0.604	
Molybdenum	7439-98-7	E440/VA	0.10	mg/kg	46.4	37.1	30.3	19.5	22.2	



## Analytical Results

Sub-Matrix: Soil  
 (Matrix: Soil/Solid)

					Client sample ID	HS-41	HS-42	HS-43	HS-44	HS-45
					Client sampling date / time	----	----	----	----	----
Analyte	CAS Number	Method/Lab	LOR	Unit	27-Jan-2026 10:26	27-Jan-2026 10:41	27-Jan-2026 10:17	27-Jan-2026 10:32	27-Jan-2026 10:37	
					VA26A2119-006	VA26A2119-007	VA26A2119-008	VA26A2119-009	VA26A2119-010	
					Result	Result	Result	Result	Result	
<b>Metals</b>										
Nickel	7440-02-0	E440/VA	0.50	mg/kg	241	202	151	108	113	
Phosphorus	7723-14-0	E440/VA	50	mg/kg	1550	1270	1590	1550	1380	
Potassium	7440-09-7	E440/VA	100	mg/kg	1770	1520	1710	1890	1670	
Selenium	7782-49-2	E440/VA	0.20	mg/kg	1.11	0.54	0.63	0.66	0.64	
Silver	7440-22-4	E440/VA	0.10	mg/kg	2.26	2.62	4.53	1.59	1.84	
Sodium	7440-23-5	E440/VA	50	mg/kg	619	445	576	718	526	
Strontium	7440-24-6	E440/VA	0.50	mg/kg	30.5	29.7	31.8	37.9	51.0	
Sulfur	7704-34-9	E440/VA	1000	mg/kg	<1000	<1000	<1000	<1000	<1000	
Thallium	7440-28-0	E440/VA	0.050	mg/kg	0.197	0.119	0.212	0.182	0.140	
Tin	7440-31-5	E440/VA	2.0	mg/kg	25.6	25.4	100	21.1	21.0	
Titanium	7440-32-6	E440/VA	1.0	mg/kg	1180	788	1060	1210	920	
Tungsten	7440-33-7	E440/VA	0.50	mg/kg	4.03	2.71	4.66	3.44	2.88	
Uranium	7440-61-1	E440/VA	0.050	mg/kg	0.710	0.721	0.849	0.678	1.03	
Vanadium	7440-62-2	E440/VA	0.20	mg/kg	84.2	61.3	67.5	83.5	73.6	
Zinc	7440-66-6	E440/VA	2.0	mg/kg	255	249	933	236	244	
Zirconium	7440-67-7	E440/VA	1.0	mg/kg	2.3	2.7	2.6	2.2	3.0	

Please refer to the General Comments section for an explanation of any qualifiers detected.



### Analytical Results

Sub-Matrix: Soil  
 (Matrix: Soil/Solid)

					Client sample ID	HS-46	HS-47	HS-48	HS-49	HS-50
					Client sampling date / time	27-Jan-2026 10:51	27-Jan-2026 10:58	27-Jan-2026 11:06	27-Jan-2026 09:29	27-Jan-2026 11:25
Analyte	CAS Number	Method/Lab	LOR	Unit	VA26A2119-011	VA26A2119-012	VA26A2119-013	VA26A2119-014	VA26A2119-015	
					Result	Result	Result	Result	Result	
<b>Sample Preparation</b>										
Weight, extraction (wet)	---	EP800/BU	0.0001	g	20.1248	5.1184	20.2799	---	---	
<b>Physical Tests</b>										
Moisture	---	E144/VA	0.25	%	9.55	17.0	22.5	---	---	
pH (1:2 soil:water)	---	E108/VA	0.10	pH units	---	---	---	11.97	12.04	
<b>Metals</b>										
Aluminum	7429-90-5	E440/VA	50	mg/kg	---	---	---	3670	8170	
Antimony	7440-36-0	E440/VA	0.10	mg/kg	---	---	---	302	404	
Arsenic	7440-38-2	E440/VA	0.10	mg/kg	---	---	---	42.2	48.5	
Barium	7440-39-3	E440/VA	0.50	mg/kg	---	---	---	244	328	
Beryllium	7440-41-7	E440/VA	0.10	mg/kg	---	---	---	0.12	0.13	
Bismuth	7440-69-9	E440/VA	0.20	mg/kg	---	---	---	47.5	45.4	
Boron	7440-42-8	E440/VA	5.0	mg/kg	---	---	---	68.9	101	
Cadmium	7440-43-9	E440/VA	0.020	mg/kg	---	---	---	264	163	
Calcium	7440-70-2	E440/VA	50	mg/kg	---	---	---	285000	290000	
Chromium	7440-47-3	E440/VA	0.50	mg/kg	---	---	---	21.4	40.7	
Cobalt	7440-48-4	E440/VA	0.10	mg/kg	---	---	---	4.17	8.57	
Copper	7440-50-8	E440/VA	0.50	mg/kg	---	---	---	774	685	
Iron	7439-89-6	E440/VA	50	mg/kg	---	---	---	2450	4080	
Lead	7439-92-1	E440/VA	0.50	mg/kg	---	---	---	1210	1070	
Lithium	7439-93-2	E440/VA	2.0	mg/kg	---	---	---	21.5	25.4	
Magnesium	7439-95-4	E440/VA	20	mg/kg	---	---	---	6450	7130	



## Analytical Results

Sub-Matrix: Soil  
 (Matrix: Soil/Solid)

					Client sample ID	HS-46	HS-47	HS-48	HS-49	HS-50
					Client sampling date / time	27-Jan-2026 10:51	27-Jan-2026 10:58	27-Jan-2026 11:06	27-Jan-2026 09:29	27-Jan-2026 11:25
Analyte	CAS Number	Method/Lab	LOR	Unit	VA26A2119-011	VA26A2119-012	VA26A2119-013	VA26A2119-014	VA26A2119-015	
					Result	Result	Result	Result	Result	
<b>Metals</b>										
Manganese	7439-96-5	E440/VA	1.0	mg/kg	----	----	----	123	198	
Mercury	7439-97-6	E510/VA	0.0500	mg/kg	----	----	----	7.54	17.7	
Molybdenum	7439-98-7	E440/VA	0.10	mg/kg	----	----	----	8.01	9.09	
Nickel	7440-02-0	E440/VA	0.50	mg/kg	----	----	----	14.0	39.5	
Phosphorus	7723-14-0	E440/VA	50	mg/kg	----	----	----	1800	2860	
Potassium	7440-09-7	E440/VA	100	mg/kg	----	----	----	31000	25000	
Selenium	7782-49-2	E440/VA	0.20	mg/kg	----	----	----	2.32	2.97	
Silver	7440-22-4	E440/VA	0.10	mg/kg	----	----	----	19.9	15.9	
Sodium	7440-23-5	E440/VA	50	mg/kg	----	----	----	45100	37500	
Strontium	7440-24-6	E440/VA	0.50	mg/kg	----	----	----	795	744	
Sulfur	7704-34-9	E440/VA	1000	mg/kg	----	----	----	17800	14800	
Thallium	7440-28-0	E440/VA	0.050	mg/kg	----	----	----	0.418	0.402	
Tin	7440-31-5	E440/VA	2.0	mg/kg	----	----	----	344	380	
Titanium	7440-32-6	E440/VA	1.0	mg/kg	----	----	----	765	1190	
Tungsten	7440-33-7	E440/VA	0.50	mg/kg	----	----	----	7.38	8.76	
Uranium	7440-61-1	E440/VA	0.050	mg/kg	----	----	----	1.67	1.69	
Vanadium	7440-62-2	E440/VA	0.20	mg/kg	----	----	----	23.8	24.6	
Zinc	7440-66-6	E440/VA	2.0	mg/kg	----	----	----	12000	13300	
Zirconium	7440-67-7	E440/VA	1.0	mg/kg	----	----	----	10.1	5.1	
<b>Dioxins and Furans</b>										
TCDD, 2,3,7,8-	1746-01-6	XE766/BU	1	pg/g	13.5	24.7 <sup>M</sup>	4.75	----	----	



## Analytical Results

Sub-Matrix: Soil  
 (Matrix: Soil/Solid)

					Client sample ID	HS-46	HS-47	HS-48	HS-49	HS-50
					Client sampling date / time	27-Jan-2026 10:51	27-Jan-2026 10:58	27-Jan-2026 11:06	27-Jan-2026 09:29	27-Jan-2026 11:25
Analyte	CAS Number	Method/Lab	LOR	Unit	VA26A2119-011	VA26A2119-012	VA26A2119-013	VA26A2119-014	VA26A2119-015	
					Result	Result	Result	Result	Result	
<b>Dioxins and Furans</b>										
PeCDD, 1,2,3,7,8-	40321-76-4	XE766/BU	1	pg/g	47.6	115 <sup>M</sup>	18.1	----	----	
HxCDD, 1,2,3,4,7,8-	39227-28-6	XE766/BU	1	pg/g	44.2	106 <sup>M</sup>	20.3	----	----	
HxCDD, 1,2,3,6,7,8-	57653-85-7	XE766/BU	1	pg/g	132	255 <sup>M</sup>	57.0	----	----	
HxCDD, 1,2,3,7,8,9-	19408-74-3	XE766/BU	1	pg/g	80.7	161 <sup>M</sup>	35.0	----	----	
HpCDD, 1,2,3,4,6,7,8-	35822-46-9	XE766/BU	1	pg/g	1090	1530 <sup>M</sup>	579	----	----	
OCDD	3268-87-9	XE766/BU	2	pg/g	2020	3390 <sup>M</sup>	1420	----	----	
Tetrachlorodibenzo-p-dioxins [TCDD], total	41903-57-5	XE766/BU	1	pg/g	943	2950	350	----	----	
TCDD, total, # homologues detected	----	XE766/BU	0	-	17	16	15	----	----	
Pentachlorodibenzo-p-dioxins [PeCDD], total	----	XE766/BU	1	pg/g	1480	4060	602	----	----	
PeCDD, total, # homologues detected	----	XE766/BU	0	-	10	9	10	----	----	
Hexachlorodibenzo-p-dioxins [HxCDD], total	34465-46-8	XE766/BU	1	pg/g	2670	4740	1350	----	----	
HxCDD, total, # homologues detected	----	XE766/BU	0	-	8	8	8	----	----	
Heptachlorodibenzo-p-dioxins [HpCDD], total	37871-00-4	XE766/BU	1	pg/g	2230	3210	1200	----	----	
HpCDD, total, # homologues detected	----	XE766/BU	0	-	2	2	2	----	----	
TCDF, 2,3,7,8-	51207-31-9	XE766/BU	1	pg/g	58.2	112 <sup>M</sup>	19.4	----	----	
PeCDF, 1,2,3,7,8-	57117-41-6	XE766/BU	1	pg/g	<76 <sup>[U], M, EMPC</sup>	163	<25 <sup>[U], M, EMPC</sup>	----	----	
PeCDF, 2,3,4,7,8-	57117-31-4	XE766/BU	1	pg/g	109	293 <sup>M</sup>	35.5	----	----	
HxCDF, 1,2,3,4,7,8-	70648-26-9	XE766/BU	1	pg/g	96.1	233 <sup>M</sup>	33.4	----	----	
HxCDF, 1,2,3,6,7,8-	57117-44-9	XE766/BU	1	pg/g	111	264 <sup>M</sup>	36.5	----	----	
HxCDF, 1,2,3,7,8,9-	72918-21-9	XE766/BU	1	pg/g	36.7	103 <sup>M</sup>	13.2	----	----	
HxCDF, 2,3,4,6,7,8-	60851-34-5	XE766/BU	1	pg/g	143	400 <sup>M</sup>	50.7	----	----	



## Analytical Results

Sub-Matrix: Soil  
 (Matrix: Soil/Solid)

					Client sample ID	HS-46 ----	HS-47 ----	HS-48 ----	HS-49 ----	HS-50 ----
					Client sampling date / time	27-Jan-2026 10:51	27-Jan-2026 10:58	27-Jan-2026 11:06	27-Jan-2026 09:29	27-Jan-2026 11:25
Analyte	CAS Number	Method/Lab	LOR	Unit	VA26A2119-011	VA26A2119-012	VA26A2119-013	VA26A2119-014	VA26A2119-015	
					Result	Result	Result	Result	Result	
<b>Dioxins and Furans</b>										
HpCDF, 1,2,3,4,6,7,8-	67562-39-4	XE766/BU	2	pg/g	471	1230	202	----	----	
HpCDF, 1,2,3,4,7,8,9-	55673-89-7	XE766/BU	1	pg/g	59.9	138 <sup>M</sup>	21.6	----	----	
OCDF	39001-02-0	XE766/BU	2	pg/g	253	704 <sup>M</sup>	150	----	----	
Tetrachlorodibenzofurans [TCDF], total	----	XE766/BU	1	pg/g	1660	4250	510	----	----	
TCDF, total, # homologues detected	----	XE766/BU	0	-	28	29	25	----	----	
Pentachlorodibenzofurans [PeCDF], total	----	XE766/BU	1	pg/g	1490	3650	463	----	----	
PeCDF, total, # homologues detected	----	XE766/BU	0	-	16	16	15	----	----	
Hexachlorodibenzofurans [HxCDF], total	55684-94-1	XE766/BU	1	pg/g	1100	2800	391	----	----	
HxCDF, total, # homologues detected	----	XE766/BU	0	-	13	13	13	----	----	
Heptachlorodibenzofurans [HpCDF], total	38998-75-3	XE766/BU	2	pg/g	727	1900	330	----	----	
HpCDF, total, # homologues detected	----	XE766/BU	0	-	4	4	4	----	----	
<b>Dioxins and Furans Extraction Standards</b>										
TCDD-13C12, 2,3,7,8-	76523-40-5	XE766/BU	0.1	%	78.3	71.5	75.9	----	----	
PeCDD-13C12, 1,2,3,7,8-	109719-79-1	XE766/BU	0.1	%	55.6	63.4	60.0	----	----	
HxCDD-13C12, 1,2,3,4,7,8-	109719-80-4	XE766/BU	0.1	%	85.8	67.7	80.5	----	----	
HxCDD-13C12, 1,2,3,6,7,8-	109719-81-5	XE766/BU	0.1	%	88.0	71.4	87.2	----	----	
HpCDD-13C12, 1,2,3,4,6,7,8-	109719-83-7	XE766/BU	0.1	%	57.3	52.7	56.2	----	----	
OCDD-13C12	114423-97-1	XE766/BU	0.1	%	39.9	34.5	38.5	----	----	
TCDF-13C12, 2,3,7,8-	89059-46-1	XE766/BU	0.1	%	73.7	73.2	71.2	----	----	
PeCDF-13C12, 1,2,3,7,8-	109719-77-9	XE766/BU	0.1	%	57.9	67.3	60.9	----	----	
PeCDF-13C12, 2,3,4,7,8-	116843-02-8	XE766/BU	0.1	%	55.8	72.9	62.4	----	----	



### Analytical Results

Sub-Matrix: Soil (Matrix: Soil/Solid)					Client sample ID				
					HS-46 ----	HS-47 ----	HS-48 ----	HS-49 ----	HS-50 ----
Client sampling date / time					27-Jan-2026 10:51	27-Jan-2026 10:58	27-Jan-2026 11:06	27-Jan-2026 09:29	27-Jan-2026 11:25
Analyte	CAS Number	Method/Lab	LOR	Unit	VA26A2119-011	VA26A2119-012	VA26A2119-013	VA26A2119-014	VA26A2119-015
					Result	Result	Result	Result	Result
<b>Dioxins and Furans Extraction Standards</b>									
HxCDF-13C12, 1,2,3,4,7,8-	114423-98-2	XE766/BU	0.1	%	92.6	79.9	89.8	----	----
HxCDF-13C12, 1,2,3,6,7,8-	116843-03-9	XE766/BU	0.1	%	89.9	77.1	84.9	----	----
HxCDF-13C12, 2,3,4,6,7,8-	116843-05-1	XE766/BU	0.1	%	83.9	67.4	78.2	----	----
HxCDF-13C12, 1,2,3,7,8,9-	116843-04-0	XE766/BU	0.1	%	74.1	62.8	71.7	----	----
HpCDF-13C12, 1,2,3,4,6,7,8-	67562-39-4	XE766/BU	0.1	%	59.3	50.8	57.1	----	----
HpCDF-13C12, 1,2,3,4,7,8,9-	55673-89-7	XE766/BU	0.1	%	49.3	53.5	51.6	----	----
<b>Dioxins and Furans Cleanup Standards</b>									
TCDD-37Cl4, 2,3,7,8-	----	XE766/BU	0.1	%	70.2	64.3	66.7	----	----
<b>Toxic Equivalency</b>									
PCDD/F TEQ - WHO 2005 (ND=0*EDL)	n/a	XE766/BU	0.0	pg/g	181	426	68.7	----	----
PCDD/F TEQ - WHO 2005 (ND=0.5*EDL)	n/a	XE766/BU	0.0	pg/g	182	426	68.7	----	----
PCDD/F TEQ - WHO 2005 (ND=1*EDL)	n/a	XE766/BU	0.0	pg/g	183	426	69.3	----	----

Please refer to the General Comments section for an explanation of any qualifiers detected.

### Analytical Results

Sub-Matrix: Soil (Matrix: Soil/Solid)					Client sample ID				
					HS-51 ----	----	----	----	----
Client sampling date / time					27-Jan-2026 09:29	----	----	----	----
Analyte	CAS Number	Method/Lab	LOR	Unit	VA26A2119-016	----	----	----	----
					Result	----	----	----	----
<b>Physical Tests</b>									
pH (1:2 soil:water)	----	E108/VA	0.10	pH units	11.96	----	----	----	----
<b>Metals</b>									
Aluminum	7429-90-5	E440/VA	50	mg/kg	2910	----	----	----	----



### Analytical Results

Sub-Matrix: Soil  
 (Matrix: Soil/Solid)

					Client sample ID	HS-51	----	----	----	----
					Client sampling date / time	27-Jan-2026 09:29	----	----	----	----
Analyte	CAS Number	Method/Lab	LOR	Unit	VA26A2119-016	----	----	----	----	
						Result	----	----	----	----
<b>Metals</b>										
Antimony	7440-36-0	E440/VA	0.10	mg/kg	398	----	----	----	----	
Arsenic	7440-38-2	E440/VA	0.10	mg/kg	132	----	----	----	----	
Barium	7440-39-3	E440/VA	0.50	mg/kg	178	----	----	----	----	
Beryllium	7440-41-7	E440/VA	0.10	mg/kg	<0.10	----	----	----	----	
Bismuth	7440-69-9	E440/VA	0.20	mg/kg	21.2	----	----	----	----	
Boron	7440-42-8	E440/VA	5.0	mg/kg	57.1	----	----	----	----	
Cadmium	7440-43-9	E440/VA	0.020	mg/kg	115	----	----	----	----	
Calcium	7440-70-2	E440/VA	50	mg/kg	282000	----	----	----	----	
Chromium	7440-47-3	E440/VA	0.50	mg/kg	22.6	----	----	----	----	
Cobalt	7440-48-4	E440/VA	0.10	mg/kg	3.17	----	----	----	----	
Copper	7440-50-8	E440/VA	0.50	mg/kg	470	----	----	----	----	
Iron	7439-89-6	E440/VA	50	mg/kg	1810	----	----	----	----	
Lead	7439-92-1	E440/VA	0.50	mg/kg	908	----	----	----	----	
Lithium	7439-93-2	E440/VA	2.0	mg/kg	18.1	----	----	----	----	
Magnesium	7439-95-4	E440/VA	20	mg/kg	3890	----	----	----	----	
Manganese	7439-96-5	E440/VA	1.0	mg/kg	125	----	----	----	----	
Mercury	7439-97-6	E510/VA	0.0500	mg/kg	5.21	----	----	----	----	
Molybdenum	7439-98-7	E440/VA	0.10	mg/kg	4.96	----	----	----	----	
Nickel	7440-02-0	E440/VA	0.50	mg/kg	13.5	----	----	----	----	
Phosphorus	7723-14-0	E440/VA	50	mg/kg	1310	----	----	----	----	
Potassium	7440-09-7	E440/VA	100	mg/kg	19800	----	----	----	----	



### Analytical Results

Sub-Matrix: Soil  
 (Matrix: Soil/Solid)

					Client sample ID	HS-51	----	----	----	----
					Client sampling date / time	27-Jan-2026 09:29	----	----	----	----
Analyte	CAS Number	Method/Lab	LOR	Unit	VA26A2119-016	----	----	----	----	----
					Result	----	----	----	----	----
<b>Metals</b>										
Selenium	7782-49-2	E440/VA	0.20	mg/kg	1.27	----	----	----	----	----
Silver	7440-22-4	E440/VA	0.10	mg/kg	12.7	----	----	----	----	----
Sodium	7440-23-5	E440/VA	50	mg/kg	29000	----	----	----	----	----
Strontium	7440-24-6	E440/VA	0.50	mg/kg	738	----	----	----	----	----
Sulfur	7704-34-9	E440/VA	1000	mg/kg	12900	----	----	----	----	----
Thallium	7440-28-0	E440/VA	0.050	mg/kg	0.314	----	----	----	----	----
Tin	7440-31-5	E440/VA	2.0	mg/kg	378	----	----	----	----	----
Titanium	7440-32-6	E440/VA	1.0	mg/kg	660	----	----	----	----	----
Tungsten	7440-33-7	E440/VA	0.50	mg/kg	3.87	----	----	----	----	----
Uranium	7440-61-1	E440/VA	0.050	mg/kg	1.60	----	----	----	----	----
Vanadium	7440-62-2	E440/VA	0.20	mg/kg	25.6	----	----	----	----	----
Zinc	7440-66-6	E440/VA	2.0	mg/kg	12800	----	----	----	----	----
Zirconium	7440-67-7	E440/VA	1.0	mg/kg	6.6	----	----	----	----	----

Please refer to the General Comments section for an explanation of any qualifiers detected.

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## Quality Control Interpretive Report

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**Work Order : VA26A2119**

Client : HDR Corporation  
 Contact : Johanna Mason  
 Address : 500-1500 W. Georgia Street  
           Vancouver BC Canada V6G 2Z6  
 Telephone : ----  
 Project : HDR-100  
 PO : ----  
 C-O-C number : ----  
 Sampler : ----  
 Site : ----  
 Quote number : VA25-HDRI100-001  
 No. of samples received : 16  
 No. of samples analysed : 16

Laboratory : ALS Environmental - Vancouver  
 Account Manager : Le Van Dalfsen  
 Address : 8081 Lougheed Highway  
           Burnaby British Columbia Canada V5A 1W9  
 Telephone : +1 604 253 4188  
 Date Samples Received : 27-Jan-2026 14:00  
 Issue Date : 11-Mar-2026 15:42

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**This report is automatically generated by the ALS LIMS (Laboratory Information Management System) through evaluation of Quality Control (QC) results and other QA parameters associated with this submission, and is intended to facilitate rapid data validation by auditors or reviewers. The report highlights any exceptions and outliers to ALS Data Quality Objectives, provides holding time details and exceptions, summarizes QC sample frequencies, and lists applicable methodology references and summaries.**

**Key**

Anonymous: Refers to samples which are not part of this work order, but which formed part of the QC process lot.  
 CAS Number: Chemical Abstracts Services number is a unique identifier assigned to discrete substances.  
 DQO: Data Quality Objective.  
 LOR: Limit of Reporting (detection limit).  
 RPD: Relative Percent Difference.

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***Workorder Comments***

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Holding times are displayed as "---" if no guidance exists from CCME, Canadian provinces, or broadly recognized international references.

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## Summary of Outliers

### Outliers : Quality Control Samples

- No Method Blank value outliers occur.
- Duplicate outliers occur - please see following pages for full details.
- No Laboratory Control Sample (LCS) outliers occur
- No Laboratory Control Sample Duplicate (LCSD) outliers occur
- No Matrix Spike outliers occur.
- No Matrix Spike Duplicate (MSD) outliers occur.
- No Test sample Surrogate recovery outliers exist.

### Outliers: Reference Material (RM) Samples

- No Reference Material (RM) Sample outliers occur.

### Outliers : Analysis Holding Time Compliance (Breaches)

- No Analysis Holding Time Outliers exist.

### Outliers : Frequency of Quality Control Samples

- No Quality Control Sample Frequency Outliers occur.



## Outliers : Quality Control Samples

Duplicates, Method Blanks, Laboratory Control Samples and Matrix Spikes

Matrix : **Soil/Solid**

Analyte Group	Laboratory sample ID	Client/Ref Sample ID	Analyte	CAS Number	Method	Result	Limits	Comment
<b>Duplicate (DUP) RPDs</b>								
Metals	VA26A2119--003	HS-38	Chromium	7440-47-3	E440	43.4 % DUP-H	30%	Duplicate RPD does not meet the DQO for this test.

### Result Qualifiers

Qualifier	Description
DUP-H	Duplicate results outside ALS DQO, due to sample heterogeneity.



### Analysis Holding Time Compliance

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times, which are selected to meet known provincial and/or federal requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by organizations such as CCME, US EPA, APHA Standard Methods, ASTM, or Environment Canada (where available). Dates and holding times reported below represent the first dates of extraction or analysis. If subsequent tests or dilutions exceeded holding times, qualifiers are added (refer to COA).

If samples are identified below as having been analyzed or extracted outside of recommended holding times, measurement uncertainties may be increased, and this should be taken into consideration when interpreting results.

Where actual sampling date is not provided on the chain of custody, the date of receipt with time at 00:00 is used for calculation purposes.

Where only the sample date without time is provided on the chain of custody, the sampling date at 00:00 is used for calculation purposes.

**Matrix: Soil/Solid**

Evaluation: ✖ = Holding time exceedance; ✔ = Within Holding Time

Analyte Group : Analytical Method		ALS Sample ID	QC Lot	Method	Sampling Date	Extraction / Preparation			Analysis				
Container	Preparation Date					Holding Times		Eval	Analysis Date	Holding Times		Eval	
Client sample ID						Rec	Actual			Rec	Actual		
<b>Dioxins and Furans : Dioxins and Furans in Soil/Solid by GC-HRMS</b>													
Glass soil jar/Teflon lined cap													
HS-46		011	2462054	XE766	27-Jan-2026	09-Feb-2026	365 days	13 days	✔	13-Feb-2026	365 days	4 days	✔
HS-47		012	2474436	XE766	27-Jan-2026	09-Feb-2026	365 days	13 days	✔	13-Feb-2026	365 days	4 days	✔
HS-48		013	2462054	XE766	27-Jan-2026	09-Feb-2026	365 days	13 days	✔	13-Feb-2026	365 days	4 days	✔
<b>Dioxins and Furans Cleanup Standards : Dioxins and Furans in Soil/Solid by GC-HRMS</b>													
Glass soil jar/Teflon lined cap													
HS-46		011	2462054	XE766	27-Jan-2026	09-Feb-2026	365 days	13 days	✔	13-Feb-2026	365 days	4 days	✔
HS-47		012	2474436	XE766	27-Jan-2026	09-Feb-2026	365 days	13 days	✔	13-Feb-2026	365 days	4 days	✔
HS-48		013	2462054	XE766	27-Jan-2026	09-Feb-2026	365 days	13 days	✔	13-Feb-2026	365 days	4 days	✔
<b>Dioxins and Furans Extraction Standards : Dioxins and Furans in Soil/Solid by GC-HRMS</b>													
Glass soil jar/Teflon lined cap													
HS-46		011	2462054	XE766	27-Jan-2026	09-Feb-2026	365 days	13 days	✔	13-Feb-2026	365 days	4 days	✔
HS-47		012	2474436	XE766	27-Jan-2026	09-Feb-2026	365 days	13 days	✔	13-Feb-2026	365 days	4 days	✔
HS-48		013	2462054	XE766	27-Jan-2026	09-Feb-2026	365 days	13 days	✔	13-Feb-2026	365 days	4 days	✔



**Matrix: Soil/Solid**

Evaluation: ✖ = Holding time exceedance; ✔ = Within Holding Time

Analyte Group : Analytical Method		ALS Sample ID	QC Lot	Method	Sampling Date	Extraction / Preparation			Analysis			
Container	Preparation Date					Holding Times		Eval	Analysis Date	Holding Times		Eval
Client sample ID						Rec	Actual			Rec	Actual	
<b>Metals : Mercury in Soil/Solid by CVAAS</b>												
Glass soil jar/Teflon lined cap												
HS-36	001	2435266	E510	27-Jan-2026	31-Jan-2026	28 days	4 days	✔	02-Feb-2026	28 days	2 days	✔
HS-37	002	2435266	E510	27-Jan-2026	31-Jan-2026	28 days	4 days	✔	02-Feb-2026	28 days	2 days	✔
HS-38	003	2435266	E510	27-Jan-2026	31-Jan-2026	28 days	4 days	✔	02-Feb-2026	28 days	2 days	✔
HS-39	004	2435266	E510	27-Jan-2026	31-Jan-2026	28 days	4 days	✔	02-Feb-2026	28 days	2 days	✔
HS-40	005	2435266	E510	27-Jan-2026	31-Jan-2026	28 days	4 days	✔	02-Feb-2026	28 days	2 days	✔
HS-41	006	2435266	E510	27-Jan-2026	31-Jan-2026	28 days	4 days	✔	02-Feb-2026	28 days	2 days	✔
HS-42	007	2435266	E510	27-Jan-2026	31-Jan-2026	28 days	4 days	✔	02-Feb-2026	28 days	2 days	✔
HS-43	008	2435266	E510	27-Jan-2026	31-Jan-2026	28 days	4 days	✔	02-Feb-2026	28 days	2 days	✔
HS-44	009	2435266	E510	27-Jan-2026	31-Jan-2026	28 days	4 days	✔	02-Feb-2026	28 days	2 days	✔
HS-45	010	2435266	E510	27-Jan-2026	31-Jan-2026	28 days	4 days	✔	02-Feb-2026	28 days	2 days	✔
HS-49	014	2435266	E510	27-Jan-2026	31-Jan-2026	28 days	4 days	✔	02-Feb-2026	28 days	2 days	✔
HS-50	015	2435266	E510	27-Jan-2026	31-Jan-2026	28 days	4 days	✔	02-Feb-2026	28 days	2 days	✔
HS-51	016	2435266	E510	27-Jan-2026	31-Jan-2026	28 days	4 days	✔	02-Feb-2026	28 days	2 days	✔
<b>Metals : Metals in Soil/Solid by CRC ICPMS</b>												
Glass soil jar/Teflon lined cap												
HS-36	001	2435265	E440	27-Jan-2026	31-Jan-2026	180 days	4 days	✔	03-Feb-2026	180 days	6 days	✔
HS-37	002	2435265	E440	27-Jan-2026	31-Jan-2026	180 days	4 days	✔	03-Feb-2026	180 days	6 days	✔
HS-38	003	2435265	E440	27-Jan-2026	31-Jan-2026	180 days	4 days	✔	03-Feb-2026	180 days	6 days	✔



**Matrix: Soil/Solid**

Evaluation: \* = Holding time exceedance; ✓ = Within Holding Time

Analyte Group : Analytical Method		ALS Sample ID	QC Lot	Method	Sampling Date	Extraction / Preparation			Analysis				
Container						Preparation Date	Holding Times		Eval	Analysis Date	Holding Times		Eval
Client sample ID							Rec	Actual			Rec	Actual	
<b>Metals : Metals in Soil/Solid by CRC ICPMS</b>													
Glass soil jar/Teflon lined cap													
HS-39		004	2435265	E440	27-Jan-2026	31-Jan-2026	180 days	4 days	✓	03-Feb-2026	180 days	6 days	✓
HS-40		005	2435265	E440	27-Jan-2026	31-Jan-2026	180 days	4 days	✓	03-Feb-2026	180 days	6 days	✓
HS-41		006	2435265	E440	27-Jan-2026	31-Jan-2026	180 days	4 days	✓	03-Feb-2026	180 days	6 days	✓
HS-42		007	2435265	E440	27-Jan-2026	31-Jan-2026	180 days	4 days	✓	03-Feb-2026	180 days	6 days	✓
HS-43		008	2435265	E440	27-Jan-2026	31-Jan-2026	180 days	4 days	✓	03-Feb-2026	180 days	6 days	✓
HS-44		009	2435265	E440	27-Jan-2026	31-Jan-2026	180 days	4 days	✓	03-Feb-2026	180 days	6 days	✓
HS-45		010	2435265	E440	27-Jan-2026	31-Jan-2026	180 days	4 days	✓	03-Feb-2026	180 days	6 days	✓
HS-49		014	2435265	E440	27-Jan-2026	31-Jan-2026	180 days	4 days	✓	03-Feb-2026	180 days	6 days	✓
HS-50		015	2435265	E440	27-Jan-2026	31-Jan-2026	180 days	4 days	✓	03-Feb-2026	180 days	6 days	✓
HS-51		016	2435265	E440	27-Jan-2026	31-Jan-2026	180 days	4 days	✓	03-Feb-2026	180 days	6 days	✓
<b>Physical Tests : Moisture Content by Gravimetry</b>													
Glass soil jar/Teflon lined cap													
HS-46		011	2466548	E144	27-Jan-2026	----	----	----		24-Feb-2026	----	----	
HS-47		012	2466548	E144	27-Jan-2026	----	----	----		24-Feb-2026	----	----	
HS-48		013	2466548	E144	27-Jan-2026	----	----	----		24-Feb-2026	----	----	
<b>Physical Tests : pH by Meter (1:2 Soil:Water Extraction)</b>													
Glass soil jar/Teflon lined cap													
HS-36		001	2435267	E108	27-Jan-2026	31-Jan-2026	30 days	4 days	✓	01-Feb-2026	30 days	5 days	✓
HS-37		002	2435267	E108	27-Jan-2026	31-Jan-2026	30 days	4 days	✓	01-Feb-2026	30 days	5 days	✓



**Matrix: Soil/Solid**

Evaluation: ✖ = Holding time exceedance; ✔ = Within Holding Time

Analyte Group : Analytical Method		ALS Sample ID	QC Lot	Method	Sampling Date	Extraction / Preparation			Analysis				
Container						Preparation Date	Holding Times		Eval	Analysis Date	Holding Times		Eval
Client sample ID							Rec	Actual			Rec	Actual	
<b>Physical Tests : pH by Meter (1:2 Soil:Water Extraction)</b>													
Glass soil jar/Teflon lined cap													
HS-38		003	2435267	E108	27-Jan-2026	31-Jan-2026	30 days	4 days	✔	01-Feb-2026	30 days	5 days	✔
HS-39		004	2435267	E108	27-Jan-2026	31-Jan-2026	30 days	4 days	✔	01-Feb-2026	30 days	5 days	✔
HS-40		005	2435267	E108	27-Jan-2026	31-Jan-2026	30 days	4 days	✔	01-Feb-2026	30 days	5 days	✔
HS-41		006	2435267	E108	27-Jan-2026	31-Jan-2026	30 days	4 days	✔	01-Feb-2026	30 days	5 days	✔
HS-42		007	2435267	E108	27-Jan-2026	31-Jan-2026	30 days	4 days	✔	01-Feb-2026	30 days	5 days	✔
HS-43		008	2435267	E108	27-Jan-2026	31-Jan-2026	30 days	4 days	✔	01-Feb-2026	30 days	5 days	✔
HS-44		009	2435267	E108	27-Jan-2026	31-Jan-2026	30 days	4 days	✔	01-Feb-2026	30 days	5 days	✔
HS-45		010	2435267	E108	27-Jan-2026	31-Jan-2026	30 days	4 days	✔	01-Feb-2026	30 days	5 days	✔
HS-49		014	2435267	E108	27-Jan-2026	31-Jan-2026	30 days	4 days	✔	01-Feb-2026	30 days	5 days	✔
HS-50		015	2435267	E108	27-Jan-2026	31-Jan-2026	30 days	4 days	✔	01-Feb-2026	30 days	5 days	✔
HS-51		016	2435267	E108	27-Jan-2026	31-Jan-2026	30 days	4 days	✔	01-Feb-2026	30 days	5 days	✔
<b>Toxic Equivalency : Dioxins and Furans in Soil/Solid by GC-HRMS</b>													
Glass soil jar/Teflon lined cap													
HS-46		011	2462054	XE766	27-Jan-2026	09-Feb-2026	365 days	13 days	✔	13-Feb-2026	365 days	4 days	✔
HS-47		012	2474436	XE766	27-Jan-2026	09-Feb-2026	365 days	13 days	✔	13-Feb-2026	365 days	4 days	✔
HS-48		013	2462054	XE766	27-Jan-2026	09-Feb-2026	365 days	13 days	✔	13-Feb-2026	365 days	4 days	✔

Rec. HT: ALS recommended hold time (see units).



## Quality Control Parameter Frequency Compliance

The following report summarizes the frequency of laboratory QC samples analyzed within the analytical batches (QC lots) in which the submitted samples were processed. The actual frequency should be greater than or equal to the expected frequency.

**Matrix: Soil/Solid**

Evaluation: ✖ = QC frequency outside specification; ✔ = QC frequency within specification

Quality Control Sample Type	Method	QC Lot #	Count		Frequency (%)		
			QC	Regular	Actual	Expected	Evaluation
<b>Analytical Methods</b>							
<b>Laboratory Duplicates (DUP)</b>							
pH by Meter (1:2 Soil:Water Extraction)	E108	2435267	1	19	5.3	5.0	✔
Moisture Content by Gravimetry	E144	2466548	1	20	5.0	5.0	✔
Metals in Soil/Solid by CRC ICPMS	E440	2435265	1	19	5.3	5.0	✔
Mercury in Soil/Solid by CVAAS	E510	2435266	1	14	7.1	5.0	✔
Dioxins and Furans in Soil/Solid by GC-HRMS	XE766	2462054	2	13	15.4	5.0	✔
<b>Laboratory Control Samples (LCS)</b>							
pH by Meter (1:2 Soil:Water Extraction)	E108	2435267	1	19	5.3	5.0	✔
Moisture Content by Gravimetry	E144	2466548	1	20	5.0	5.0	✔
Metals in Soil/Solid by CRC ICPMS	E440	2435265	2	19	10.5	10.0	✔
Mercury in Soil/Solid by CVAAS	E510	2435266	2	14	14.3	10.0	✔
Dioxins and Furans in Soil/Solid by GC-HRMS	XE766	2462054	3	13	23.1	5.0	✔
<b>Method Blanks (MB)</b>							
Moisture Content by Gravimetry	E144	2466548	1	20	5.0	5.0	✔
Metals in Soil/Solid by CRC ICPMS	E440	2435265	1	19	5.3	5.0	✔
Mercury in Soil/Solid by CVAAS	E510	2435266	1	14	7.1	5.0	✔
Dioxins and Furans in Soil/Solid by GC-HRMS	XE766	2462054	3	13	23.1	5.0	✔



## Methodology References and Summaries

The analytical methods used by ALS are developed using internationally recognized reference methods (where available), such as those published by US EPA, APHA Standard Methods, ASTM, ISO, Environment Canada, BC MOE, and Ontario MOE. Reference methods may incorporate modifications to improve performance (indicated by "mod").

Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Dioxins and Furans in Soil/Solid by GC-HRMS	XE766 ALS Environmental - Burlington	Soil/Solid	USEPA 1613B	The sample is extracted by Soxhlet extraction. Extracts are prepared using column chromatography, reduced in volume and analyzed by isotope-dilution GC-HRMS. Reported on a dry-weight basis.
Mercury in Soil/Solid by CVAAS	E510 ALS Environmental - Vancouver	Soil/Solid	EPA 200.2/1631 Appendix (mod)	Samples are dried, then sieved through a 2 mm sieve, and digested with HNO <sub>3</sub> and HCl, followed by CVAAS analysis.
Metals in Soil/Solid by CRC ICPMS	E440 ALS Environmental - Vancouver	Soil/Solid	EPA 6020B (mod)	This method is intended to liberate metals that may be environmentally available. Samples are dried, then sieved through a 2 mm sieve, and digested with HNO <sub>3</sub> and HCl.  Dependent on sample matrix, some metals may be only partially recovered, including Al, Ba, Be, Cr, Sr, Ti, Tl, V, W, and Zr. Silicate minerals are not solubilized. Volatile forms of sulfur (including sulfide) may not be captured, as they may be lost during sampling, storage, or digestion. This method does not adequately recover elemental sulfur, and is unsuitable for assessment of elemental sulfur standards or guidelines.  Analysis is by Collision/Reaction Cell ICPMS.
Moisture Content by Gravimetry	E144 ALS Environmental - Vancouver	Soil/Solid	CCME PHC in Soil - Tier 1	Moisture is measured gravimetrically by drying the sample at 105°C. Moisture content is calculated as the weight loss (due to water) divided by the wet weight of the sample, expressed as a percentage.
pH by Meter (1:2 Soil:Water Extraction)	E108 ALS Environmental - Vancouver	Soil/Solid	BC Lab Manual	pH is determined by potentiometric measurement with a pH electrode at ambient laboratory temperature (normally 20 ± 5°C), and is carried out in accordance with procedures described in the BC Lab Manual (prescriptive method). The procedure involves mixing the dried (at <60 °C) and sieved (10mesh/2mm) sample with ultra pure water at a 1:2 ratio of sediment to water. The pH is then measured by a standard pH probe.
Preparation Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Digestion for Metals and Mercury	EP440 ALS Environmental - Vancouver	Soil/Solid	EPA 200.2 (mod)	Samples are dried, then sieved through a 2 mm sieve, and digested with HNO <sub>3</sub> and HCl. This method is intended to liberate metals that may be environmentally available.
Leach 1:2 Soil:Water for pH/EC	EP108 ALS Environmental - Vancouver	Soil/Solid	BC WLAP METHOD: PH, ELECTROMETRIC, SOIL	The procedure involves mixing the dried (at <60°C) and sieved (No. 10 / 2mm) sample with deionized/distilled water at a 1:2 ratio of sediment to water.
Soxhlet extraction of solids for DX/Fs, PCBs, PCNs, and/or HFRs	EP800 ALS Environmental - Burlington	Soil/Solid	EPA Method 3540C (preparation)	Solid samples are homogenized and sub-sampled, then extracted using Soxhlet apparatus.

**QUALITY CONTROL REPORT**

**Work Order : VA26A2119**

Client : HDR Corporation  
 Contact : Johanna Mason  
 Address : 500-1500 W. Georgia Street  
 Vancouver BC Canada V6G 2Z6  
 Telephone : ----  
 Project : HDR-100  
 PO : ----  
 C-O-C number : ----  
 Sampler : ----  
 Site : ----  
 Quote number : VA25-HDRI100-001  
 No. of samples received : 16  
 No. of samples analysed : 16

Laboratory : ALS Environmental - Vancouver  
 Account Manager : Le Van Dalfsen  
 Address : 8081 Lougheed Highway  
 Burnaby British Columbia Canada V5A 1W9  
 Telephone : +1 604 253 4188  
 Date Samples Received : 27-Jan-2026 14:00  
 Date Analysis Commenced : 01-Feb-2026  
 Issue Date : 11-Mar-2026 15:42

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 Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percent Difference (RPD) and Data Quality Objectives
- Reference Material (RM) Report; Recovery and Data Quality Objectives
- Method Blank (MB) Report; Recovery and Data Quality Objectives
- Laboratory Control Sample (LCS) Report; Recovery and Data Quality Objectives

**Signatories**

This document has been electronically signed by the authorized signatories below. Electronic signing is conducted in accordance with US FDA 21 CFR Part 11.

<i>Signatories</i>	<i>Position</i>	<i>Laboratory Department</i>
Brad Reimer	Technical Specialist	Burlington Organics, Burlington, Ontario
Brieanna Allen	Production/Validation Manager	Vancouver Organics, Burnaby, British Columbia
Colin Jamieson	Analyst	Burlington Organics, Burlington, Ontario
Kevin Duarte	Supervisor - Metals ICP Instrumentation	Vancouver Metals, Burnaby, British Columbia
Ophelia Chiu	Department Manager - Organics	Vancouver Organics, Burnaby, British Columbia
Robin Weeks	Supervisor - Organics Extractions	Vancouver Organics, Burnaby, British Columbia
Stephen Kennedy	Technical Department Manager	Burlington Organics, Burlington, Ontario
Twinkle Patel	Analyst	Burlington Organics, Burlington, Ontario



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### **General Comments**

The ALS Quality Control (QC) report is optionally provided to ALS clients upon request. ALS test methods include comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against predetermined Data Quality Objectives (DQOs) to provide confidence in the accuracy of associated test results. This report contains detailed results for all QC results applicable to this sample submission. Please refer to the ALS Quality Control Interpretation report (QCI) for applicable method references and methodology summaries.

Key:                    Anonymous=Refers to samples which are not part of this work order, but which formed part of the QC process lot.  
                          CAS Number=Chemical Abstracts Service number is a unique identifier assigned to discrete substances.  
                          DQO=Data Quality Objective.  
                          LOR=Limit of Reporting (detection limit).  
                          RPD=Relative Percent Difference  
                          # =Indicates a QC result that did not meet the ALS DQO.

### **Workorder Comments**

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Holding times are displayed as "---" if no guidance exists from CCME, Canadian provinces, or broadly recognized international references.

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### Laboratory Duplicate (DUP) Report

A Laboratory Duplicate (DUP) is a randomly selected intralaboratory replicate sample. Laboratory Duplicates provide information regarding method precision and sample heterogeneity. ALS DQOs for Laboratory Duplicates are expressed as test-specific limits for Relative Percent Difference (RPD), or as an absolute difference limit of 2 times the LOR for low concentration duplicates within ~ 4-10 times the LOR (cut-off is test specific).

Sub-Matrix: Soil

### Laboratory Duplicate (DUP) Report

Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	LOR	Unit	Original Result	Duplicate Result	RPD(%) or Difference	Duplicate Limits	Qualifier
<b>Physical Tests(QC Lot: 2435267)</b>											
VA26A2119-003	HS-38	pH (1:2 soil:water)	----	E108	0.10	pH units	6.34	6.42	1.3 %	5%	---
<b>Physical Tests(QC Lot: 2466548)</b>											
VA26A4205-001	Anonymous	Moisture	----	E144	0.25	%	15.1	15.9	4.73 %	20%	---
<b>Metals(QC Lot: 2435265)</b>											
VA26A2119-003	HS-38	Aluminum	7429-90-5	E440	50	mg/kg	4320	4190	3.22 %	40%	---
		Antimony	7440-36-0	E440	0.10	mg/kg	35.7	28.4	22.7 %	30%	---
		Arsenic	7440-38-2	E440	0.10	mg/kg	7.67	5.89	26.3 %	30%	---
		Barium	7440-39-3	E440	0.50	mg/kg	32.9	33.7	2.33 %	40%	---
		Beryllium	7440-41-7	E440	0.10	mg/kg	<0.10	<0.10	0	Diff <2x LOR	---
		Bismuth	7440-69-9	E440	0.20	mg/kg	5.84	5.24	10.8 %	30%	---
		Boron	7440-42-8	E440	5.0	mg/kg	5.3	<5.0	0.3	Diff <2x LOR	---
		Cadmium	7440-43-9	E440	0.020	mg/kg	1.81	1.79	1.35 %	30%	---
		Calcium	7440-70-2	E440	50	mg/kg	2260	2140	5.39 %	30%	---
		Chromium	7440-47-3	E440	0.50	mg/kg	84.5	54.4	43.4 %	30%	DUP-H
		Cobalt	7440-48-4	E440	0.10	mg/kg	4.16	3.71	11.4 %	30%	---
		Copper	7440-50-8	E440	0.50	mg/kg	50.8	44.4	13.3 %	30%	---
		Iron	7439-89-6	E440	50	mg/kg	55200	43000	24.9 %	30%	---
		Lead	7439-92-1	E440	0.50	mg/kg	49.3	50.6	2.56 %	40%	---
		Lithium	7439-93-2	E440	2.0	mg/kg	<2.0	<2.0	0	Diff <2x LOR	---
		Magnesium	7439-95-4	E440	20	mg/kg	2000	2000	0.311 %	30%	---
		Manganese	7439-96-5	E440	1.0	mg/kg	544	512	6.19 %	30%	---
		Molybdenum	7439-98-7	E440	0.10	mg/kg	22.2	15.3	36.5 %	40%	---
		Nickel	7440-02-0	E440	0.50	mg/kg	36.5	28.4	24.8 %	30%	---
		Phosphorus	7723-14-0	E440	50	mg/kg	453	467	2.93 %	30%	---
		Potassium	7440-09-7	E440	100	mg/kg	230	210	20	Diff <2x LOR	---
		Selenium	7782-49-2	E440	0.20	mg/kg	<0.20	<0.20	0	Diff <2x LOR	---
		Silver	7440-22-4	E440	0.10	mg/kg	0.35	0.37	0.03	Diff <2x LOR	---
		Sodium	7440-23-5	E440	50	mg/kg	78	79	0.7	Diff <2x LOR	---
		Strontium	7440-24-6	E440	0.50	mg/kg	9.28	8.39	10.1 %	40%	---
		Sulfur	7704-34-9	E440	1000	mg/kg	<1000	<1000	0	Diff <2x LOR	---
		Thallium	7440-28-0	E440	0.050	mg/kg	<0.050	<0.050	0	Diff <2x LOR	---
		Tin	7440-31-5	E440	2.0	mg/kg	8.3	7.9	0.4	Diff <2x LOR	---
		Titanium	7440-32-6	E440	1.0	mg/kg	299	336	11.5 %	40%	---



Sub-Matrix: Soil

Laboratory Duplicate (DUP) Report

Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	LOR	Unit	Original Result	Duplicate Result	RPD(%) or Difference	Duplicate Limits	Qualifier
<b>Metals(QC Lot: 2435265)</b>											
		Tungsten	7440-33-7	E440	0.50	mg/kg	1.11	1.10	0.01	Diff <2x LOR	---
		Uranium	7440-61-1	E440	0.050	mg/kg	0.355	0.354	0.202 %	30%	---
		Vanadium	7440-62-2	E440	0.20	mg/kg	14.7	14.2	3.26 %	30%	---
		Zinc	7440-66-6	E440	2.0	mg/kg	259	243	6.39 %	30%	---
		Zirconium	7440-67-7	E440	1.0	mg/kg	<1.0	<1.0	0	Diff <2x LOR	---
<b>Metals(QC Lot: 2435266)</b>											
VA26A2119-003	HS-38	Mercury	7439-97-6	E510	0.0500	mg/kg	0.0667	0.0648	0.0019	Diff <2x LOR	---
<b>Dioxins and Furans(QC Lot: 2440714)</b>											
VA26A2119-011	HS-46	HpCDD, 1,2,3,4,6,7,8-	35822-46-9	XE766	0.69	pg/g	1090	972	11.4 %	25%	---
		HpCDF, 1,2,3,4,6,7,8-	67562-39-4	XE766	0.27	pg/g	471	421	11.1 %	25%	---
		HpCDF, 1,2,3,4,7,8,9-	55673-89-7	XE766	0.38	pg/g	59.9	49.3	19.3 %	25%	---
		HxCDD, 1,2,3,4,7,8-	39227-28-6	XE766	0.41	pg/g	44.2	39.5	11.2 %	25%	---
		HxCDD, 1,2,3,6,7,8-	57653-85-7	XE766	0.42	pg/g	132	116	12.9 %	25%	---
		HxCDD, 1,2,3,7,8,9-	19408-74-3	XE766	0.41	pg/g	80.7	72.1	11.3 %	25%	---
		HxCDF, 1,2,3,4,7,8-	70648-26-9	XE766	0.29	pg/g	96.1	85.3	12.0 %	25%	---
		HxCDF, 1,2,3,6,7,8-	57117-44-9	XE766	0.28	pg/g	111	96.1	14.8 %	25%	---
		HxCDF, 1,2,3,7,8,9-	72918-21-9	XE766	0.44	pg/g	36.7	32.9	11.0 %	25%	---
		HxCDF, 2,3,4,6,7,8-	60851-34-5	XE766	0.33	pg/g	143	125	13.4 %	25%	---
		OCDD	3268-87-9	XE766	0.56	pg/g	2020	1820	10.7 %	25%	---
		OCDF	39001-02-0	XE766	0.37	pg/g	253	227	11.0 %	25%	---
		PeCDD, 1,2,3,7,8-	40321-76-4	XE766	0.18	pg/g	47.6	40.5	16.1 %	25%	M
		PeCDF, 1,2,3,7,8-	57117-41-6	XE766	0.2	pg/g	<76	67.0	9.51	Diff <2x LOR	M
		PeCDF, 2,3,4,7,8-	57117-31-4	XE766	0.21	pg/g	109	98.4	9.97 %	25%	---
		TCDD, 2,3,7,8-	1746-01-6	XE766	0.064	pg/g	13.5	11.7	14.9 %	25%	---
		TCDF, 2,3,7,8-	51207-31-9	XE766	0.16	pg/g	58.2	50.2	14.7 %	25%	---
<b>Dioxins and Furans(QC Lot: 2474436)</b>											
VA26A2119-012	HS-47	HpCDD, 1,2,3,4,6,7,8-	35822-46-9	XE766	3.9	pg/g	1530	1460	4.34 %	25%	M
		HpCDF, 1,2,3,4,6,7,8-	67562-39-4	XE766	2.3	pg/g	1230	1090	11.7 %	25%	---
		HpCDF, 1,2,3,4,7,8,9-	55673-89-7	XE766	3.0	pg/g	138	133	3.68 %	25%	M
		HxCDD, 1,2,3,4,7,8-	39227-28-6	XE766	2.0	pg/g	106	109	3.10 %	25%	M
		HxCDD, 1,2,3,6,7,8-	57653-85-7	XE766	1.9	pg/g	255	230	10.3 %	25%	M
		HxCDD, 1,2,3,7,8,9-	19408-74-3	XE766	1.9	pg/g	161	158	1.70 %	25%	M
		HxCDF, 1,2,3,4,7,8-	70648-26-9	XE766	1.6	pg/g	233	215	8.09 %	25%	M
		HxCDF, 1,2,3,6,7,8-	57117-44-9	XE766	1.5	pg/g	264	249	5.70 %	25%	M
		HxCDF, 1,2,3,7,8,9-	72918-21-9	XE766	2.2	pg/g	103	95.1	7.68 %	25%	M
		HxCDF, 2,3,4,6,7,8-	60851-34-5	XE766	1.6	pg/g	400	365	9.05 %	25%	M
		OCDD	3268-87-9	XE766	3.5	pg/g	3390	3230	4.84 %	25%	M



**Sub-Matrix: Soil**

**Laboratory Duplicate (DUP) Report**

Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	LOR	Unit	Original Result	Duplicate Result	RPD(%) or Difference	Duplicate Limits	Qualifier
<b>Dioxins and Furans(QC Lot: 2474436)</b>											
		OCDF	39001-02-0	XE766	3.2	pg/g	704	664	5.86 %	25%	M
		PeCDD, 1,2,3,7,8-	40321-76-4	XE766	0.97	pg/g	115	106	7.51 %	25%	M
		PeCDF, 1,2,3,7,8-	57117-41-6	XE766	0.6	pg/g	163	143	13.6 %	25%	M
		PeCDF, 2,3,4,7,8-	57117-31-4	XE766	0.60	pg/g	293	278	5.26 %	25%	M
		TCDD, 2,3,7,8-	1746-01-6	XE766	0.63	pg/g	24.7	23.6	4.72 %	25%	M
		TCDF, 2,3,7,8-	51207-31-9	XE766	0.97	pg/g	112	109	2.77 %	25%	M

**Qualifiers**

Qualifier	Description
DUP-H	Duplicate results outside ALS DQO, due to sample heterogeneity.
M	Peak has been manually integrated.

**Method Blank (MB) Report**

A Method Blank is an analyte-free matrix that undergoes sample processing identical to that carried out for test samples. Method Blank results are used to monitor and control for potential contamination from the laboratory environment and reagents. For most tests, the DQO for Method Blanks is for the result to be < LOR.

**Sub-Matrix: Soil/Solid**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
<b>Physical Tests(QC Lot: 2435267)</b>						
pH (1:2 soil:water)	----	E108	----	pH units	----	----
<b>Physical Tests(QC Lot: 2466548)</b>						
Moisture	----	E144	0.25	%	<0.25	----
<b>Metals(QC Lot: 2435265)</b>						
Aluminum	7429-90-5	E440	50	mg/kg	<50	----
Antimony	7440-36-0	E440	0.1	mg/kg	<0.10	----
Arsenic	7440-38-2	E440	0.1	mg/kg	<0.10	----
Barium	7440-39-3	E440	0.5	mg/kg	<0.50	----
Beryllium	7440-41-7	E440	0.1	mg/kg	<0.10	----
Bismuth	7440-69-9	E440	0.2	mg/kg	<0.20	----
Boron	7440-42-8	E440	5	mg/kg	<5.0	----
Cadmium	7440-43-9	E440	0.02	mg/kg	<0.020	----
Calcium	7440-70-2	E440	50	mg/kg	<50	----



**Sub-Matrix: Soil/Solid**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
<b>Metals(QC Lot: 2435265)</b>						
Chromium	7440-47-3	E440	0.5	mg/kg	<0.50	----
Cobalt	7440-48-4	E440	0.1	mg/kg	<0.10	----
Copper	7440-50-8	E440	0.5	mg/kg	<0.50	----
Iron	7439-89-6	E440	50	mg/kg	<50	----
Lead	7439-92-1	E440	0.5	mg/kg	<0.50	----
Lithium	7439-93-2	E440	2	mg/kg	<2.0	----
Magnesium	7439-95-4	E440	20	mg/kg	<20	----
Manganese	7439-96-5	E440	1	mg/kg	<1.0	----
Molybdenum	7439-98-7	E440	0.1	mg/kg	<0.10	----
Nickel	7440-02-0	E440	0.5	mg/kg	<0.50	----
Phosphorus	7723-14-0	E440	50	mg/kg	<50	----
Potassium	7440-09-7	E440	100	mg/kg	<100	----
Selenium	7782-49-2	E440	0.2	mg/kg	<0.20	----
Silver	7440-22-4	E440	0.1	mg/kg	<0.10	----
Sodium	7440-23-5	E440	50	mg/kg	<50	----
Strontium	7440-24-6	E440	0.5	mg/kg	<0.50	----
Sulfur	7704-34-9	E440	1000	mg/kg	<1000	----
Thallium	7440-28-0	E440	0.05	mg/kg	<0.050	----
Tin	7440-31-5	E440	2	mg/kg	<2.0	----
Titanium	7440-32-6	E440	1	mg/kg	<1.0	----
Tungsten	7440-33-7	E440	0.5	mg/kg	<0.50	----
Uranium	7440-61-1	E440	0.05	mg/kg	<0.050	----
Vanadium	7440-62-2	E440	0.2	mg/kg	<0.20	----
Zinc	7440-66-6	E440	2	mg/kg	<2.0	----
Zirconium	7440-67-7	E440	1	mg/kg	<1.0	----
<b>Metals(QC Lot: 2435266)</b>						
Mercury	7439-97-6	E510	0.005	mg/kg	<0.0050	----
<b>Dioxins and Furans(QC Lot: 2440714)</b>						
HpCDD, 1,2,3,4,6,7,8-	35822-46-9	XE766	1	pg/g	<1.0	[J],M
HpCDF, 1,2,3,4,6,7,8-	67562-39-4	XE766	2	pg/g	<2.0	[U]
HpCDF, 1,2,3,4,7,8,9-	55673-89-7	XE766	1	pg/g	<1.0	[U]
HxCDD, 1,2,3,4,7,8-	39227-28-6	XE766	1	pg/g	<1.0	[U]
HxCDD, 1,2,3,6,7,8-	57653-85-7	XE766	1	pg/g	<1.0	[U]
HxCDD, 1,2,3,7,8,9-	19408-74-3	XE766	1	pg/g	<1.0	[U]
HxCDF, 1,2,3,4,7,8-	70648-26-9	XE766	1	pg/g	<1.0	[U]
HxCDF, 1,2,3,6,7,8-	57117-44-9	XE766	1	pg/g	<1.0	[U]
HxCDF, 1,2,3,7,8,9-	72918-21-9	XE766	1	pg/g	<1.0	[U]
HxCDF, 2,3,4,6,7,8-	60851-34-5	XE766	1	pg/g	<1.0	[U]



**Sub-Matrix: Soil/Solid**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
<b>Dioxins and Furans(QC Lot: 2440714)</b>						
OCDD	3268-87-9	XE766	2	pg/g	<2.0	[J],M
OCDF	39001-02-0	XE766	2	pg/g	<2.0	[J],F
PeCDD, 1,2,3,7,8-	40321-76-4	XE766	1	pg/g	<1.0	[U]
PeCDF, 1,2,3,7,8-	57117-41-6	XE766	1	pg/g	<1	[U]
PeCDF, 2,3,4,7,8-	57117-31-4	XE766	1	pg/g	<1.0	[U]
TCDD, 2,3,7,8-	1746-01-6	XE766	1	pg/g	<1.0	[U]
TCDF, 2,3,7,8-	51207-31-9	XE766	1	pg/g	<1.0	[U]
<b>Dioxins and Furans(QC Lot: 2462054)</b>						
HpCDD, 1,2,3,4,6,7,8-	35822-46-9	XE766	1	pg/g	<1.0	[J],F,M
HpCDF, 1,2,3,4,6,7,8-	67562-39-4	XE766	2	pg/g	<2.0	[J],F
HpCDF, 1,2,3,4,7,8,9-	55673-89-7	XE766	1	pg/g	<1.0	[U]
HxCDD, 1,2,3,4,7,8-	39227-28-6	XE766	1	pg/g	<1.0	[U]
HxCDD, 1,2,3,6,7,8-	57653-85-7	XE766	1	pg/g	<1.0	[U]
HxCDD, 1,2,3,7,8,9-	19408-74-3	XE766	1	pg/g	<1.0	[U]
HxCDF, 1,2,3,4,7,8-	70648-26-9	XE766	1	pg/g	<1.0	[U],M
HxCDF, 1,2,3,6,7,8-	57117-44-9	XE766	1	pg/g	<1.0	[U],F,M
HxCDF, 1,2,3,7,8,9-	72918-21-9	XE766	1	pg/g	<1.0	[U],M
HxCDF, 2,3,4,6,7,8-	60851-34-5	XE766	1	pg/g	<1.0	[U]
OCDD	3268-87-9	XE766	2	pg/g	<2.0	[J],M
OCDF	39001-02-0	XE766	2	pg/g	<2.0	[J],F,M
PeCDD, 1,2,3,7,8-	40321-76-4	XE766	1	pg/g	<1.0	[U]
PeCDF, 1,2,3,7,8-	57117-41-6	XE766	1	pg/g	<1	[J]
PeCDF, 2,3,4,7,8-	57117-31-4	XE766	1	pg/g	<1.0	[J],F,M
TCDD, 2,3,7,8-	1746-01-6	XE766	1	pg/g	<1.0	[U]
TCDF, 2,3,7,8-	51207-31-9	XE766	1	pg/g	<1.0	[U]
<b>Dioxins and Furans(QC Lot: 2474436)</b>						
HpCDD, 1,2,3,4,6,7,8-	35822-46-9	XE766	1	pg/g	<1.0	[U],F,M
HpCDF, 1,2,3,4,6,7,8-	67562-39-4	XE766	2	pg/g	<2.0	[U]
HpCDF, 1,2,3,4,7,8,9-	55673-89-7	XE766	1	pg/g	<1.0	[U]
HxCDD, 1,2,3,4,7,8-	39227-28-6	XE766	1	pg/g	<1.0	[U]
HxCDD, 1,2,3,6,7,8-	57653-85-7	XE766	1	pg/g	<1.0	[U]
HxCDD, 1,2,3,7,8,9-	19408-74-3	XE766	1	pg/g	<1.0	[U]
HxCDF, 1,2,3,4,7,8-	70648-26-9	XE766	1	pg/g	<1.0	[U]
HxCDF, 1,2,3,6,7,8-	57117-44-9	XE766	1	pg/g	<1.0	[U]
HxCDF, 1,2,3,7,8,9-	72918-21-9	XE766	1	pg/g	<1.0	[U],M
HxCDF, 2,3,4,6,7,8-	60851-34-5	XE766	1	pg/g	<1.0	[U]
OCDD	3268-87-9	XE766	2	pg/g	<2.0	[J],F,M
OCDF	39001-02-0	XE766	2	pg/g	<2.0	[U]



**Sub-Matrix: Soil/Solid**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
<b>Dioxins and Furans(QC Lot: 2474436)</b>						
PeCDD, 1,2,3,7,8-	40321-76-4	XE766	1	pg/g	<1.0	[U]
PeCDF, 1,2,3,7,8-	57117-41-6	XE766	1	pg/g	<1	[U],M
PeCDF, 2,3,4,7,8-	57117-31-4	XE766	1	pg/g	<1.0	[U]
TCDD, 2,3,7,8-	1746-01-6	XE766	1	pg/g	<1.0	[U]
TCDF, 2,3,7,8-	51207-31-9	XE766	1	pg/g	<1.0	[U]

**Qualifiers**

Qualifier	Description
[J]	Estimated value. The reported concentration is below the calibrated range of the instrument but above the EDL.
[U]	The analyte was not detected above the EDL (or LOR where applicable).
F	The ion abundance ratio(s) did not meet the acceptance criteria. Estimated Detection Limit for that compound has been elevated to the level of the EMPC.
M	Peak has been manually integrated.

**Laboratory Control Sample (LCS) Report**

A Laboratory Control Sample (LCS) is an analyte-free matrix that has been fortified (spiked) with test analytes at known concentration and processed in an identical manner to test samples. LCS results are expressed as percent recovery, and are used to monitor and control test method accuracy and precision, independent of test sample matrix.

**Sub-Matrix: Soil**

Analyte	CAS Number	Method	LOR	Unit	Laboratory Control Sample (LCS) Report				
					Spike Target Concentration	Recovery (%) LCS	Recovery Limits (%)		Qualifier
							Low	High	
<b>Physical Tests(QC Lot: 2435267)</b>									
pH (1:2 soil:water)	----	E108	----	pH units	6 pH units	100	95.0	105	----
<b>Physical Tests(QC Lot: 2466548)</b>									
Moisture	----	E144	0.25	%	50 %	99.1	90.0	110	----
<b>Metals(QC Lot: 2435265)</b>									
Aluminum	7429-90-5	E440	50	mg/kg	200 mg/kg	105	80.0	120	----
Antimony	7440-36-0	E440	0.1	mg/kg	100 mg/kg	105	80.0	120	----
Arsenic	7440-38-2	E440	0.1	mg/kg	100 mg/kg	101	80.0	120	----
Barium	7440-39-3	E440	0.5	mg/kg	25 mg/kg	100	80.0	120	----
Beryllium	7440-41-7	E440	0.1	mg/kg	10 mg/kg	103	80.0	120	----
Bismuth	7440-69-9	E440	0.2	mg/kg	100 mg/kg	96.4	80.0	120	----
Boron	7440-42-8	E440	5	mg/kg	100 mg/kg	96.6	80.0	120	----
Cadmium	7440-43-9	E440	0.02	mg/kg	10 mg/kg	102	80.0	120	----
Calcium	7440-70-2	E440	50	mg/kg	5000 mg/kg	100	80.0	120	----



**Sub-Matrix: Soil**

**Laboratory Control Sample (LCS) Report**

Analyte	CAS Number	Method	LOR	Unit	Laboratory Control Sample (LCS) Report				Qualifier
					Spike Target Concentration	Recovery (%) LCS	Recovery Limits (%)		
				Low	High				
<b>Metals(QC Lot: 2435265)</b>									
Chromium	7440-47-3	E440	0.5	mg/kg	25 mg/kg	98.3	80.0	120	---
Cobalt	7440-48-4	E440	0.1	mg/kg	25 mg/kg	97.5	80.0	120	---
Copper	7440-50-8	E440	0.5	mg/kg	25 mg/kg	99.0	80.0	120	---
Iron	7439-89-6	E440	50	mg/kg	100 mg/kg	100	80.0	120	---
Lead	7439-92-1	E440	0.5	mg/kg	50 mg/kg	102	80.0	120	---
Lithium	7439-93-2	E440	2	mg/kg	25 mg/kg	102	80.0	120	---
Magnesium	7439-95-4	E440	20	mg/kg	5000 mg/kg	110	80.0	120	---
Manganese	7439-96-5	E440	1	mg/kg	25 mg/kg	102	80.0	120	---
Molybdenum	7439-98-7	E440	0.1	mg/kg	25 mg/kg	105	80.0	120	---
Nickel	7440-02-0	E440	0.5	mg/kg	50 mg/kg	97.9	80.0	120	---
Phosphorus	7723-14-0	E440	50	mg/kg	1000 mg/kg	108	80.0	120	---
Potassium	7440-09-7	E440	100	mg/kg	5000 mg/kg	100.0	80.0	120	---
Selenium	7782-49-2	E440	0.2	mg/kg	100 mg/kg	98.6	80.0	120	---
Silver	7440-22-4	E440	0.1	mg/kg	10 mg/kg	108	80.0	120	---
Sodium	7440-23-5	E440	50	mg/kg	5000 mg/kg	105	80.0	120	---
Strontium	7440-24-6	E440	0.5	mg/kg	25 mg/kg	108	80.0	120	---
Sulfur	7704-34-9	E440	1000	mg/kg	5000 mg/kg	100	80.0	120	---
Thallium	7440-28-0	E440	0.05	mg/kg	100 mg/kg	99.1	80.0	120	---
Tin	7440-31-5	E440	2	mg/kg	50 mg/kg	102	80.0	120	---
Titanium	7440-32-6	E440	1	mg/kg	25 mg/kg	96.0	80.0	120	---
Tungsten	7440-33-7	E440	0.5	mg/kg	10 mg/kg	99.2	80.0	120	---
Uranium	7440-61-1	E440	0.05	mg/kg	0.5 mg/kg	104	80.0	120	---
Vanadium	7440-62-2	E440	0.2	mg/kg	50 mg/kg	101	80.0	120	---
Zinc	7440-66-6	E440	2	mg/kg	50 mg/kg	98.9	80.0	120	---
Zirconium	7440-67-7	E440	1	mg/kg	10 mg/kg	106	80.0	120	---
<b>Metals(QC Lot: 2435266)</b>									
Mercury	7439-97-6	E510	0.005	mg/kg	0.1 mg/kg	105	80.0	120	---
<b>Dioxins and Furans(QC Lot: 2440714)</b>									
HpCDD, 1,2,3,4,6,7,8-	35822-46-9	XE766	1	pg/g	49.9 pg/g	93.7	70.0	140	---
HpCDF, 1,2,3,4,6,7,8-	67562-39-4	XE766	2	pg/g	49.9 pg/g	97.1	82.0	122	---
HpCDF, 1,2,3,4,7,8,9-	55673-89-7	XE766	1	pg/g	49.9 pg/g	92.1	78.0	138	---
HxCDD, 1,2,3,4,7,8-	39227-28-6	XE766	1	pg/g	49.9 pg/g	95.9	70.0	164	---
HxCDD, 1,2,3,6,7,8-	57653-85-7	XE766	1	pg/g	49.9 pg/g	93.0	76.0	134	---
HxCDD, 1,2,3,7,8,9-	19408-74-3	XE766	1	pg/g	49.9 pg/g	97.9	64.0	162	---
HxCDF, 1,2,3,4,7,8-	70648-26-9	XE766	1	pg/g	49.9 pg/g	96.8	72.0	134	---
HxCDF, 1,2,3,6,7,8-	57117-44-9	XE766	1	pg/g	49.9 pg/g	94.6	84.0	130	---
HxCDF, 1,2,3,7,8,9-	72918-21-9	XE766	1	pg/g	49.9 pg/g	96.4	78.0	130	---



**Sub-Matrix: Soil**

					Laboratory Control Sample (LCS) Report				
Analyte	CAS Number	Method	LOR	Unit	Spike	Recovery (%)	Recovery Limits (%)		Qualifier
					Target Concentration	LCS	Low	High	
<b>Dioxins and Furans(QC Lot: 2440714)</b>									
HxCDF, 2,3,4,6,7,8-	60851-34-5	XE766	1	pg/g	49.9 pg/g	94.8	70.0	156	---
OCDD	3268-87-9	XE766	2	pg/g	99.8 pg/g	93.9	78.0	144	---
OCDF	39001-02-0	XE766	2	pg/g	99.8 pg/g	139	63.0	170	---
PeCDD, 1,2,3,7,8-	40321-76-4	XE766	1	pg/g	49.9 pg/g	90.0	70.0	142	---
PeCDF, 1,2,3,7,8-	57117-41-6	XE766	1	pg/g	49.9 pg/g	94.3	80.0	134	---
PeCDF, 2,3,4,7,8-	57117-31-4	XE766	1	pg/g	49.9 pg/g	89.6	68.0	160	---
TCDD, 2,3,7,8-	1746-01-6	XE766	1	pg/g	9.98 pg/g	89.6	67.0	158	---
TCDF, 2,3,7,8-	51207-31-9	XE766	1	pg/g	9.98 pg/g	91.2	75.0	158	---
<b>Dioxins and Furans(QC Lot: 2462054)</b>									
HpCDD, 1,2,3,4,6,7,8-	35822-46-9	XE766	1	pg/g	49.36 pg/g	98.5	70.0	140	---
HpCDF, 1,2,3,4,6,7,8-	67562-39-4	XE766	2	pg/g	49.36 pg/g	98.3	82.0	122	---
HpCDF, 1,2,3,4,7,8,9-	55673-89-7	XE766	1	pg/g	49.36 pg/g	96.5	78.0	138	---
HxCDD, 1,2,3,4,7,8-	39227-28-6	XE766	1	pg/g	49.36 pg/g	94.7	70.0	164	---
HxCDD, 1,2,3,6,7,8-	57653-85-7	XE766	1	pg/g	49.36 pg/g	94.0	76.0	134	---
HxCDD, 1,2,3,7,8,9-	19408-74-3	XE766	1	pg/g	49.36 pg/g	90.9	64.0	162	---
HxCDF, 1,2,3,4,7,8-	70648-26-9	XE766	1	pg/g	49.36 pg/g	93.3	72.0	134	---
HxCDF, 1,2,3,6,7,8-	57117-44-9	XE766	1	pg/g	49.36 pg/g	92.3	84.0	130	---
HxCDF, 1,2,3,7,8,9-	72918-21-9	XE766	1	pg/g	49.36 pg/g	94.0	78.0	130	---
HxCDF, 2,3,4,6,7,8-	60851-34-5	XE766	1	pg/g	49.36 pg/g	91.1	70.0	156	---
OCDD	3268-87-9	XE766	2	pg/g	98.73 pg/g	89.6	78.0	144	---
OCDF	39001-02-0	XE766	2	pg/g	98.73 pg/g	89.7	63.0	170	---
PeCDD, 1,2,3,7,8-	40321-76-4	XE766	1	pg/g	49.36 pg/g	97.7	70.0	142	---
PeCDF, 1,2,3,7,8-	57117-41-6	XE766	1	pg/g	49.36 pg/g	96.7	80.0	134	---
PeCDF, 2,3,4,7,8-	57117-31-4	XE766	1	pg/g	49.36 pg/g	87.8	68.0	160	---
TCDD, 2,3,7,8-	1746-01-6	XE766	1	pg/g	9.873 pg/g	90.0	67.0	158	---
TCDF, 2,3,7,8-	51207-31-9	XE766	1	pg/g	9.873 pg/g	92.5	75.0	158	---
<b>Dioxins and Furans(QC Lot: 2474436)</b>									
HpCDD, 1,2,3,4,6,7,8-	35822-46-9	XE766	1	pg/g	49.48 pg/g	94.5	70.0	140	---
HpCDF, 1,2,3,4,6,7,8-	67562-39-4	XE766	2	pg/g	49.48 pg/g	102	82.0	122	---
HpCDF, 1,2,3,4,7,8,9-	55673-89-7	XE766	1	pg/g	49.48 pg/g	92.3	78.0	138	---
HxCDD, 1,2,3,4,7,8-	39227-28-6	XE766	1	pg/g	49.48 pg/g	94.2	70.0	164	---
HxCDD, 1,2,3,6,7,8-	57653-85-7	XE766	1	pg/g	49.48 pg/g	93.5	76.0	134	---
HxCDD, 1,2,3,7,8,9-	19408-74-3	XE766	1	pg/g	49.48 pg/g	92.6	64.0	162	---
HxCDF, 1,2,3,4,7,8-	70648-26-9	XE766	1	pg/g	49.48 pg/g	94.3	72.0	134	---
HxCDF, 1,2,3,6,7,8-	57117-44-9	XE766	1	pg/g	49.48 pg/g	96.7	84.0	130	---
HxCDF, 1,2,3,7,8,9-	72918-21-9	XE766	1	pg/g	49.48 pg/g	91.1	78.0	130	---
HxCDF, 2,3,4,6,7,8-	60851-34-5	XE766	1	pg/g	49.48 pg/g	93.7	70.0	156	---



**Sub-Matrix: Soil**

					Laboratory Control Sample (LCS) Report				
Analyte	CAS Number	Method	LOR	Unit	Spike	Recovery (%)	Recovery Limits (%)		Qualifier
					Target Concentration	LCS	Low	High	
<b>Dioxins and Furans(QC Lot: 2474436)</b>									
OCDD	3268-87-9	XE766	2	pg/g	98.96 pg/g	88.3	78.0	144	---
OCDF	39001-02-0	XE766	2	pg/g	98.96 pg/g	93.2	63.0	170	---
PeCDD, 1,2,3,7,8-	40321-76-4	XE766	1	pg/g	49.48 pg/g	99.0	70.0	142	---
PeCDF, 1,2,3,7,8-	57117-41-6	XE766	1	pg/g	49.48 pg/g	99.5	80.0	134	---
PeCDF, 2,3,4,7,8-	57117-31-4	XE766	1	pg/g	49.48 pg/g	88.7	68.0	160	---
TCDD, 2,3,7,8-	1746-01-6	XE766	1	pg/g	9.896 pg/g	93.6	67.0	158	---
TCDF, 2,3,7,8-	51207-31-9	XE766	1	pg/g	9.896 pg/g	92.4	75.0	158	---
<b>Dioxins and Furans Extraction Standards(QC Lot: 2440714)</b>									
HpCDD-13C12, 1,2,3,4,6,7,8-	109719-83-7	XE766	0.1	pg/g	99.8 pg/g	66.8	23	140	---
HpCDF-13C12, 1,2,3,4,6,7,8-	67562-39-4	XE766	0.1	pg/g	99.8 pg/g	50.6	28	143	---
HpCDF-13C12, 1,2,3,4,7,8,9-	55673-89-7	XE766	0.1	pg/g	99.8 pg/g	64.4	26	138	---
HxCDD-13C12, 1,2,3,4,7,8-	109719-80-4	XE766	0.1	pg/g	99.8 pg/g	78.4	32	141	---
HxCDD-13C12, 1,2,3,6,7,8-	109719-81-5	XE766	0.1	pg/g	99.8 pg/g	76.4	28	130	---
HxCDF-13C12, 1,2,3,4,7,8-	114423-98-2	XE766	0.1	pg/g	99.8 pg/g	78.4	26	152	---
HxCDF-13C12, 1,2,3,6,7,8-	116843-03-9	XE766	0.1	pg/g	99.8 pg/g	75.6	26	123	---
HxCDF-13C12, 1,2,3,7,8,9-	116843-04-0	XE766	0.1	pg/g	99.8 pg/g	75.8	28	136	---
HxCDF-13C12, 2,3,4,6,7,8-	116843-05-1	XE766	0.1	pg/g	99.8 pg/g	72.7	29	147	---
OCDD-13C12	114423-97-1	XE766	0.1	pg/g	199.6 pg/g	21.8	17	157	---
PeCDD-13C12, 1,2,3,7,8-	109719-79-1	XE766	0.1	pg/g	99.8 pg/g	74.2	25	181	---
PeCDF-13C12, 1,2,3,7,8-	109719-77-9	XE766	0.1	pg/g	99.8 pg/g	63.9	24	185	---
PeCDF-13C12, 2,3,4,7,8-	116843-02-8	XE766	0.1	pg/g	99.8 pg/g	65.6	21	178	---
TCDD-13C12, 2,3,7,8-	76523-40-5	XE766	0.1	pg/g	99.8 pg/g	73.1	25	164	---
TCDF-13C12, 2,3,7,8-	89059-46-1	XE766	0.1	pg/g	99.8 pg/g	72.7	24	169	---
<b>Dioxins and Furans Extraction Standards(QC Lot: 2462054)</b>									
HpCDD-13C12, 1,2,3,4,6,7,8-	109719-83-7	XE766	0.1	pg/g	98.73 pg/g	53.6	23	140	---
HpCDF-13C12, 1,2,3,4,6,7,8-	67562-39-4	XE766	0.1	pg/g	98.73 pg/g	59.1	28	143	---
HpCDF-13C12, 1,2,3,4,7,8,9-	55673-89-7	XE766	0.1	pg/g	98.73 pg/g	48.6	26	138	---
HxCDD-13C12, 1,2,3,4,7,8-	109719-80-4	XE766	0.1	pg/g	98.73 pg/g	80.6	32	141	---
HxCDD-13C12, 1,2,3,6,7,8-	109719-81-5	XE766	0.1	pg/g	98.73 pg/g	84.1	28	130	---
HxCDF-13C12, 1,2,3,4,7,8-	114423-98-2	XE766	0.1	pg/g	98.73 pg/g	83.3	26	152	---
HxCDF-13C12, 1,2,3,6,7,8-	116843-03-9	XE766	0.1	pg/g	98.73 pg/g	87.8	26	123	---
HxCDF-13C12, 1,2,3,7,8,9-	116843-04-0	XE766	0.1	pg/g	98.73 pg/g	71.1	28	136	---
HxCDF-13C12, 2,3,4,6,7,8-	116843-05-1	XE766	0.1	pg/g	98.73 pg/g	75.5	29	147	---
OCDD-13C12	114423-97-1	XE766	0.1	pg/g	197.5 pg/g	38.9	17	157	---
PeCDD-13C12, 1,2,3,7,8-	109719-79-1	XE766	0.1	pg/g	98.73 pg/g	63.0	25	181	---
PeCDF-13C12, 1,2,3,7,8-	109719-77-9	XE766	0.1	pg/g	98.73 pg/g	63.1	24	185	---
PeCDF-13C12, 2,3,4,7,8-	116843-02-8	XE766	0.1	pg/g	98.73 pg/g	62.1	21	178	---



**Sub-Matrix: Soil**

					Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
Analyte	CAS Number	Method	LOR	Unit	Target Concentration	LCS	Low	High	Qualifier
<b>Dioxins and Furans Extraction Standards(QC Lot: 2462054)</b>									
TCDD-13C12, 2,3,7,8-	76523-40-5	XE766	0.1	pg/g	98.73 pg/g	66.8	25	164	---
TCDF-13C12, 2,3,7,8-	89059-46-1	XE766	0.1	pg/g	98.73 pg/g	60.8	24	169	---
<b>Dioxins and Furans Extraction Standards(QC Lot: 2474436)</b>									
HpCDD-13C12, 1,2,3,4,6,7,8-	109719-83-7	XE766	0.1	pg/g	98.96 pg/g	63.3	23	140	---
HpCDF-13C12, 1,2,3,4,6,7,8-	67562-39-4	XE766	0.1	pg/g	98.96 pg/g	68.8	28	143	---
HpCDF-13C12, 1,2,3,4,7,8,9-	55673-89-7	XE766	0.1	pg/g	98.96 pg/g	60.6	26	138	---
HxCDD-13C12, 1,2,3,4,7,8-	109719-80-4	XE766	0.1	pg/g	98.96 pg/g	80.3	32	141	---
HxCDD-13C12, 1,2,3,6,7,8-	109719-81-5	XE766	0.1	pg/g	98.96 pg/g	86.6	28	130	---
HxCDF-13C12, 1,2,3,4,7,8-	114423-98-2	XE766	0.1	pg/g	98.96 pg/g	89.2	26	152	---
HxCDF-13C12, 1,2,3,6,7,8-	116843-03-9	XE766	0.1	pg/g	98.96 pg/g	88.4	26	123	---
HxCDF-13C12, 1,2,3,7,8,9-	116843-04-0	XE766	0.1	pg/g	98.96 pg/g	82.1	28	136	---
HxCDF-13C12, 2,3,4,6,7,8-	116843-05-1	XE766	0.1	pg/g	98.96 pg/g	82.2	29	147	---
OCDD-13C12	114423-97-1	XE766	0.1	pg/g	197.9 pg/g	45.5	17	157	---
PeCDD-13C12, 1,2,3,7,8-	109719-79-1	XE766	0.1	pg/g	98.96 pg/g	68.3	25	181	---
PeCDF-13C12, 1,2,3,7,8-	109719-77-9	XE766	0.1	pg/g	98.96 pg/g	72.2	24	185	---
PeCDF-13C12, 2,3,4,7,8-	116843-02-8	XE766	0.1	pg/g	98.96 pg/g	73.5	21	178	---
TCDD-13C12, 2,3,7,8-	76523-40-5	XE766	0.1	pg/g	98.96 pg/g	67.4	25	164	---
TCDF-13C12, 2,3,7,8-	89059-46-1	XE766	0.1	pg/g	98.96 pg/g	70.3	24	169	---
<b>Dioxins and Furans Cleanup Standards(QC Lot: 2440714)</b>									
TCDD-37Cl4, 2,3,7,8-	----	XE766	0.1	pg/g	1.996 pg/g	69.2	35	197	---
<b>Dioxins and Furans Cleanup Standards(QC Lot: 2462054)</b>									
TCDD-37Cl4, 2,3,7,8-	----	XE766	0.1	pg/g	1.975 pg/g	65.2	35	197	---
<b>Dioxins and Furans Cleanup Standards(QC Lot: 2474436)</b>									
TCDD-37Cl4, 2,3,7,8-	----	XE766	0.1	pg/g	1.979 pg/g	66.3	35	197	---

**Reference Material (RM) Report**

A Reference Material (RM) is a homogenous material with known and well-established analyte concentrations. RMs are processed in an identical manner to test samples, and are used to monitor and control the accuracy and precision of a test method for a typical sample matrix. RM results are expressed as percent recovery of the target analyte concentration. RM targets may be certified target concentrations provided by the RM supplier, or may be ALS long-term mean values (for empirical test methods).



**Sub-Matrix: Soil**

Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Reference Material (RM) Report					
					Spike		Recovery (%)	Recovery Limits (%)		Qualifier
					Target Concentration	Original Result	LCS	Low	High	
<b>Metals(QC Lot: 2435265)</b>										
QC-MRG2-2435265001		Aluminum	7429-90-5	E440	22490 mg/kg	22490 mg/kg		70.0	130	---
		Antimony	7440-36-0	E440	24.8 mg/kg	24.8 mg/kg		70.0	130	---
		Arsenic	7440-38-2	E440	21.2 mg/kg	21.2 mg/kg		70.0	130	---
		Barium	7440-39-3	E440	788 mg/kg	788 mg/kg		70.0	130	---
		Beryllium	7440-41-7	E440	1.82 mg/kg	1.82 mg/kg		70.0	130	---
		Bismuth	7440-69-9	E440	1.78 mg/kg	1.78 mg/kg		70.0	130	---
		Cadmium	7440-43-9	E440	2.15 mg/kg	2.15 mg/kg		70.0	130	---
		Calcium	7440-70-2	E440	4904 mg/kg	4904 mg/kg		70.0	130	---
		Chromium	7440-47-3	E440	56.9 mg/kg	56.9 mg/kg		70.0	130	---
		Cobalt	7440-48-4	E440	32 mg/kg	32 mg/kg		70.0	130	---
		Copper	7440-50-8	E440	969 mg/kg	969 mg/kg		70.0	130	---
		Iron	7439-89-6	E440	32740 mg/kg	32740 mg/kg		70.0	130	---
		Lead	7439-92-1	E440	919 mg/kg	919 mg/kg		70.0	130	---
		Lithium	7439-93-2	E440	47.3 mg/kg	47.3 mg/kg		70.0	130	---
		Magnesium	7439-95-4	E440	7780 mg/kg	7780 mg/kg		70.0	130	---
		Manganese	7439-96-5	E440	8639 mg/kg	8639 mg/kg		70.0	130	---
		Molybdenum	7439-98-7	E440	25.1 mg/kg	25.1 mg/kg		70.0	130	---
		Nickel	7440-02-0	E440	1004 mg/kg	1004 mg/kg		70.0	130	---
		Phosphorus	7723-14-0	E440	660 mg/kg	660 mg/kg		70.0	130	---
		Potassium	7440-09-7	E440	10820 mg/kg	10820 mg/kg		70.0	130	---
		Selenium	7782-49-2	E440	1.04 mg/kg	1.04 mg/kg		60.0	140	---
		Silver	7440-22-4	E440	8.98 mg/kg	8.98 mg/kg		70.0	130	---
		Sodium	7440-23-5	E440	1771 mg/kg	1771 mg/kg		70.0	130	---
		Strontium	7440-24-6	E440	41 mg/kg	41 mg/kg		70.0	130	---



**Sub-Matrix: Soil**

					Reference Material (RM) Report					
					Spike		Recovery (%)	Recovery Limits (%)		
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Target Concentration	Original Result	LCS	Low	High	Qualifier
<b>Metals(QC Lot: 2435265)</b>										
		Sulfur	7704-34-9	E440	3935 mg/kg	3935 mg/kg		50.0	150	---
		Thallium	7440-28-0	E440	0.907 mg/kg	0.907 mg/kg		70.0	130	---
		Tin	7440-31-5	E440	3.79 mg/kg	3.79 mg/kg		40.0	160	---
		Titanium	7440-32-6	E440	2786 mg/kg	2786 mg/kg		70.0	130	---
		Tungsten	7440-33-7	E440	6.99 mg/kg	6.99 mg/kg		70.0	130	---
		Uranium	7440-61-1	E440	3.97 mg/kg	3.97 mg/kg		70.0	130	---
		Vanadium	7440-62-2	E440	66.2 mg/kg	66.2 mg/kg		70.0	130	---
		Zinc	7440-66-6	E440	828 mg/kg	828 mg/kg		70.0	130	---
		Zirconium	7440-67-7	E440	6.91 mg/kg	6.91 mg/kg		70.0	130	---
<b>Metals(QC Lot: 2435266)</b>										
QC-MRG2-2435265001		Mercury	7439-97-6	E510	0.0675 mg/kg	0.0675 mg/kg		70.0	130	---



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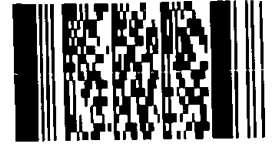
Chain of Custody (COC) / Analytical Request Form

COC Number: 22 -

Page 1 of 2

Canada Toll Free: 1 800 668 9878

Environmental Division
Vancouver
Work Order Reference
VA26A2119



Telephone : + 1 604 253 4188

Form containing sections: Report To, Reports / Recipients, Turnaround Time (TAT) Requested, Invoice To, Invoice Recipients, Project Information, Oil and Gas Required Fields, ALS Lab Work Order #, Sample Identification and/or Coordinates, Drinking Water (DW) Samples, SHIPMENT RELEASE, INITIAL SHIPMENT RECEPTION, FINAL SHIPMENT RECEPTION.

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.
1. If any water samples are taken from a Regulated Drinking Water (DW) System, please submit using an Authorized DW COC form.



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Chain of Custody (COC) / Analytical Request Form

COC Number: 22 -

Page 2 of 2

Canada Toll Free: 1 800 668 9878

<b>Report To</b> Contact and company name below will appear on the final report		<b>Reports / Recipients</b>			<b>Turnaround Time (TAT) Requested</b>				<b>AFFIX ALS BARCODE LABEL HERE</b> (ALS use only)		
Company:	HDR	Select Report Format:	<input checked="" type="checkbox"/> PDF <input type="checkbox"/> EXCEL <input type="checkbox"/> EDD (DIGITAL)	<input checked="" type="checkbox"/> Routine [R] if received by 3pm M-F - no surcharges apply <input type="checkbox"/> 4 day [P4] if received by 3pm M-F - 20% rush surcharge minimum <input type="checkbox"/> 3 day [P3] if received by 3pm M-F - 25% rush surcharge minimum <input type="checkbox"/> 2 day [P2] if received by 3pm M-F - 50% rush surcharge minimum <input type="checkbox"/> 1 day [E] if received by 3pm M-F - 100% rush surcharge minimum <input type="checkbox"/> Same day [E2] if received by 10am M-S - 200% rush surcharge.							
Contact:	Johanna Mason	Merge QC/QCI Reports with COA:	<input type="checkbox"/> YES <input type="checkbox"/> NO <input type="checkbox"/> N/A	Additional fees may apply to rush requests on weekends, statutory holidays and for non-routine tests.							
Phone:	604-202-4559	Compare Results to Criteria on Report - provide details below if box checked	<input checked="" type="checkbox"/>	Date and Time Required for all E&P TATs:				dd-mmm-yy hh:mm am/pm			
Company address below will appear on the final report		Select Distribution:	<input checked="" type="checkbox"/> EMAIL <input type="checkbox"/> MAIL <input type="checkbox"/> FAX	For all tests with rush TATs requested, please contact your AM to confirm availability.							
Street:	601 W Hastings St Suite 1500	Email 1 or Fax:	johanna.mason@hdrinc.com	<b>Analysis Request</b>							
City/Province:	Vancouver/BC	Email 2:		Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below							
Postal Code:	V6B1M8	Email 3:									
Invoice To:	Same as Report To <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO	<b>Invoice Recipients</b>			<b>NUMBER OF CONTAINERS</b>				<b>SAMPLES ON HOLD</b>		
	Copy of Invoice with Report <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO	Select Invoice Distribution:	<input checked="" type="checkbox"/> EMAIL <input type="checkbox"/> MAIL <input type="checkbox"/> FAX								
Company:	HDR	Email 1 or Fax:	APCanada@hdrinc.com	metals				<b>EXTENDED STORAGE REQUIRED</b>			
Contact:	Johanna Mason	Email 2:	kimberley.churchill@hdrinc.com								dioxins/furans
<b>Project Information</b>		<b>Oil and Gas Required Fields (client use)</b>									
ALS Client Code / QUOTE #:	HDR	AFE/Cost Center:									
Job / Project #:	HDR-100	Major/Minor Code:									
PO / AFE:		Requisitioner:									
LSD:		Location:									
ALS Lab Work Order # (ALS use only):		ALS Contact:									
		Sampler:									
ALS Sample # (ALS use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type							
	HS-48	27-Jan-26	11:06	Solid	2		R				
	HS-49	27-Jan-26	9:29	Solid	2	R					
	HS-50	27-Jan-26	11:25	Solid	2	R					
	HS-51	27-Jan-26	9:29	Solid	2	R					
<b>Drinking Water (DW) Samples<sup>1</sup> (client use)</b>		<b>Notes / Specify Limits for result evaluation by selecting from drop-down below (Excel COC only)</b>			<b>SAMPLE RECEIPT DETAILS (ALS use only)</b>						
Are samples taken from a Regulated DW System? <input type="checkbox"/> YES <input type="checkbox"/> NO		Sample ID HS-49, HS-50, and HS-51 are fly ash from an incinerator so are likely high in metal content and should be handled appropriately.			Cooling Method: <input type="checkbox"/> NONE <input type="checkbox"/> ICE <input type="checkbox"/> ICE PACKS <input type="checkbox"/> FROZEN <input type="checkbox"/> COOLING INITIATED						
Are samples for human consumption/ use? <input type="checkbox"/> YES <input type="checkbox"/> NO					INITIAL COOLER TEMPERATURES °C		Sample Custody Seals Intact: <input type="checkbox"/> YES <input type="checkbox"/> N/A				
<b>SHIPMENT RELEASE (client use)</b>		<b>INITIAL SHIPMENT RECEPTION (ALS use only)</b>			<b>FINAL SHIPMENT RECEPTION (ALS use only)</b>						
Released by:	Johanna Mason	Date:	1/27/2026	Time:	Received by:	Date:	Time:	Received by:	Date:	Time:	
					14°C						

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

1. If any water samples are taken from a Regulated Drinking Water (DW) System, please submit using an Authorized DW COC form.

MAY 2023 FRONT

# Appendix E

Scanning Electron Microscope/Energy Dispersive X-ray  
Spectroscopy UBC Lab Report

## **Soil Samples SEM/EDX Analysis Report**

### **Objective**

Soil samples collected from rooftops are suspected to have some metallic contamination based on ICP analysis results. The objective of this analysis is to determine which, if any, metallic particles are present in each soil sample and compare with control samples of contaminants from the suspected source. In this study we will assess which samples contain metallic particles and assess whether they could have come from the suspected contamination source.

### **Samples Submitted**

Initially, twelve soil samples were submitted for analysis in December 2025. These samples were labelled as "HS-##". No information pertaining to the location from which the soil samples was provided nor any expected compositions to prevent inducing any bias into the analysis. The sample names are listed below.

HS-8  
HS-9  
HS-10  
HA-17  
HS-18  
HS-19  
HS-23  
HS-24  
HS-25  
HS-32  
HS-33  
HS-34

The samples were hydrated to varying degrees, most of them with a mud-like consistency, and were provided in sealed containers.

Additional controls samples were provided in February 2026. This batch included filter samples and powder material:

#### Filters

HDR 1  
HDR 2

#### Powders

Unit 1  
Unit 3  
Composite

Similar to the soil samples, specific details of where these samples came from were withheld to avoid biasing the analysis.

## **Analysis Method**

The soil samples were first dried out by heating to 60°C using a combination of an oven and a heat lamp until they were completely free of any moisture. Once dried, a thin layer of sample material was spread on a 24.5mm diameter SEM stub. Three such stubs were prepared for each sample to allow for a larger sampling volume. It must be acknowledged that even with multiple stubs prepared the sample size is still quite small and may not necessarily be completely representative of the bulk distribution of particles in the soil samples.

To quickly survey the samples for candidate particles to have their compositions analyzed, the samples were imaged with a scanning electron microscope (SEM). Images collected from backscattered electron signal were used to identify metal containing particles. Once identified, the particles were analyzed using energy dispersive x-ray analysis (EDX) to determine their composition.

Prior to imaging, the samples were coated with a thin (~10nm) layer of conductive carbon to mitigate charging during analyses. Carbon is used as a coating material over more typical conductive coating materials (i.e. gold) because it has negligible contribution to the backscattered electron signal its characteristic x-ray peaks in EDX spectra do not overlap with those from other elements. It is to be noted that this will result in a small increase in the measured carbon concentration in the sample during quantitative analysis.

## **Background on Analysis Methods**

### Backscattered Electron Imaging

Backscattered electrons are high energy electrons which are elastically scattered and possess the same energy as the incident electrons of the electron beam in the SEM. The probability of backscattering increases with atomic number,  $Z$ , of the sample material. This results in contrast difference in regions of the specimen which differ significantly in atomic weight. Backscattered electrons have a much higher escape depth than secondary electron, due to their significantly higher energy, and consequently there is much less topological contrast in backscattered electron images compared to secondary electron images. Through the use of a specialized backscattered electron detector an image formed exclusively from these electrons can be acquired. From this imaging it should be easier to identify any materials in the samples which contain metal elements as they should be significantly higher in atomic mass than the soil material (i.e. organic compounds and alumina-silicate minerals).

Specific element identification based on backscattered electron imaging contrast is not feasible. While the fraction of backscattered electrons ejected scales with  $Z$  it is not a strong enough dependence (varying roughly as  $\sim 0.05Z^{1/2}$ ) to be able to attribute contrast differences to specific elements. Thus, another method is needed to assess the composition of any particles imaged. The compositional analyses were performed with energy dispersive x-ray analysis (EDX).

### Energy Dispersive X-Ray Analysis

EDX is an analysis technique in which x-rays are counted as a function of their energy. These x-rays are created as a result of a material being irradiated by the electron beam in a SEM (or TEM). There are two types of x-rays signals detected by an EDX detector, Bremsstrahlung x-rays and characteristic x-rays. The former are what make up the background signal in an EDX spectrum while the latter have

very specific energies and are what cause the peaks in an x-ray spectrum. These characteristic x-rays are used to identify elements present in the material.

The x-ray emission process for characteristic x-rays is initiated when an electron from the incident beam of the SEM collides with an atom in the sample and an electron from one of that atom's shells is ejected. To return the atom to its lowest energy state, an electron from a higher energy shell will drop down to the lower energy shell to fill the vacancy created in the lower energy shell, emitting an X-ray of energy equal to the energy difference between shells in the process. This x-ray has a characteristic energy specific to the difference between the originating electron shell and the electron shell to which the electron transitions. Because these characteristic energies are unique to specific electron transitions in each element, we can use them to identify the presence of specific elements in a material if they are detected in the x-ray spectrum. By analyzing the x-ray peaks in the x-ray spectrum we can determine the composition of the material in the analysis area.

It is worth noting that the volume of material that is analyzed by the EDX is limited to the region in the sample with which the primary electron from the electron beam interacts. This volume is dictated by energy of the electron (SEM accelerating voltage) and the material itself. Denser/heavier materials have smaller interaction volumes while lighter materials have larger interaction volumes. Typical volumes can range from a few 100nm to several microns. Thus, EDX cannot be considered a true bulk measurement and quantification analysis is very skewed by the surface conditions of a material. In the case of metals, a thick oxide layer will result in a composition skewed towards oxide rather than purely metallic. This will be relevant for metallic particles exposed to the elements of nature.

### **Analysis Equipment and Conditions**

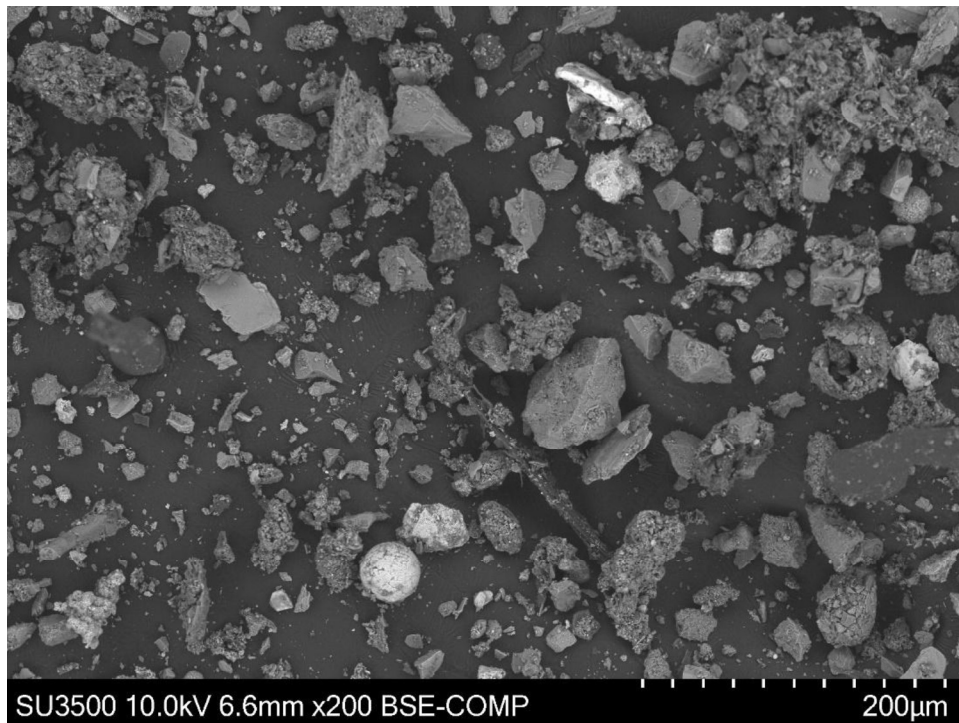
The analysis of the soil was carried out using a Hitachi SU-3500 SEM. All images were acquired using the backscattered electron detector, using an accelerating Voltage of 10kV. EDX spectra were acquired with an accelerating voltage of 15kV using a Bruker XFlash 6-10 EDX detector.

The samples were coated with a thin layer (~10nm) of amorphous conductive carbon using a Leica MED 020 Coater with spectrally pure grade carbon rods. The addition of a thin film of carbon is used to mitigate the problem of sample charging during imaging/EDX analysis.

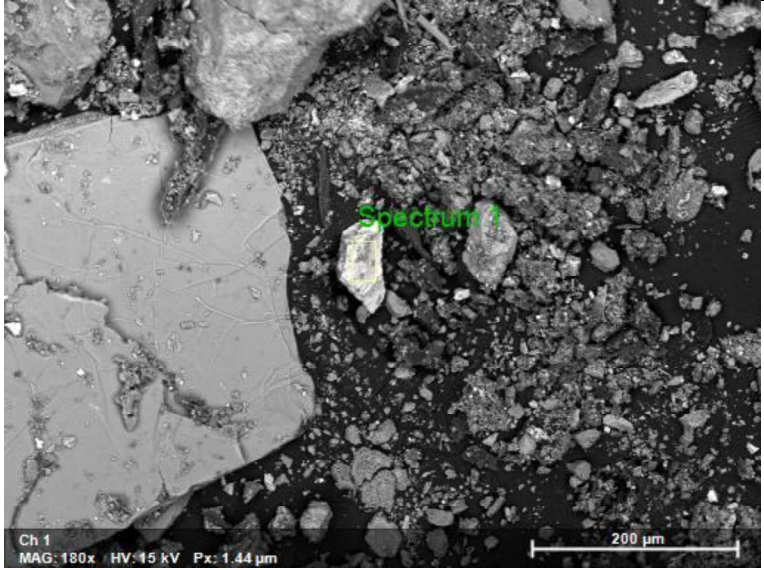
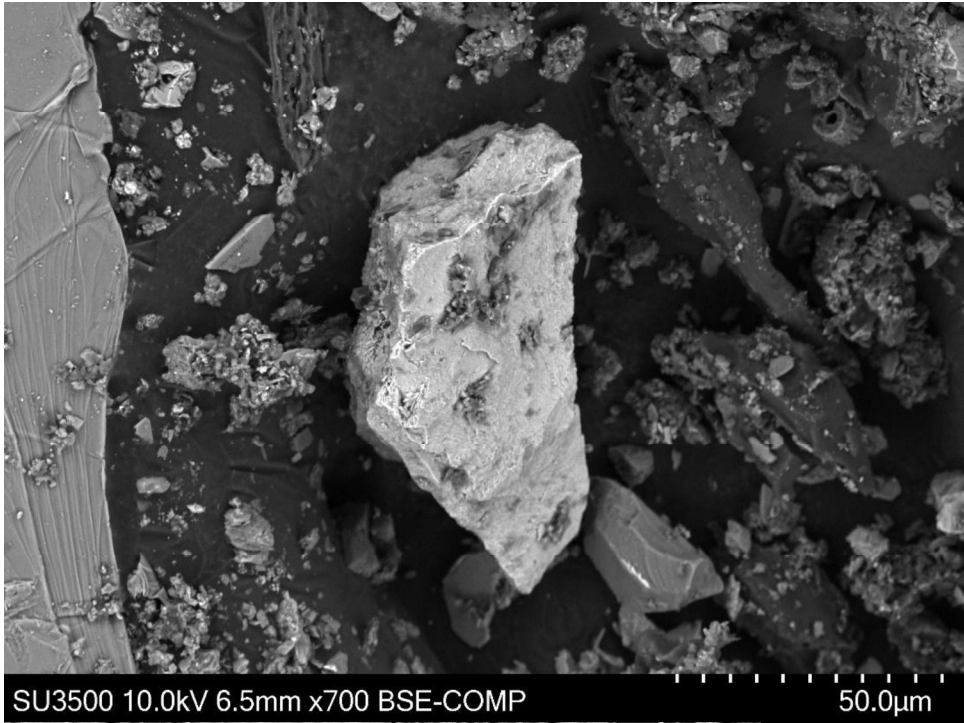
### **Soil Sample Analysis Results**

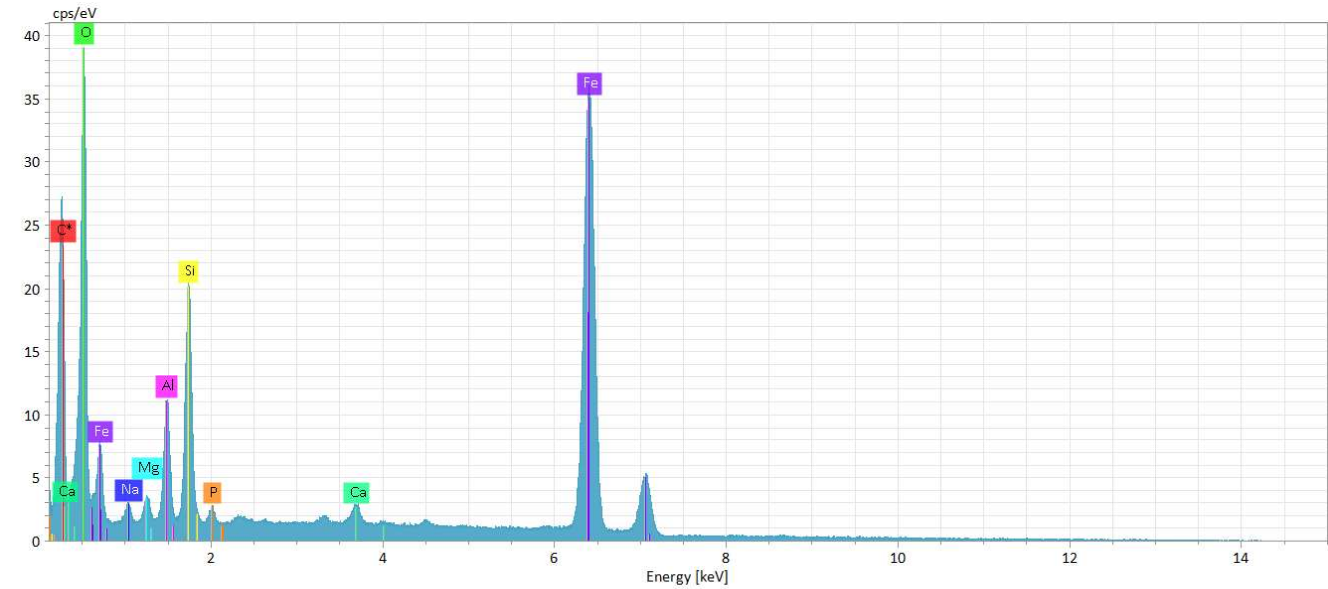
Overall analysis results of each of the samples are presented below with specific examples. A zoomed-out image of the sample material is provided to give a sense of the density of heavier particles and then images of specific examples are provided. The full image sets along with EDX collection data are included in the supplementary files provided. It became quite apparent that there are just too many candidate particles to analyze on each sample. To that end, specific examples were chosen that were representative of the shape/size observed as well as any individual particles that stood out as being unique.

Initial inspection of this sample This sample had a large number of particles containing heavier elements. It was not difficult to find analysis candidates. All analyzed examples were found to be primarily iron/iron oxide. The shapes of the particles varied. Of note the spherical particles were found quite commonly and seemed to vary in size significantly.



Below are representative particles chosen for EDX analysis

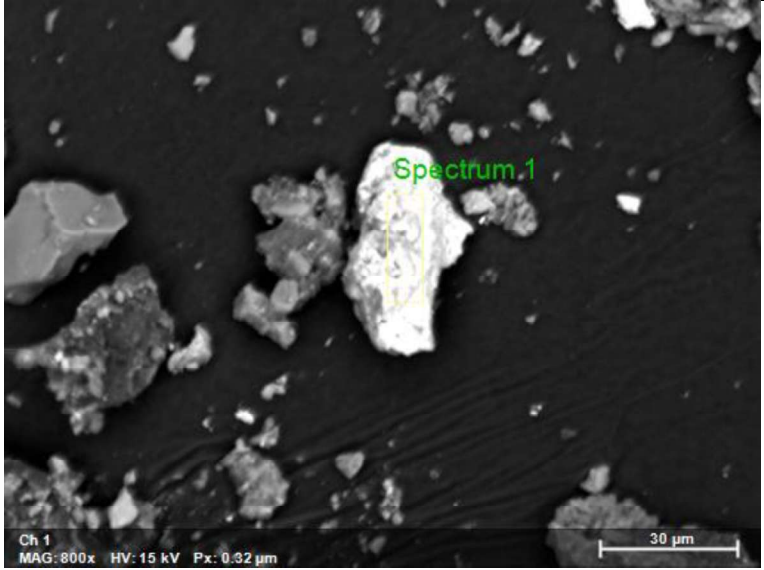
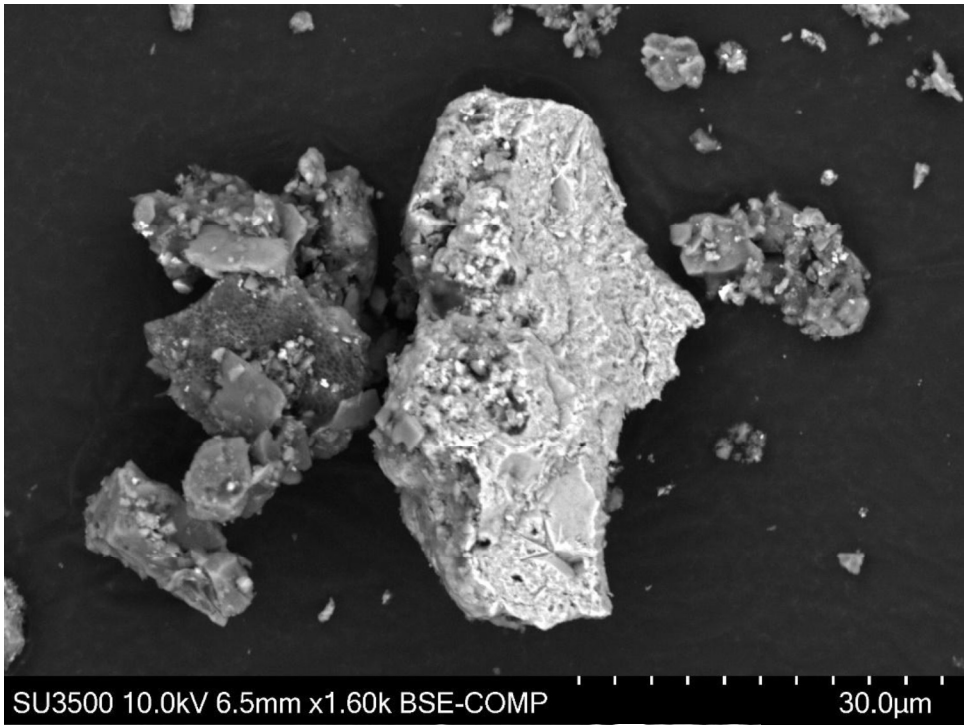


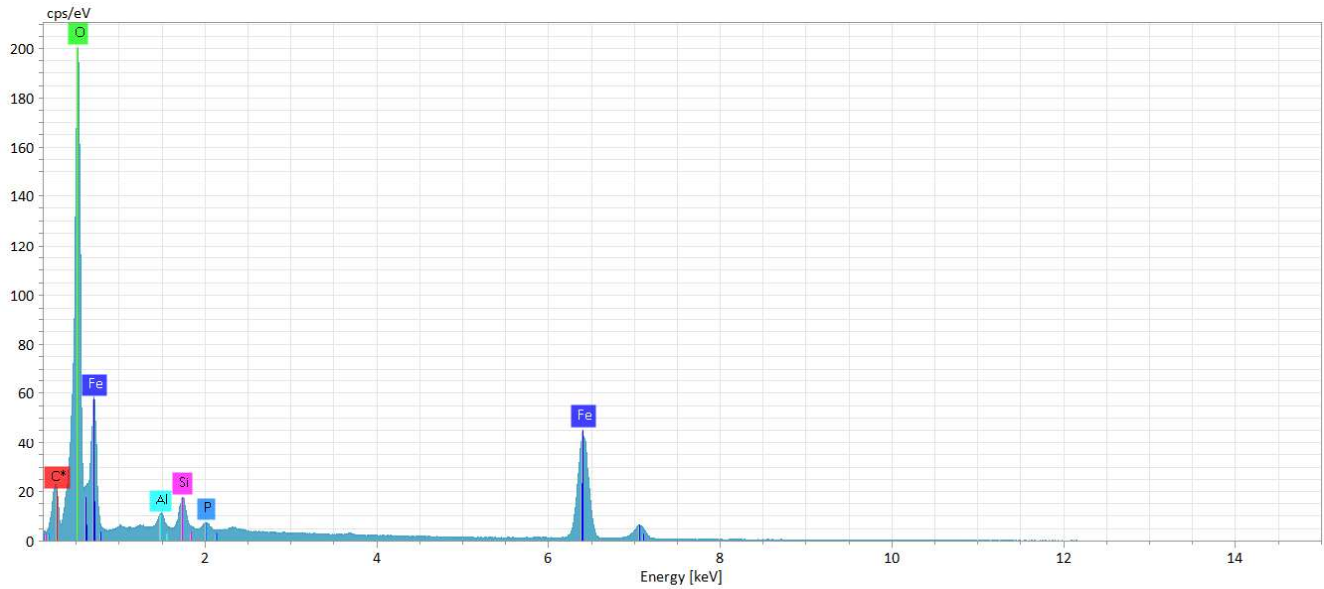


Element	At. No.	Net	Mass[%]	Mass Norm.[%]	Atom[%]	abs. error[mass%] (1 $\sigma$ )	rel. error[%] (1 $\sigma$ )
Carbon	6	68656	22.26	22.62	44.02	1.13	5.06
Oxygen	8	103588	17.80	18.08	26.42	0.80	4.48
Iron	26	236796	47.50	48.26	20.21	0.94	1.99
Silicon	14	64057	5.39	5.48	4.56	0.17	3.12
Aluminium	13	30589	2.88	2.92	2.53	0.11	3.71
Sodium	11	5828	1.00	1.01	1.03	0.06	6.11
Magnesium	12	5527	0.64	0.65	0.63	0.03	5.03
Calcium	20	8235	0.81	0.82	0.48	0.02	2.41
Phosphorus	15	1812	0.15	0.16	0.12	0.01	4.30
		Sum	98.42	100	100		

This is iron, partially oxidized, with some traces of aluminum, magnesium, sodium, and calcium. It's likely a metal particle that oxidized due to the aqueous environment it was in. It could also be a steel given the high carbon concentration. The carbon is partially from the coating and the debris on the surface of the particle itself, so the carbon concentration calculated is not as accurate as the indicated by the error in the table. The EDX data fit is based on a model that assumes a uniform composition on a flat surface, which is not often the case in practice (i.e. surface oxide + curved surface), so the actual errors can be larger than calculated.

The next example is a similarly shaped particle with a rougher surface texture.

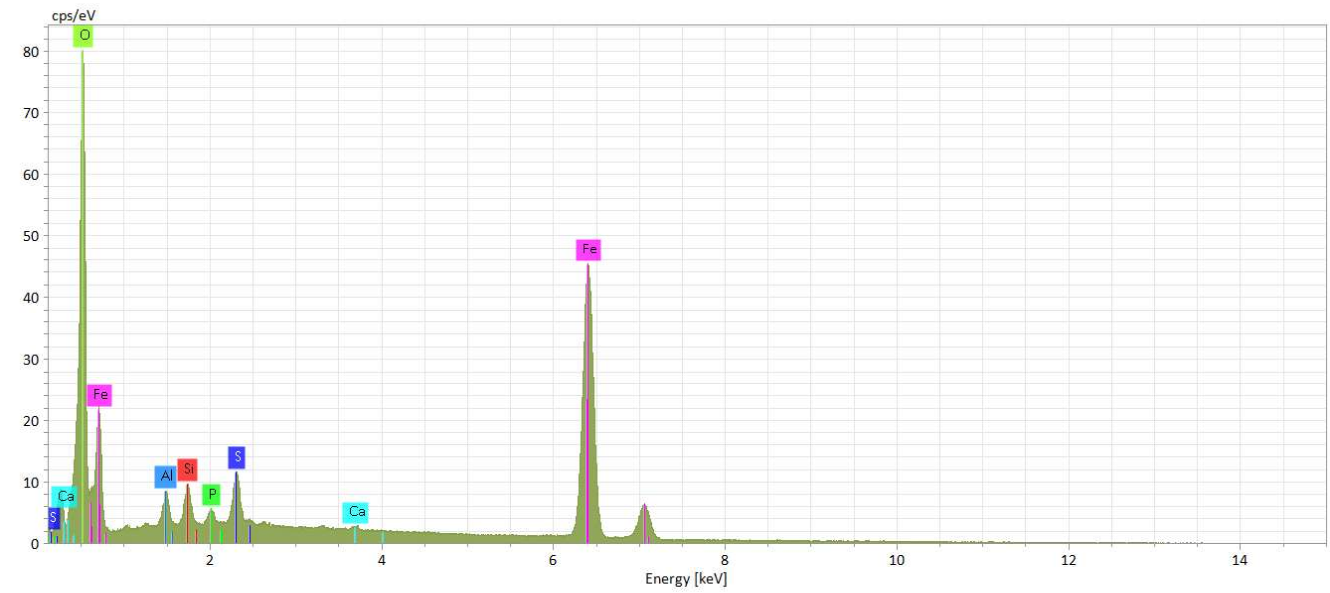
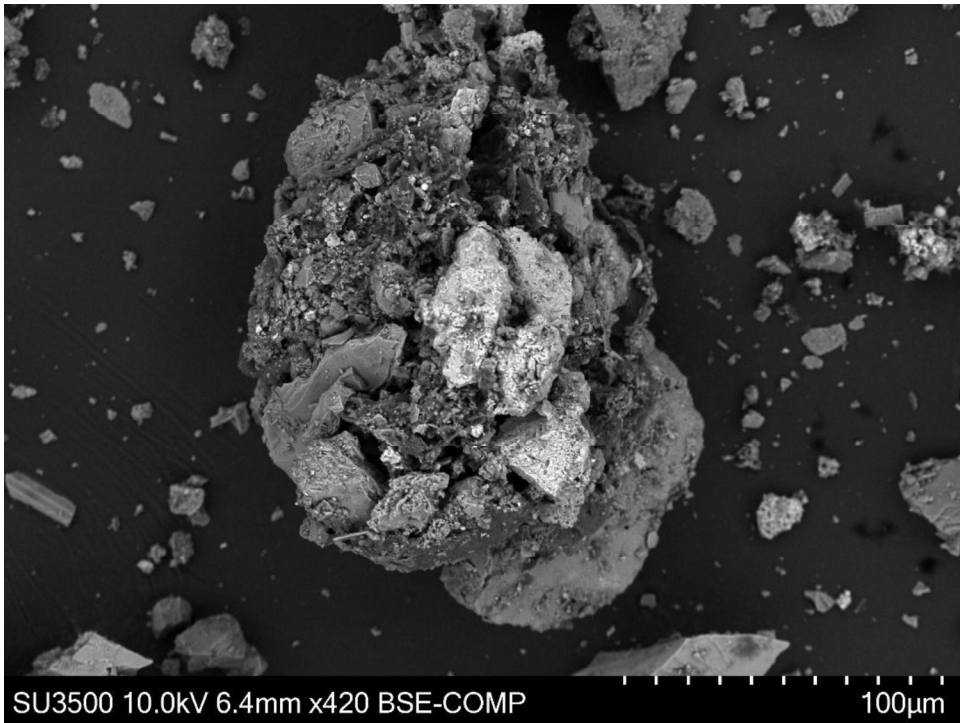




Element	At. No.	Net	Mass[%]	Mass Norm.[%]	Atom[%]	abs. error[mass%] (1 $\sigma$ )	rel. error[%] (1 $\sigma$ )
Oxygen	8	200299	34.50	40.72	64.30	1.36	3.96
Iron	26	130984	43.83	51.72	23.40	1.01	2.29
Carbon	6	7822	3.88	4.58	9.63	0.21	5.42
Silicon	14	21439	1.49	1.76	1.58	0.05	3.21
Aluminium	13	9144	0.67	0.79	0.74	0.03	3.95
Phosphorus	15	4890	0.37	0.43	0.35	0.01	3.45
		Sum	84.74	100	100		

Again, we see another iron particle, albeit more oxidized. It will be difficult to distinguish oxides that were pre-existing from those that formed after due to the environment.

The last example from this sample is what appears to be a rock with some heavier elements at the surface.

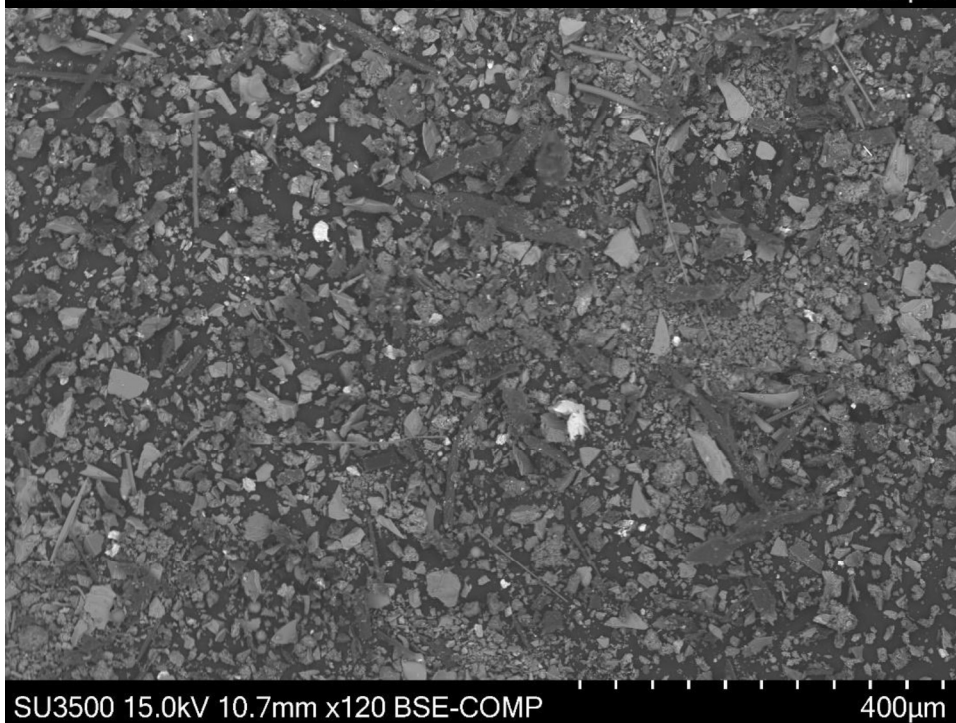
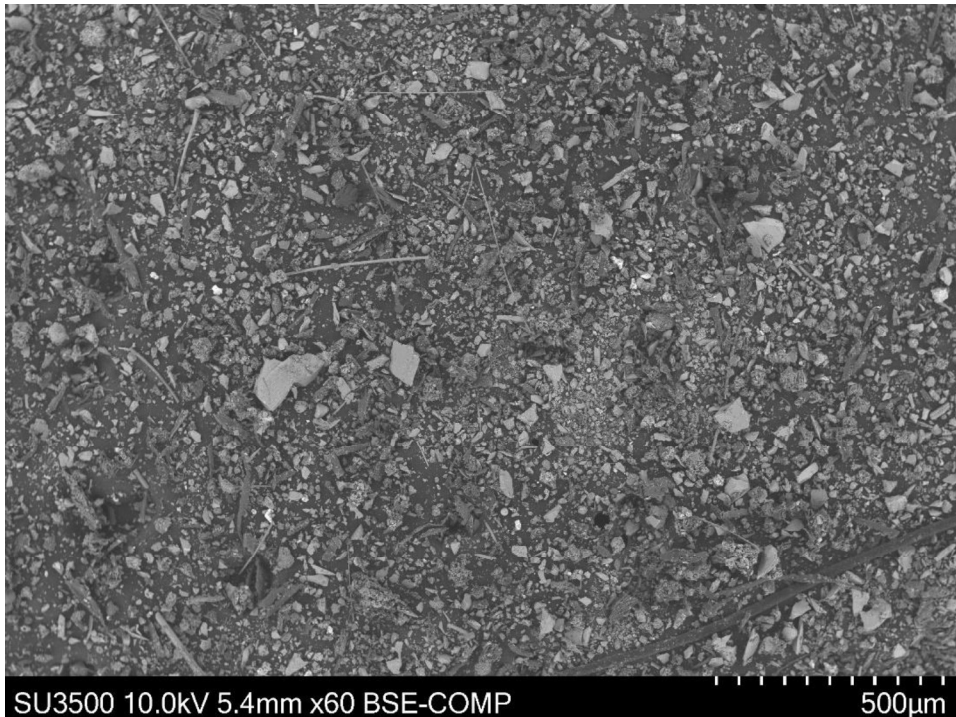


Element	At. No.	Net	Mass[%]	Mass Norm.[%]	Atom[%]	abs. error[mass%] (1 $\sigma$ )	rel. error[%] (1 $\sigma$ )
Oxygen	8	152106	22.02	26.53	53.91	0.89	4.04
Iron	26	210784	55.52	66.91	38.94	1.14	2.06
Sulfur	16	26708	1.94	2.33	2.37	0.05	2.57
Aluminium	13	13755	1.34	1.62	1.95	0.05	3.86
Silicon	14	16709	1.37	1.65	1.91	0.05	3.32
Phosphorus	15	6540	0.50	0.61	0.64	0.02	3.40
Calcium	20	2891	0.29	0.35	0.28	0.01	3.03
		Sum	82.98	100	100		

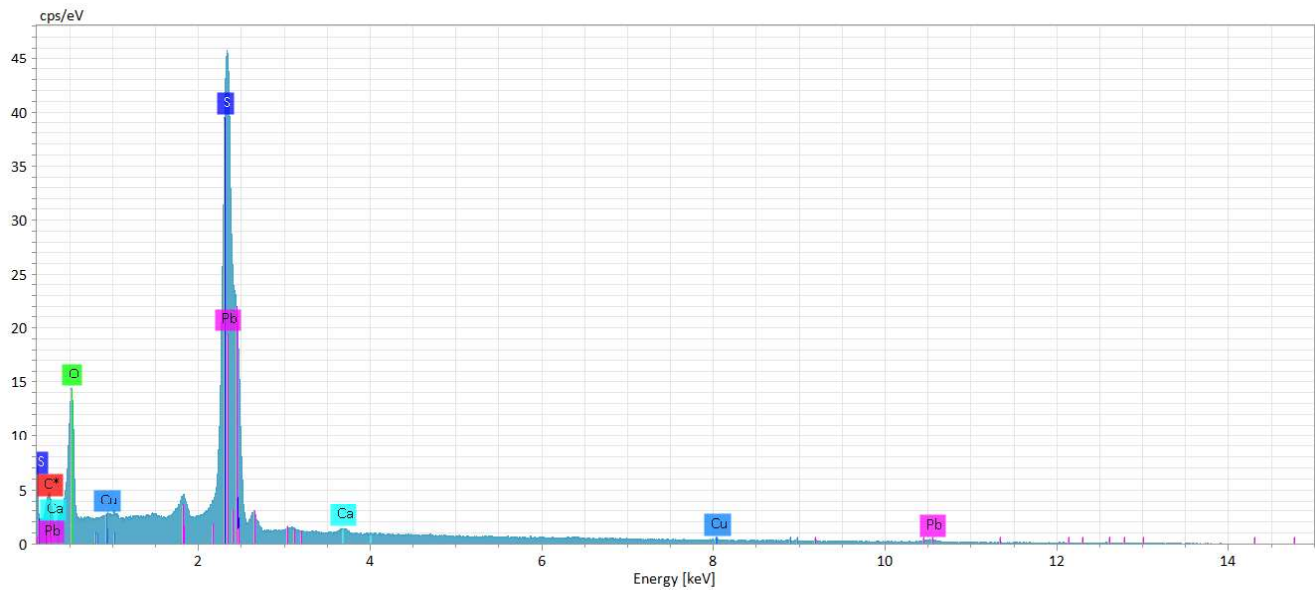
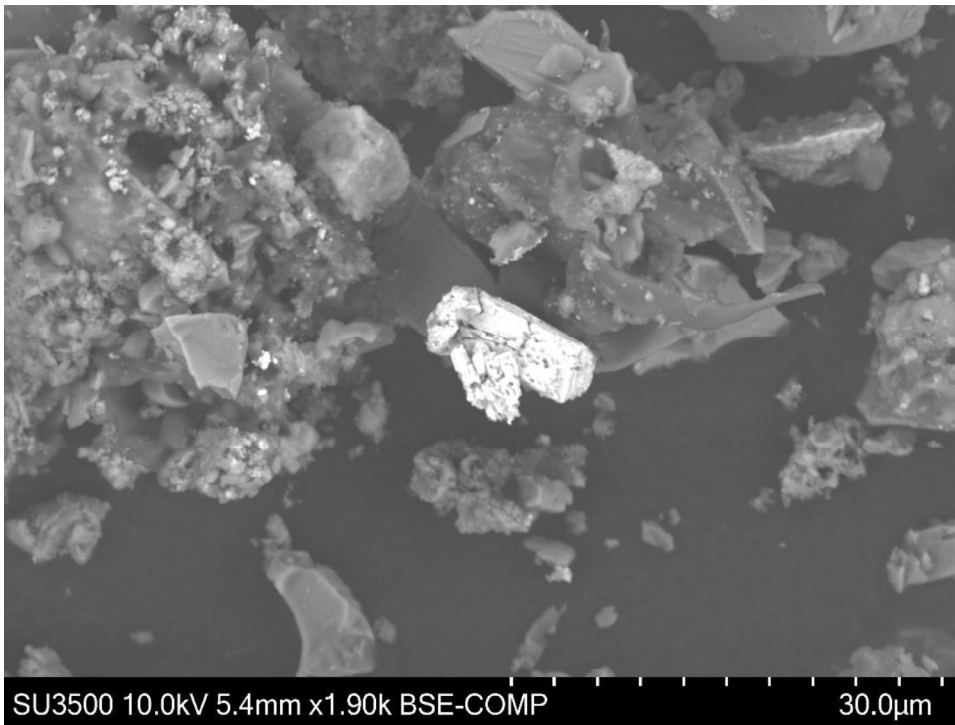
We see a similar composition, i.e. mainly iron and oxygen. The aluminum and silicon could be from the rock itself as aluminum/silicon/oxygen are fairly common in rock and mineral compositions.

## HS-9

At first glance, this sample was not terribly dissimilar to HS-8. There were a larger than expected number of heavier element-containing particles in this sample than what could be expected from the ICP data. This will be an ongoing theme in these samples. It should be noted that merely containing heavier elements doesn't by itself indicate that there are metallic contaminants in the soil as these elements can be present in naturally occurring rocks and minerals in the soil. An assessment will need to be made based on their concentrations and shapes.



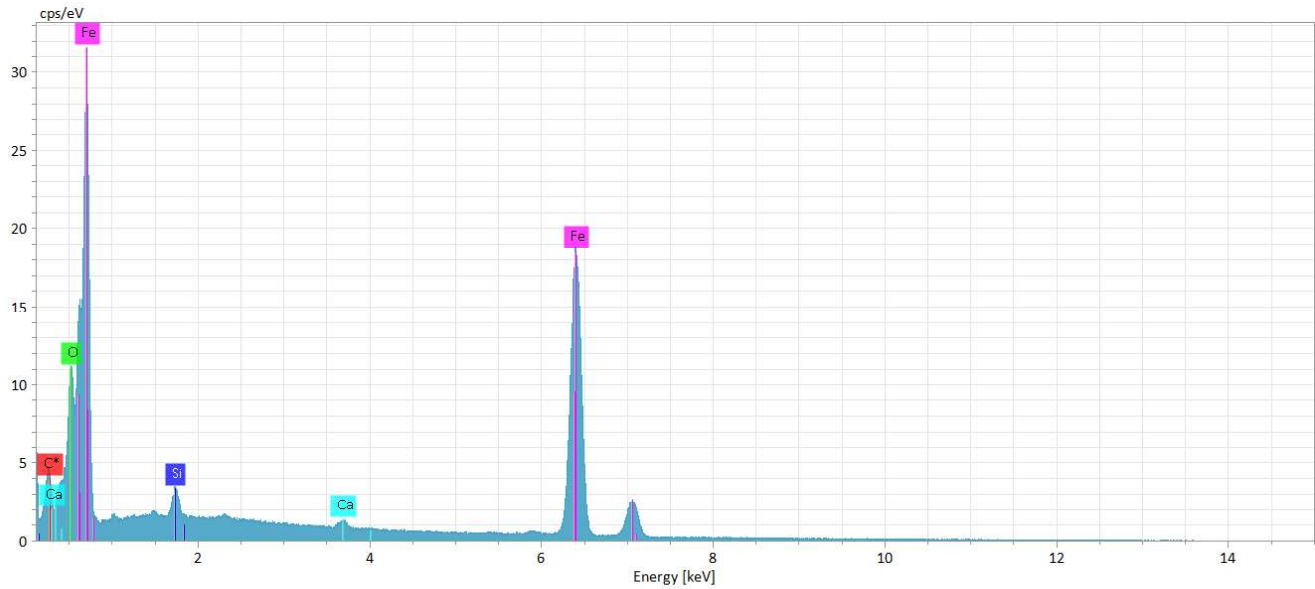
One of the particles analyzed stood out in that it contained some unexpected elements.



Element	At. No.	Net	Mass[%]	Mass Norm.[%]	Atom[%]	abs. error[mass%] (1 $\sigma$ )	rel. error[%] (1 $\sigma$ )
Oxygen	8	43929	21.27	24.32	60.04	1.04	4.91
Carbon	6	5519	3.67	4.19	13.79	0.29	8.03
Sulfur	16	110220	9.67	11.05	13.62	0.29	3.05
Lead	82	280978	51.38	58.73	11.20	1.27	2.47
Calcium	20	3276	0.69	0.78	0.77	0.02	2.97
Copper	29	810	0.81	0.93	0.58	0.04	4.91
		Sum	87.48	100	100		

Oxygen and carbon are the highest concentration elements but the lead and sulfur concentration here are what stand out. This is likely a lead sulfate particle. There were trace amounts of copper present as well. This was the only particle across the entire sample set that contained lead in such high quantity, and I did not manage to find another example of it in this sample. I would tend to conclude that this is not naturally occurring and is likely from some source of contamination.

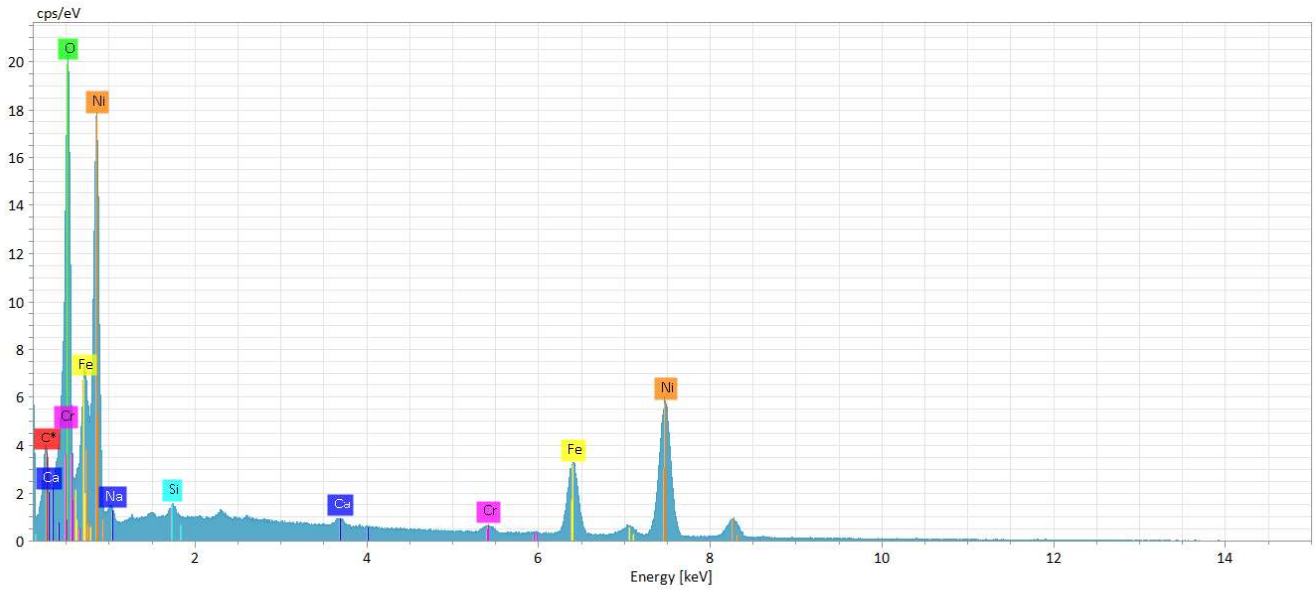




Element	At. No.	Net	Mass[%]	Mass Norm.[%]	Atom[%]	abs. error[mass%] (1 $\sigma$ )	rel. error[%] (1 $\sigma$ )
Iron	26	205017	61.79	75.14	43.67	1.31	2.12
Carbon	6	19070	9.26	11.27	30.44	0.50	5.37
Oxygen	8	48306	9.81	11.93	24.19	0.45	4.54
Silicon	14	11352	0.83	1.01	1.17	0.03	3.40
Calcium	20	4601	0.53	0.65	0.53	0.02	2.83
		Sum	82.22	100	100		

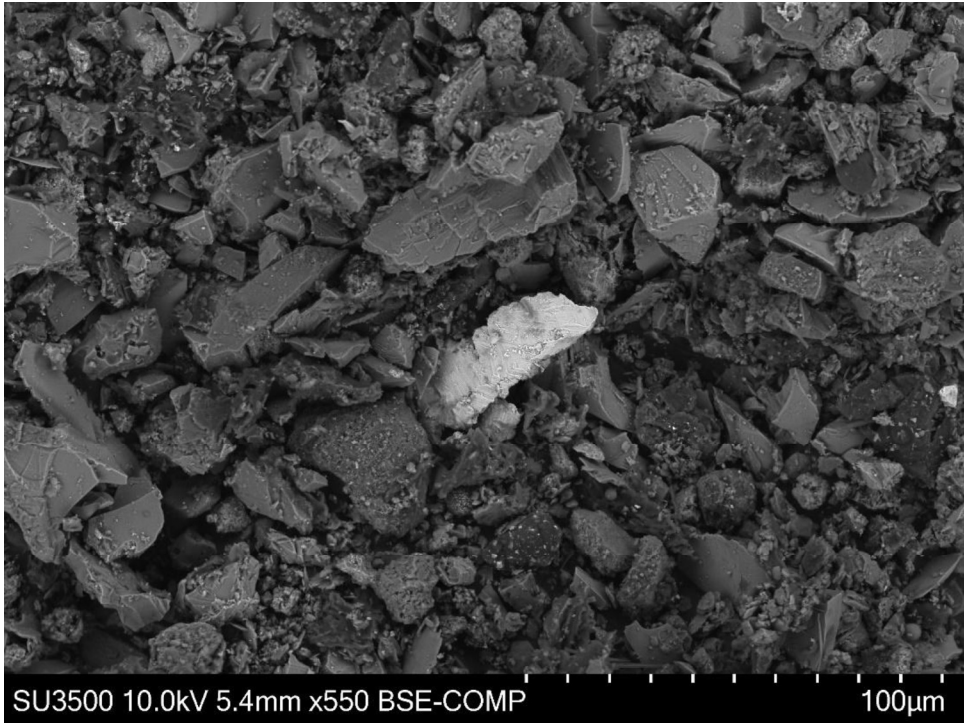
This particle does appear to be composed of iron and is oxidized, as is to be expected for all of the metal particles found due to the environment they were in. Looking at the shape of the particle it does have an appearance of metal more than steel, but this can be a subjective assessment. The iron to oxygen ratio is too high for it to be a naturally occurring mineral though. This is likely from metal.

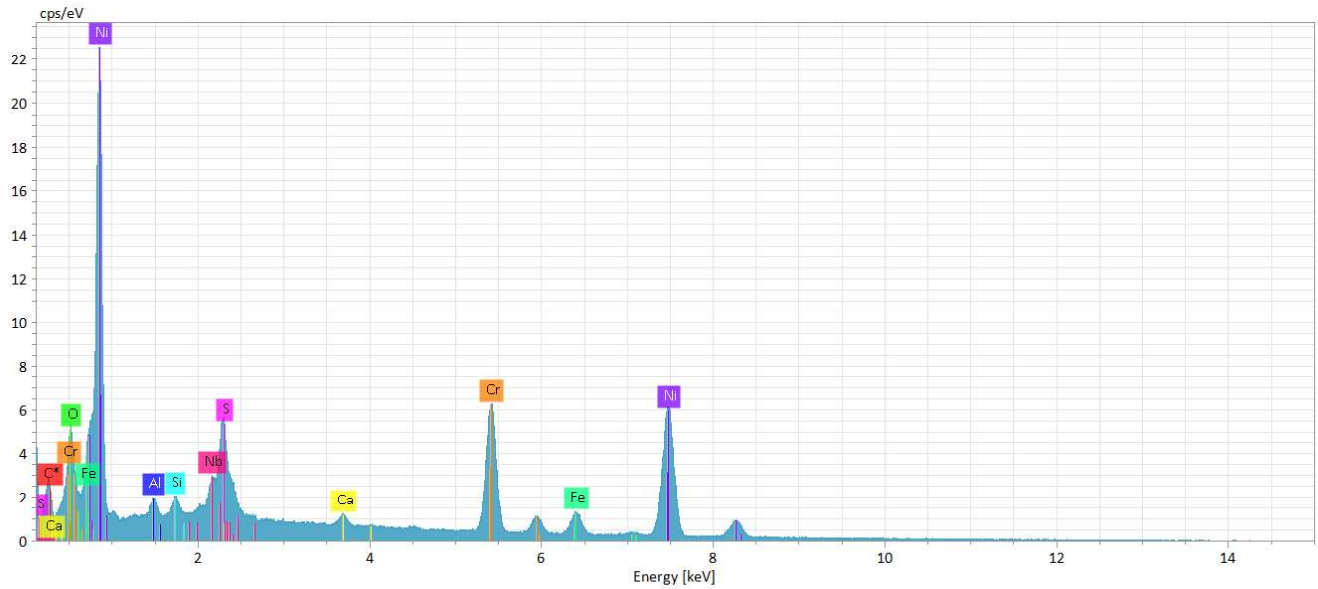
One of the many spherical particles observed is next analyzed.



Element	At. No.	Net	Mass[%]	Mass Norm.[%]	Atom[%]	abs. error[mass%] (1σ)	rel. error[%] (1σ)
Carbon	6	27040	15.38	15.79	37.36	0.79	5.15
Oxygen	8	61742	15.41	15.82	28.10	0.70	4.51
Nickel	28	95803	49.84	51.18	24.77	1.24	2.49
Iron	26	48677	14.08	14.46	7.36	0.31	2.23
Sodium	11	5283	0.94	0.97	1.20	0.06	5.94
Chromium	24	5032	0.95	0.98	0.54	0.03	2.65
Silicon	14	4278	0.36	0.37	0.37	0.01	3.87
Calcium	20	3813	0.42	0.43	0.31	0.01	2.81
		Sum	97.39	100	100		

This one is a nickel-iron oxide with traces of chromium and sodium.

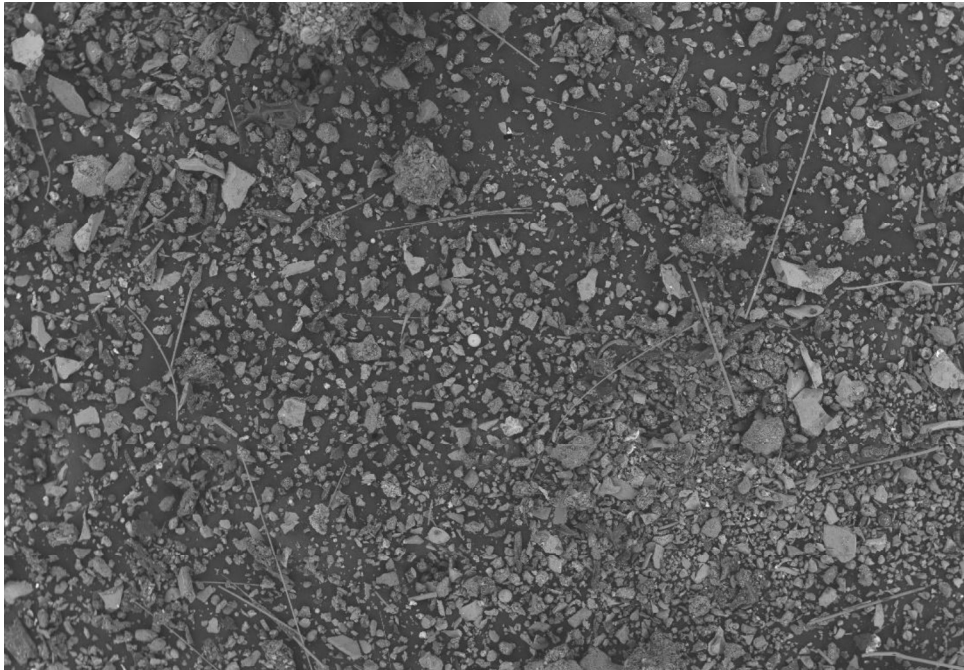




Element	At. No.	Net	Mass[%]	Mass Norm.[%]	Atom[%]	abs. error[mass%] (1 $\sigma$ )	rel. error[%] (1 $\sigma$ )
Nickel	28	89348	48.04	54.10	37.56	1.17	2.44
Carbon	6	9827	7.50	8.44	28.65	0.42	5.61
Chromium	24	76721	16.14	18.18	14.25	0.32	1.96
Oxygen	8	8088	2.35	2.65	6.74	0.14	5.90
Iron	26	13925	4.40	4.95	3.61	0.10	2.36
Sulfur	16	28728	2.30	2.60	3.30	0.44	19.12
Niobium	41	46584	6.15	6.93	3.04	0.17	2.80
Aluminium	13	6503	0.67	0.75	1.14	0.03	4.11
Silicon	14	7057	0.62	0.69	1.01	0.02	3.58
Calcium	20	5133	0.63	0.71	0.72	0.02	2.63
		Sum	88.80	100	100		

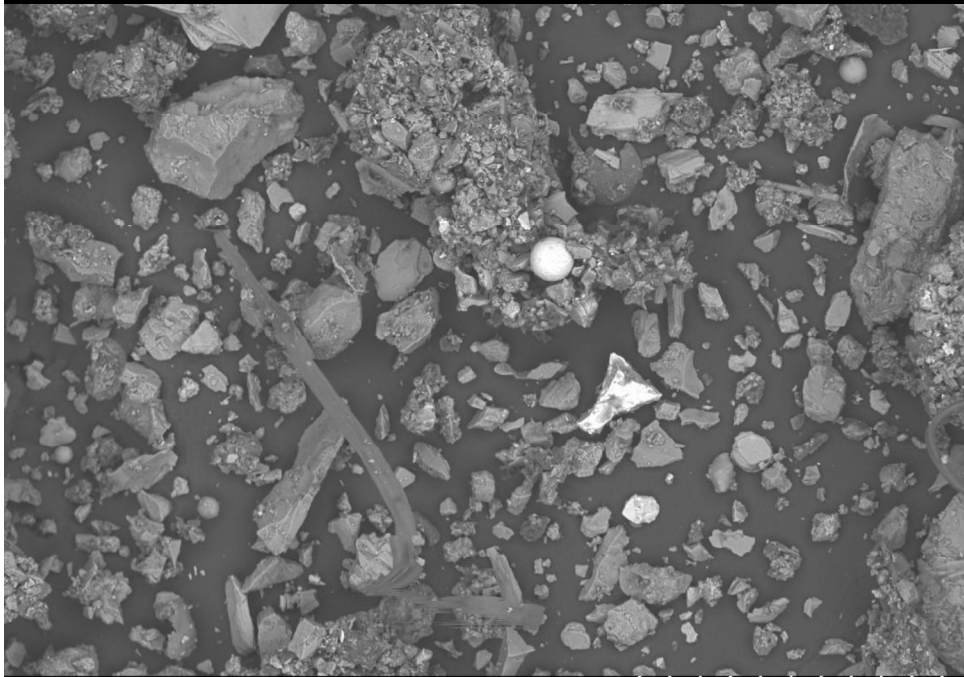
This is an oxidized nickel-chromium alloy with trace amounts of niobium, iron, and sulfur.

HS-10



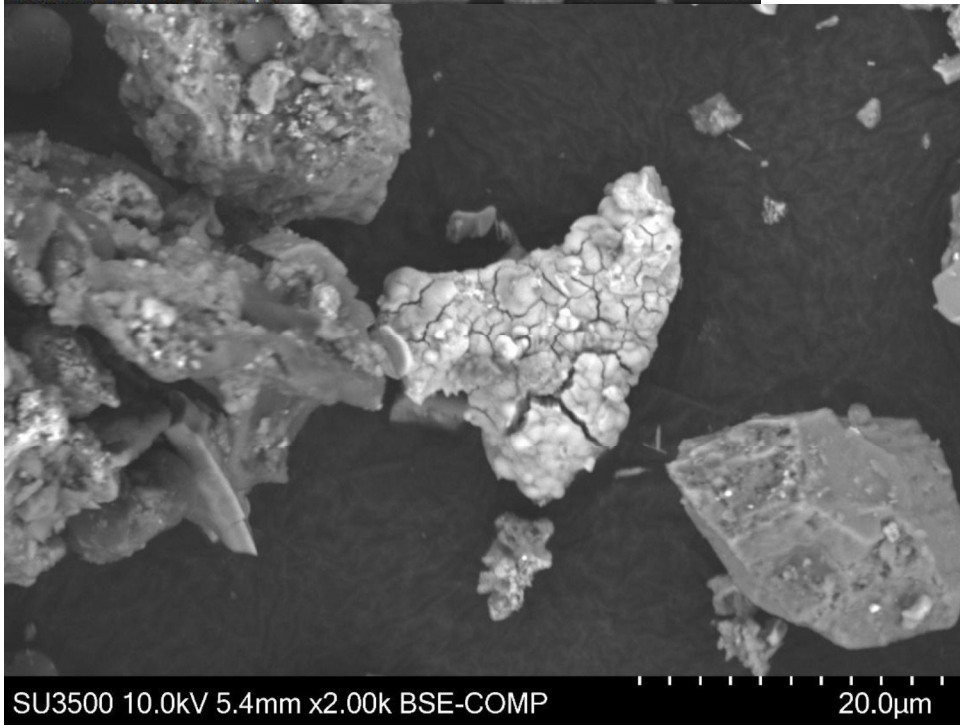
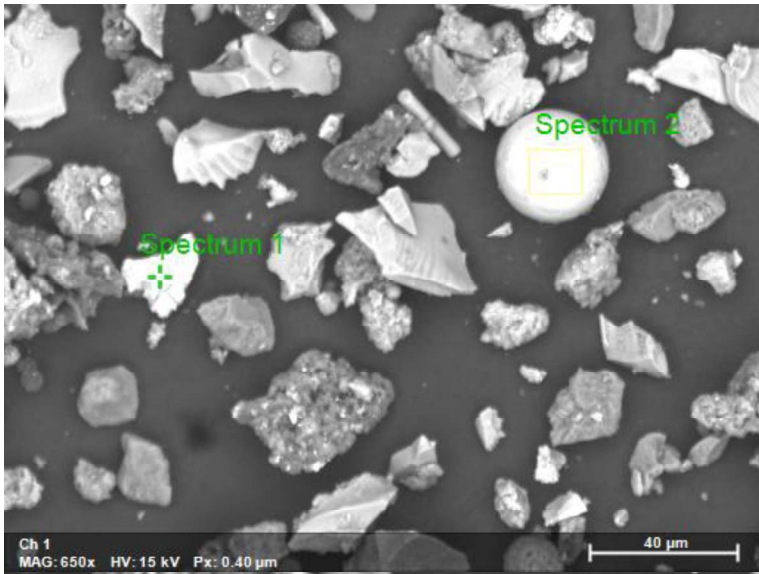
SU3500 10.0kV 5.5mm x60 BSE-COMP

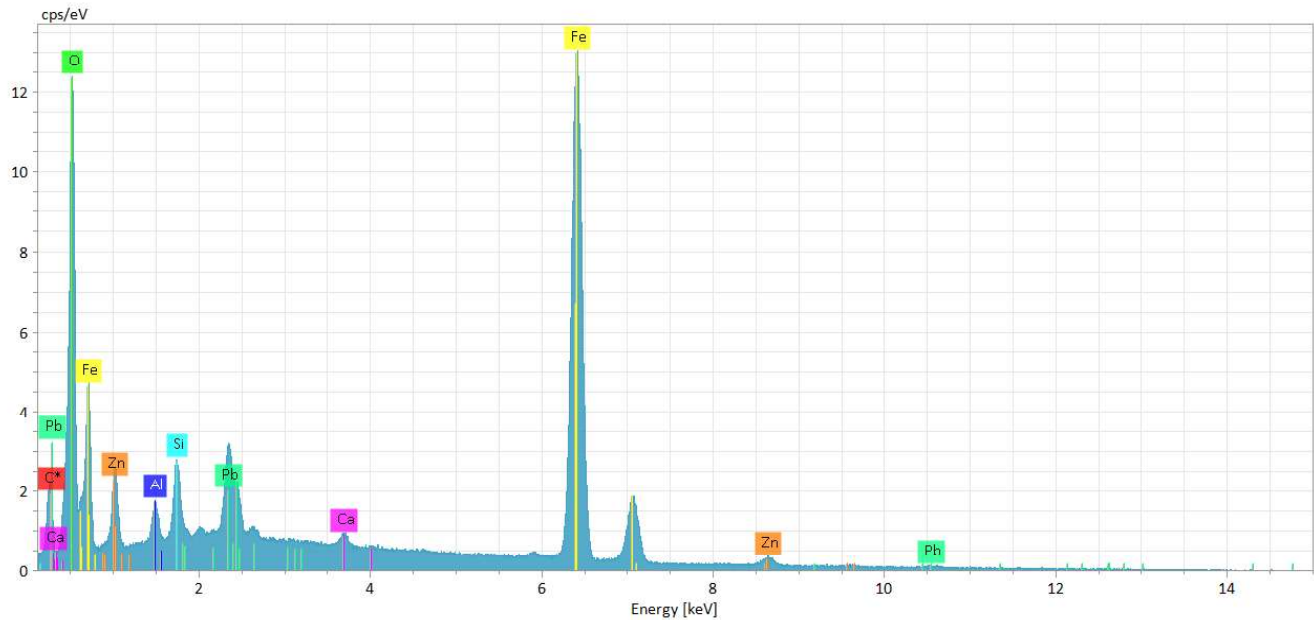
500µm



SU3500 15.0kV 10.6mm x200 BSE-COMP

200µm

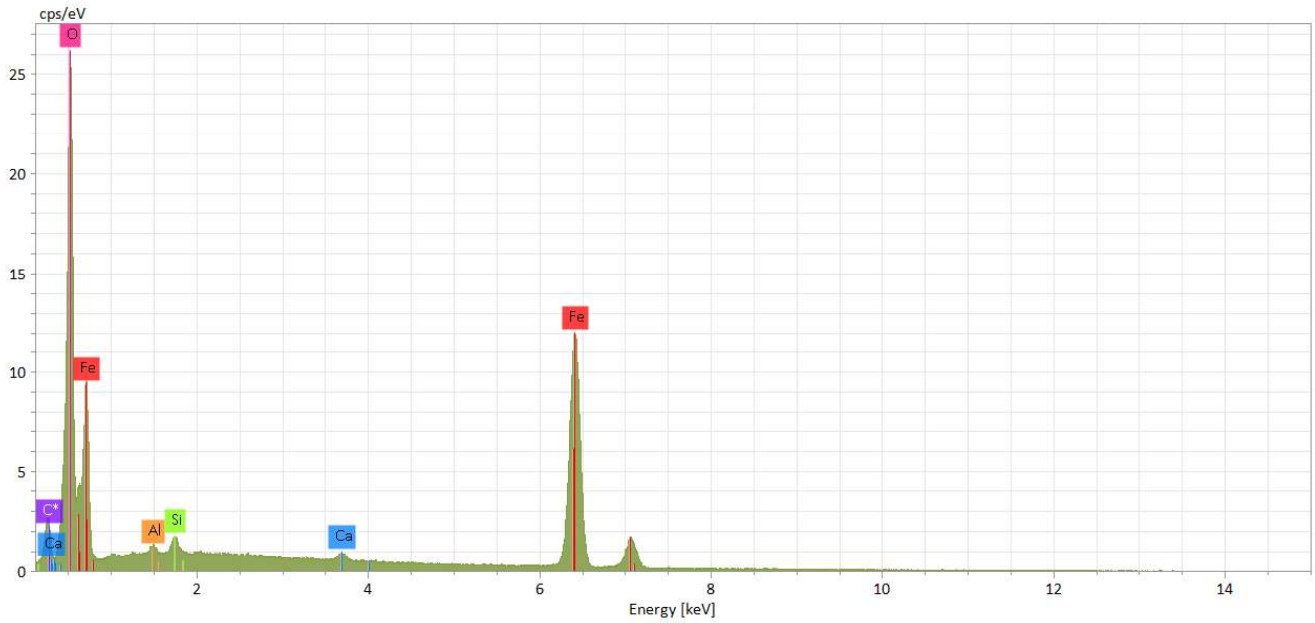
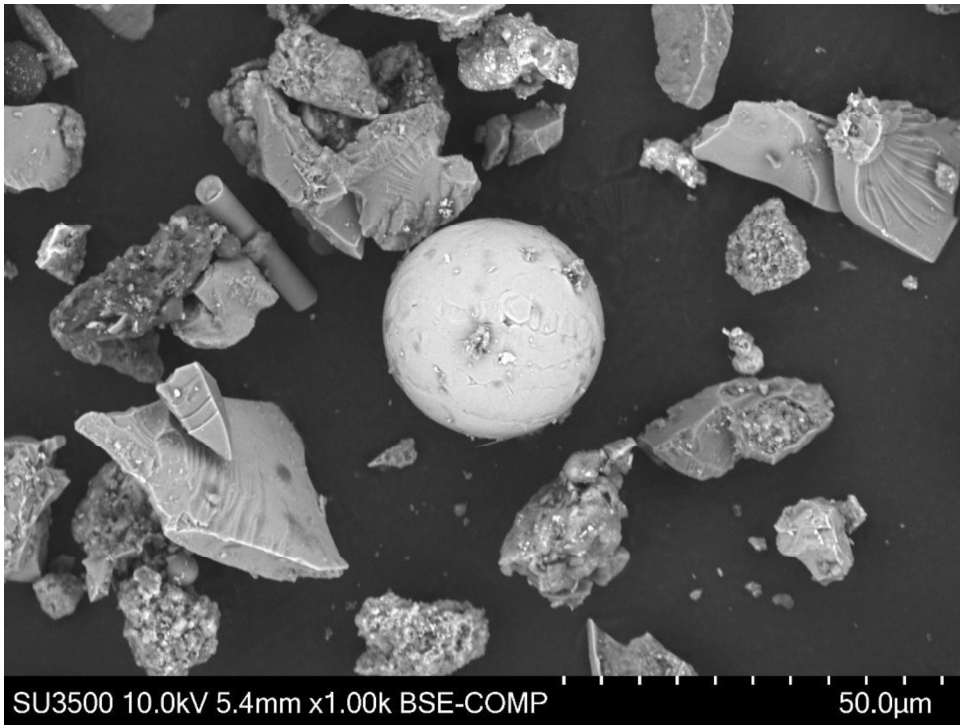




Element	At. No.	Net	Mass[%]	Mass Norm. [%]	Atom[%]	abs. error[mass%] (1 $\sigma$ )	rel. error[%] (1 $\sigma$ )
Iron	26	234555	59.29	64.46	39.08	1.17	1.97
Oxygen	8	90090	15.61	16.97	35.90	0.68	4.35
Carbon	6	15409	6.41	6.97	19.65	0.38	5.97
Zinc	30	4346	3.65	3.97	2.05	0.12	3.40
Silicon	14	15738	1.09	1.19	1.43	0.04	3.24
Lead	82	38884	5.05	5.49	0.90	0.13	2.53
Aluminium	13	5104	0.42	0.45	0.57	0.02	4.54
Calcium	20	4686	0.46	0.50	0.42	0.01	2.68
		Sum	91.98	100	100		

This particle was composed mainly of iron with some small quantities of zinc and lead. The lead concentration is a lot lower than in the previous particle analyzed with lead on HS-9, but still a meaningful amount.

Once again there were spherical particles on this sample. Analyzing the composition of the spherical particle, it's clearly oxidized iron.



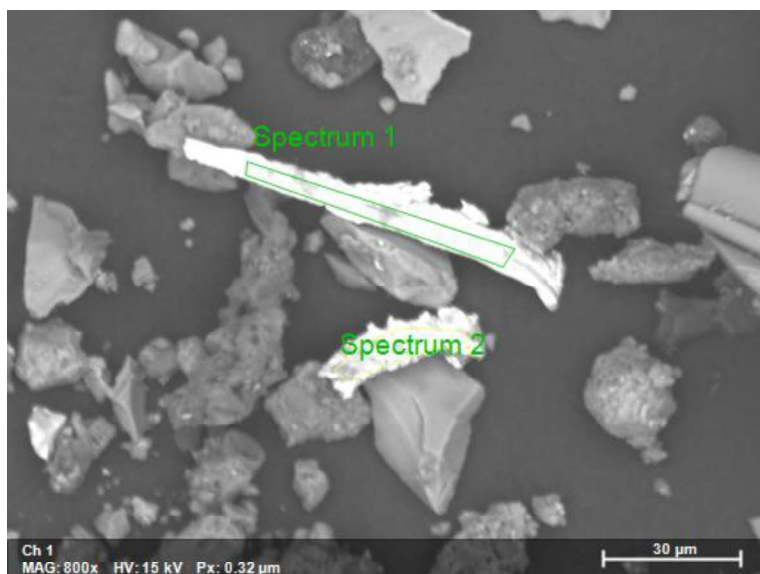
Element	At. No.	Net	Mass[%]	Mass Norm.[%]	Atom[%]	abs. error[mass%] (1σ)	rel. error[%] (1σ)
Oxygen	8	185081	30.68	31.32	53.21	1.26	4.10
Iron	26	203115	58.85	60.07	29.23	1.27	2.17
Carbon	6	16792	7.09	7.24	16.38	0.37	5.17
Silicon	14	8183	0.58	0.59	0.57	0.02	3.52
Calcium	20	5480	0.54	0.56	0.38	0.01	2.69
Aluminium	13	2855	0.22	0.23	0.23	0.01	4.66
		Sum	97.97	100	100		

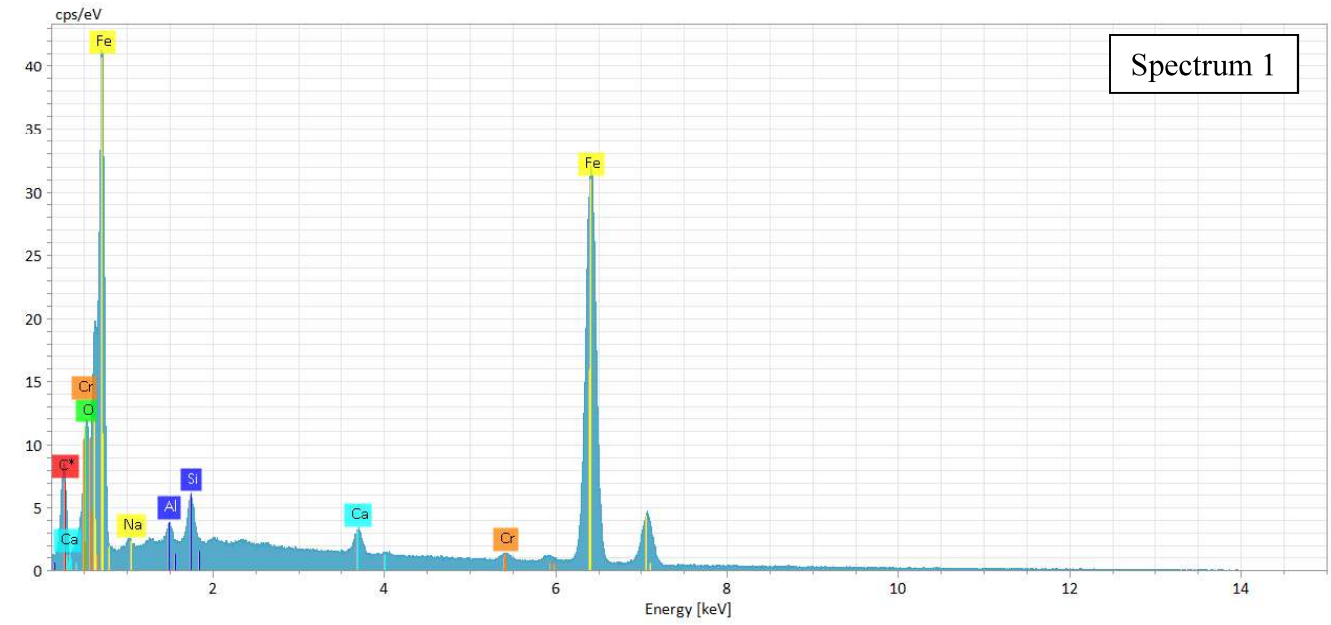
There was no nickel observed in this sphere, so it's possible that not all of the spherical particles are the same/from the same source.

The last examples from this sample are a couple of particles that have the appearance of strips of metal.



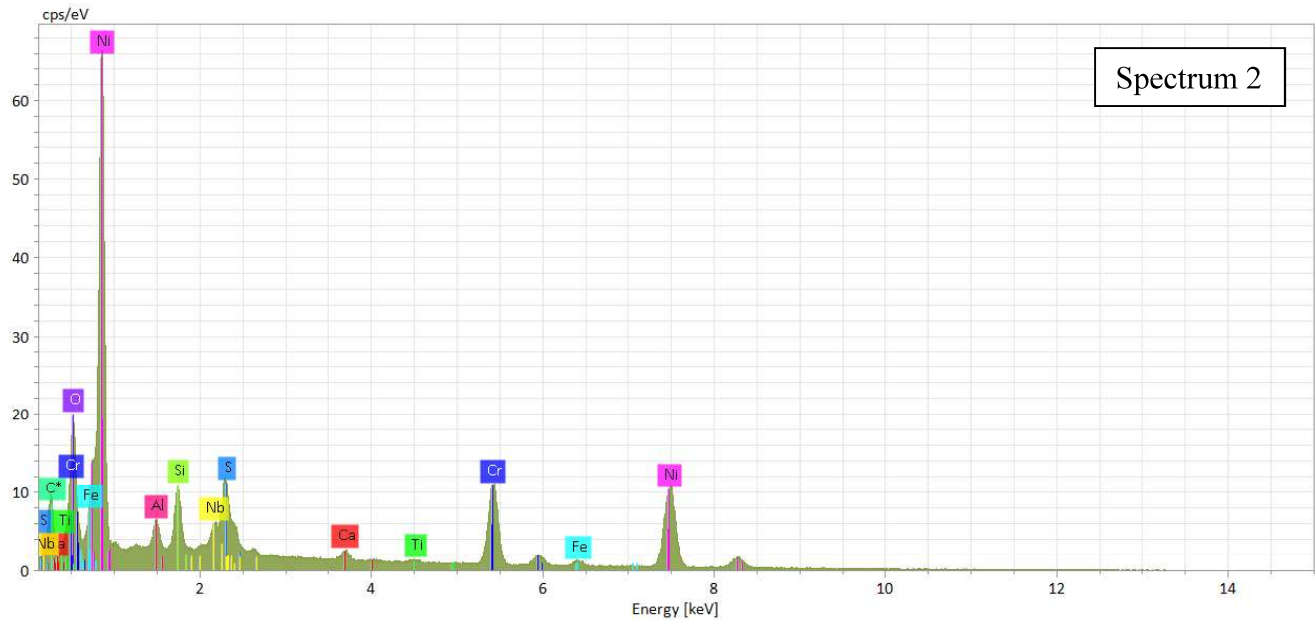
Analyzing them with EDX we can see their compositions are different.





Element	At. No.	Net	Mass[%]	Mass Norm. [%]	Atom[%]	abs. error[mass%] (1 $\sigma$ )	rel. error[%] (1 $\sigma$ )
Iron	26	232720	75.82	79.26	50.05	1.63	2.15
Carbon	6	23129	12.62	13.20	38.75	0.65	5.17
Oxygen	8	12214	2.92	3.06	6.74	0.15	5.07
Silicon	14	15276	1.20	1.26	1.58	0.04	3.26
Calcium	20	11007	1.18	1.24	1.09	0.03	2.29
Chromium	24	7843	1.31	1.37	0.93	0.03	2.42
Aluminium	13	4411	0.37	0.39	0.50	0.02	4.32
Sodium	11	1773	0.23	0.24	0.37	0.02	6.79
		Sum	95.67	100	100		

The larger particle has high iron content with chromium indicating stainless steel.



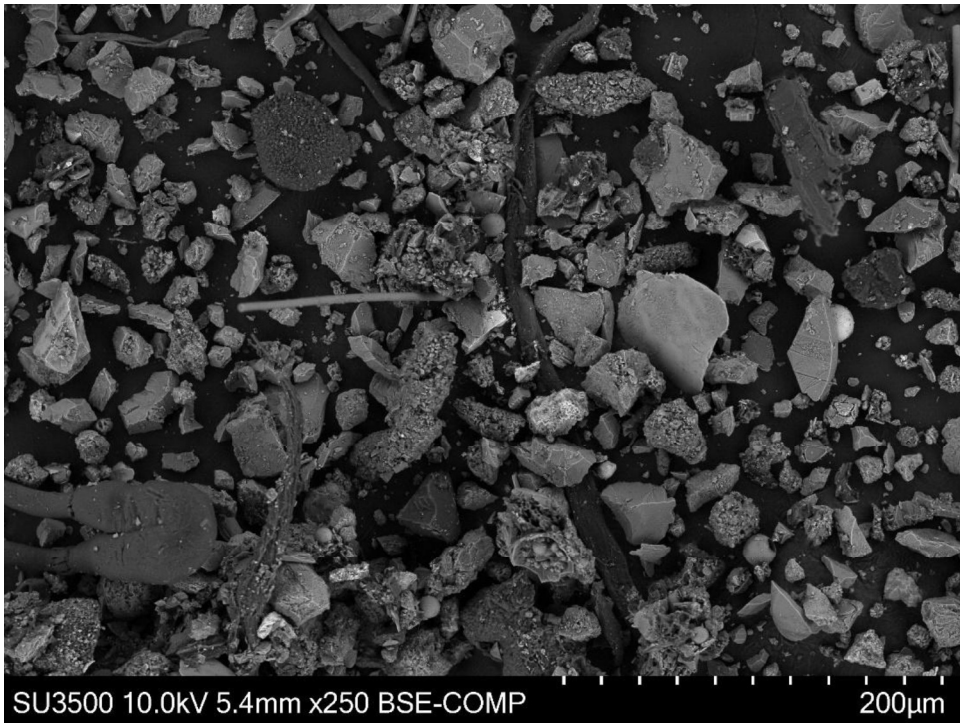
Spectrum 2

Element	At. No.	Net	Mass[%]	Mass Norm. [%]	Atom[%]	abs. error[mass%] (1 $\sigma$ )	rel. error[%] (1 $\sigma$ )
Carbon	6	14816	11.05	13.23	35.20	0.58	5.28
Nickel	28	67897	38.81	46.49	25.31	0.98	2.53
Oxygen	8	26225	8.21	9.83	19.63	4.10	49.92
Chromium	24	58953	14.08	16.87	10.36	0.29	2.09
Sulfur	16	26459	1.95	2.34	2.33	0.39	19.91
Silicon	14	23524	1.63	1.95	2.22	0.05	3.12
Niobium	41	36921	4.33	5.19	1.78	0.14	3.24
Aluminium	13	9688	0.74	0.89	1.06	0.03	3.88
Iron	26	4269	1.48	1.77	1.01	0.04	2.92
Calcium	20	6199	0.83	1.00	0.80	0.02	2.56
Titanium	22	1981	0.37	0.44	0.30	0.01	3.36
		Sum	83.47	100	100		

The smaller of the two particles contains a much smaller amount of iron but has a high nickel and chromium concentration. While it's possible this could be a different stainless-steel alloy, it is more likely to be a nickel-chromium alloy with some iron and niobium additives/impurities.

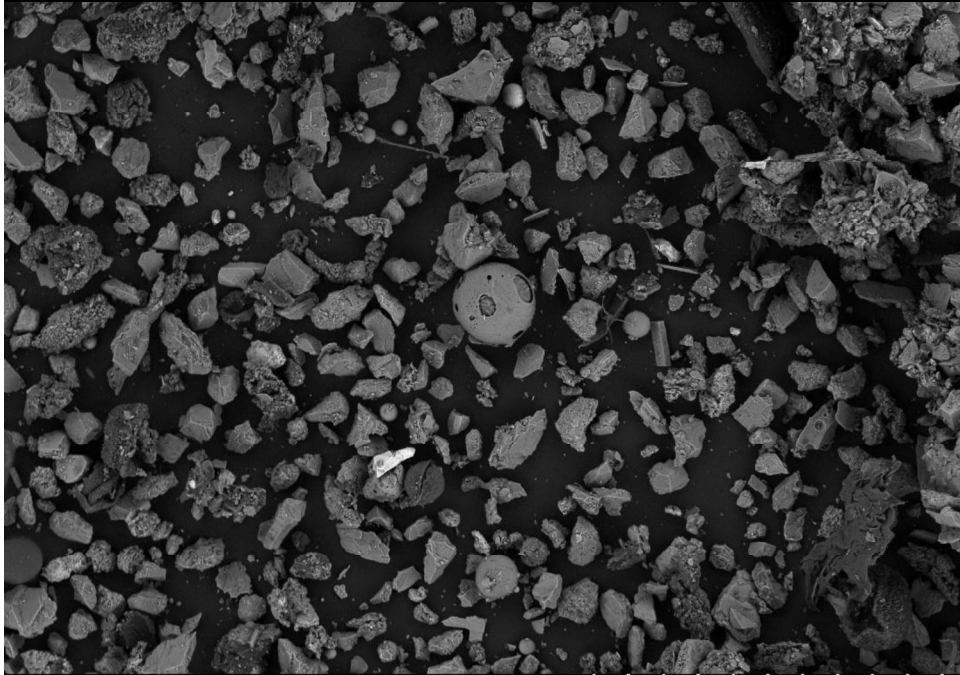
### HS-17

Like the previous samples, there's not really anything that sets this sample apart as visually distinct compared to the others. We again see spherical particles as well as other shapes.



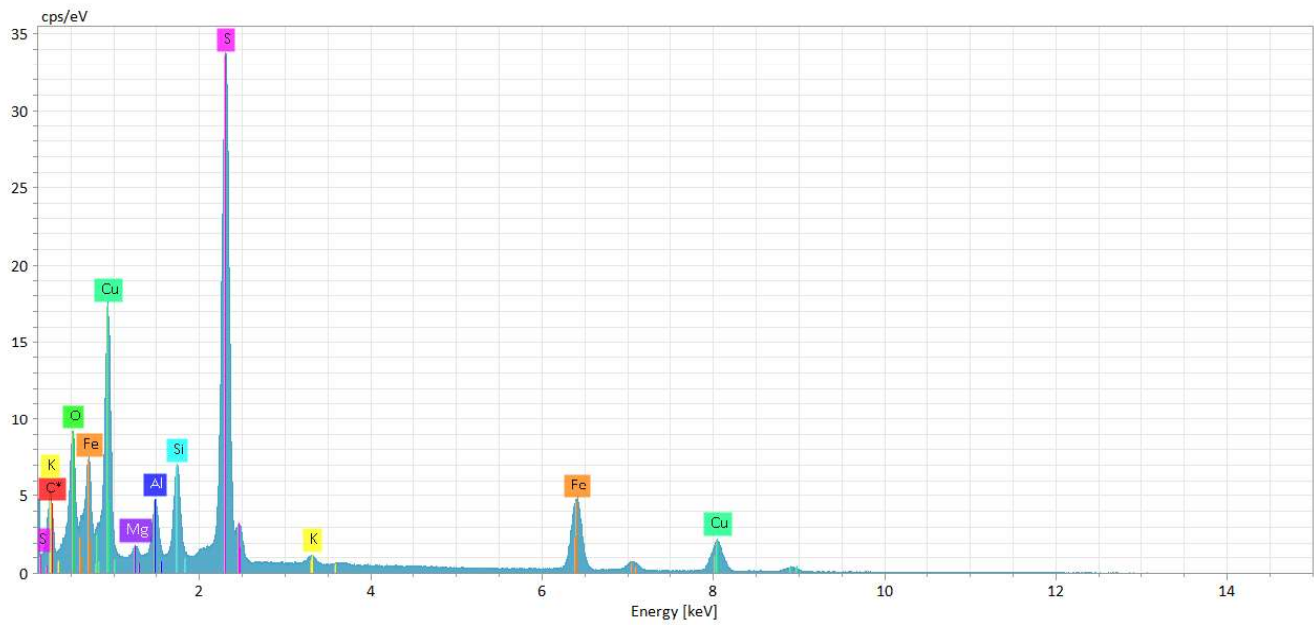
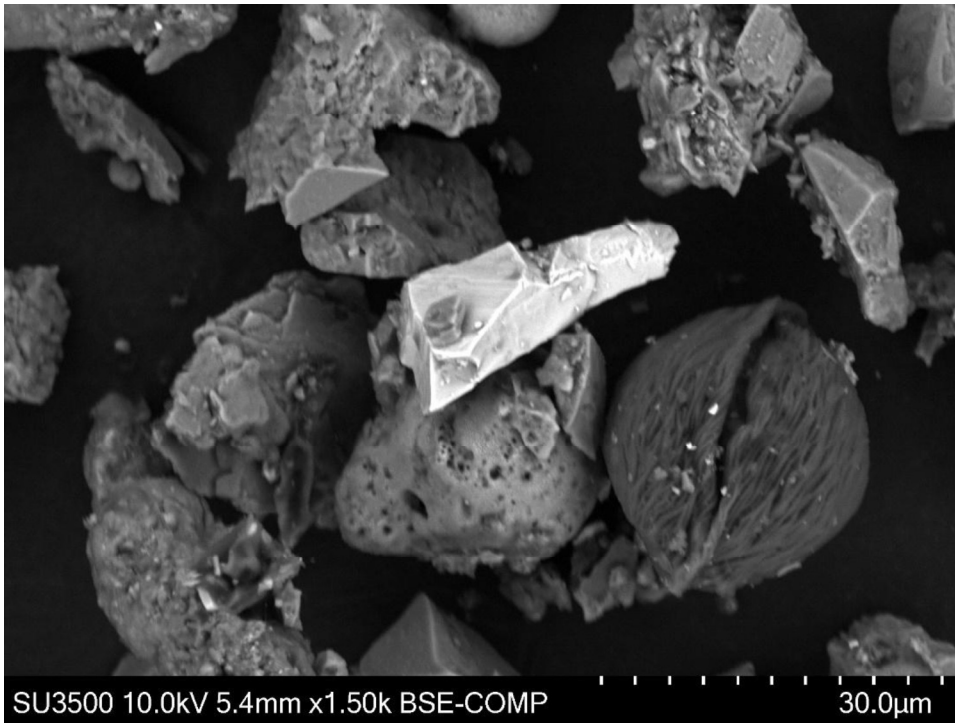
SU3500 10.0kV 5.4mm x250 BSE-COMP

200µm



SU3500 10.0kV 5.4mm x230 BSE-COMP

200µm

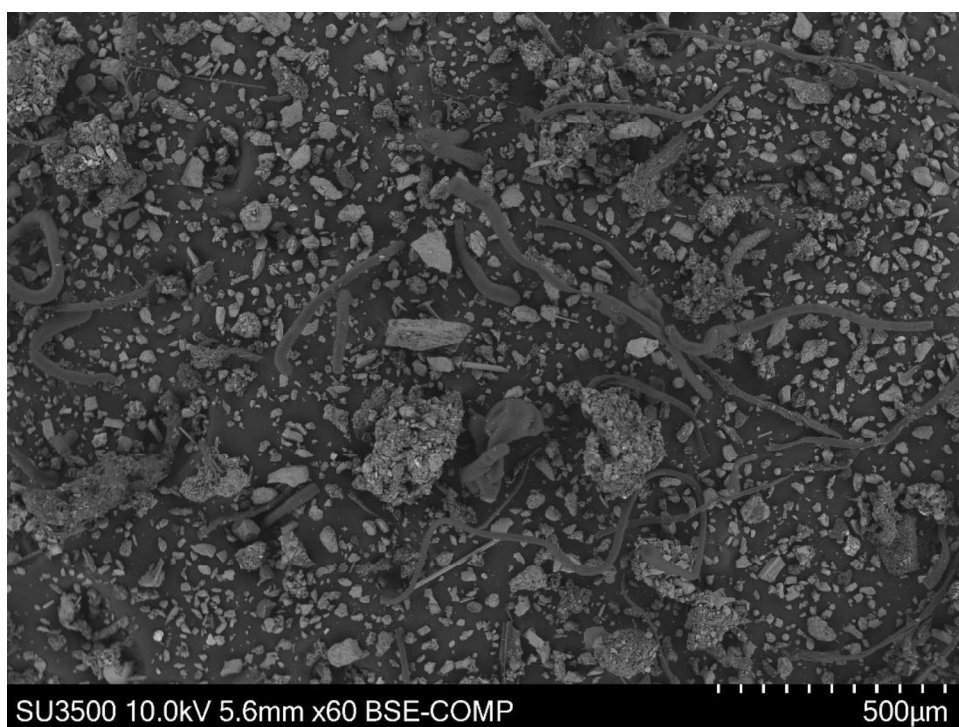
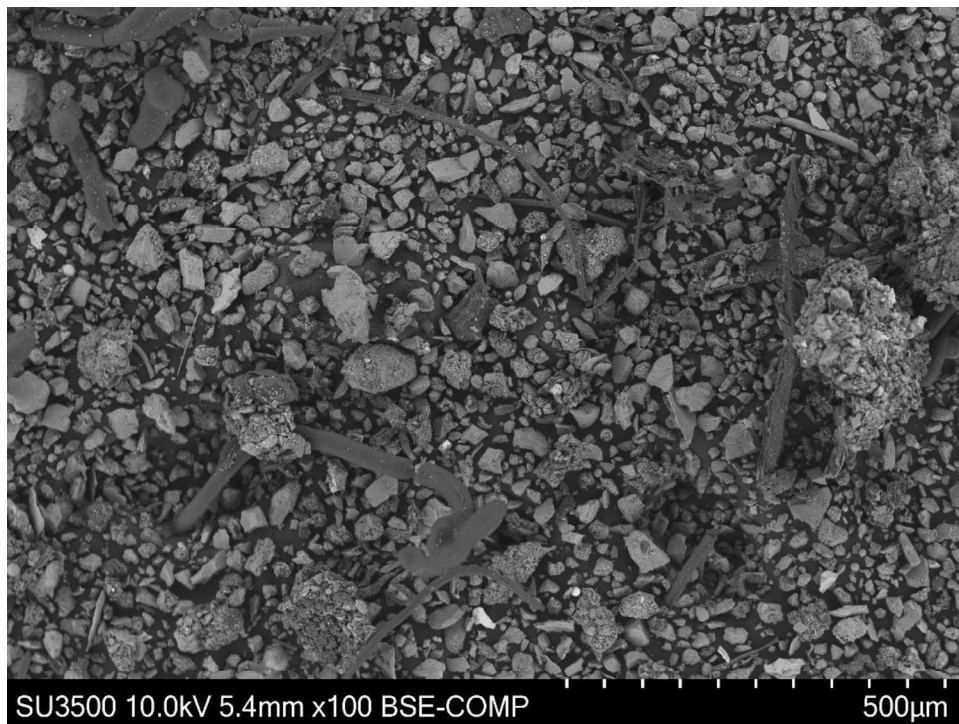


Element	At. No.	Net	Mass[%]	Mass Norm.[%]	Atom[%]	abs. error[mass%] (1 $\sigma$ )	rel. error[%] (1 $\sigma$ )
Carbon	6	9402	11.40	13.05	32.48	0.68	5.96
Oxygen	8	24456	8.82	10.11	18.88	0.42	4.75
Sulfur	16	243841	15.02	17.20	16.04	0.34	2.27
Iron	26	54498	22.99	26.33	14.09	0.56	2.42
Copper	29	25995	24.62	28.20	13.26	0.74	3.01
Silicon	14	31281	1.99	2.28	2.42	0.06	3.06
Aluminium	13	17381	1.33	1.52	1.68	0.05	3.70
Potassium	19	6498	0.88	1.00	0.77	0.02	2.68
Magnesium	12	2728	0.27	0.31	0.39	0.01	5.38
		Sum	87.32	100	100		

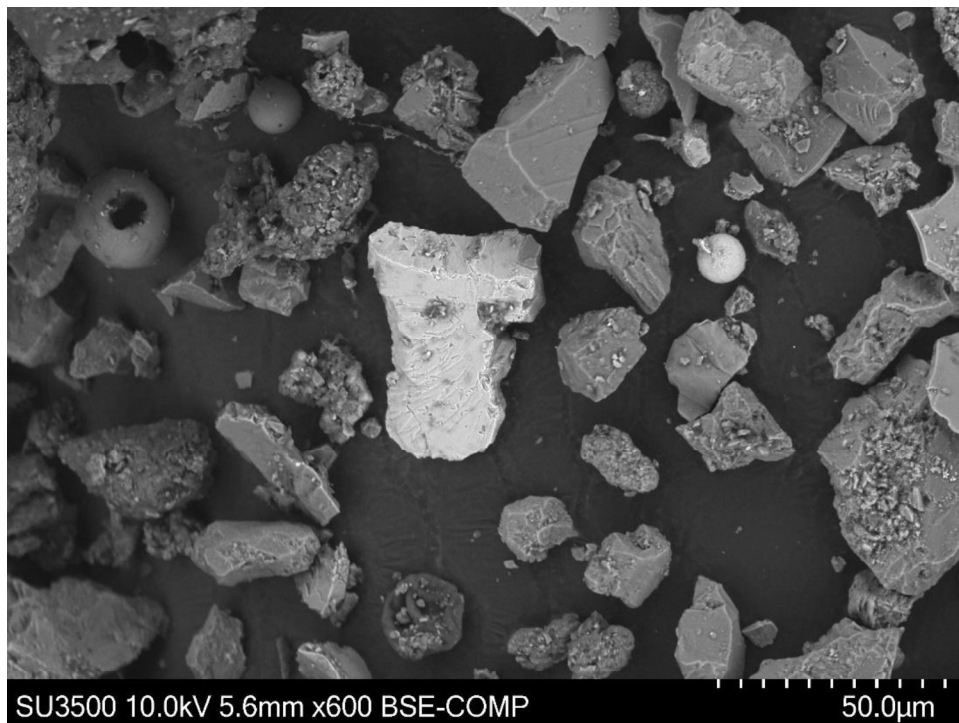
This particle had notably high copper and sulfur concentrations in addition to iron and oxygen.

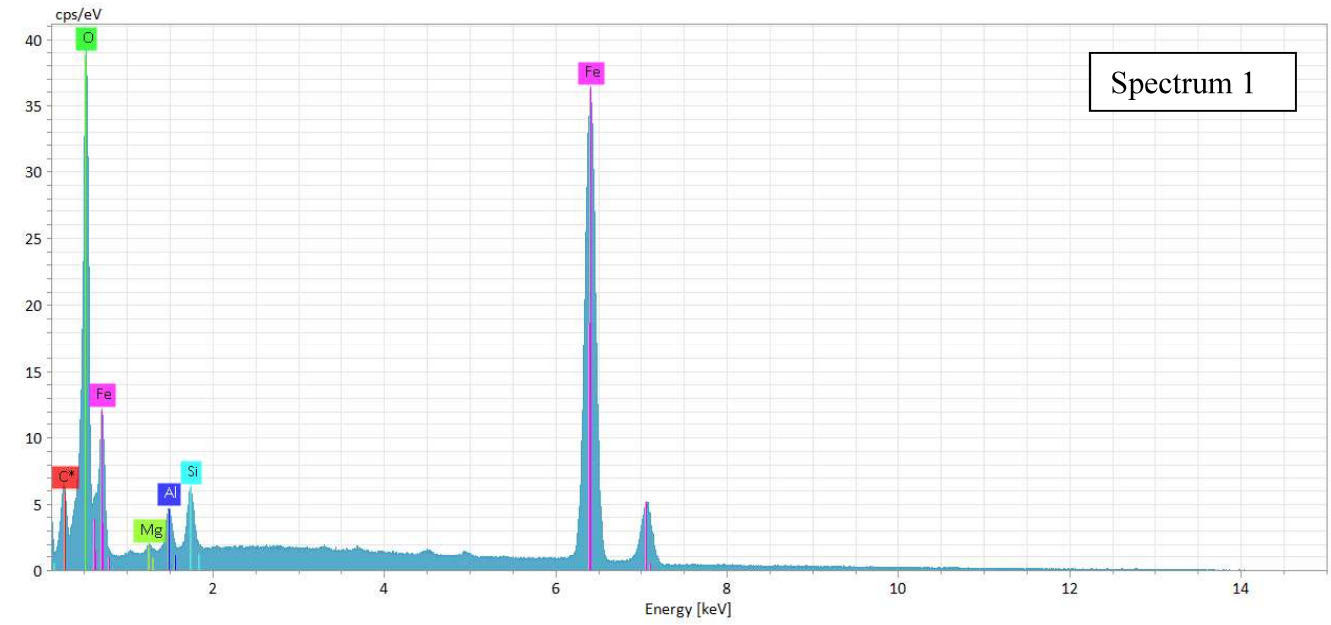
### HS-18

HS-18 was notable in that it had one of the sparser densities of particles containing heavier elements.



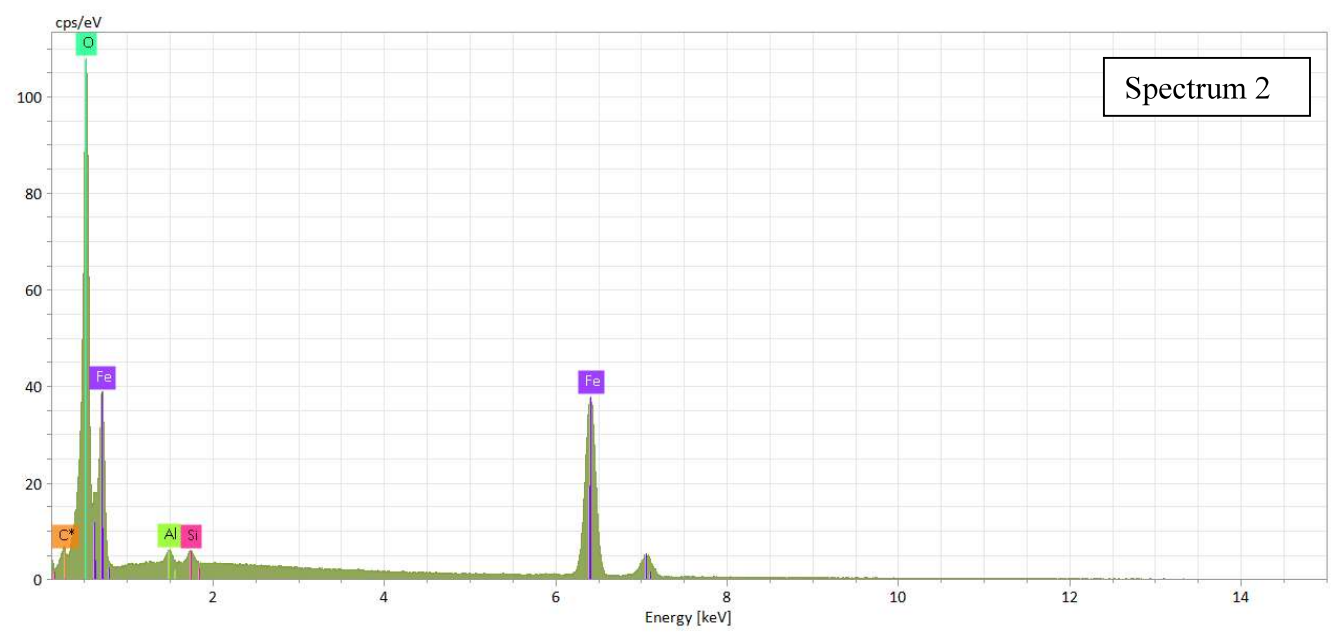
Here is an area with 3 differently shaped particles.





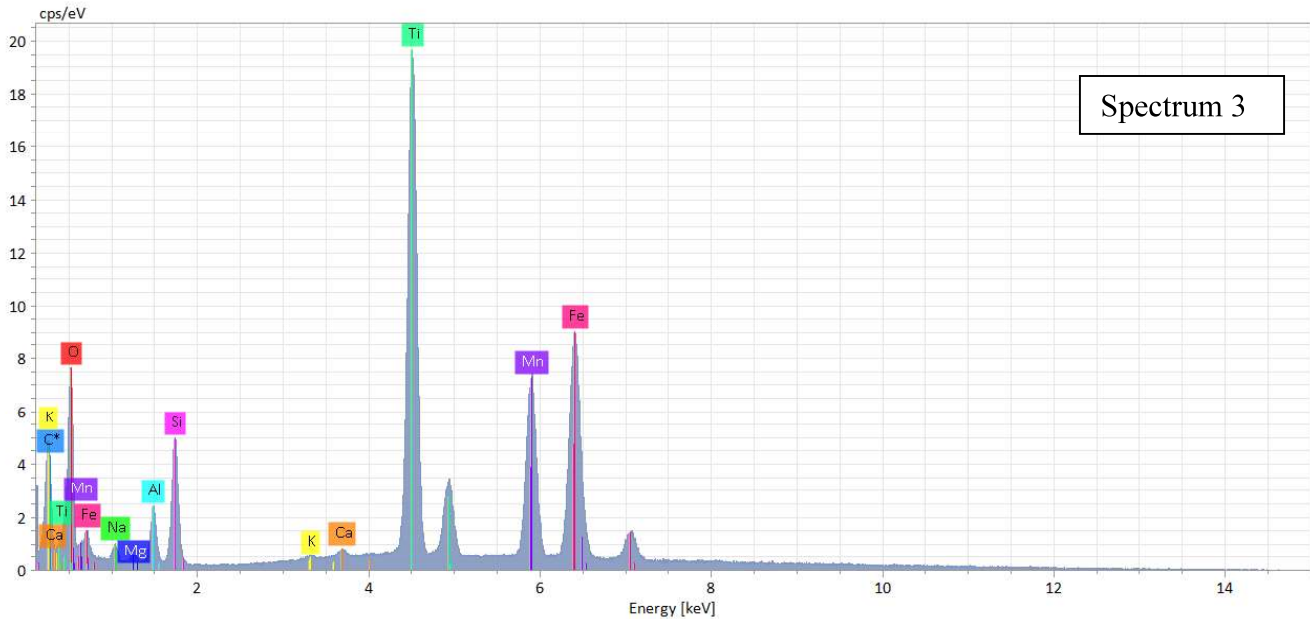
Element	At. No.	Net	Mass[%]	Mass Norm.[%]	Atom[%]	abs. error[mass%] (1 $\sigma$ )	rel. error[%] (1 $\sigma$ )
Iron	26	273331	65.58	76.37	48.21	1.29	1.97
Oxygen	8	90937	13.08	15.24	33.58	0.55	4.20
Carbon	6	9095	3.86	4.49	13.19	0.20	5.31
Silicon	14	18433	1.79	2.08	2.61	0.06	3.31
Aluminium	13	11396	1.28	1.49	1.95	0.05	3.94
Magnesium	12	1850	0.28	0.32	0.46	0.02	5.84
		Sum	85.86	100	100		

The first particle is from iron.



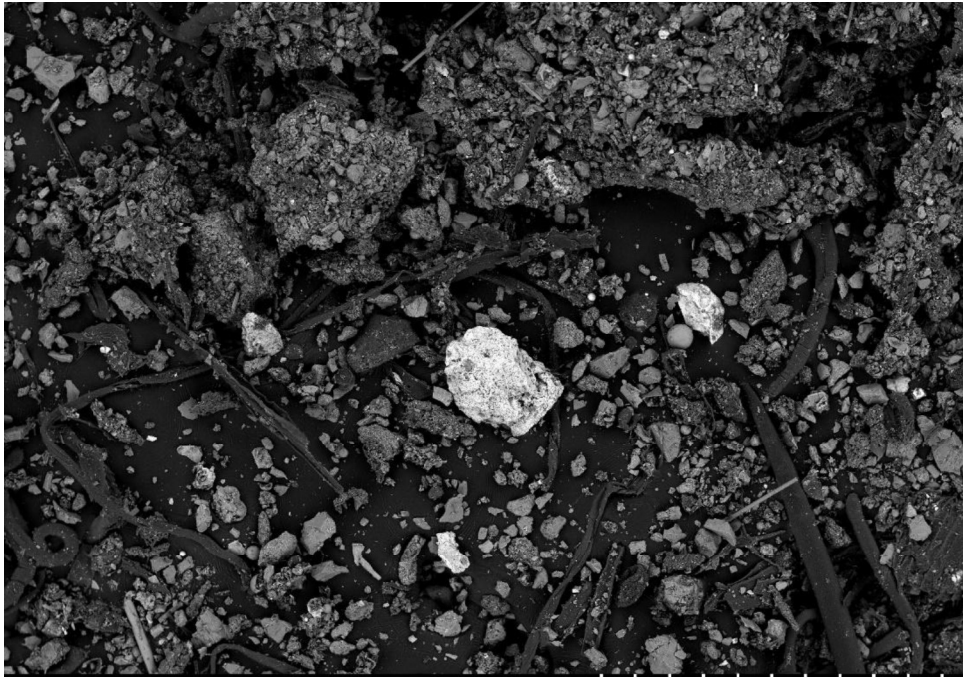
Element	At. No.	Net	Mass[%]	Mass Norm.[%]	Atom[%]	abs. error[mass%] (1 $\sigma$ )	rel. error[%] (1 $\sigma$ )
Oxygen	8	161776	26.63	31.13	60.76	1.03	3.86
Iron	26	174159	57.81	67.59	37.79	1.27	2.19
Aluminium	13	6863	0.56	0.66	0.76	0.02	4.07
Silicon	14	6975	0.52	0.61	0.68	0.02	3.58
Carbon	6	0	0.00	0.00	0.00	0.00	100.13
		Sum	85.53	100	100		

The second of the particles, spherical in shape, is iron oxide.

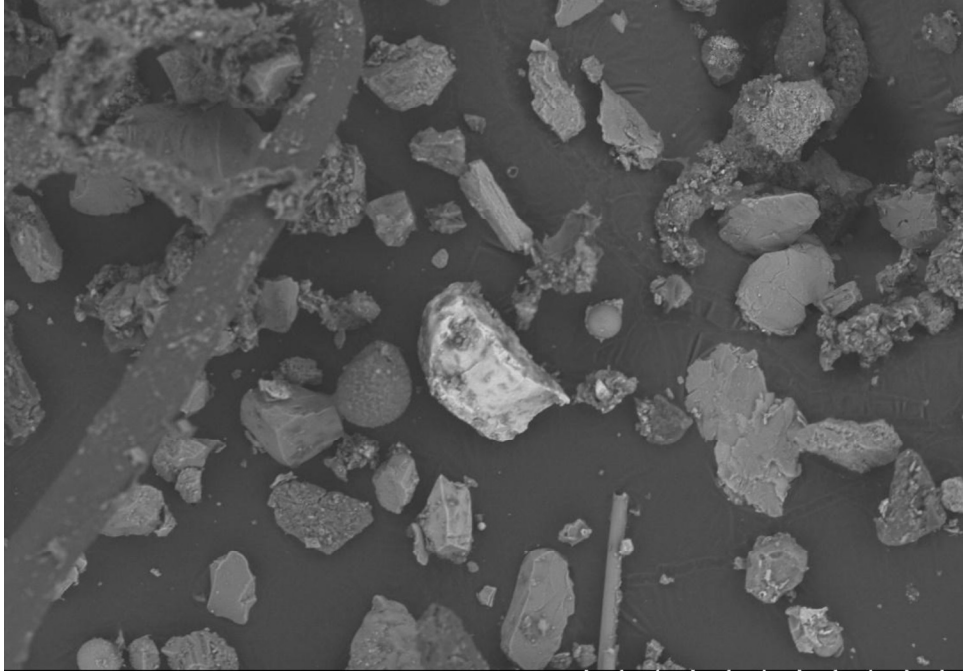


Element	At. No.	Net	Mass[%]	Mass Norm.[%]	Atom[%]	abs. error[mass%] (1 $\sigma$ )	rel. error[%] (1 $\sigma$ )
Carbon	6	33203	12.96	11.04	24.84	0.66	5.07
Oxygen	8	39895	13.81	11.77	19.87	2.58	18.70
Silicon	14	40166	17.68	15.07	14.49	0.75	4.23
Titanium	22	244167	24.15	20.58	11.61	0.42	1.74
Iron	26	119208	18.27	15.57	7.53	0.35	1.89
Aluminium	13	18550	8.64	7.36	7.37	0.42	4.83
Sodium	11	8143	6.07	5.18	6.08	0.43	7.02
Manganese	25	96167	12.38	10.55	5.19	0.23	1.83
Magnesium	12	5216	2.87	2.44	2.72	0.17	5.99
Calcium	20	4262	0.50	0.43	0.29	0.01	2.81
		Sum	117.33	100	100		

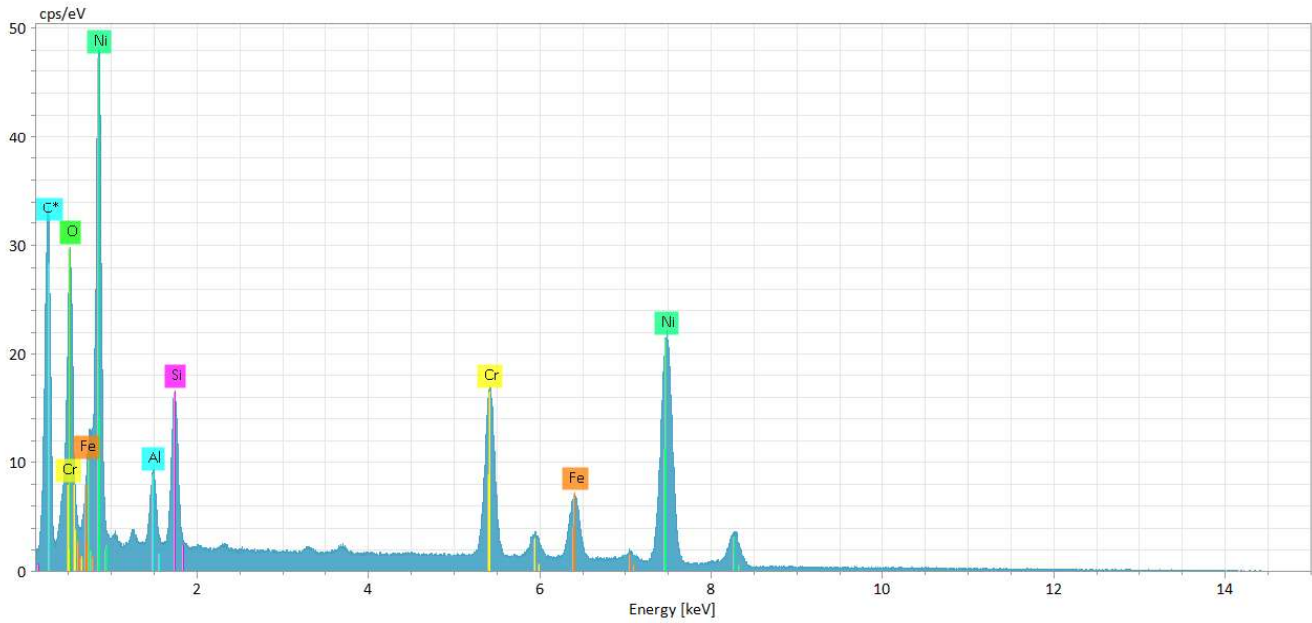
The third example would appear to be an oxide mixture of titanium, silicon, iron, aluminum and magnesium. This could likely be a naturally occurring rock



SU3500 10.0kV 6.5mm x90 BSE-COMP 500µm



SU3500 10.0kV 6.6mm x470 BSE-COMP 100µm

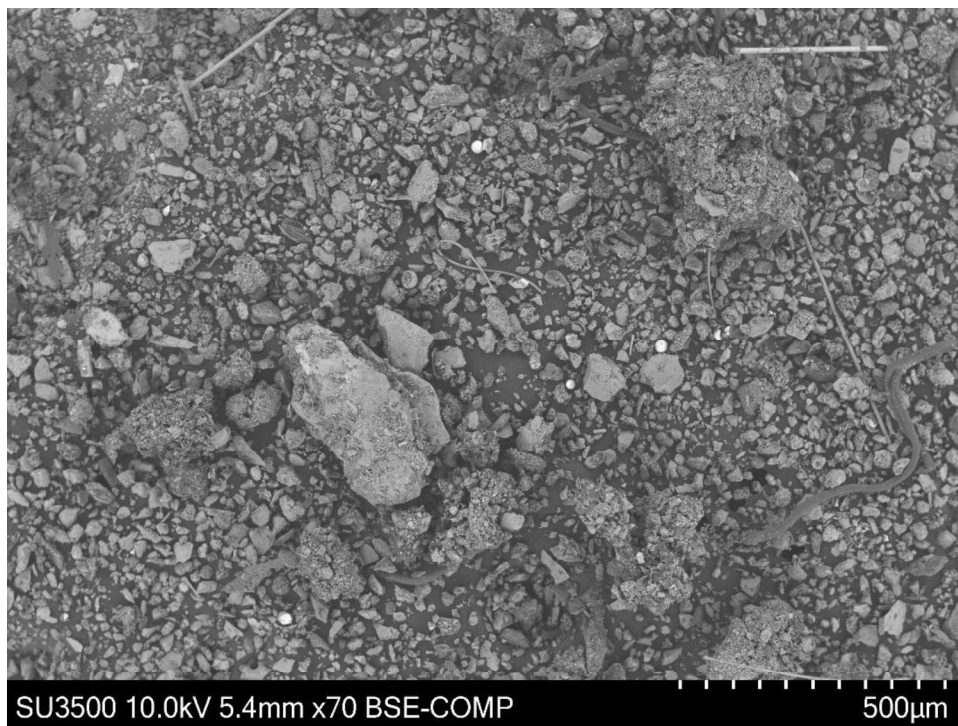


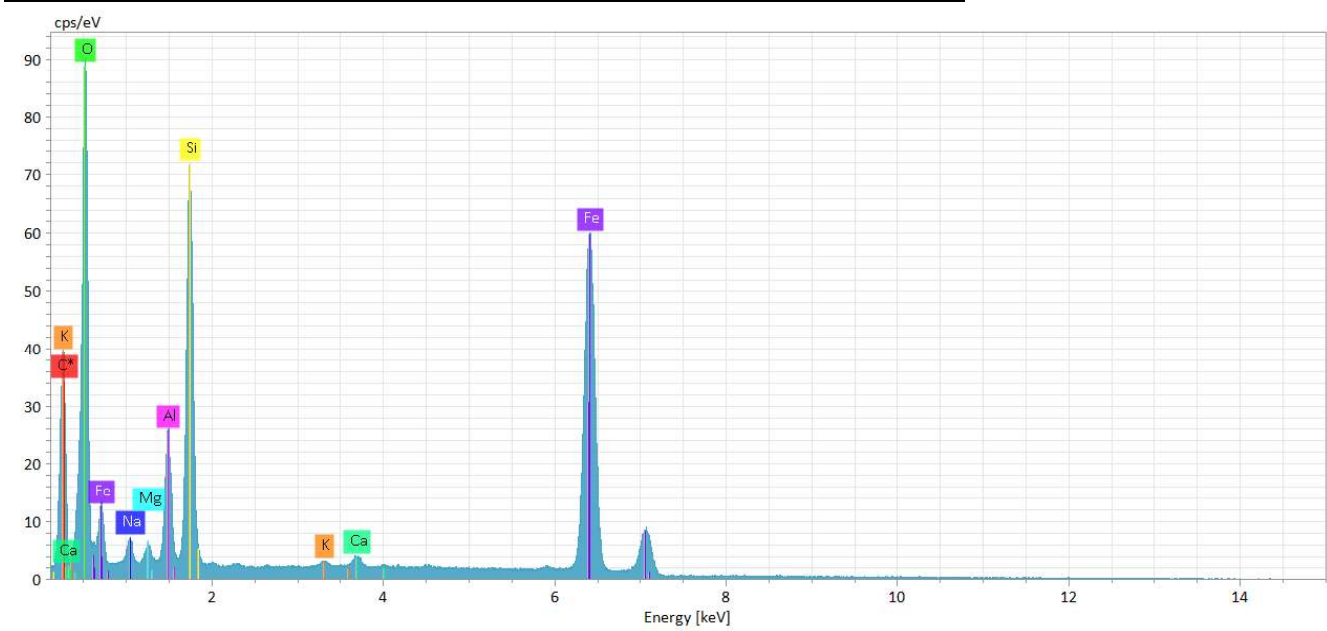
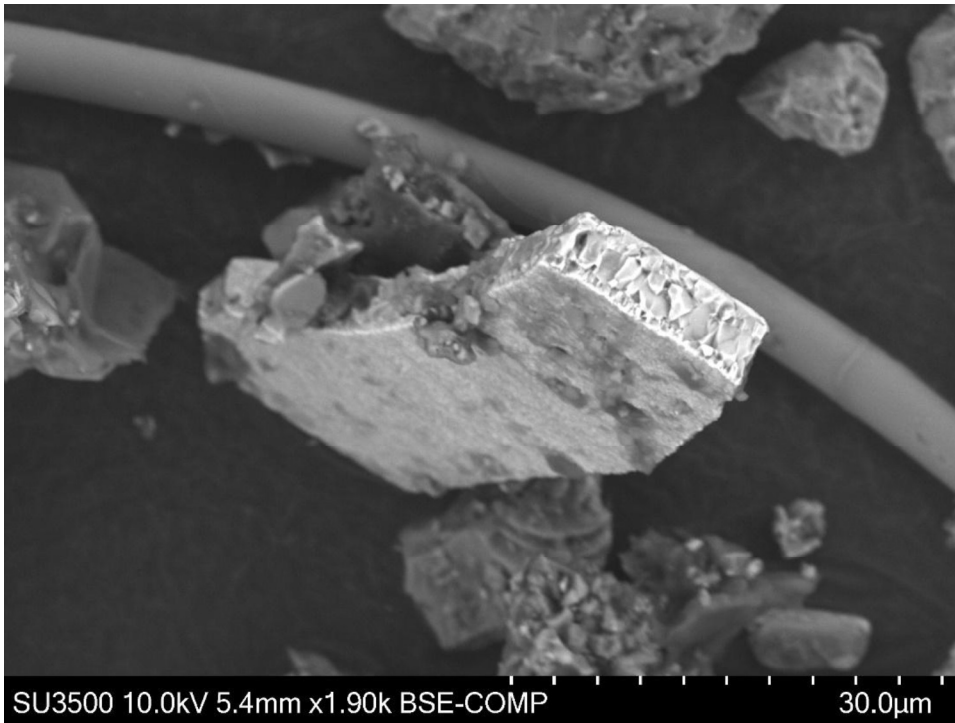
Element	At. No.	Net	Mass[%]	Mass Norm.[%]	Atom[%]	abs. error[mass%] (1σ)	rel. error[%] (1σ)
Nickel	28	117831	66.45	65.63	54.60	1.61	2.42
Chromium	24	75027	13.90	13.73	12.90	0.26	1.90
Oxygen	8	18913	4.20	4.15	12.67	0.20	4.70
Iron	26	35312	10.50	10.37	9.07	0.23	2.18
Silicon	14	36983	4.31	4.25	7.40	0.14	3.20
Aluminium	13	15470	1.88	1.86	3.36	0.07	3.82
Carbon	6	71863	0	0	0	0	0
		Sum	101.25	100	100		

There was a lot of carbon material on the surface of this particle so I set the peak fitting algorithm in the EDX analysis software to analyze the carbon peak for deconvolution purposes only and not include it in the composition calculation (carbon is manually set to zero). This appears to be a nickel chrome alloy, or possibly a steel.

### HS-23

This sample had comparatively fewer particles than most others, but it was still not difficult to find them.

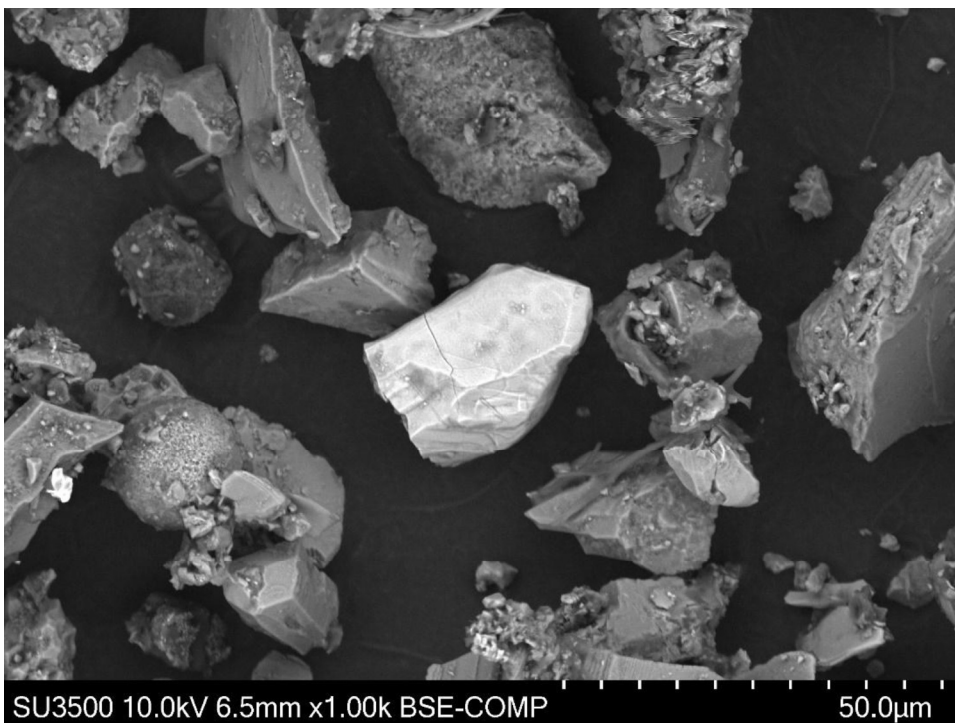
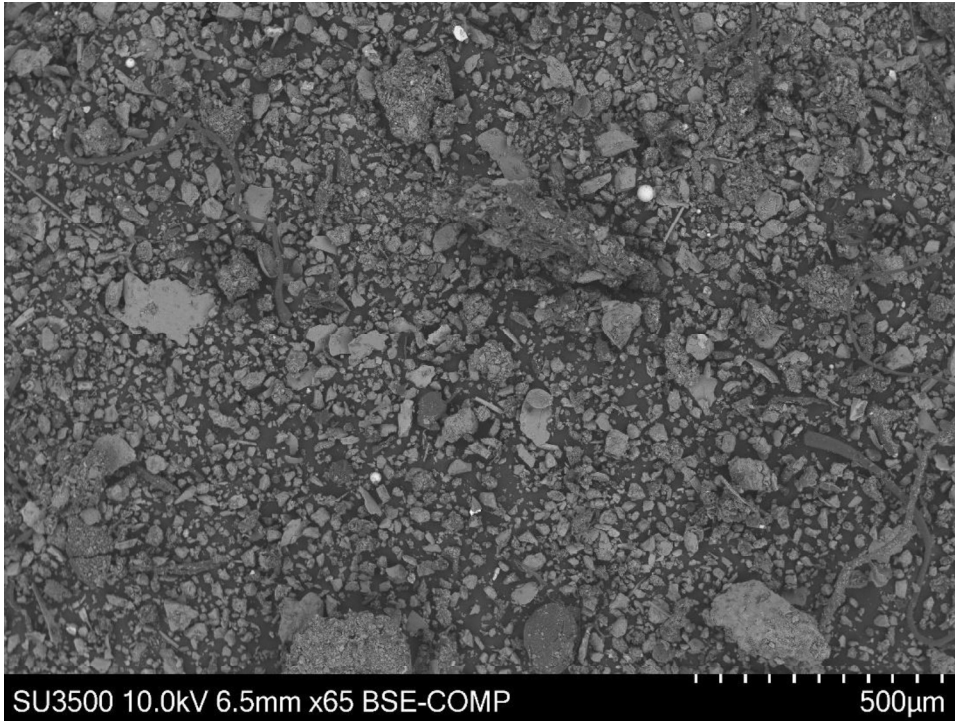


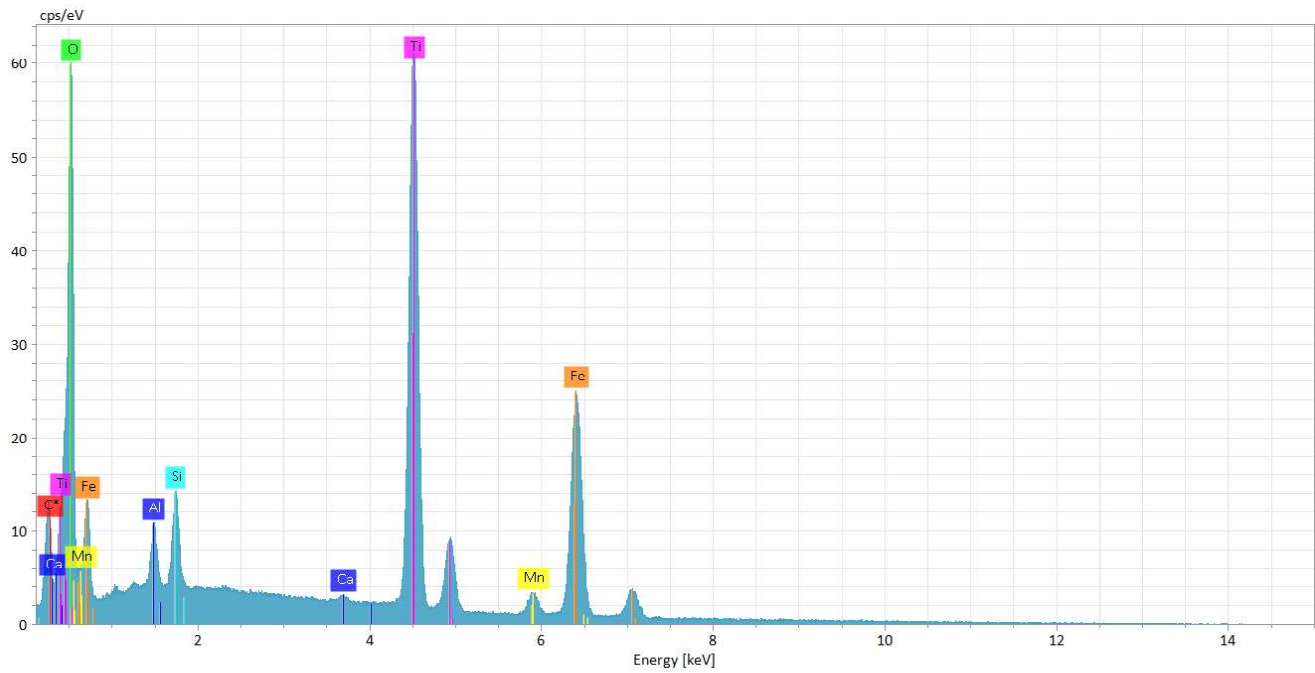


Element	At. No.	Net	Mass[%]	Mass Norm.[%]	Atom[%]	abs. error	rel. error[%] (1 $\sigma$ )
Oxygen	8	126940	20.28	21.98	43.62	0.84	4.14
Iron	26	212776	52.21	56.60	32.18	1.06	2.04
Silicon	14	129805	13.42	14.55	16.45	0.42	3.11
Aluminium	13	37988	3.70	4.01	4.72	0.14	3.65
Sodium	11	5793	0.82	0.89	1.23	0.05	5.84
Calcium	20	6147	0.85	0.92	0.73	0.02	2.61
Potassium	19	4770	0.61	0.66	0.54	0.02	2.84
Magnesium	12	3012	0.32	0.35	0.45	0.02	5.35
Carbon	6	45	0.03	0.03	0.07	0.02	74.68
		Sum	92.24664	100	100		

This particle has a high iron and oxygen content. The higher silicon content might conclude that this is a silicate mineral containing iron. On the other hand, the shape is not necessarily what would be expected from such a mineral, and from the edge it does look like some visible grain structure can be seen which points to a metallic particle.

HS-24





Element	At. No.	Net	Mass[%]	Mass Norm.[%]	Atom[%]	abs. error[mass%] (1 $\sigma$ )	rel. error[%] (1 $\sigma$ )
Oxygen	8	86443	30.67	30.93	51.09	4.02	13.11
Carbon	6	20180	7.42	7.49	16.47	0.37	5.03
Titanium	22	215297	26.73	26.96	14.88	0.49	1.85
Iron	26	96385	28.91	29.16	13.80	0.65	2.26
Manganese	25	12130	2.90	2.92	1.41	0.08	2.73
Silicon	14	22338	1.41	1.42	1.34	0.04	3.18
Aluminium	13	13106	0.91	0.92	0.90	0.03	3.79
Calcium	20	2242	0.19	0.20	0.13	0.01	3.34
		Sum	99.14	100	100		

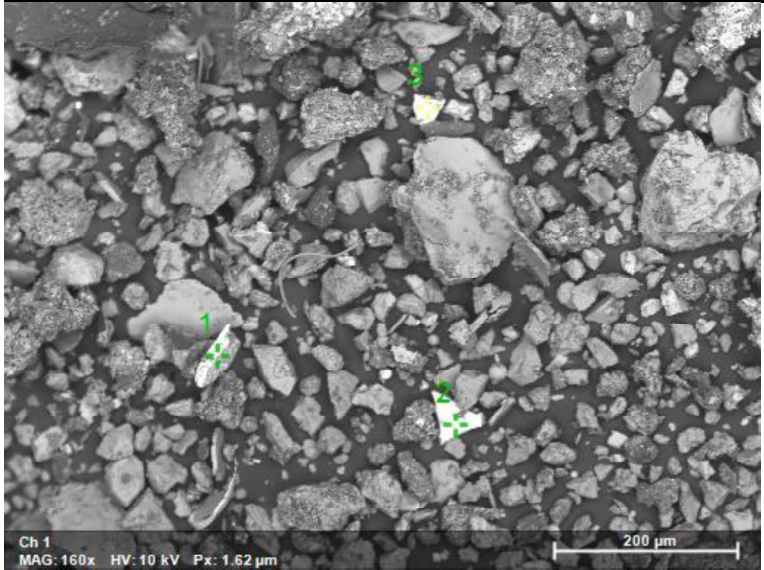
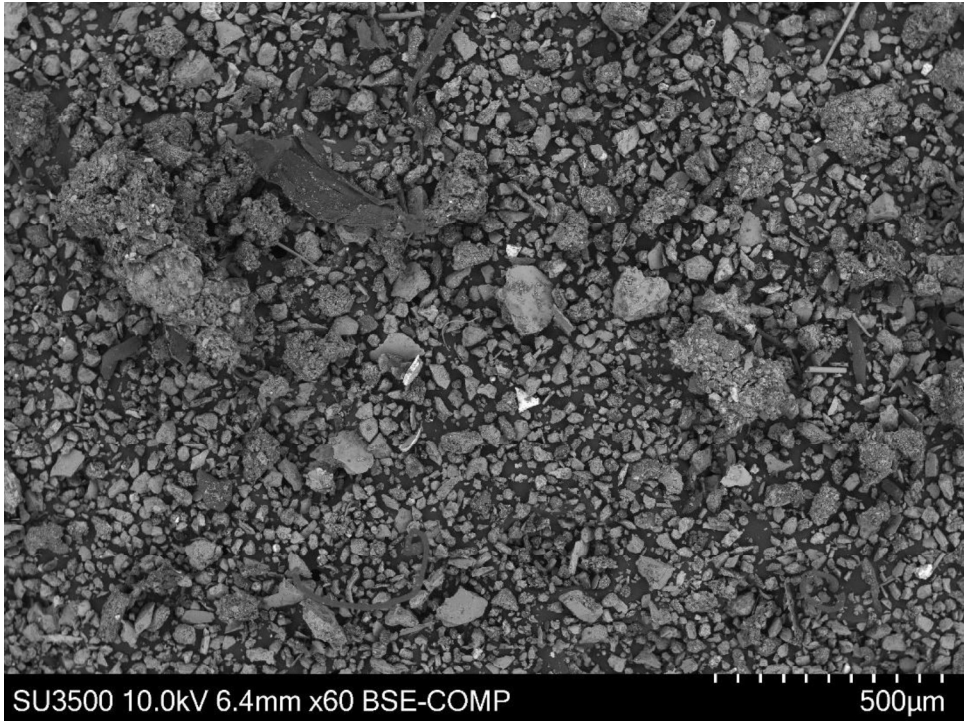
This is a titanium and iron oxide. The shape seems pretty congruent with the other materials and what I would expect from a rock. I'm inclined to believe this is a naturally occurring rock.

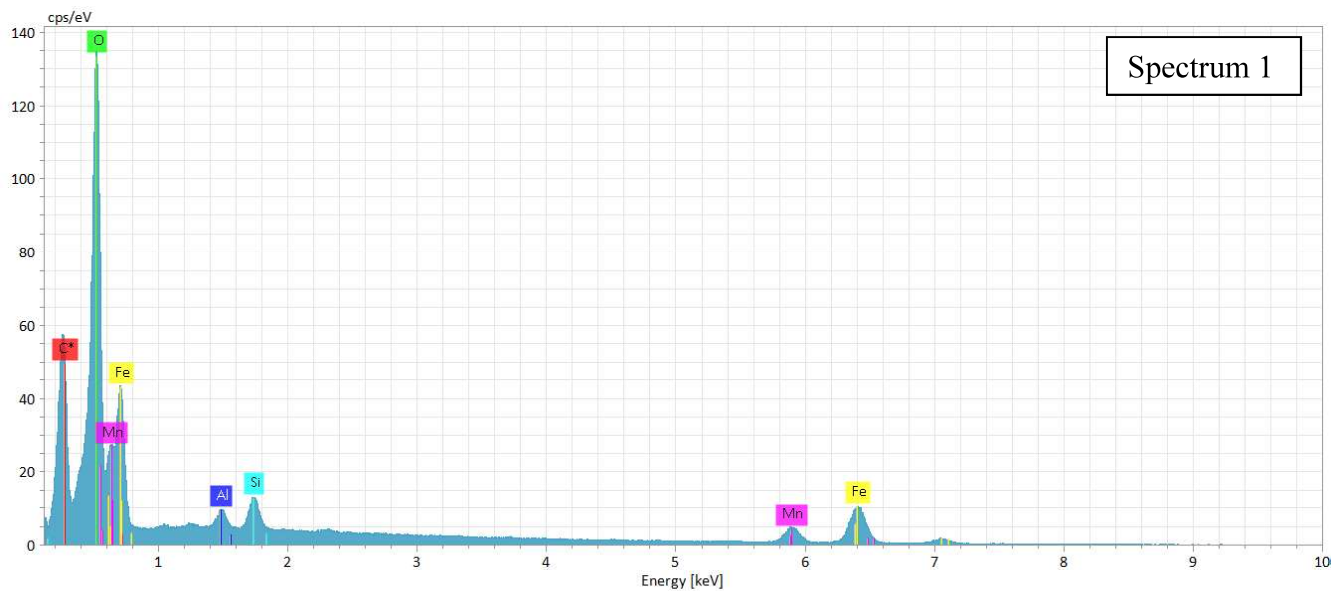


The last image is of one of the spherical particles. While EDX data was not collected on the particle (lots of iron oxide spheres had been observed at this point to the point that further analysis of spheres seemed unnecessary), it was interesting to note that the particle itself appears to be hollow (with some lighter materials inside). This was the only “broken” sphere observed so it’s not clear if this is a one-off or indicative all spheres.

### HS-25

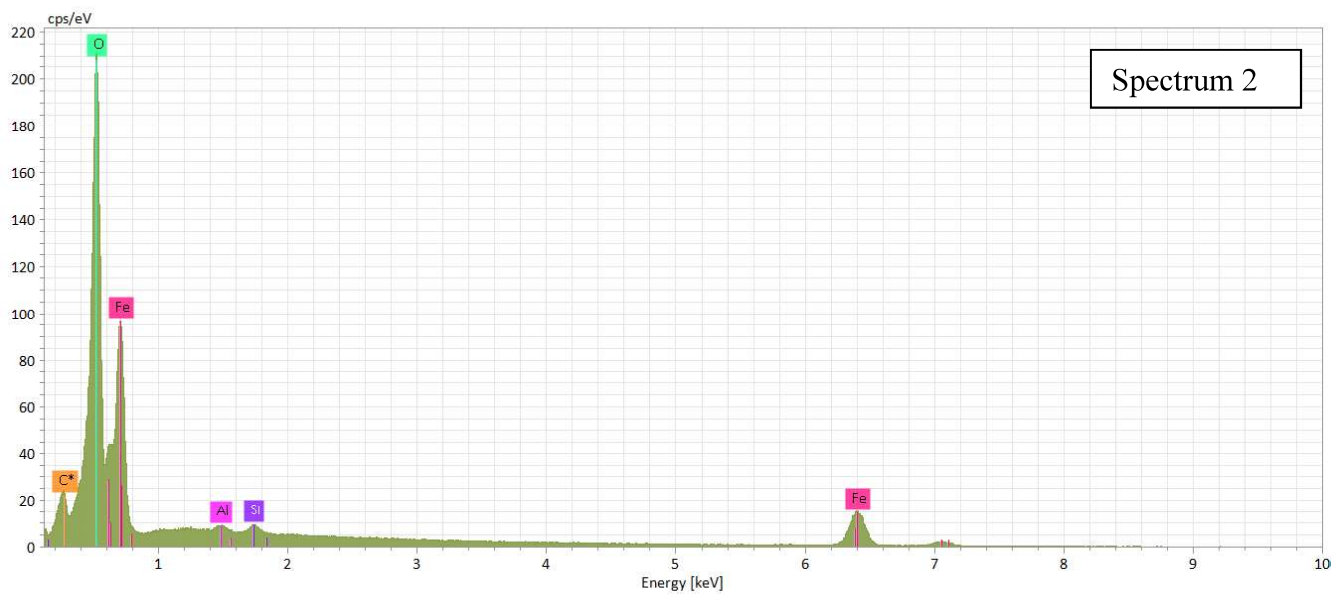
Immediately from the over-view there are several examples worth investigating.





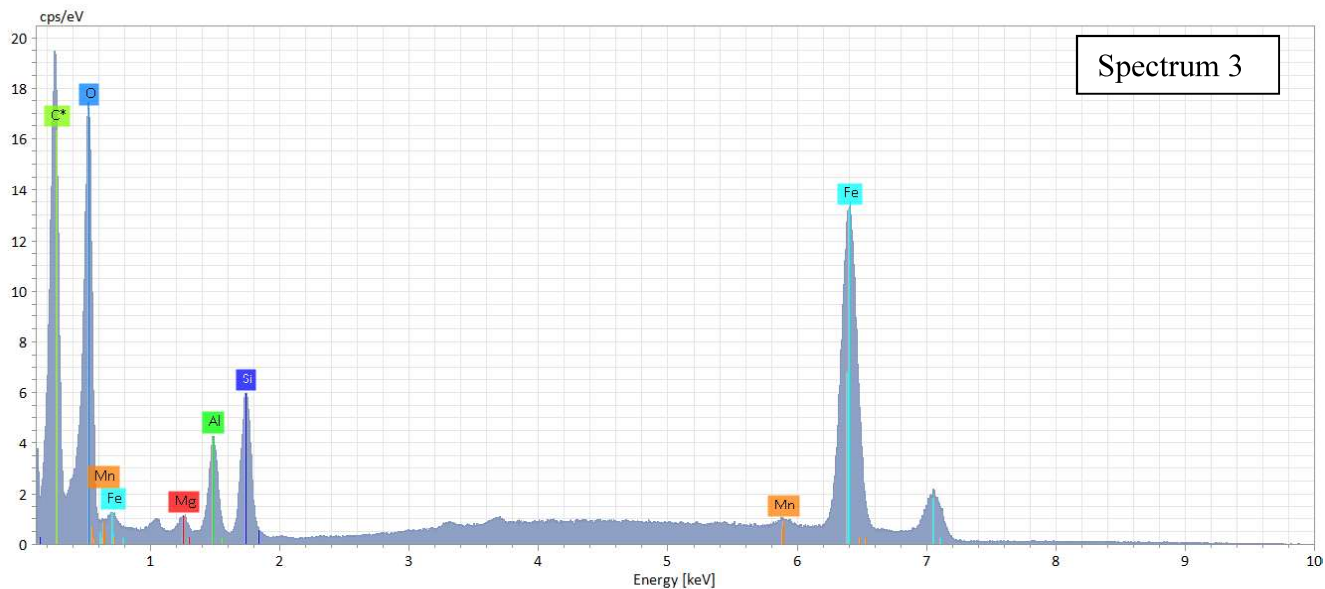
Element	At. No.	Net	Mass[%]	Mass Norm.[%]	Atom[%]	abs. error[mass%] (1 $\sigma$ )	rel. error[%] (1 $\sigma$ )
Oxygen	8	167483	23.56	23.45	38.73	0.83	3.52
Carbon	6	58688	13.83	13.76	30.28	0.62	4.49
Iron	26	37861	47.60	47.38	22.42	1.91	4.02
Manganese	25	16264	13.05	12.99	6.25	0.48	3.66
Silicon	14	18824	1.72	1.71	1.61	0.05	3.10
Aluminium	13	9665	0.72	0.71	0.70	0.03	3.73
		Sum	100.47	100	100		

The first is another iron oxide particle.



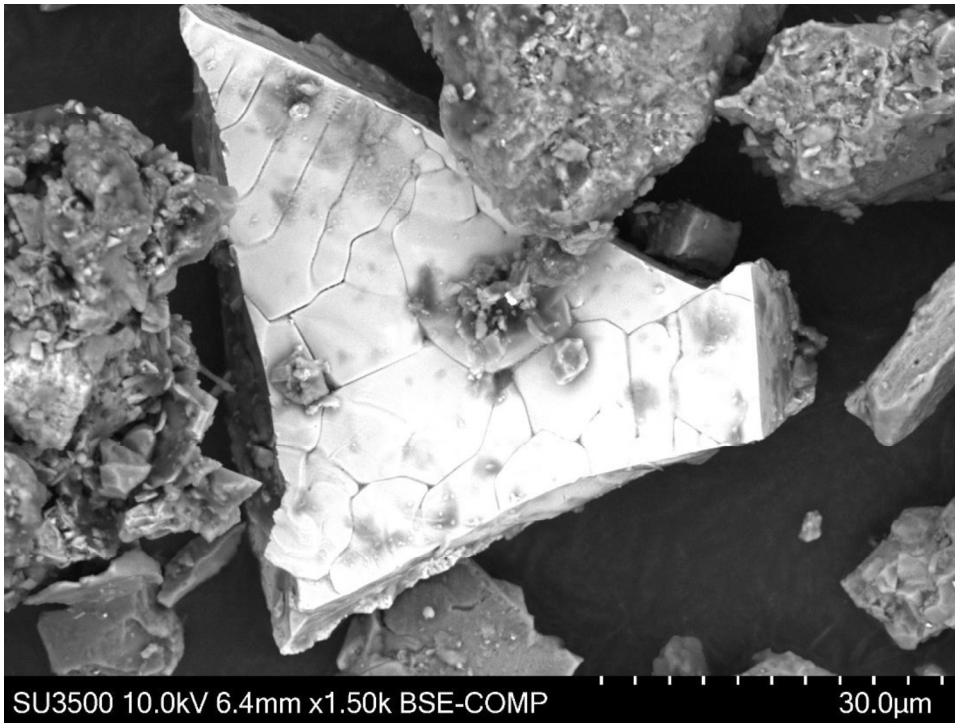
Element	At. No.	Net	Mass[%]	Mass Norm.[%]	Atom[%]	abs. error[mass%] (1 $\sigma$ )	rel. error[%] (1 $\sigma$ )
Oxygen	8	213210	31.11	31.33	60.41	1.00	3.21
Iron	26	44021	66.76	67.24	37.15	2.74	4.10
Carbon	6	1875	0.58	0.59	1.51	0.04	6.70
Silicon	14	6304	0.62	0.63	0.69	0.02	3.53
Aluminium	13	2964	0.21	0.21	0.24	0.01	4.44
		Sum	99.28	100	100		

The second particle is also iron oxide.



Element	At. No.	Net	Mass[%]	Mass Norm.[%]	Atom[%]	abs. error[mass%] (1 $\sigma$ )	rel. error[%] (1 $\sigma$ )
Iron	26	202119	102.20	54.75	30.02	3.43	3.35
Carbon	6	136594	21.30	11.41	29.09	0.98	4.60
Silicon	14	51680	28.58	15.31	16.69	1.11	3.89
Oxygen	8	120436	10.08	5.40	10.33	0.36	3.58
Aluminium	13	34329	14.97	8.02	9.10	0.64	4.31
Magnesium	12	10774	5.09	2.72	3.43	0.26	5.12
Manganese	25	17993	4.46	2.39	1.33	0.14	3.14
		Sum	186.68	100	100		

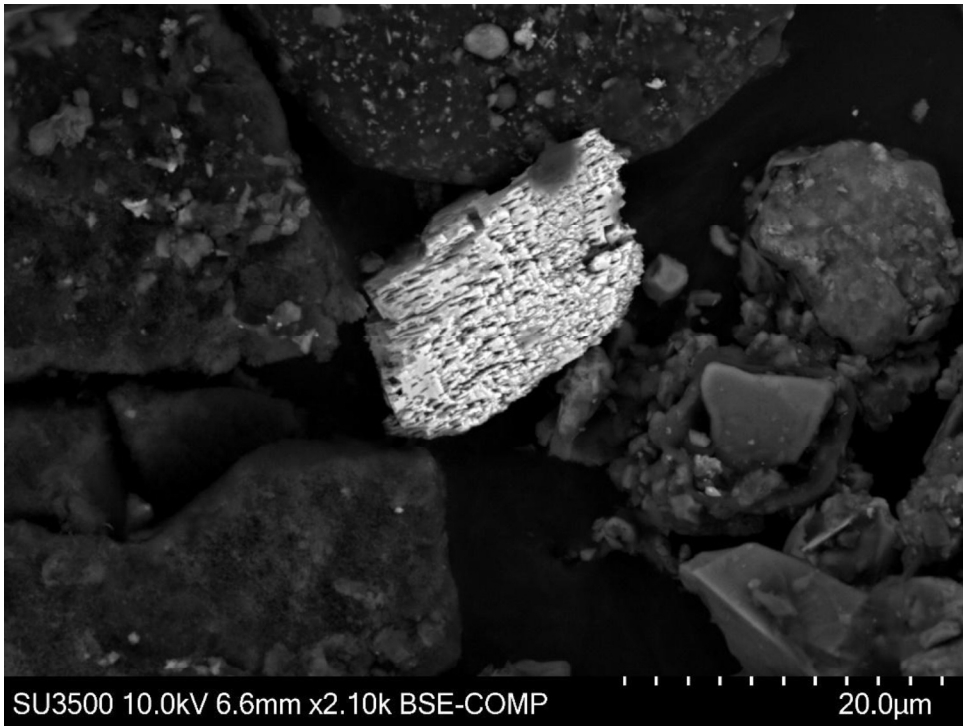
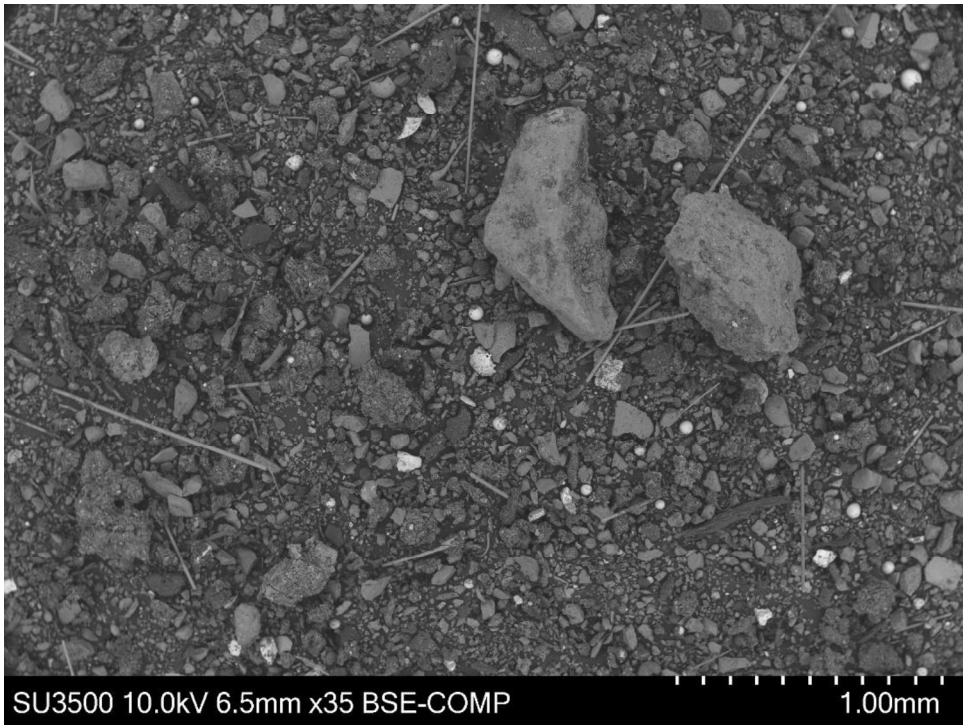
The third particle is another iron containing aluminosilicate, probably naturally occurring.

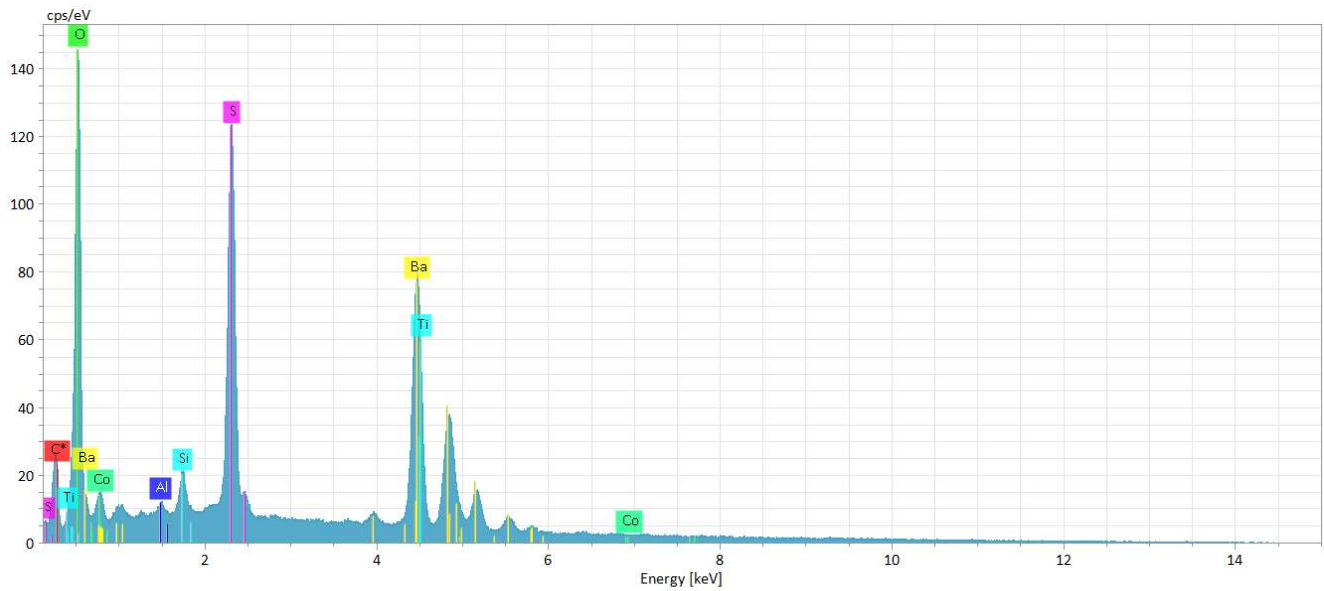


The image above is a close up of the second particle analyzed. The shape and visible grains could be indicative of a metallic particle (that has been oxidized).

### HS-32

This sample had far and away the highest density of heavier element containing particles. Far too many to find a representative collection in the allotted time. The most interesting example is noted below.



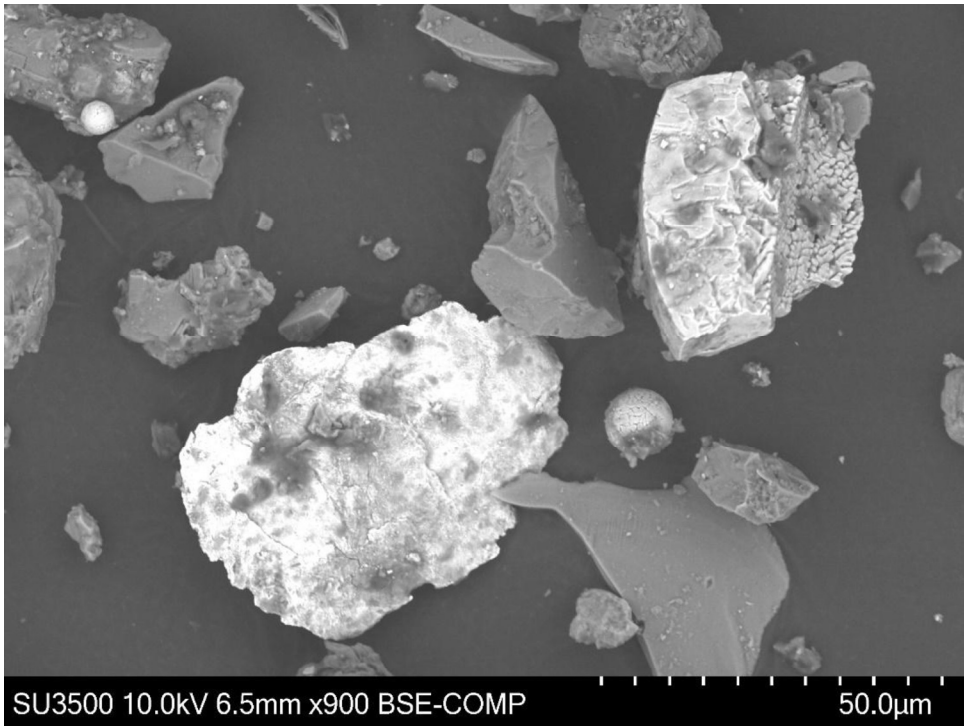
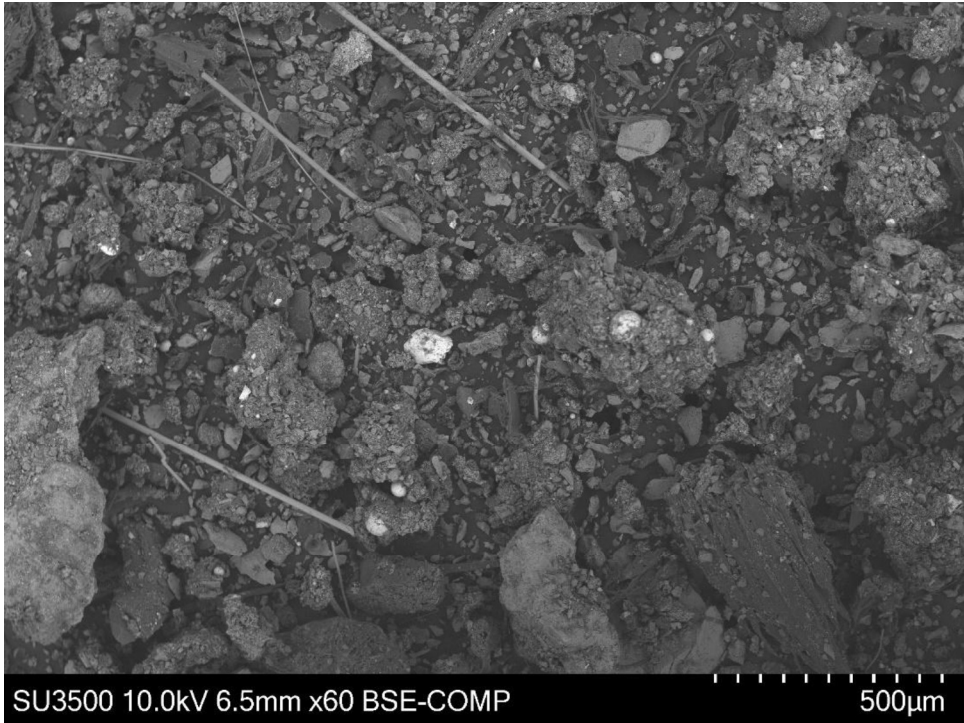


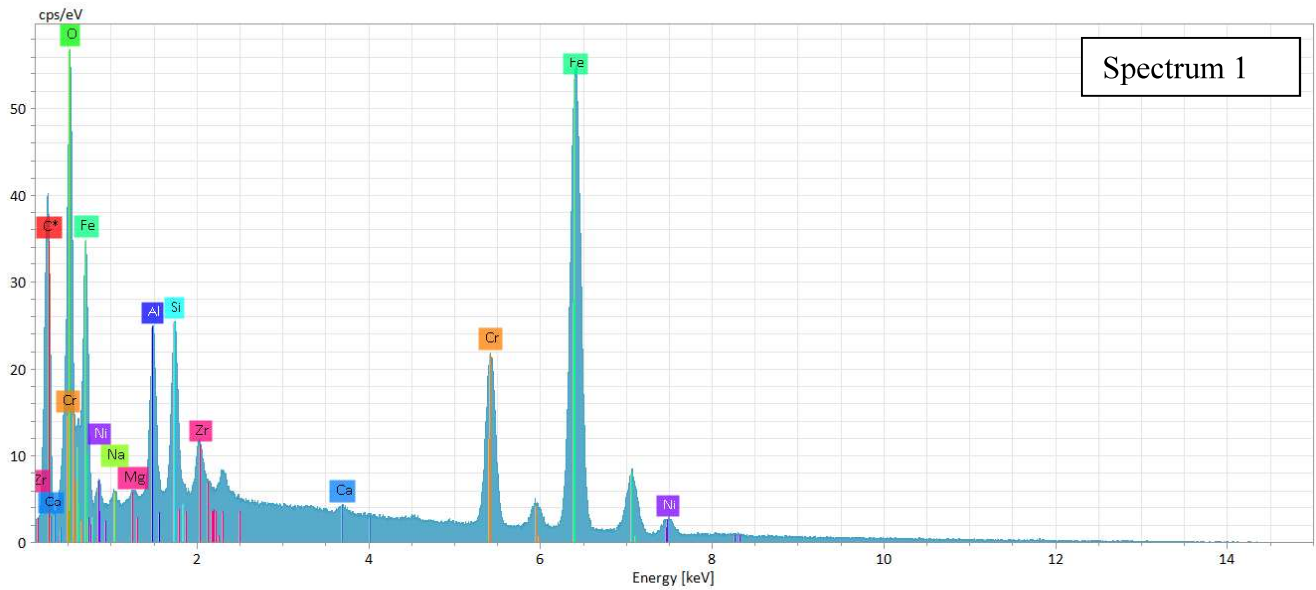
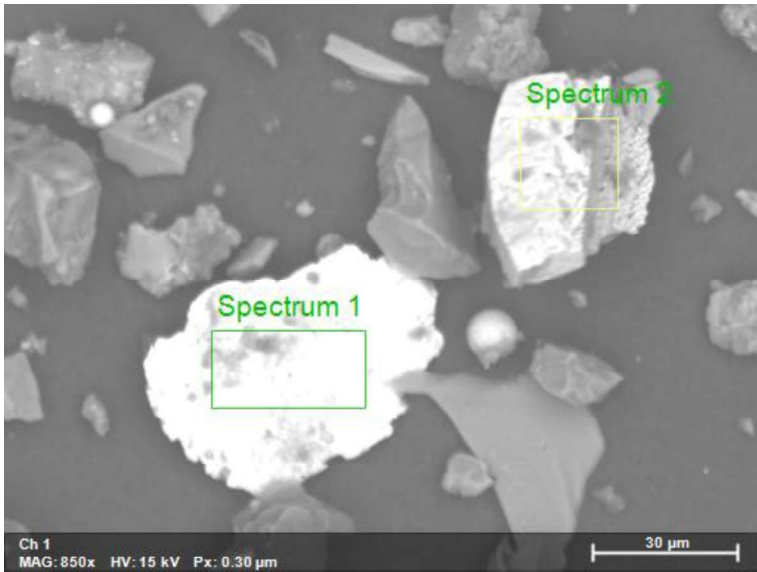
Element	At. No.	Net	Mass[%]	Mass Norm.[%]	Atom[%]	abs. error[mass%] (1 $\sigma$ )	rel. error[%] (1 $\sigma$ )
Oxygen	8	96017	23.72	27.21	53.87	2.84	11.99
Carbon	6	12907	6.88	7.90	20.82	0.35	5.15
Barium	56	186187	43.25	49.62	11.44	1.75	4.05
Sulfur	16	128304	8.84	10.14	10.02	0.20	2.27
Titanium	22	16085	2.73	3.13	2.07	0.21	7.72
Silicon	14	10151	0.82	0.94	1.06	0.03	3.39
Cobalt	27	1557	0.73	0.84	0.45	0.03	3.79
Aluminium	13	2058	0.20	0.23	0.27	0.01	4.97
		Sum	87.17	100	100		

This is a barium oxide/sulfide. Very unusual and the only example of barium in any sample. Most probably some kind of contaminant.

### HS-33

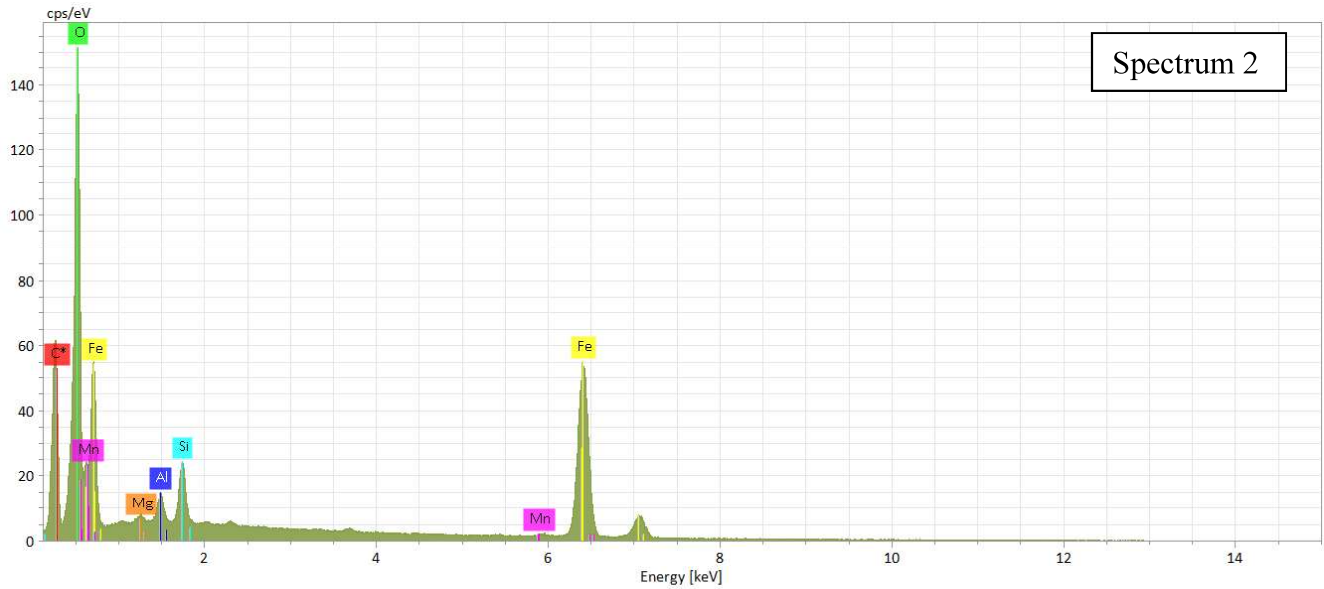
This sample had quite a lot of candidates to analyze.





Element	At. No.	Net	Mass[%]	Mass Norm.[%]	Atom[%]	abs. error[mass%] (1 σ)	rel. error[%] (1 σ)
Carbon	6	51761	22.13	23.33	51.45	1.13	5.10
Iron	26	165905	45.28	47.73	22.64	0.95	2.10
Oxygen	8	34024	7.75	8.18	13.53	0.37	4.74
Chromium	24	59732	9.20	9.70	4.94	0.18	1.96
Aluminium	13	30302	2.27	2.39	2.35	0.08	3.61
Silicon	14	32307	2.13	2.24	2.12	0.07	3.10
Nickel	28	6084	2.71	2.86	1.29	0.08	2.91
Zirconium	40	24107	2.56	2.70	0.78	0.07	2.72
Sodium	11	3332	0.47	0.49	0.57	0.03	6.22
Magnesium	12	2021	0.19	0.20	0.22	0.01	5.79
Calcium	20	1866	0.17	0.18	0.12	0.01	3.43
		Sum	94.85	100	100		

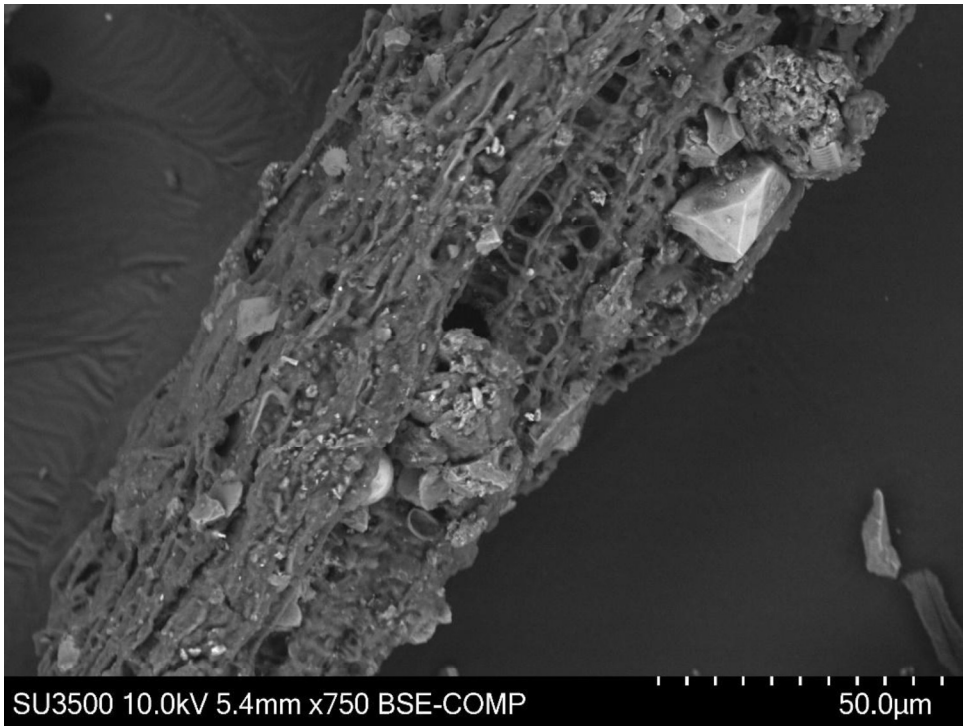
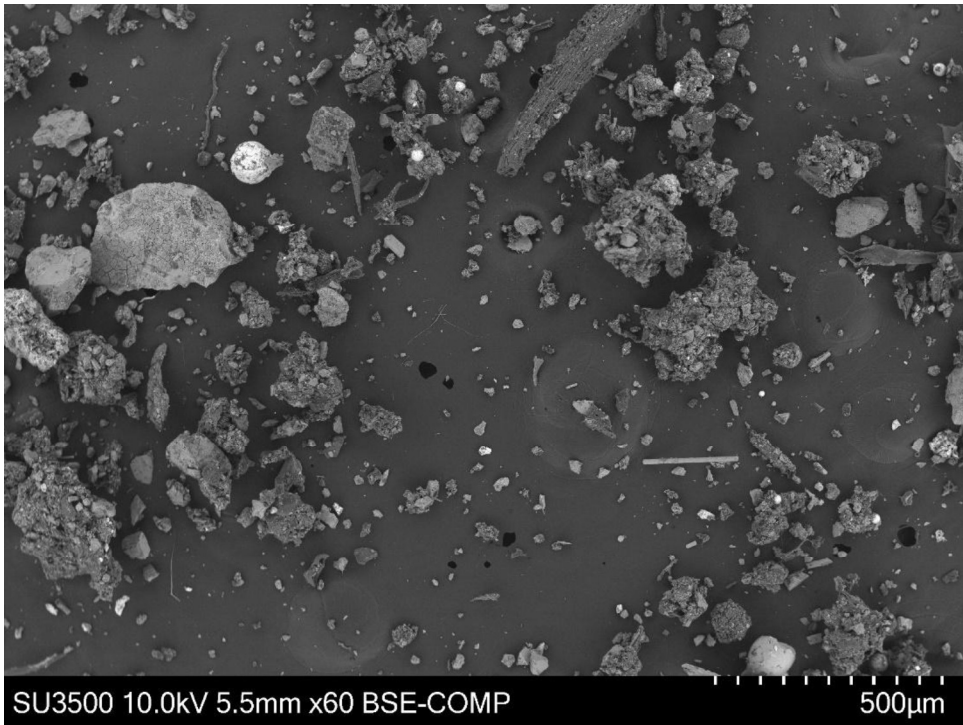
This would appear to be a stainless-steel chunk.

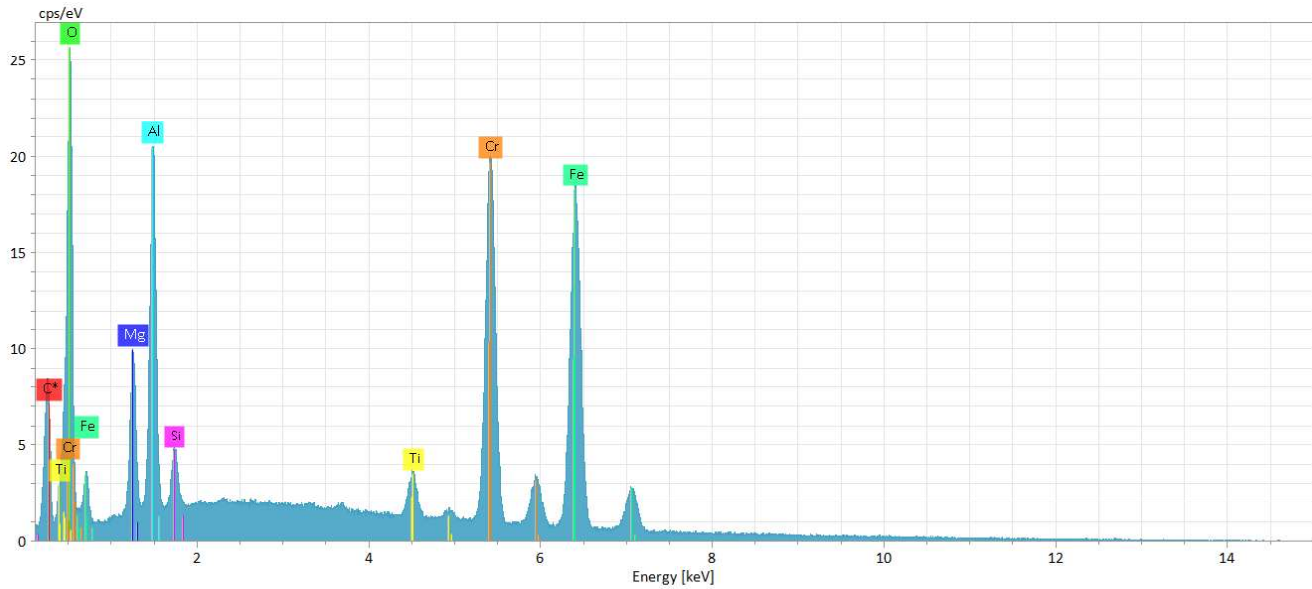


Element	At. No.	Net	Mass[%]	Mass Norm.[%]	Atom[%]	abs. error[mass%] (1 $\sigma$ )	rel. error[%] (1 $\sigma$ )
Oxygen	8	195258	39.96	34.45	43.78	1.76	4.39
Carbon	6	78316	27.26	23.50	39.78	1.35	4.96
Iron	26	152609	43.65	37.63	13.70	1.01	2.31
Silicon	14	29932	1.78	1.53	1.11	0.06	3.13
Aluminium	13	15263	1.02	0.88	0.66	0.04	4.37
Manganese	25	8393	1.76	1.52	0.56	0.07	3.80
Magnesium	12	6775	0.56	0.48	0.40	0.03	5.65
		Sum	116.00	100	100		

Again, we see iron, carbon, and oxygen, likely an iron particle with a thick surface oxide. If this particle has the same porosity as the seen previously then it could be an iron oxide shell with carbon inside.

HS-34





Element	At. No.	Net	Mass[%]	Mass Norm.[%]	Atom[%]	abs. error[mass%] (1 $\sigma$ )	rel. error[%] (1 $\sigma$ )
Carbon	6	26607	11.21	12.85	31.51	0.58	5.16
Iron	26	131962	33.11	37.95	20.01	0.70	2.11
Oxygen	8	48769	8.98	10.29	18.95	3.32	36.93
Chromium	24	137530	20.51	23.51	13.32	0.40	1.93
Aluminium	13	71532	6.91	7.91	8.64	0.25	3.63
Magnesium	12	29785	3.62	4.15	5.03	0.16	4.41
Titanium	22	17573	1.94	2.22	1.37	0.04	2.04
Silicon	14	11593	0.97	1.12	1.17	0.03	3.41
		Sum	87.26	100	100		

This appears to be a chunk of stainless steel.

## Discussion

All of the samples contained quite a significant quantity of particles that could be identified with backscattered electron imaging to contain heavier elements. Upon analyzing these particles with EDX it is clear that most of them are oxidized forms of iron and/or naturally occurring rocks/minerals. More prominently were stainless steel particles, a couple lead containing particles and one barium containing particle. These were clearly not natural, but any speculation on their origin would be premature. A comparison with controls is needed. And it must be noted that the controls may not necessarily exist in a moist environment and not necessarily prone to strong oxidation. Because the naturally occurring minerals would be oxide and all of the iron samples were oxidized to a degree, it makes it more difficult to ascertain which is naturally occurring and which is not. The samples which appear to have a substoichiometric oxide are probably due to the interaction volume of the electron beam containing a mixture of surface oxide and pure metal, and these examples could be concluded to be metal.

The spherical particles existed on every sample. Given that some samples were from areas well away from the potential contamination source, it seems extremely unlikely that these spheres could come from that source.

There is sufficient evidence of stainless-steel particles on a number of the samples. Stainless steel could come from any number of sources and there does not seem to be any kind of distinct pattern to their presence in the soil samples. The filter and powder samples were analyzed next.

### **Filter and Powder Sample Preparation**

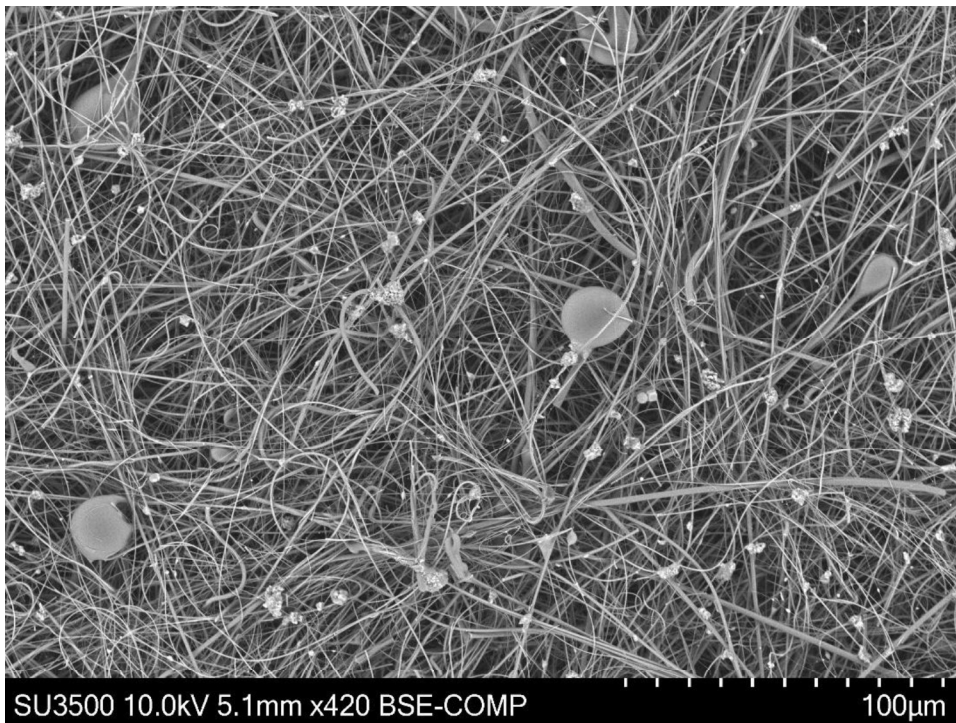
Circular pieces of the filters were cut out and placed directly on SEM stubs with double-sided adhesive carbon tape. The powder samples similarly were stuck to the stubs by placing the adhesive tape on the stub and dipping the stub in the powder. As with the soil samples, there were given a conductive coating of amorphous carbon using the coating system.

### **Filter Analysis**

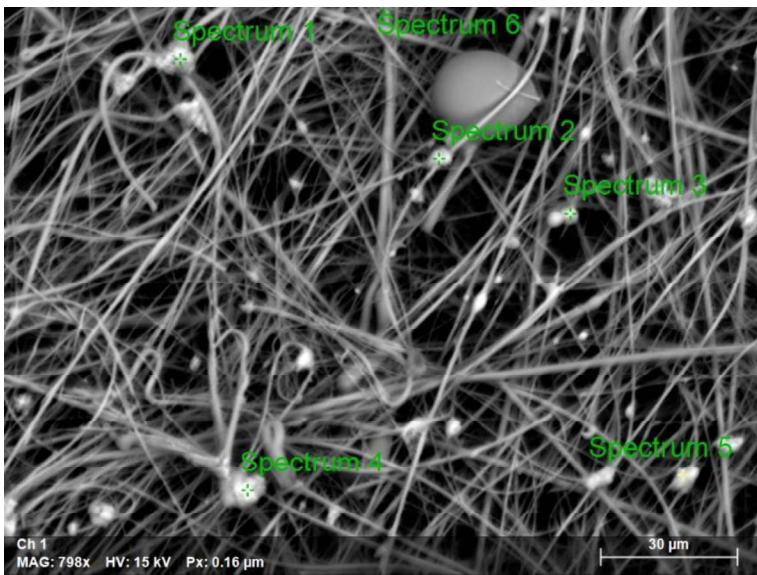
The filters were very clean, with very few particles to be found. HDR 2 especially had very little to find.

#### HDR 1

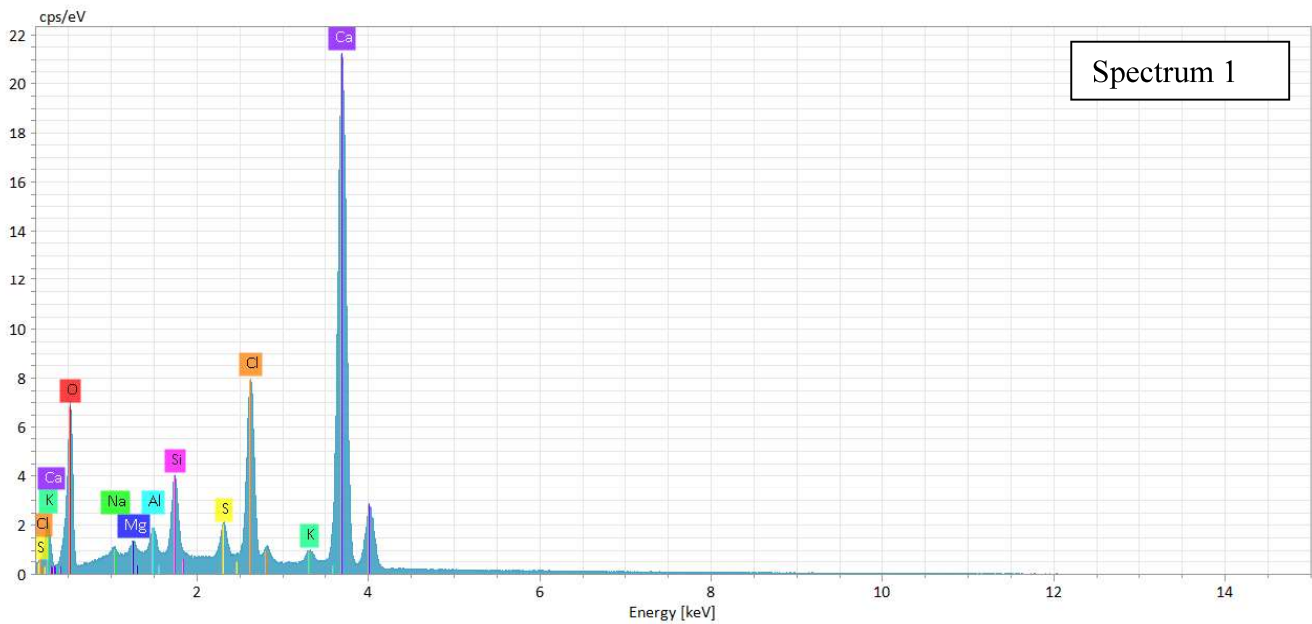
The filter labelled “HDR 1” contained a significant number of small particles.

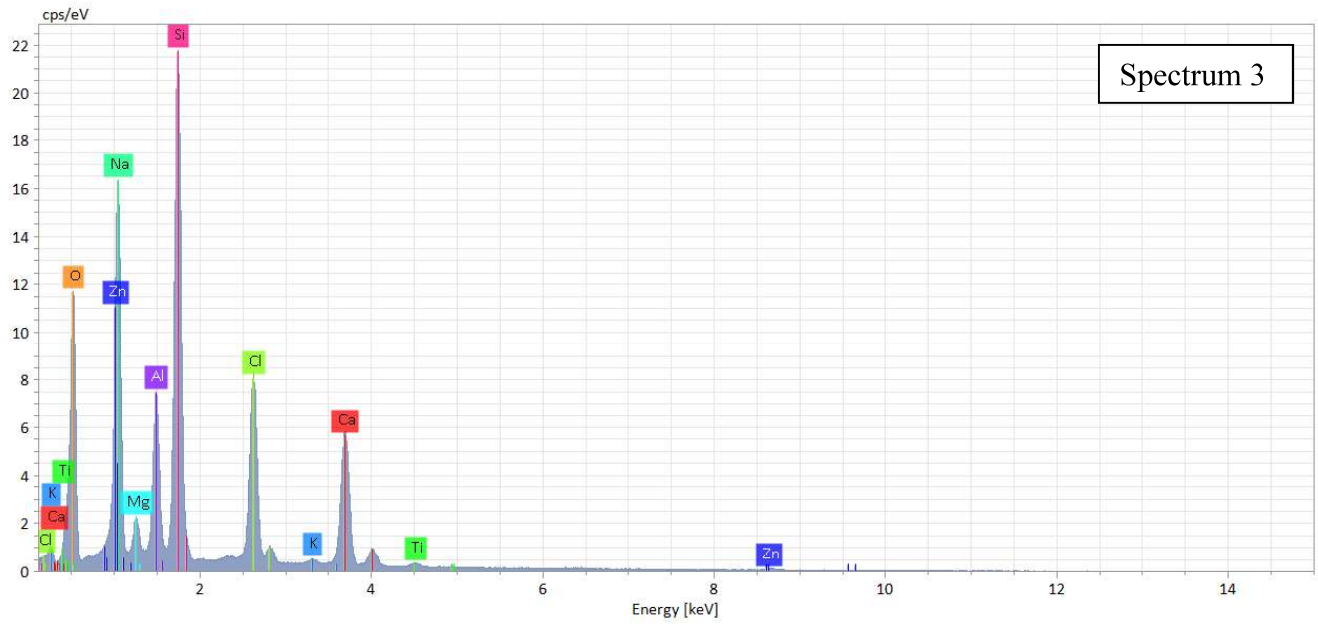
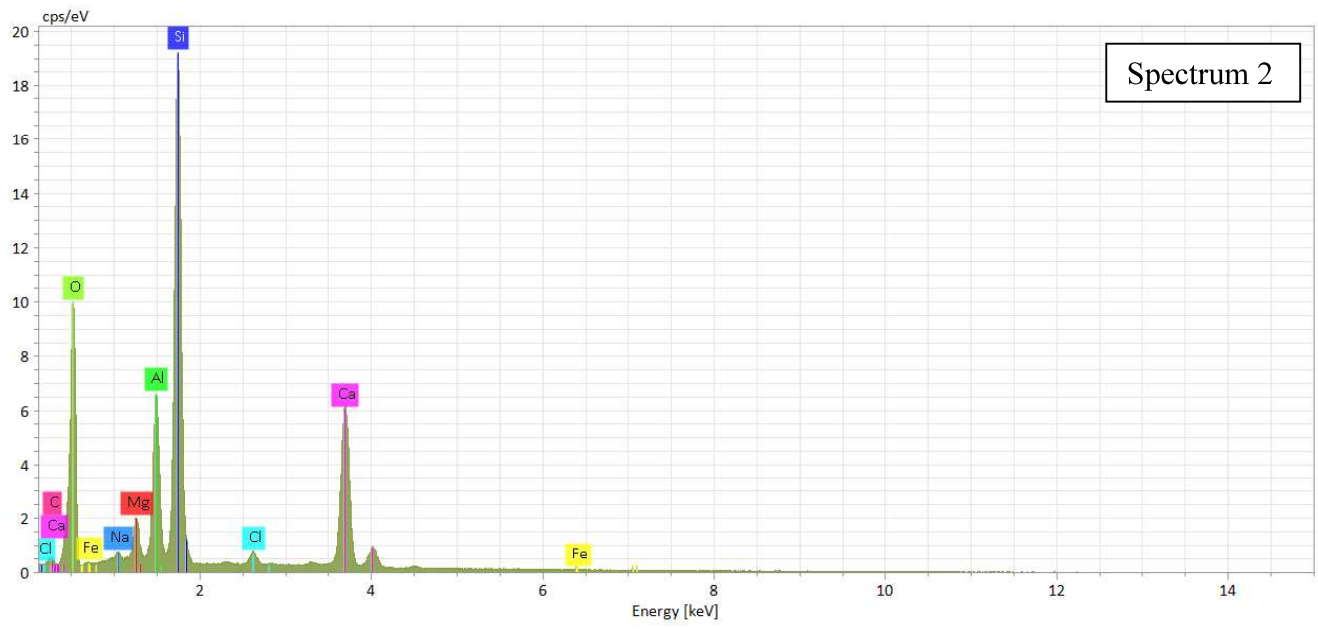


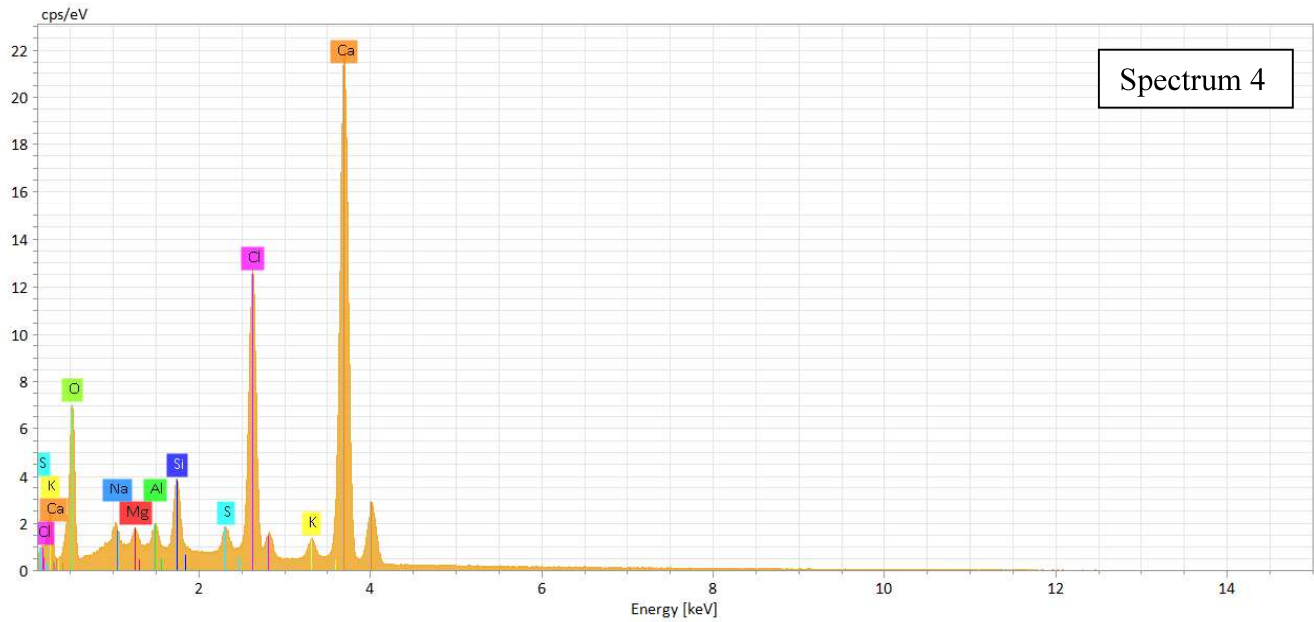
EDX analysis of these particles revealed that most of them are not metallic particles.



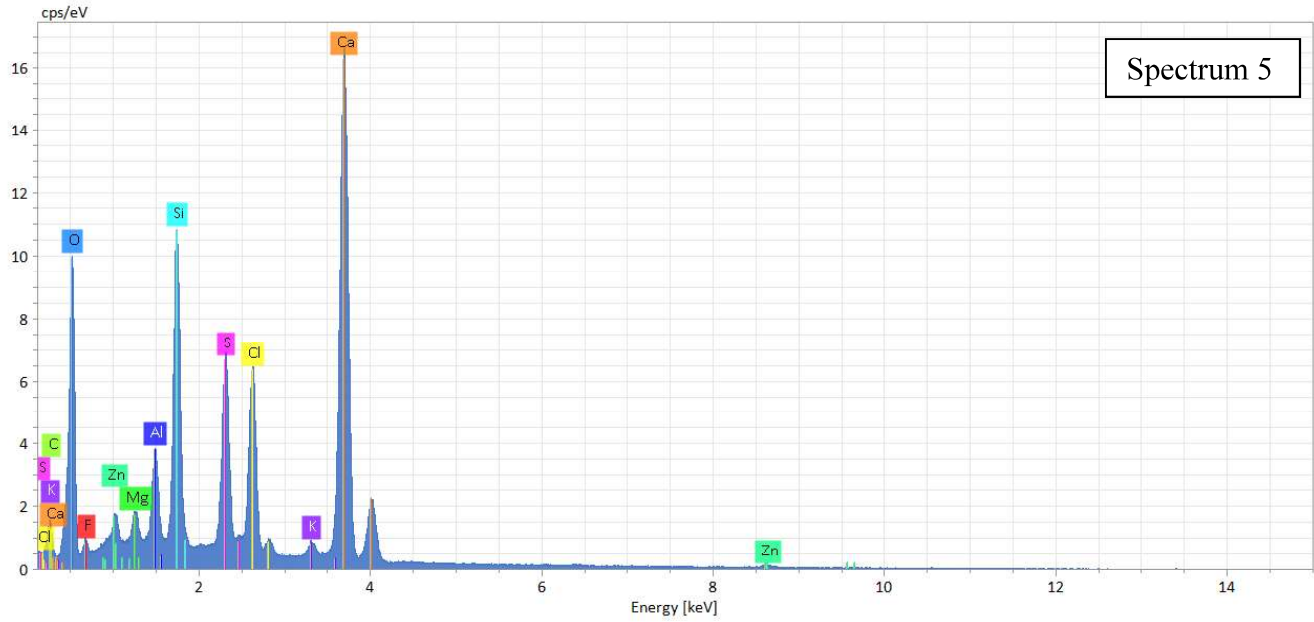
All of these particles analyzed were found to be non-metallic particles, as can be seen from the spectra below. Note that sixth analysis spot was aborted before finishing due to insufficient x-ray counts, so that spectrum is omitted.





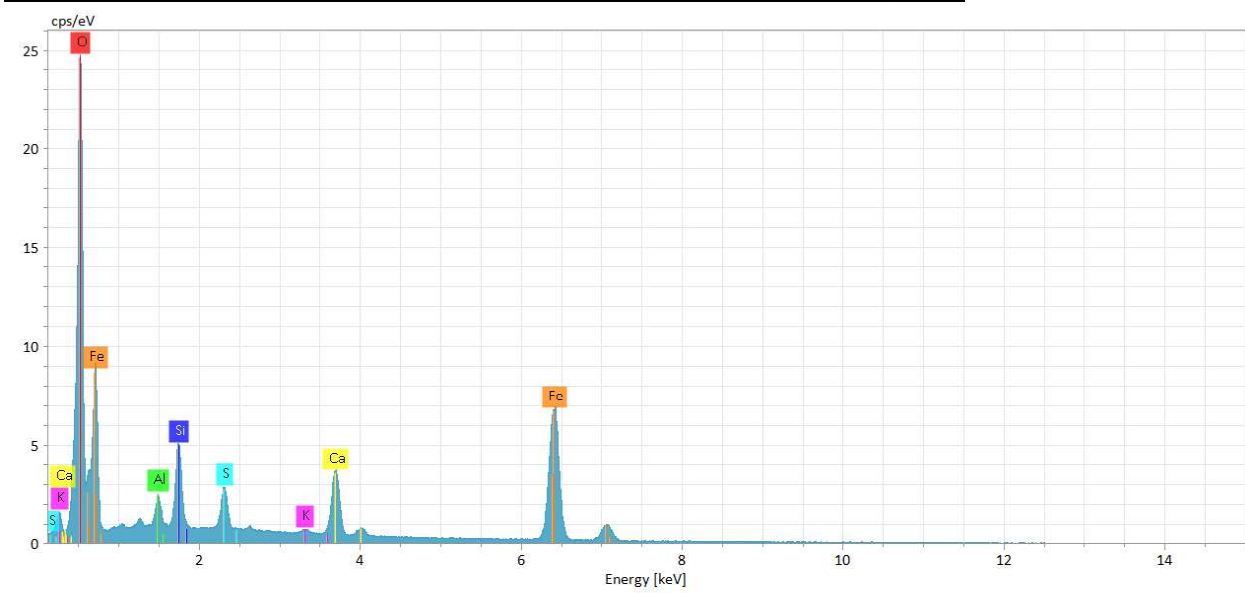
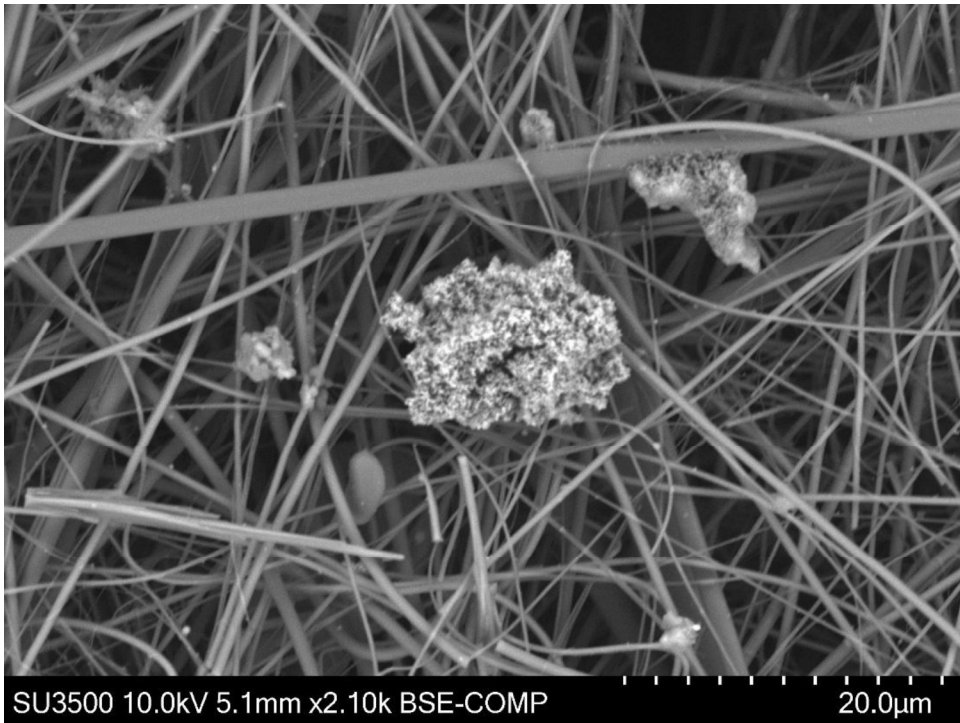


Spectrum 4



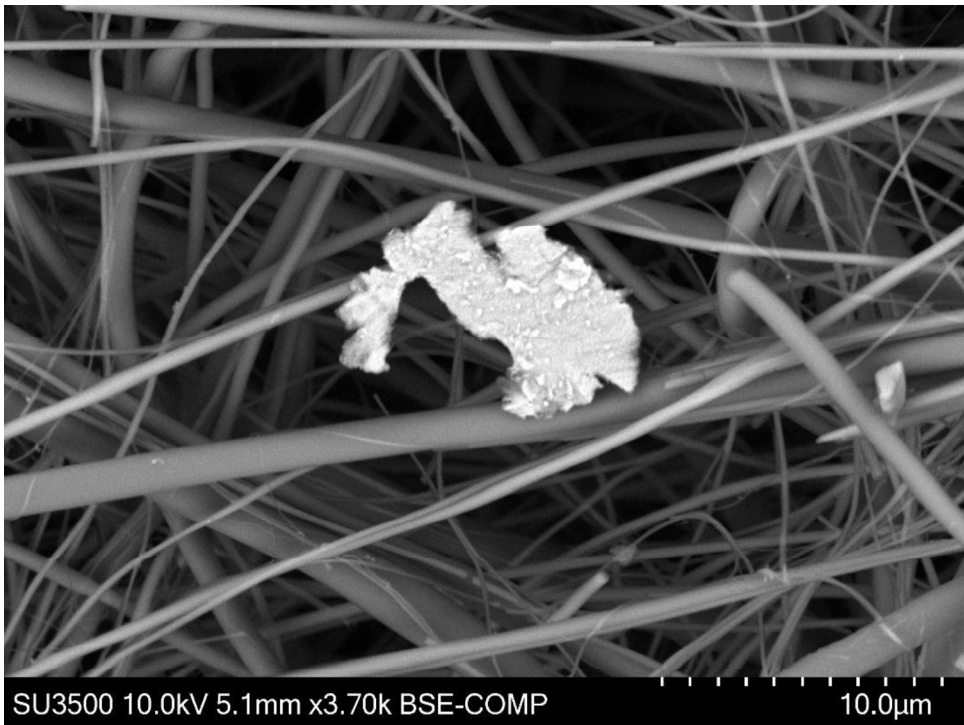
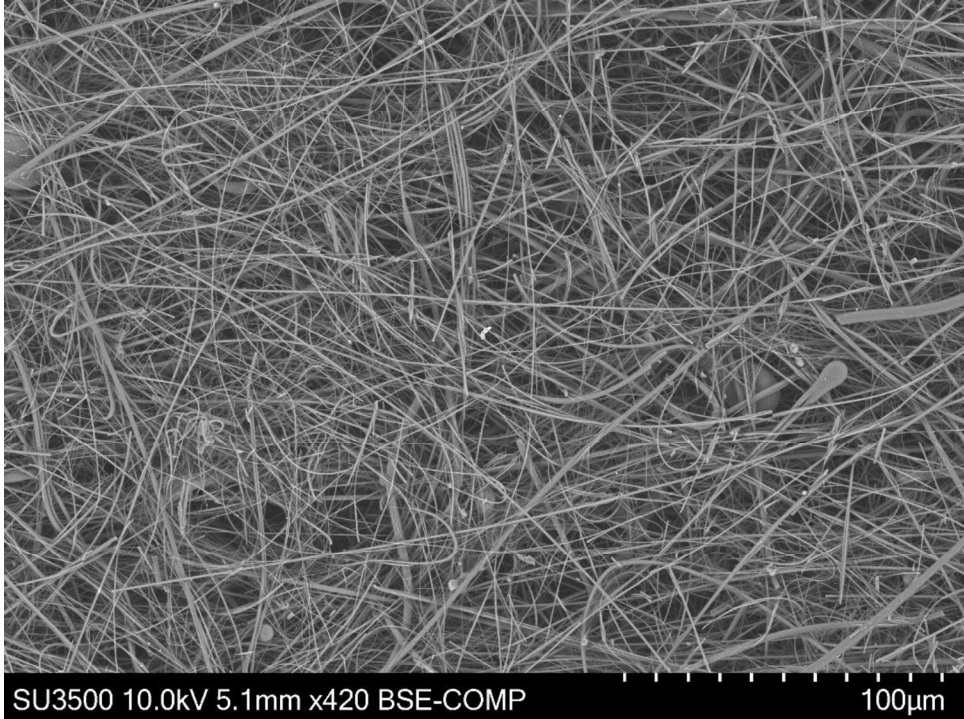
Spectrum 5

While the majority of particles found on the filter material did not contain heavier elements, a handful of iron oxide particles were observed. They were quite small with the largest observable still being under 20µm in diameter (example in the image below).

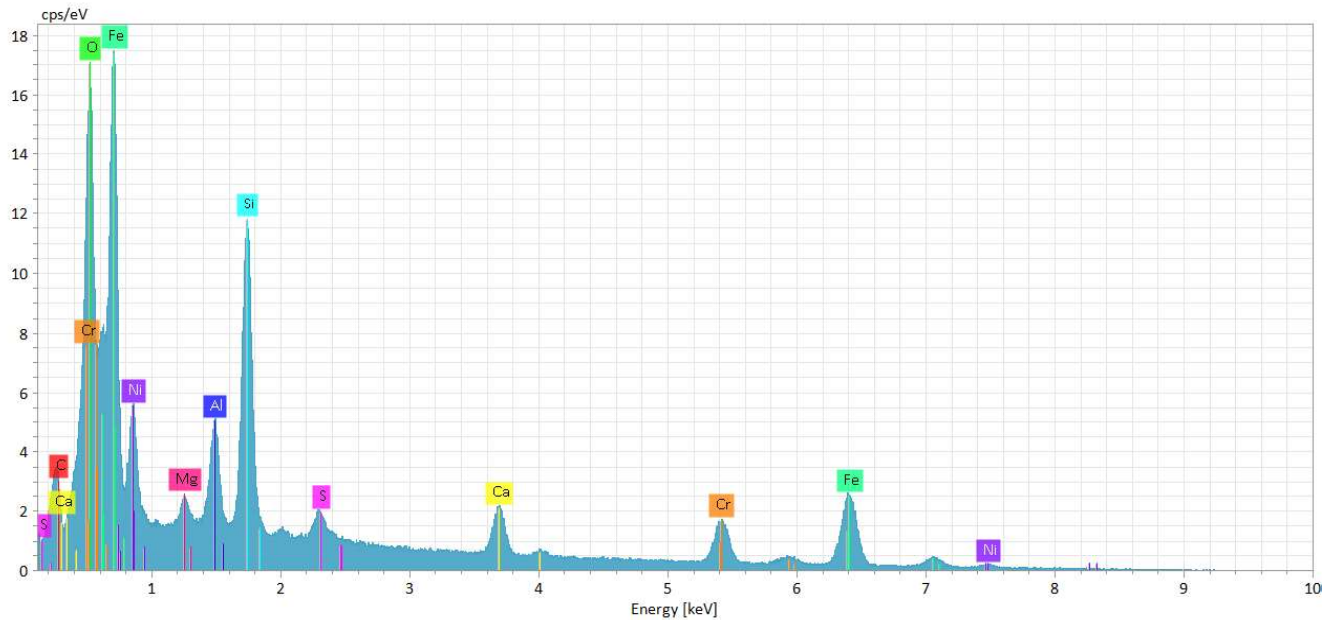


Element	Mass[%]	Mass Norm.[%]	Atom[%]	abs. error[mass%] (1 $\sigma$ )	rel. error[%] (1 $\sigma$ )
Oxygen	37.55	41.02	68.20	1.58	4.21
Iron	42.88	46.84	22.31	0.99	2.30
Calcium	5.58	6.09	4.04	0.11	2.06
Silicon	2.69	2.94	2.79	0.08	3.07
Sulfur	1.62	1.77	1.47	0.04	2.54
Aluminium	0.85	0.93	0.92	0.03	3.80
Potassium	0.37	0.40	0.27	0.01	2.99
	91.55	100	100		

HDR 2 filter was extremely clean, with very little particles visible, and even fewer that were of high atomic density. The backscattered electron image below shows a lone particle of high atomic weight against a background of mostly empty filter material (with a few lower atomic weight particles). There were so few of these particles that it was especially difficult to even find them. They are also much smaller than anything observed in the soil samples with a thin flake-like morphology.



The higher magnification image above shows the small size and shape of the particle



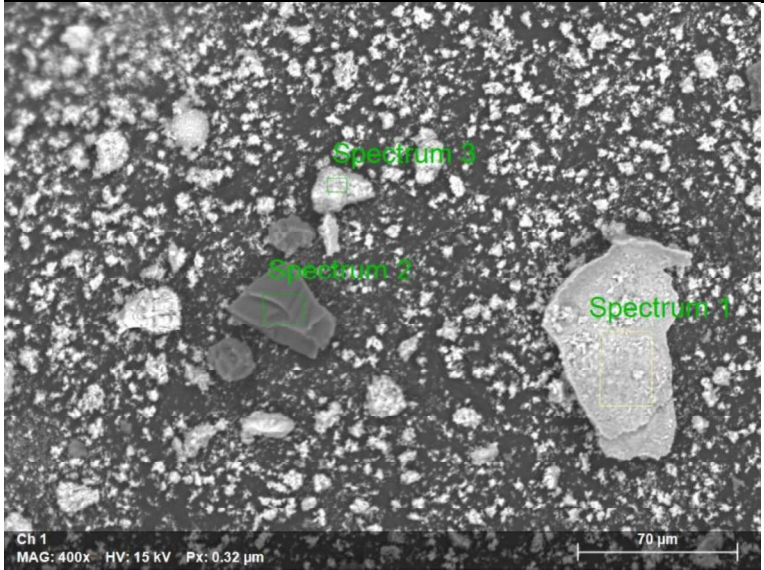
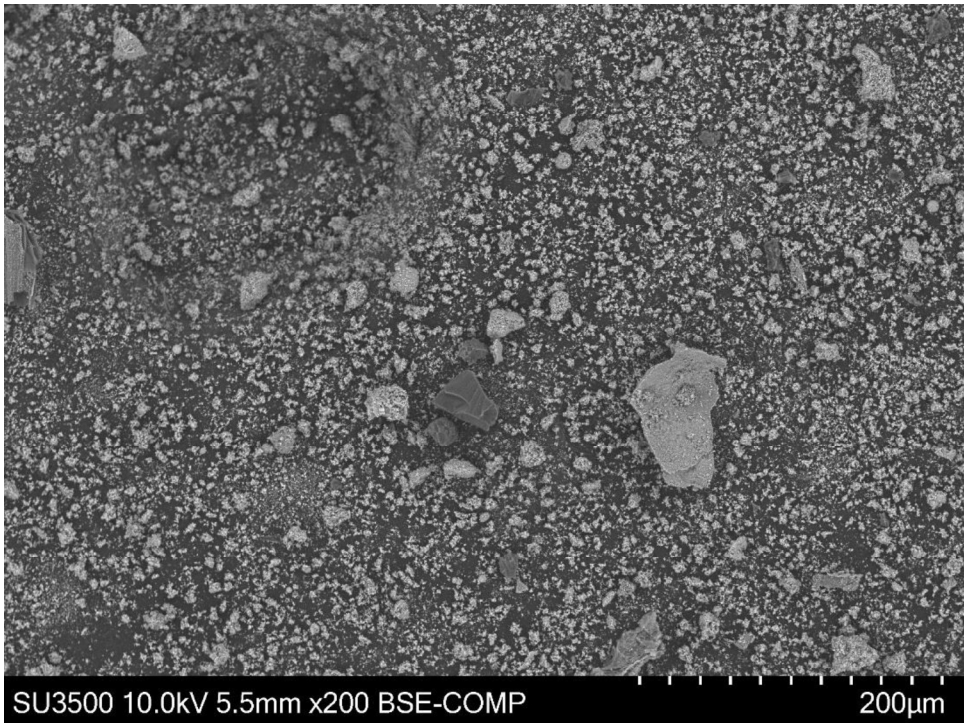
Element	Mass[%]	Mass Norm.[%]	Atom[%]	abs. error[mass%] (1 $\sigma$ )	rel. error[%] (1 $\sigma$ )
Iron	52.87	53.00	36.88	2.13	4.02
Oxygen	6.58	6.60	16.03	0.26	3.93
Carbon	3.97	3.98	12.88	0.21	5.21
Silicon	7.64	7.66	10.60	0.22	2.89
Chromium	11.97	12.00	8.97	0.38	3.17
Nickel	9.87	9.90	6.55	0.43	4.39
Calcium	3.46	3.47	3.36	0.09	2.52
Aluminium	1.86	1.86	2.68	0.06	3.48
Sulfur	1.07	1.08	1.30	0.03	2.76
Magnesium	0.46	0.46	0.73	0.02	4.63
	99.76	100	100		

EDX analysis on the particles reveals this to be a stainless-steel particle. Given the absence of larger particles (which should be easily trapped by a filter) and the smaller size and shape of these particles compared to those found in the soil samples, it seems extremely unlikely that the source of these particles could be the same source as for the stainless-steel particles observed in the soil samples.

## Powder Sample Analysis

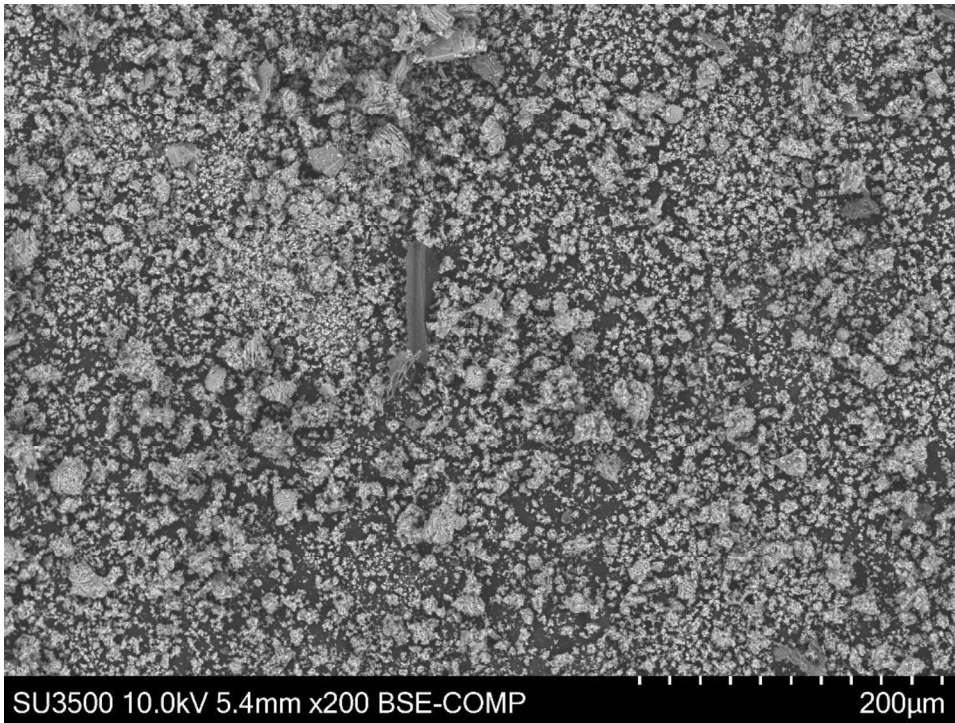
### Unit 1

Backscattered electron imaging of this sample revealed no high contrast particles present. This would imply that there are no metallic particles present in the sample. Some EDX analysis of the material was performed to verify that none of the particles observed contained metals.



### Unit 3

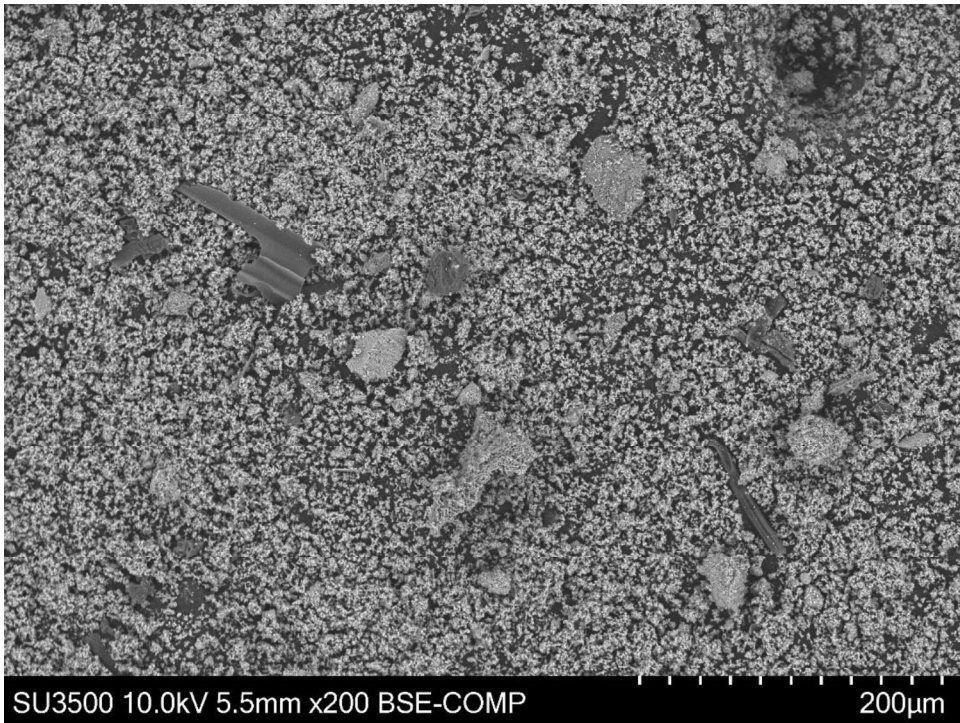
This sample was near identical to “Unit 1”. No evidence of metallic particles could be found through backscattered electron imaging and EDX analyses.



### Composite

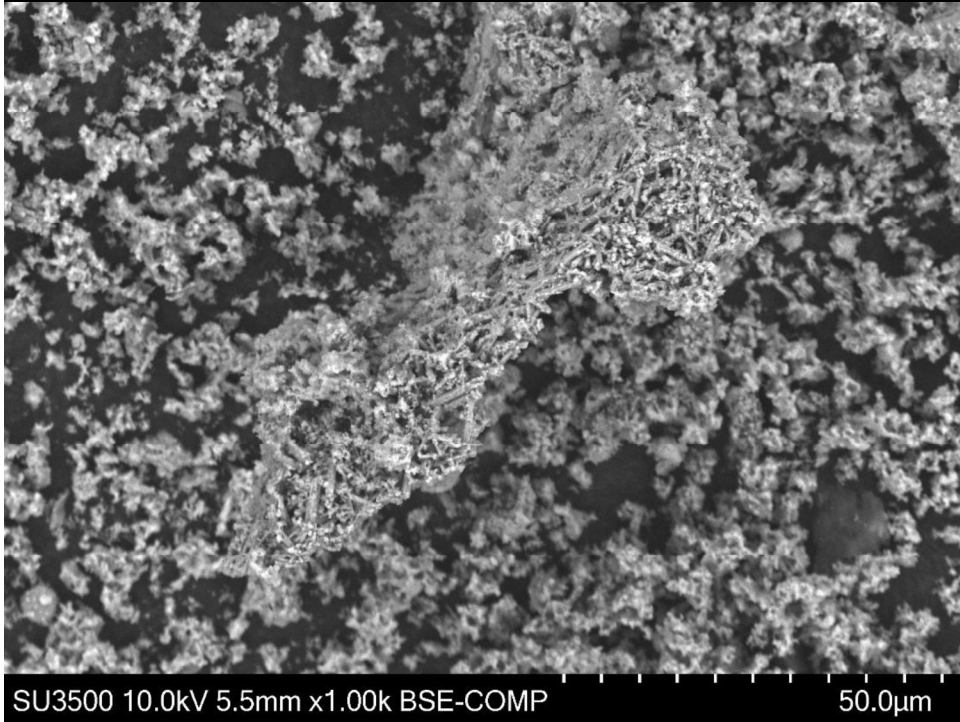
The composite sample included ash from the previous two materials as well as a “Unit 2”. An isolated sample of Unit 2 was not provided. Based on the findings of the previous two samples it might be reasonable to conclude that anything found in this sample could be attributed to Unit 2. It would be worthwhile to do an independent analysis of unit 2 to verify though.

Imaging of the composite sample revealed a similar story to the Unit 1 and Unit 3 powder samples, namely a lack of metallic particles.



SU3500 10.0kV 5.5mm x200 BSE-COMP

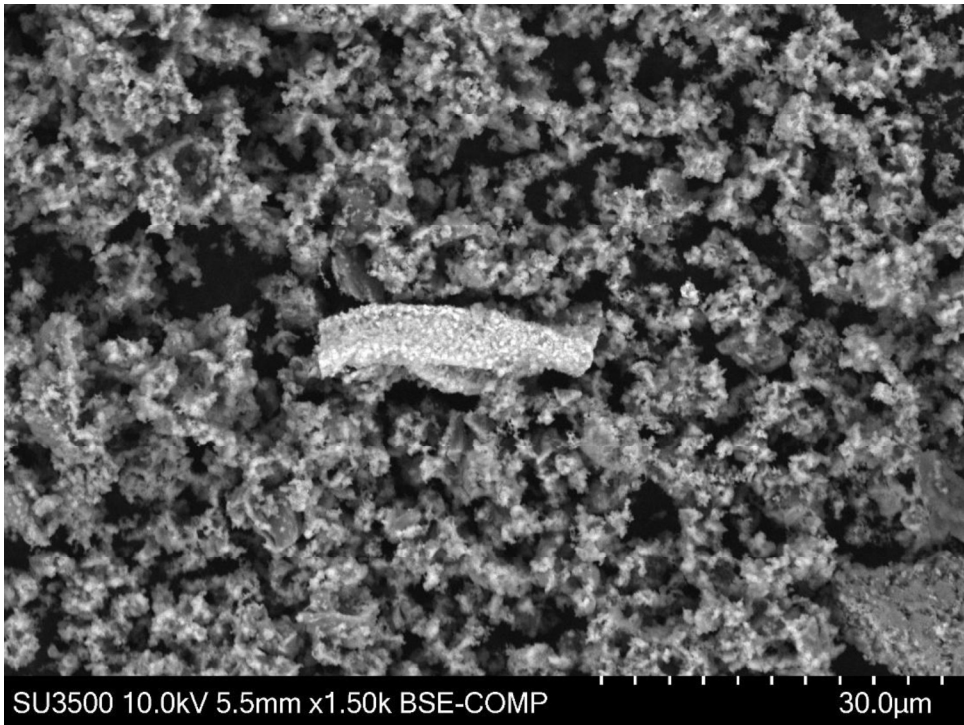
200µm



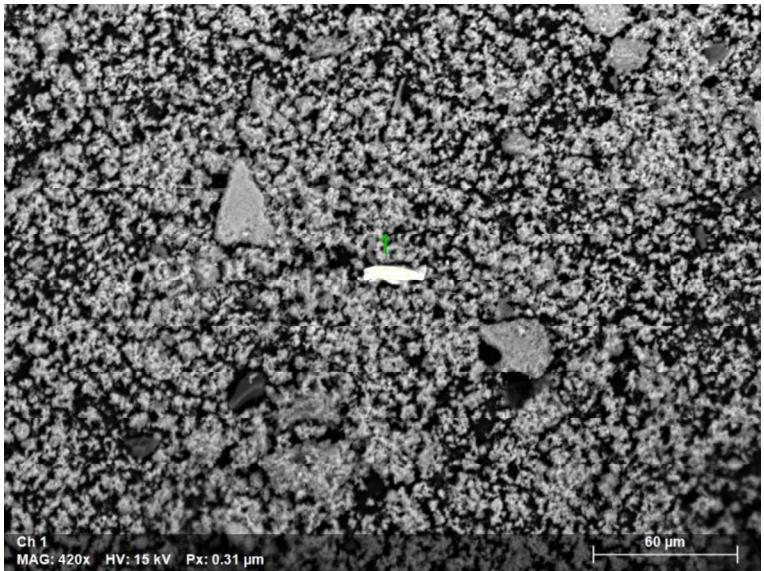
SU3500 10.0kV 5.5mm x1.00k BSE-COMP

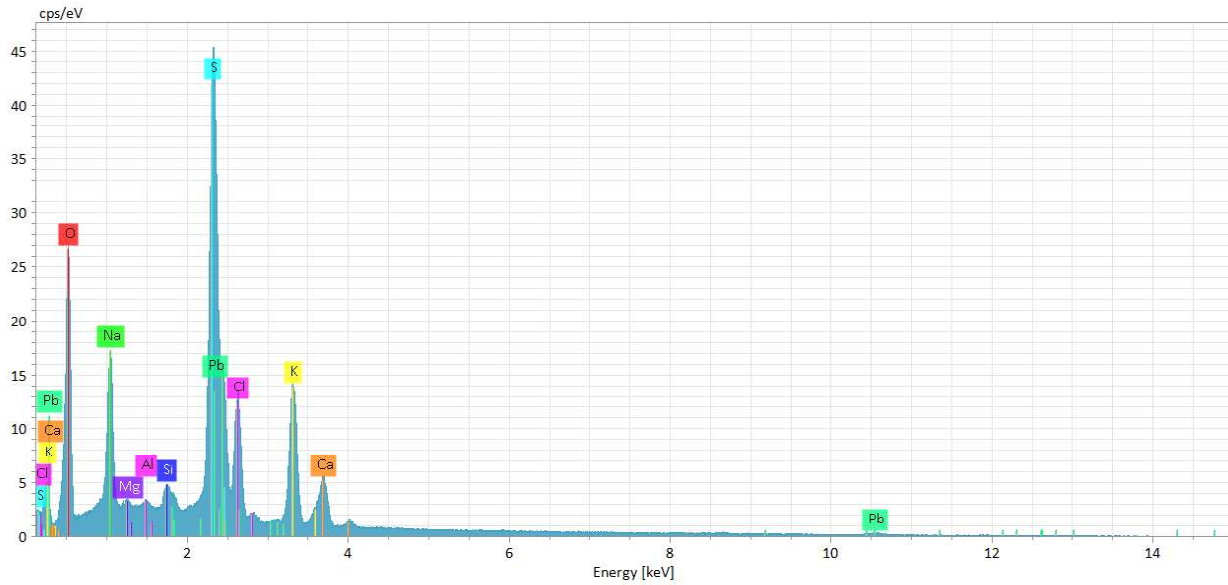
50.0µm

With some prolonged searching one higher atomic weight particle was found with backscattered electron imaging. The only one in the sample:



The particle is fairly small compared to most particles observed in the soil samples.





Element	Mass[%]	Mass Norm.[%]	Atom[%]	abs. error[mass%] (1 $\sigma$ )	rel. error[%] (1 $\sigma$ )
Oxygen	28.35	33.71	62.76	1.37	4.85
Sulfur	8.14	9.68	8.99	0.31	3.84
Potassium	9.12	10.84	8.26	0.19	2.10
Sodium	4.05	4.82	6.25	0.21	5.07
Chlorine	4.81	5.73	4.81	0.12	2.43
Lead	24.59	29.24	4.20	0.72	2.91
Calcium	4.38	5.21	3.87	0.10	2.20
Silicon	0.43	0.52	0.55	0.02	3.59
Aluminium	0.12	0.15	0.16	0.01	5.19
Magnesium	0.10	0.12	0.14	0.01	6.19
	84.10	100	100		

EDX analysis of this particle revealed that it contains lead, which accounts for its high contrast in the backscattered electron image. The actual lead concentration, is not especially high. The sulfur content plus high oxygen concentration would imply that it could be a lead sulfate particle. There was one lead sulfate particle found on the soil sample HS-9. The relative amount of lead to sulfur and oxygen in this particle is on the low side compared to what was observed in the particle on HS-9. It has a similar shape to the lead sulfate particle found on HS-9 but is smaller. The shape is not so especially unique that this could be considered unequivocally from the same source.

## Conclusions

All of the soil samples had a significant number of particles containing heavier/metallic elements. Outside of all soil samples having spherical particles containing iron there were no observable patterns in terms of size or shape of particles. The soil concentration with the highest concentration of particles was located the furthest distance (25km)

The filter and fly ash (powder) samples contained little to no particles containing metallic elements. The few examples found were sparse and extremely small. Neither of the “Unit 1” and “Unit 3”

samples contained any particles with metallic elements. Only one particle of lead sulfate was found in the composite ash sample. This low number of particles observed is not conducive to the volume of particles observed in the soil samples. Concentrations of the metallic particles in each of the soil samples was significantly higher than anything on the filter or ash samples. Furthermore, the particles observed in the soil samples on average were significantly larger than anything observed in the filters/ash.

Analysis of the one particle found in the ash samples revealed a lead sulphate composition which was similar to one particle found on rooftop sample HS-9, which was revealed to be from the location "WTEF Roof" after the analysis was complete. One single particle on a single rooftop, which is the WTEF rooftop itself, is not sufficient evidence to draw a conclusion of particles migrating to other rooftops as far as 25km away.

Based on the analysis results it is extremely unlikely that metallic particles observed in the soil samples originated from the same source as the filter/powder samples. The soil sample with the highest concentration of metal containing particles, HS-32, was located more 25km away from the alleged contaminant source. When compared with the low number of particles observed on the filters and ash samples, there is no evidence to suggest that this concentration of particles could be from the WTEF stack 25km away. Moreover, the metallic particles observed are not so unique in composition to be able to identify a definitive source. There are quite likely many sources of iron or stainless steel (the most commonly identified particles) within the vicinity of the different soil samples.

It is the conclusion of this analysis that the particles observed in the soil samples are likely from the local environment from which they were collected, not from an alleged contaminant source up to 25km away.

# Appendix F

Scanning Electron Microscope/Energy Dispersive X-ray  
Spectroscopy MVA Lab Report



**A. Lanfranco  
& Associates Inc.**

Environmental Consultants

Prepared for

**METRO VANCOUVER**

**Metrotower III**

**4515 Central Boulevard**

**Burnaby, BC V5H 0C6**

**Waste-to-Energy Facility  
January 2026 Research Survey**

**Particle Characterization**

**Prepared by: Mr. Carter Lanfranco**

**Issued: March 11, 2026**

**Operational Certificate: 107051**

**CERTIFICATION**

The field crew consisted of:

Mr. C. Lanfranco (certified), Mr. C. De La O (certified), and Mr. S. Verby (certified).

The report was prepared by Mr. C. Lanfranco using reporting principles and guidelines generally acceptable to Metro Vancouver (MV).

The report was reviewed on March 11, 2026, by:



---

Mr. Mark Lanfranco  
President | Owner

## **TABLE OF CONTENTS**

<b>1.0</b>	<b>TEST PROGRAM ORGANIZATION</b>	<b>3</b>
<b>2.0</b>	<b>INTRODUCTION</b>	<b>3</b>
<b>3.0</b>	<b>SUMMARY</b>	<b>4</b>
<b>4.0</b>	<b>PROCESS DESCRIPTIONS</b>	<b>4</b>
<b>5.0</b>	<b>METHODOLOGY</b>	<b>4</b>
<b>5.1</b>	<b>Sampling and Analytical Methods</b>	<b>4</b>
<b>5.2</b>	<b>Quality Assurance / Quality Control (QA/QC) Techniques</b>	<b>7</b>
<b>6.0</b>	<b>RESULTS</b>	<b>7</b>
<b>6.1</b>	<b>QA/QC Results</b>	<b>11</b>
<b>7.0</b>	<b>DISCUSSION OF RESULTS</b>	<b>12</b>

## **APPENDICES**

**Appendix 1 – MVA SCIENTIFIC ANALYTICAL REPORT**

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## 1.0 TEST PROGRAM ORGANIZATION

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**Sampling Crew:**

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Mr. C. De La O – A. Lanfranco and Associates Inc.  
Mr. S. Verby – A. Lanfranco and Associates Inc.

## 2.0 INTRODUCTION

In January 2026, Metro Vancouver (MV) commissioned an emission survey at the Waste-To-Energy Facility (WTEF) in Burnaby, BC for the purpose of researching the potential emissions of condensable particulate matter and to understand particle size distribution.

Unit 1 was the individual source monitored for these parameters. The boiler is identified as discharge E300670 in the operational certificate

This report documents the methods used and results found from the Unit 1 stack as tested on Jan 27-29, 2026.

### 3.0 SUMMARY

Field measurements were carried out by Lanfranco and analysis was performed initially by Lanfranco and Element Laboratory for particulate using gravimetric techniques. The samples were then delivered to MVA Scientific for chemical composition and particle sizing.

### 4.0 PROCESS DESCRIPTIONS

Using a mass-burn process, garbage is incinerated at over 1000°C to create steam, which powers turbines to generate electricity. Garbage is unloaded into a bunker, mixed, and fed into three combustion lines. This facility utilizes advanced pollution control systems, including conditioning towers, dry lime injection reactors, and fabric filter baghouses to manage emissions.

### 5.0 METHODOLOGY

Test methods on Jan.27-28, 2026 were modified to sample maximum gas volume and achieve maximum particulate loading as part of the research process.

#### 5.1 Sampling and Analytical Methods

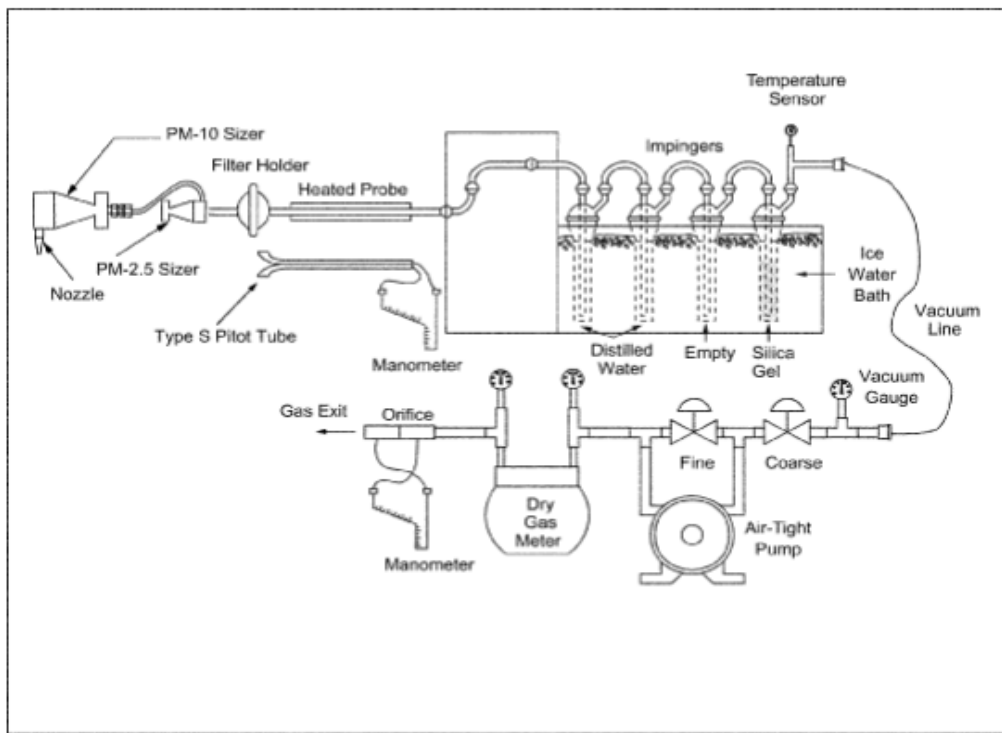
<u>Parameter</u>	<u>Reference Method</u>
Sample and Velocity traverse points	AE Method 1 Sample and Velocity Traverses for Stationary Sources
Velocity and Flowrate	AE Method 2 Determination of Stack Gas Velocity and Volumetric Flow Rate (Type S Pitot Tube)
Gas molecular weight (O <sub>2</sub> /CO <sub>2</sub> )	AE Method 3 Gas Analysis for the Determination of Dry Molecular Weight
Gas molecular weight (O <sub>2</sub> /CO <sub>2</sub> )	EPA Method 3a Determination of Oxygen and Carbon Dioxide Concentrations in Emissions From Stationary Sources (Instrumental Analyzer Procedure)
Fluegas Moisture	AE Method 4 Determination of Moisture Content in Stack Gases
Particulate Matter	AE Method 5 Determination of Particulate Matter Emissions from Stationary Sources
Particulate Matter <sub>2.5</sub>	EPA Method 201A Determination of PM <sub>2.5</sub> Emissions from Stationary Sources (Constant Rate Sampling Procedure)
Condensable Particulate Matter	EPA Method 202 Dry Impinger Method for Determining Condensable Particulate Emissions from Stationary Sources

Particulate Matter (PM<sub>2.5</sub>)

Primary:

EPA Method 201A

To measure PM<sub>2.5</sub> a sample of gas was extracted at a predetermined constant flow rate through an in-stack sizing device. The particle sizing device separates particles with nominal aerodynamic diameter of 2.5 micrometers (PM<sub>2.5</sub>). After a sample is obtained, uncombined water is removed (by oven drying and desiccation) from the particulate and gravimetric analysis is used to determine the particulate mass for each size fraction.



**Figure 4:** PM<sub>10</sub> and PM<sub>2.5</sub> sampling train

**Note – As per section 2.1 of US EPA method 201a, the PM<sub>10</sub> cyclone was removed to enable the measurement of PM<sub>2.5</sub> only**

Condensable Particulate Matter (PM<sub>2.5</sub>)

Primary:

EPA Method 202

The Condensable Particulate Matter is collected in dry impingers after filterable particulate has been collected. The organic and aqueous fractions of the impingers and out-of-stack filter are

then taken to dryness and weighed. Nitrogen is used to purge any artifact formation of sulfur dioxide from the sample.

At MVA Scientific the samples were prepared for analysis in accordance with MVA SOP 310, “Sample Preparation Methods for Total Particle Sizing Using Microscopical Techniques.”

The particle size distributions of the filter samples were measured in accordance with MVA SOP 318, “Manual Feature Sizing in Digital Images Using ImageJ” from digital images of the particles on the filters obtained using a JEOL JSM-6500F field emission scanning electron microscope equipped with a Thermo Scientific Noran System 7 x-ray analysis system.

The particle size distributions of the rinse samples were measured in accordance with MVA SOP 316, “Automated Particle Size Analysis Using the JEOL JSM-6500F and 16850report030926.docx Page 3 of 40

Thermo Scientific Noran System 7” using a JEOL JSM-6500F field emission scanning electron microscope equipped with a Thermo Scientific Noran System 7 x-ray analysis system.

The particle size data is presented in terms of particle number and in terms of estimated mass. The assumption has been made that the particles are all of similar density, and therefore, the particle volume distribution is equivalent to the particle mass distribution.

The samples were examined visually and with the aid of a stereomicroscope.

Portions of each sample for material characterization were analyzed by scanning electron microscopy-energy dispersive x-ray spectrometry (SEM-EDS), confocal Raman microscopy (CRM), and Fourier transform infrared spectroscopy (FTIR) as necessary. SEM-EDS analysis was conducted using a JEOL JSM-IT700HR field emission scanning electron microscope equipped with a Thermo Scientific Noran System 7 energy dispersive x-ray spectrometer. CRM analysis was performed using a Renishaw inVia confocal Raman microscope. FTIR analysis was conducted using a SensIR IlluminatIR infrared spectrometer attached to an Olympus BX51 compound microscope.

In the included EDS spectra, the presence of a peak labeled with an element symbol indicates the presence of that element in the sample, and the height of the peak can be related to the concentration of the element.

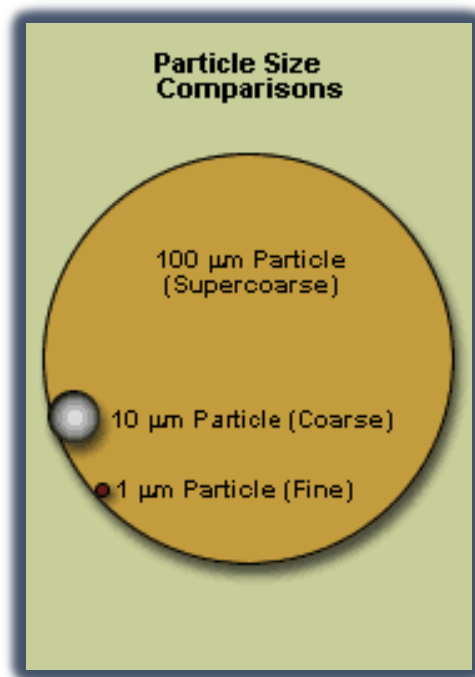
## 5.2 Quality Assurance / Quality Control (QA/QC) Techniques

QA/QC of this survey was accomplished by the following mechanisms.

1. Pre-test leak checks (post-test leak checks with cyclone removed)
2. Use of acid cleaned micro-quartz filters.
3. Calibration of volume measuring and monitoring instrumentation.
4. Analysis of all blank solutions.

## 6.0 RESULTS

The following diagram provides a visual comparison of the size of a fine particle (1.0 $\mu\text{m}$ ), a coarse particle (10 $\mu\text{m}$ ) and a super coarse particle (100 $\mu\text{m}$ ). There is a substantial difference in size between the particles, all of which are considered moderate-to-large in air pollution control.



The results of particulate and stack parameters were calculated using a computer program consistent with the reporting requirements of the MOE. Standard conditions used were 20°C and 101.325 kPa (dry basis). O<sub>2</sub> corrections were not applied to the data. Detailed emission results are presented in Table 3 with supporting data in the Appendices.

**TABLE 2: UNIT 1 - SUMMARY OF OPERATING DATA**

Parameter		Run 1	Run 2	Run 3	Run 4	Run 5	Run 6	Normal
		27-Jan-26	27-Jan-26	28-Jan-26	28-Jan-26	29-Jan-26	29-Jan-26	
<b>Test Date - Particulate/Metals</b>		27-Jan-26	27-Jan-26	28-Jan-26	28-Jan-26	29-Jan-26	29-Jan-26	
<b>Test Time - Particulate/Metals</b>		10:18 - 12:35	13:00 - 15:03	09:16 - 11:18	11:37 - 14:24	09:30 - 11:35	12:05 - 14:10	
<b>Boiler Steam Production</b>	(kg/h)	37,352	33,345	35,198	32,692	36,607	36,495	36,714
<b>Percentage of normal</b>	(%)	102%	91%	96%	89%	100%	99%	
<b>Boiler Secondary Combustion Zone Temp</b>	(°C)	985	907	919	885	975	978	945
<b>Percentage of normal</b>	(%)	104%	96%	97%	94%	103%	103%	
<b>Rate of refuse fired</b>	(kg/hr)	11,150	9,954	10,507	9,759	10,927	10,894	10,959
<b>Percentage of normal</b>	(%)	102%	91%	96%	89%	100%	99%	
<b>Rate of aux. fuel fired (Natural Gas)</b>	m <sup>3</sup> /hr	0	0	0	19.06	0	0	46.64
<b>Percentage of normal (%)</b>	(%)	0%	0%	0%	%	0%	0%	

\*Normal refers to the average operating rate from the previous 30 days

**TABLE 3: UNIT #1 - TOTAL PARTICULATE PM<sub>2.5</sub> EMISSION RESULTS**

Parameter	Run 1	Run 2	Run 3	Run 4	Run 5 - 201A/202	Run 6 - 201A/202	Average
Test Date	27-Jan-26	27-Jan-26	28-Jan-26	28-Jan-26	29-Jan-26	29-Jan-26	
Test Times (Particulate)	10:18 - 12:35	13:00 - 15:03	09:16 - 11:18	11:37 - 14:24	09:30 - 11:35	12:05 - 14:10	
Test Duration (minutes)	120	120	120	120	120	120	120
Total Particulate (mg/Sm <sup>3</sup> )	4.10	33.9	10.0	1.36	5.27	12.0	11.11
Total Particulate (mg/Sm <sup>3</sup> @ 11% O <sub>2</sub> )	3.92	34.1	9.60	1.35	4.93	11.0	10.83
Particulate (kg/hr)	0.35	2.89	0.80	0.11	0.41	0.93	0.91
Filterable Particulate (mg/Sm <sup>3</sup> @ 11% O <sub>2</sub> )	1.83	2.47	3.65	1.36	2.82	8.98	3.52
Condensable Particulate (mg/Sm <sup>3</sup> @ 11% O <sub>2</sub> )	2.09	31.7	5.95	-	2.11	2.06	8.78
Particulate PM <sub>2.5</sub> (mg/Sm <sup>3</sup> @ 11% O <sub>2</sub> )	-	-	-	-	4.85	2.48	3.67
Particulate PM <sub>2.5</sub> (% of total particulate)	-	-	-	-	98.4	22.5	60.5
Particulate PM <sub>2.5</sub> Emission Rate (kg/hr)	-	-	-	-	0.40	0.21	0.30
Flowrate (Sm <sup>3</sup> /min)	1408	1420	1328	1365	1288	1289	1350
Flowrate (m <sup>3</sup> /min actual)	2336	2331	2199	2306	2234	2233	2270
Oxygen (vol % dry)	10.6	11.1	10.6	10.9	10.3	10.1	10.6
Carbon Dioxide (vol % dry)	9.42	8.92	9.35	9.25	10.0	10.0	9.49
Stack Temp (°C)	148	144	143	149	151	152	148
Moisture (vol %)	9.60	9.16	10.9	11.4	13.1	12.9	11.2
Isokinetic Variation (%)	97.6	97.2	100	102	96.7	96.0	98.4

All results are at standard conditions (S) of 20 °C and 101.325 kPa (dry)

The following table correlates the MVA sample number with the Lanfranco identification.

<b>MVA Sample Number and Requested Analysis</b>	<b>Lanfranco Test ID</b>
1-1 AN0183 PSD/Material Characterization	Unit 1 Run 1 Filter (Filterable)
1-2 AN0184 PSD/Material Characterization	Unit 1 Run 1 Rinsings (Filterable)
1-3 AN0185 Material Characterization	Unit 1 Run 1 Organic Condensable Particulate
1-4 AN0186 Material Characterization	Unit 1 Run 1 Inorganic Condensable Particulate
2-1 AN0187 PSD/Material Characterization	Unit 1 Run 2 Filter (Filterable)
2-2 AN0188 PSD/Material Characterization	Unit 1 Run 2 Rinsings (Filterable)
2-3 AN0189 Material Characterization	Unit 1 Run 2 Organic Condensable Particulate
2-4 AN0190 Material Characterization	Unit 1 Run 2 Inorganic Condensable Particulate
3-3 AN0191 PSD/Material Characterization	Unit 1 Run 5 201A/202 (Filterable)
4 AN0192 PSD	Unit 1 Run 4 Filter (Filterable)

## 6.1 QA/QC Results

The results of the QA/QC program instituted for this survey are as follows:

- 1) **Leak Checks**  
All tests passed sampling code requirements for pre-test events.
- 2) **Calibrations**  
Dry gas meters, pitot tubes, temperature, and nozzles calibrated (See. App. 6)
- 3) Very low blank values indicating adequate cleaning of equipment and avoidance of sample contamination. (Less than 1 mg)

Further QA/QC measures instituted for this survey were:

- 1) Reagent grade solvents used for glassware cleaning

## **7.0 DISCUSSION OF RESULTS**

Two full sets of samples plus a filter “bulk sample” and a cyclone catch were analyzed by MVA Scientific.

The particle size distribution was similar to what we would expect to see. All six samples for particle size distribution matched each other as well.

On average (omitting one outlier result) Lanfranco produced results indicating that by weight, 98.4% of the particles were in the PM<sub>2.5</sub> range. The MVA results indicated that on average 89.1% of the particles were in the PM<sub>2.5</sub> range. The MVA results indicated that on average about 9.5% of the particles were between 2.5 and 10 microns. The MVA results by mass % indicated that the majority of the mass was from particles greater than 10 microns. This can be true if the flaky crystals are distorting the counting statistics. In other words, one flake may be counted as one particle by the microscope, but it may contain 100x the mass of a typical particle.

Due to the nature of the particle composition at the WTEF (calcium chloride, calcium sulfate flakes, etc) it is likely that the values from Lanfranco method 201a/202 should be used exclusively for particle size distribution. In April, Lanfranco is planning to run the full sizing method including the PM<sub>10</sub> size fraction.

The majority of particulate material is composed of calcium chloride and calcium sulfate with lesser amounts of ammonium chloride and ammonium sulfate. This is as we would expect with MSW incineration when hydrated lime is injected prior to the baghouse. There is also hydrocarbon defoamer present in most of the condensable samples.

In the filterable particulate trace amounts of iron and/or zinc were present alongside the calcium salts, probably as metal chlorides/sulfates associated with corrosion. In the probe washings analysis, which is also filterable particulate, the material was primarily crystalline with minor amounts of fibrous material. The fibrous material is upstream of the filter used for stack sampling so we believe it must

be from the fabric filters or something else entrained from the waste stream. The analytical report highlights that most of the fiber phase was aluminosilicate.

The material identified in the filterable particulate was also found in the inorganic condensable sample which is surprising.

The organic condensables were primarily carbon rich amorphous particulate. Minor amounts of the particulate had silica, aluminasilicate and sodium chloride chemistries. Trace amounts of copper and/or zinc were present.

The two sample runs demonstrated good repeatability in terms of chemical composition.

**APPENDIX 1**  
**MVA SCIENTIFIC REPORT**

3300 Breckinridge Blvd  
Suite 400  
Duluth, GA 30096

770.662.8509  
FAX 770.662.8532  
www.mvainc.com

**Stack Sample Analysis**

PM10 & PM2.5 Custom  
Particle Sizing

Particle Shape Analysis

Particulate Matter  
Identification

Back-Half Catch Residue  
Identification (M202)

Filter Debris Analysis

Ambient Air Sample  
Characterization

Condensable Analysis

Litigation Support

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**Techniques**

Light Microscopy

Scanning Electron  
Microscopy

Transmission Electron  
Microscopy

Fourier Transform  
Infrared Spectroscopy

Confocal Raman Microscopy

White Light Interference  
Microscopy

Energy Dispersive X-ray  
Spectrometry

Fluorescence Microscopy

Ion Milling & Ultramicrotomy

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**Accreditations**

ISO/IEC 17025  
A2LA Certificate #2096.01

cGMP Compliant

FDA Registered

DEA Licensed

**Report of Results: MVA16850**

**Particle Size Distribution and  
Material Characterization of Stack Samples**

**Prepared for:**

**A. Lanfranco & Associates  
9488 189 St., Suite 101  
Surrey, BC V4N 4W7  
Canada**

**Respectfully Submitted by:** \_\_\_\_\_

**Jake Mosely, M.S.  
Research Scientist**

**9 March 2026**

## Report of Results: MVA16850

### Particle Size Distribution and Material Characterization of Stack Samples

#### Introduction

On 18 February 2026 we received four fiber filters, four glass beakers, and two ceramic dishes with the request that we determine the composition of the sample material (material characterization) and/or determine their particle size distributions (PSD) down to 0.5 micrometer as presented in the table below. Upon receipt the samples were assigned the unique MVA Scientific Consultants laboratory identification numbers shown in the table below. The analyses and data reduction were performed at MVA Scientific Consultants during the period 23 February through 6 March 2026.

Client Identification	MVA Sample Number	Requested Analysis
1-1	AN0183	PSD/Material Characterization
1-2	AN0184	PSD/Material Characterization
1-3	AN0185	Material Characterization
1-4	AN0186	Material Characterization
2-1	AN0187	PSD/Material Characterization
2-2	AN0188	PSD/Material Characterization
2-3	AN0189	Material Characterization
2-4	AN0190	Material Characterization
3-3	AN0191	PSD/Material Characterization
4	AN0192	PSD

#### Methods

The samples were prepared for analysis in accordance with MVA SOP 310, "Sample Preparation Methods for Total Particle Sizing Using Microscopical Techniques."

The particle size distributions of the filter samples were measured in accordance with MVA SOP 318, "Manual Feature Sizing in Digital Images Using ImageJ" from digital images of the particles on the filters obtained using a JEOL JSM-6500F field emission scanning electron microscope equipped with a Thermo Scientific Noran System 7 x-ray analysis system.

The particle size distributions of the rinse samples were measured in accordance with MVA SOP 316, "Automated Particle Size Analysis Using the JEOL JSM-6500F and

Thermo Scientific Noran System 7" using a JEOL JSM-6500F field emission scanning electron microscope equipped with a Thermo Scientific Noran System 7 x-ray analysis system.

The particle size data is presented in terms of particle number and in terms of estimated mass. The assumption has been made that the particles are all of similar density, and therefore, the particle volume distribution is equivalent to the particle mass distribution.

The samples were examined visually and with the aid of a stereomicroscope. Portions of each sample for material characterization were analyzed by scanning electron microscopy-energy dispersive x-ray spectrometry (SEM-EDS), confocal Raman microscopy (CRM), and Fourier transform infrared spectroscopy (FTIR) as necessary. SEM-EDS analysis was conducted using a JEOL JSM-IT700HR field emission scanning electron microscope equipped with a Thermo Scientific Noran System 7 energy dispersive x-ray spectrometer. CRM analysis was performed using a Renishaw inVia confocal Raman microscope. FTIR analysis was conducted using a SensIR IlluminatIR infrared spectrometer attached to an Olympus BX51 compound microscope.

In the included EDS spectra, the presence of a peak labeled with an element symbol indicates the presence of that element in the sample, and the height of the peak can be related to the concentration of the element. A table of common elements and their elemental symbol is provided at the end of this report.

## Results

The size distributions of the particulate in the samples analyzed for PSD down to 0.5 micrometer are shown in Tables 1 and 2.

### AN0183 (1-1):

The sample presented as a fiber filter with no visible residue.

SEM-EDS analysis of material removed from the filter showed that it was crystalline and was consistent with a mixture of fine calcium chloride (primary phase, >50% by volume) with larger crystals of calcium sulfate. Trace amounts (<1% by volume) of iron and/or zinc were present alongside the calcium salts, probably as metal chlorides/sulfates associated with corrosion (Figures A1 through A4).

CRM analysis of a deionized (DI) water extract of the filter produced a spectrum consistent with calcium sulfate (Figure A5).

### AN0184 (1-2):

The sample presented as a glass beaker with amorphous residue.

SEM-EDS analysis of material removed from the sample showed that the material was primarily crystalline with minor amounts (<10% by volume) of fibrous material (Figure B1).

The bulk crystalline composition was complex and consistent with a mixture of sodium chloride and calcium sulfate, with lesser amounts of calcium chloride (Figure B2) along with trace amounts of stainless steel/stainless steel corrosion. Two types of fibers were observed: one, the more abundant fiber phase, with aluminosilicate chemistry, was consistent with glass filter fiber (Figure B3) and two, the less abundant fiber phase, had cellulose fiber morphology, enriched in carbon relative to other sample material, consistent with cellulose (Figure B4). Most individually analyzed particles were dominated by one of the three noted crystalline phases with occasional lesser amounts of the other two (Figures B5 through B7).

FTIR analysis of a hexane extract from the sample produced a spectrum consistent with oleamide and a hydrocarbon defoamer (Figure B8).

CRM analysis of a DI water extract from the sample produced a spectrum consistent with calcium sulfate (Figure B9).

#### AN0185 (1-3):

The sample presented as residue in a ceramic bowl.

SEM-EDS analysis of material removed from the sample showed that the material was primarily crystalline with major amounts ( $\geq 10\%$  by volume) of fibrous material (Figure C1). The bulk crystalline composition was complex and consistent with a mixture of sodium chloride and calcium sulfate with probable lesser amounts of calcium chloride (Figure C2). The fibrous material had aluminosilicate chemistry and was consistent with glass filter fiber (Figures C3 and C4). Most individually analyzed particles were discretely calcium sulfate or sodium chloride crystals (Figures C5 and C6).

CRM analysis of a DI water extract from the sample produced a spectrum consistent with calcium sulfate (Figure C7).

#### AN0186 (1-4):

The sample presented as residue in a glass beaker.

SEM-EDS analysis of material removed from the sample showed that the material was primarily carbon-rich amorphous particulate (Figures D1 and D2). Minor amounts ( $<10\%$  by volume) of the particulate had silica, aluminosilicate, and sodium chloride chemistries (Figures D3 through D5). Trace amounts ( $<1\%$  by volume) of particles consistent with copper and/or zinc metal were present (Figures D6 and D7).

FTIR analysis of a DI water extract from the sample produced a spectrum consistent with ammonium sulfate (Figure D8). The carbon-rich particles that dominated the sample had small amounts of sulfur present and could be a repository for the probable ammonium sulfate.

FTIR analysis of a hexane extract from the sample produced a spectrum consistent with a hydrocarbon defoamer and an alkyd (Figure D9).

#### AN0187 (2-1):

The sample presented as a fiber filter with no visible residue.

SEM-EDS analysis of material removed from the filter showed that it was crystalline and was consistent with fine calcium chloride (primary phase, >50% by volume) with occasional small amounts of calcium sulfate (Figures E1 and E2). Lesser amounts of discrete sodium chloride crystals were present (Figure E3). Trace amounts (<1% by volume) of discrete calcium sulfate crystals were present (Figure E4).

CRM analysis of a DI water extract of the filter produced a spectrum consistent with calcium sulfate (Figure E5).

#### AN0188 (2-2):

The sample presented as a glass beaker with amorphous residue.

SEM-EDS analysis of material removed from the sample showed that it was crystalline and was consistent with ammonium chloride, calcium sulfate, and sodium chloride appearing discretely and as mixtures in the particulate (Figures F1 through F4).

FTIR analysis of a DI water extract of the sample produced a spectrum consistent with ammonium chloride (Figure F5).

FTIR analysis of a hexane extract from the sample produced a spectrum consistent with a hydrocarbon defoamer (Figure F6).

CRM analysis of a DI water extract from the sample produced a spectrum consistent with calcium sulfate (Figure F7).

#### AN0189 (2-3):

The sample presented as residue in a ceramic bowl.

SEM-EDS analysis of material removed from the sample showed that the material was primarily crystalline with trace amounts (<1% by volume) of fibrous material (Figure G1). The bulk crystalline composition was consistent with ammonium sulfate (Figure G2). The fibrous material had aluminosilicate chemistry and was consistent with glass filter fiber (Figure G3).

CRM analysis of a DI water extract from the sample produced a spectrum consistent with ammonium sulfate (Figure G4).

#### AN0190 (2-4):

The sample presented as residue in a glass beaker.

SEM-EDS analysis of material removed from the sample showed that the material was primarily large sulfur- and sodium-rich flakes, along with zinc and chlorine, consistent with sodium sulfate, ammonium sulfate, and zinc chloride (Figures H1 through H4). Trace amounts of fibers consistent with glass filter fiber and cellulose were present. Trace amounts of particles consistent with zinc metal are present. The fine crystalline material was complex and consistent with a mixture of sodium sulfate, ammonium sulfate, and zinc chloride (Figures H5 and H6). Trace amounts of stainless steel/stainless steel corrosion were present (Figure H7).

CRM analysis of a DI water extract from the sample produced a spectrum consistent with sodium sulfate (Figure H8).

#### AN0191 (3-3):

The sample presented as residue in a glass beaker.

SEM-EDS analysis of material removed from the sample showed that the material was crystalline (Figure I1). The bulk composition was consistent with ammonium chloride (Figure I2).

FTIR analysis of a DI water extract from the sample produced a spectrum consistent with ammonium chloride (Figure I3).

FTIR analysis of a hexane extract from the sample produced a spectrum consistent with an oleamide and hydrocarbon oil (Figure I4).

CRM analysis of a DI water extract from the sample produced a spectrum consistent with ammonium chloride (Figure I5).

**Table 1. MVA 16850. Percentages of Particles in Various Average Diameter Ranges by Number of Particles**

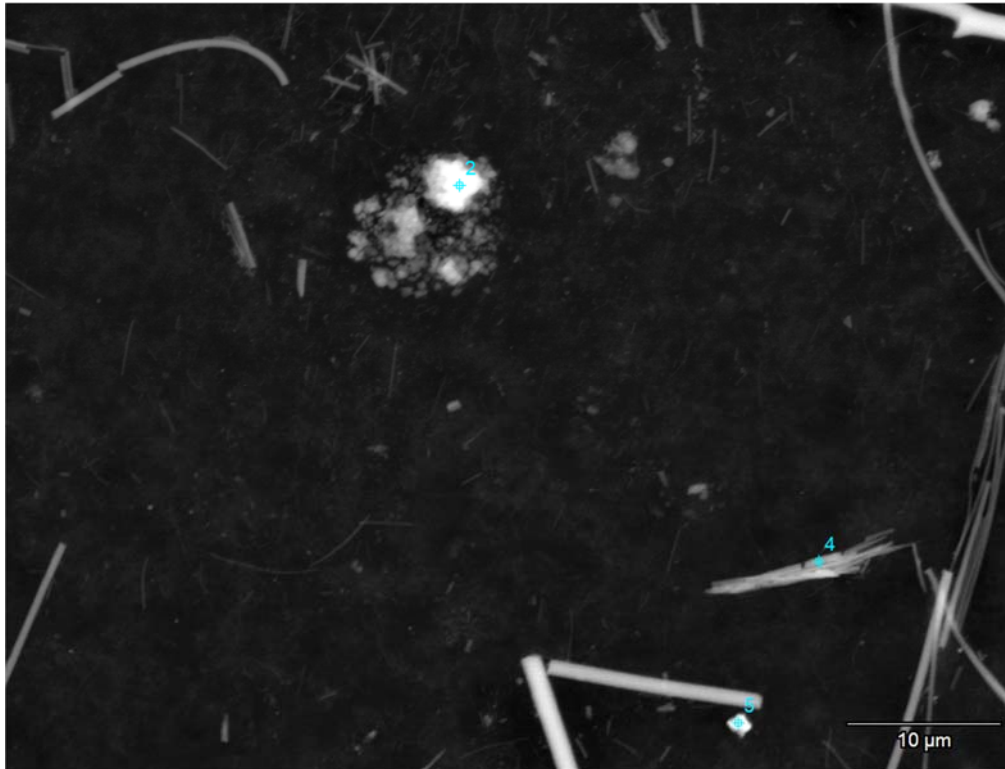
MVA Sample Number	AN0183	AN0184	AN0187	AN0188	AN0191	AN0192
Client ID	1-1	1-2	2-1	2-2	3-3	4
Average Diameter Range (µm)	Number %	Number %	Number %	Number %	Number %	Number %
0.5 - 1	54.3	59.0	38.1	57.0	46.1	51.5
>1 - 2.5	38.1	33.3	48.0	33.0	35.8	40.1
>2.5 - 5	6.4	5.7	12.1	6.9	11.9	6.6
>5 - 7.5	1.0	1.2	1.7	1.7	3.1	1.3
>7.5 - 10	0.1	0.5	0.2	0.6	1.2	0.3
>10 - 75	0.1	0.4	nd	0.7	1.8	0.2
>75	nd	nd	nd	0.01	0.1	nd
<b>Total Particles</b>	<b>1001</b>	<b>15233</b>	<b>1009</b>	<b>18812</b>	<b>19129</b>	<b>1122</b>

nd = not detected

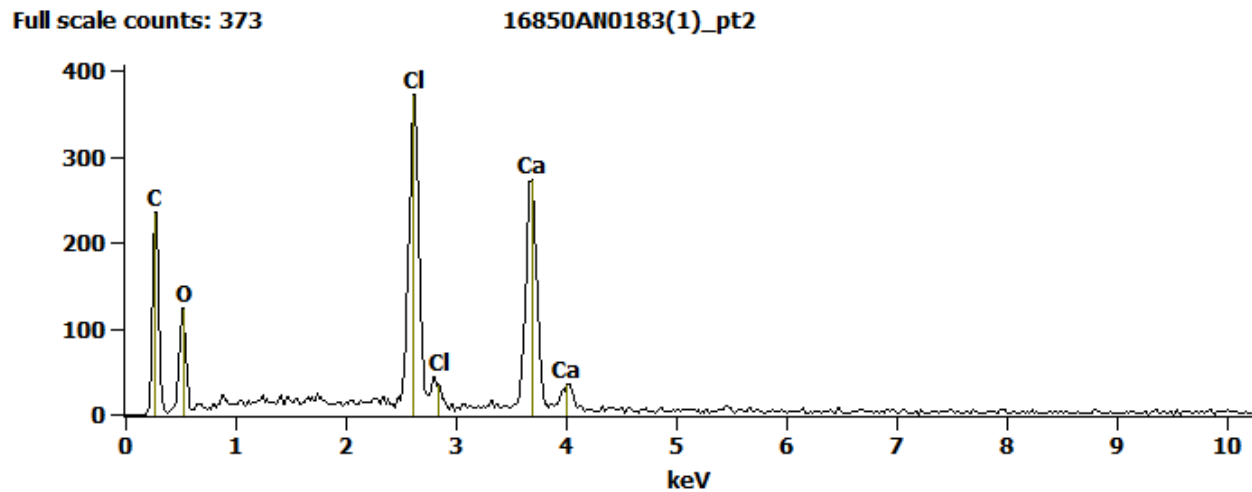
**Table 2. MVA 16850. Percentages of Particles in Various Average Diameter Ranges by Mass of Particles**

MVA Sample Number	AN0183	AN0184	AN0187	AN0188	AN0191	AN0192
Client ID	1-1	1-2	2-1	2-2	3-3	4
Average Diameter Range (µm)	Mass %	Mass %	Mass %	Mass %	Mass %	Mass %
0.5 - 1	2.9	1.7	1.6	0.6	0.1	2.6
>1 - 2.5	13.5	8.3	19.9	2.8	0.5	13.5
>2.5 - 5	27.7	11.2	41.1	5.2	1.3	24.2
>5 - 7.5	24.8	11.8	27.5	6.4	1.3	23.7
>7.5 - 10	1.1	12.1	9.9	6.5	1.3	13.9
>10 - 75	30.0	54.9	nd	73.2	36.4	22.2
>75	nd	nd	nd	5.2	59.2	nd

nd = not detected



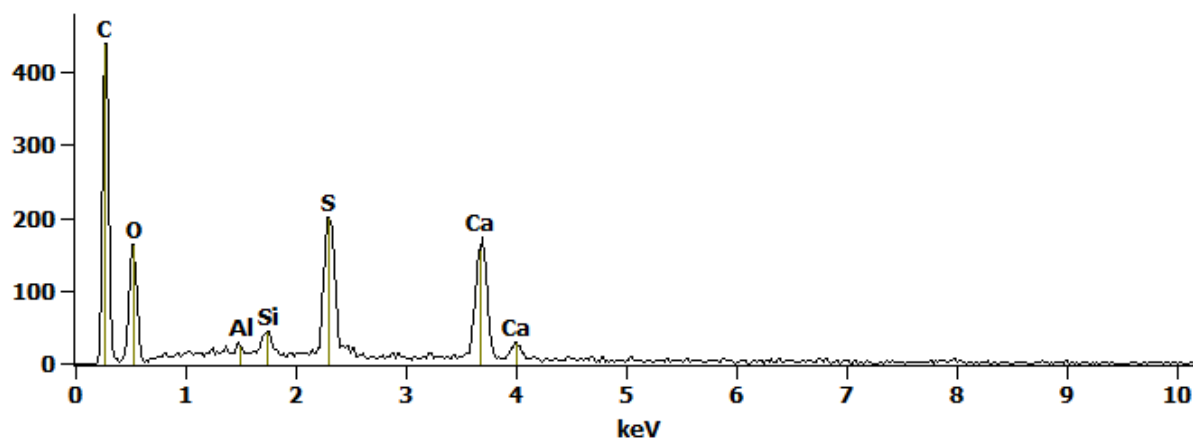
**Figure A1.** AN0183. SEM backscattered electron image of sample particulate on a carbon substrate.



**Figure A2.** AN0183. SEM-EDS spectrum from area 2 in Figure A1. Calcium chloride.

Full scale counts: 439

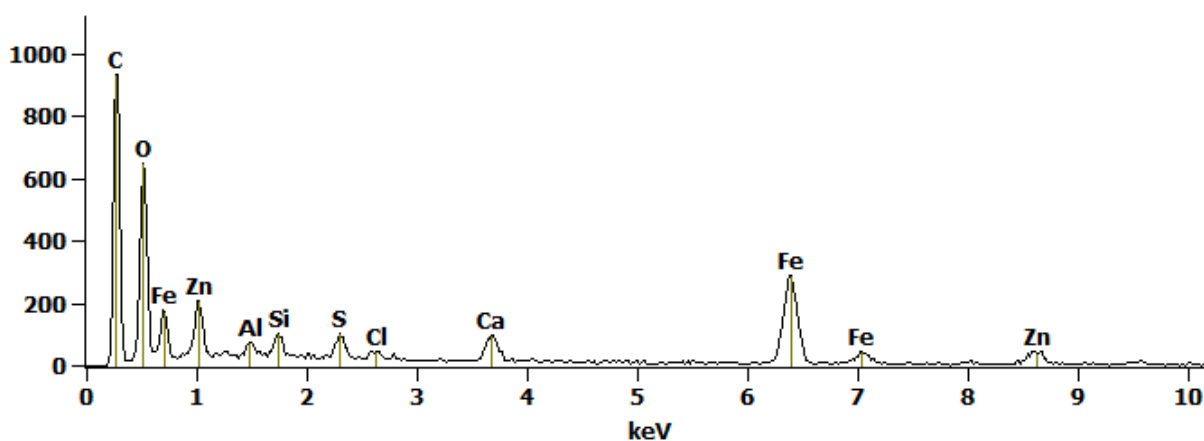
16850AN0183(1)\_pt4



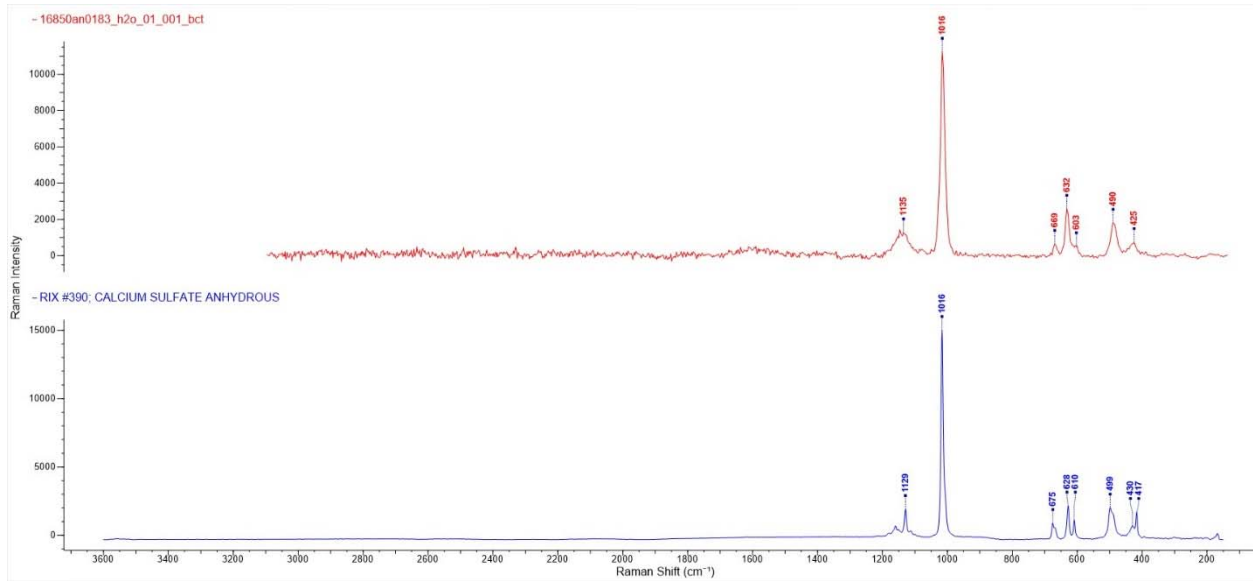
**Figure A3.** AN0183. SEM-EDS spectrum from area 4 in Figure A1.  
Calcium sulfate.

Full scale counts: 933

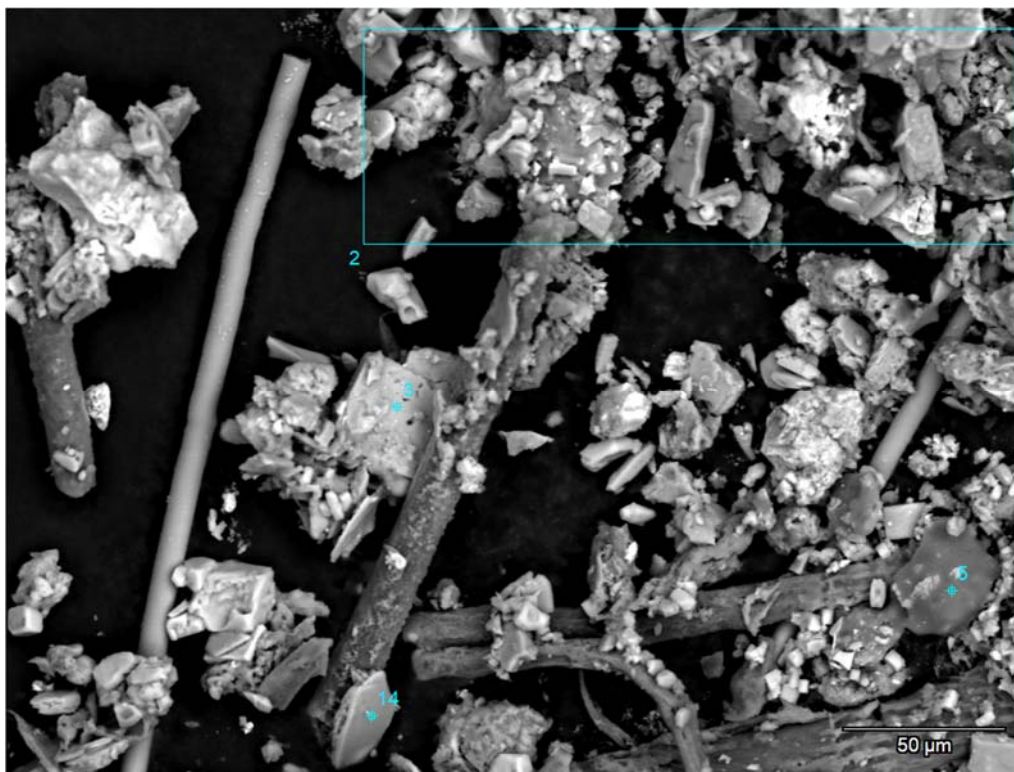
16850AN0183(1)\_pt5



**Figure A4.** AN0183. SEM-EDS spectrum from area 5 in Figure A1.  
Iron/zinc.



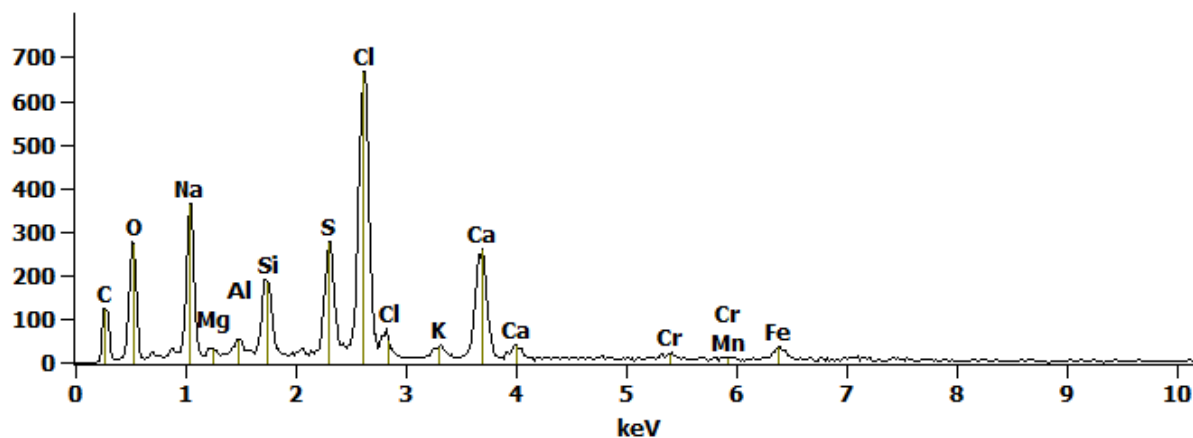
**Figure A5.** AN0183. CRM spectra of a DI water extract from the sample (top trace) plotted with a reference for calcium sulfate (bottom trace).



**Figure B1.** AN0184. SEM backscattered electron image of sample particulate on a carbon substrate.

Full scale counts: 667

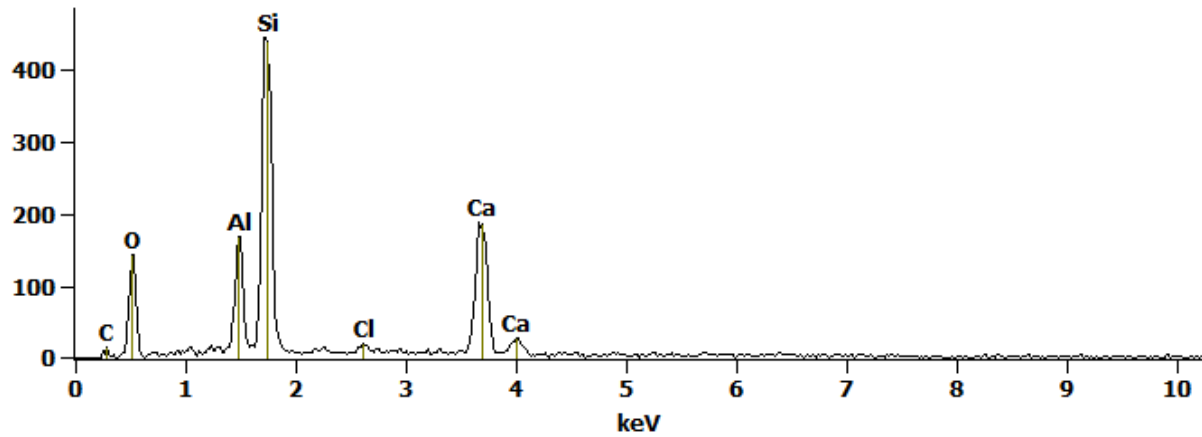
16850AN0184(1)\_pt2



**Figure B2.** AN0184. SEM-EDS spectrum from area 2 in Figure B1. Bulk chemistry.

Full scale counts: 445

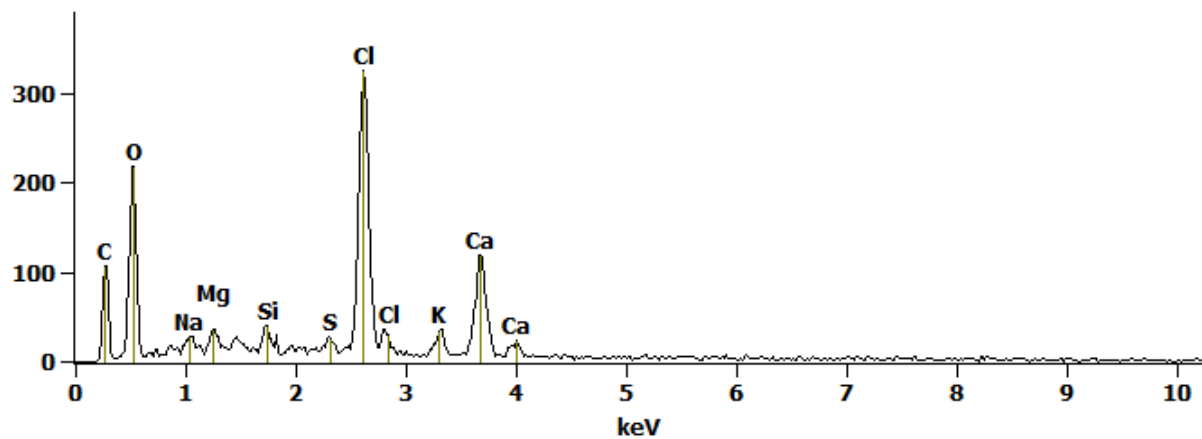
16850AN0184(1)\_pt6



**Figure B3.** AN0184. SEM-EDS spectrum from area 6 in Figure B1.  
Glass fiber.

Full scale counts: 325

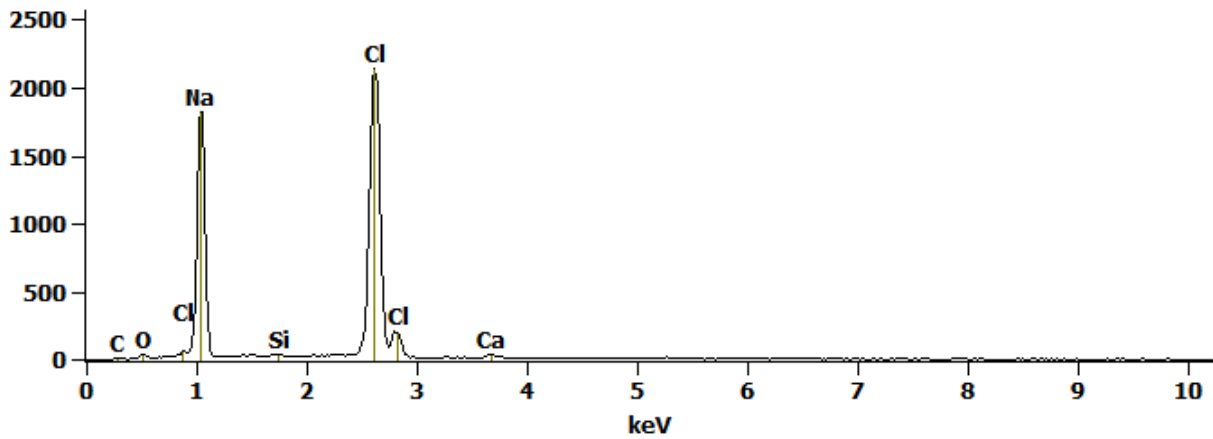
16850AN0184(1)\_pt8



**Figure B4.** AN0184. SEM-EDS spectrum from area 8 in Figure B1.  
Cellulose fiber with encrusting material.

Full scale counts: 2140

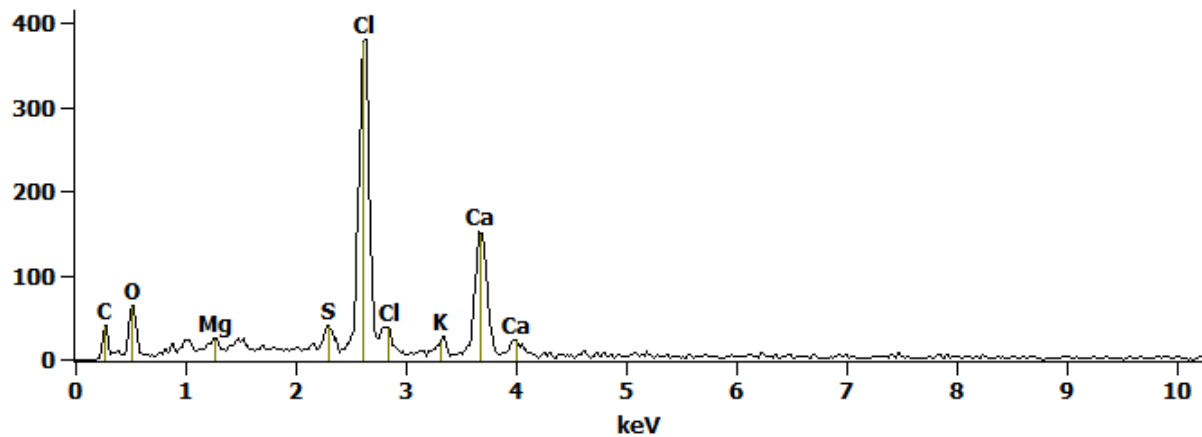
16850AN0184(1)\_pt3



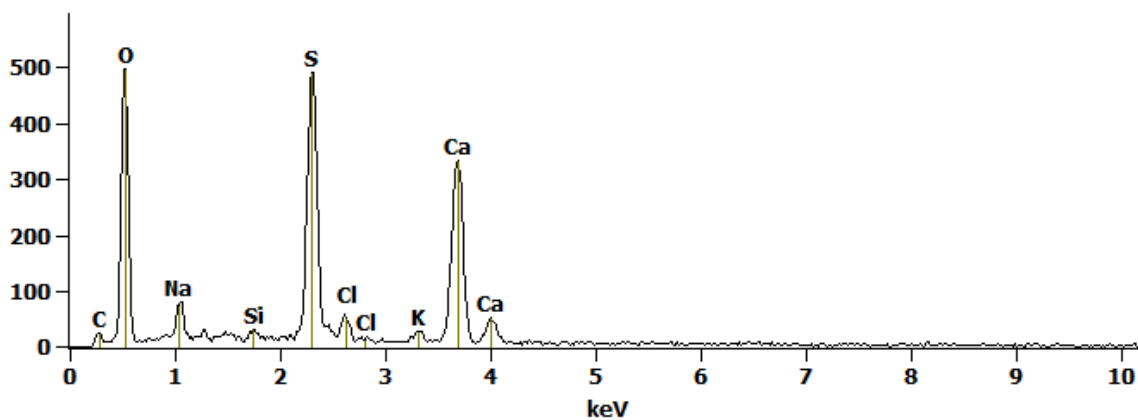
**Figure B5.** AN0184. SEM-EDS spectrum from area 3 in Figure B1.  
Sodium chloride.

Full scale counts: 381

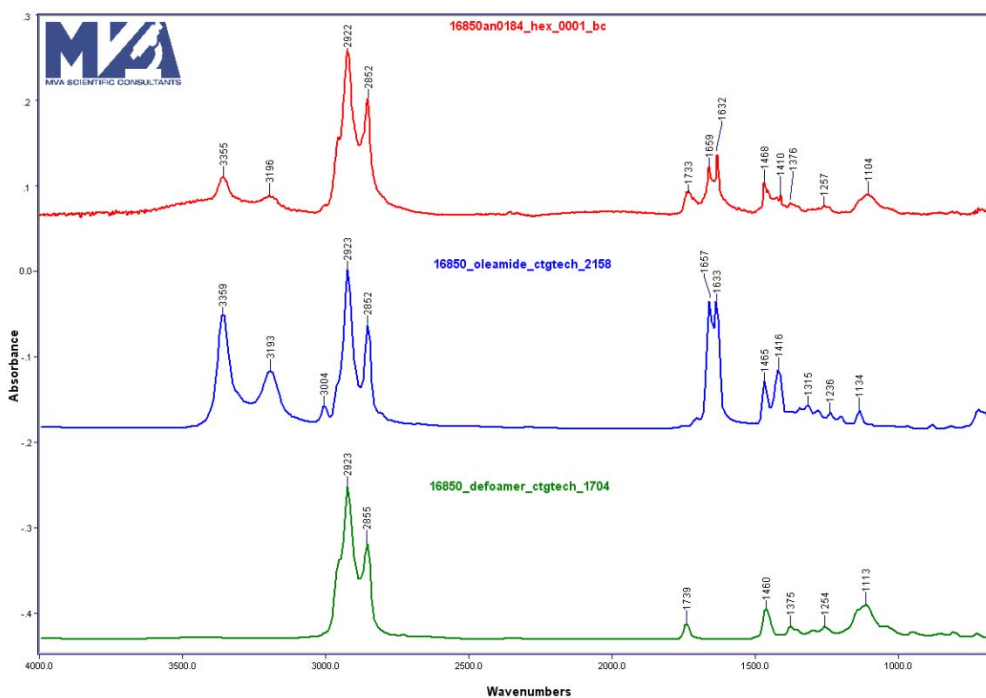
16850AN0184(1)\_pt5



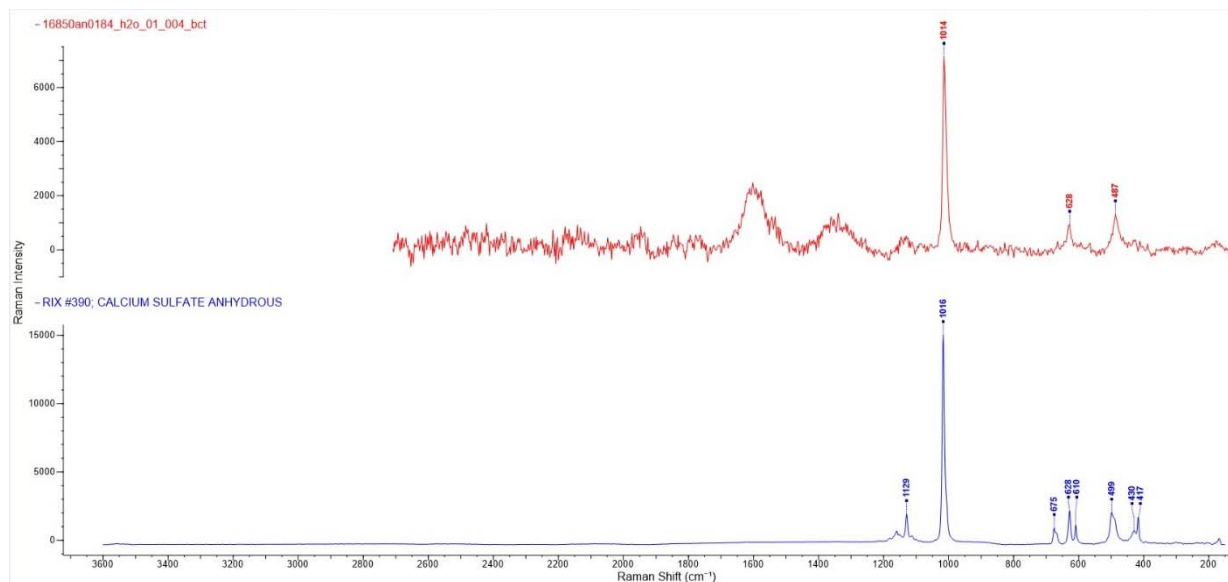
**Figure B6.** AN0184. SEM-EDS spectrum from area 5 in Figure B1.  
Calcium chloride.



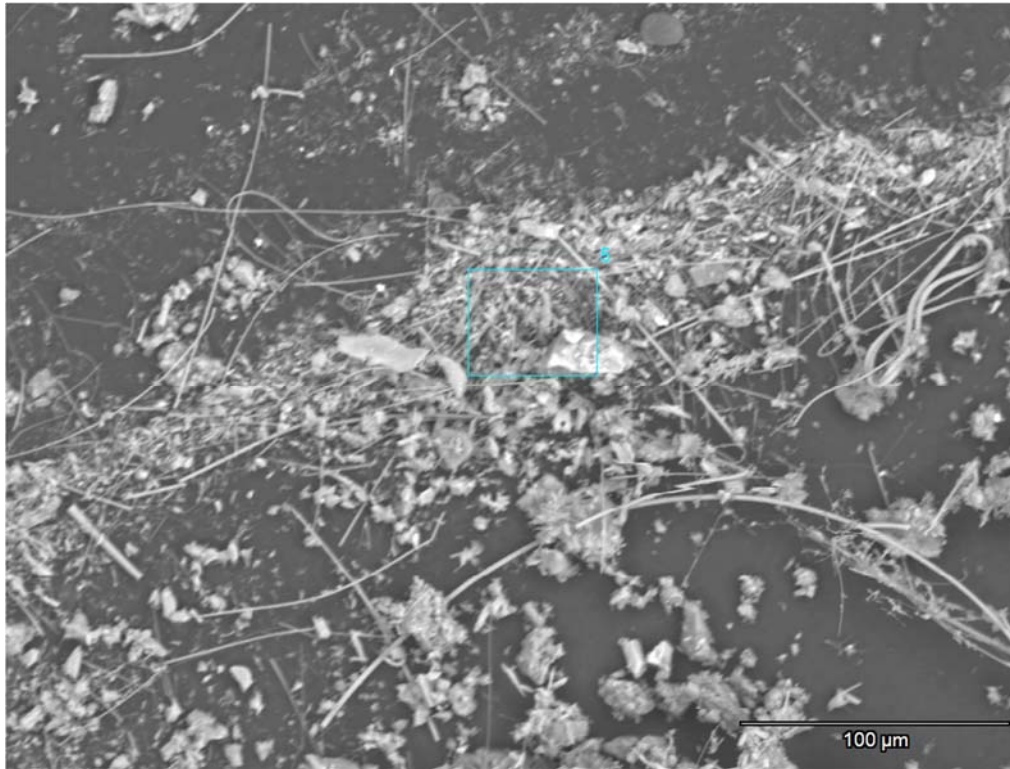
**Figure B7.** AN0184. SEM-EDS spectrum from area 14 in Figure B1. Calcium sulfate.



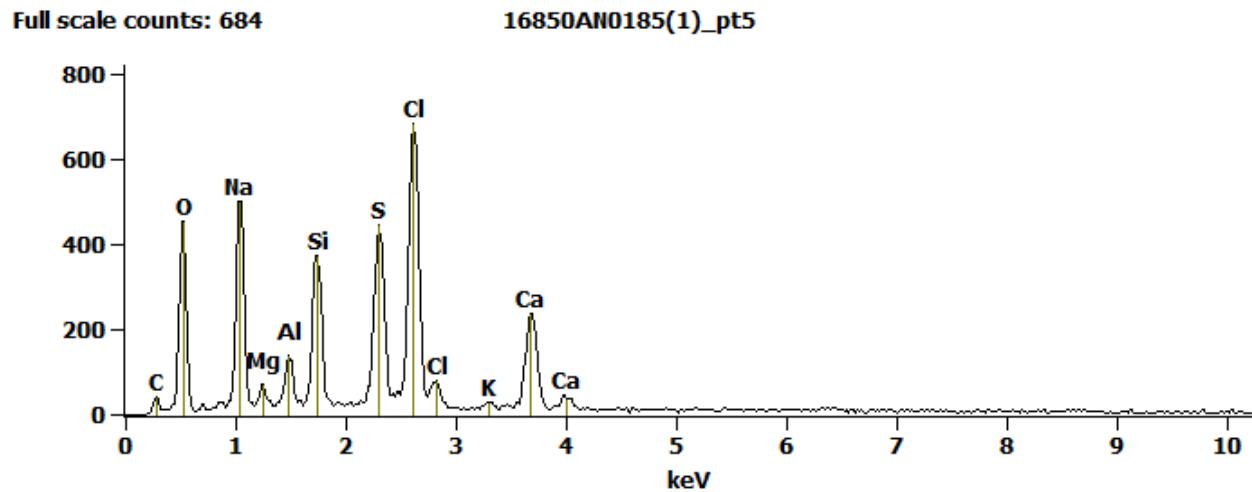
**Figure B8.** AN0184. FTIR spectra of a hexane extract from the sample (top trace), an oleamide reference (middle trace), and a defoamer reference (bottom trace).



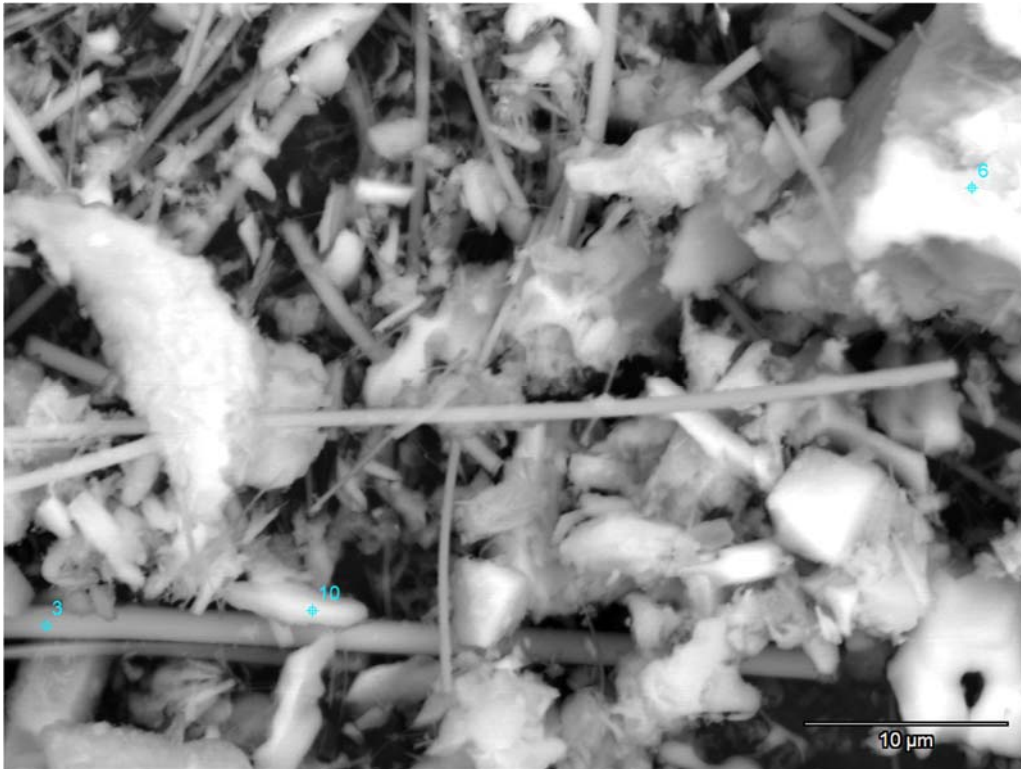
**Figure B9.** AN0184. CRM spectra of a DI water extract from the sample (top trace) plotted with a reference for calcium sulfate (bottom trace).



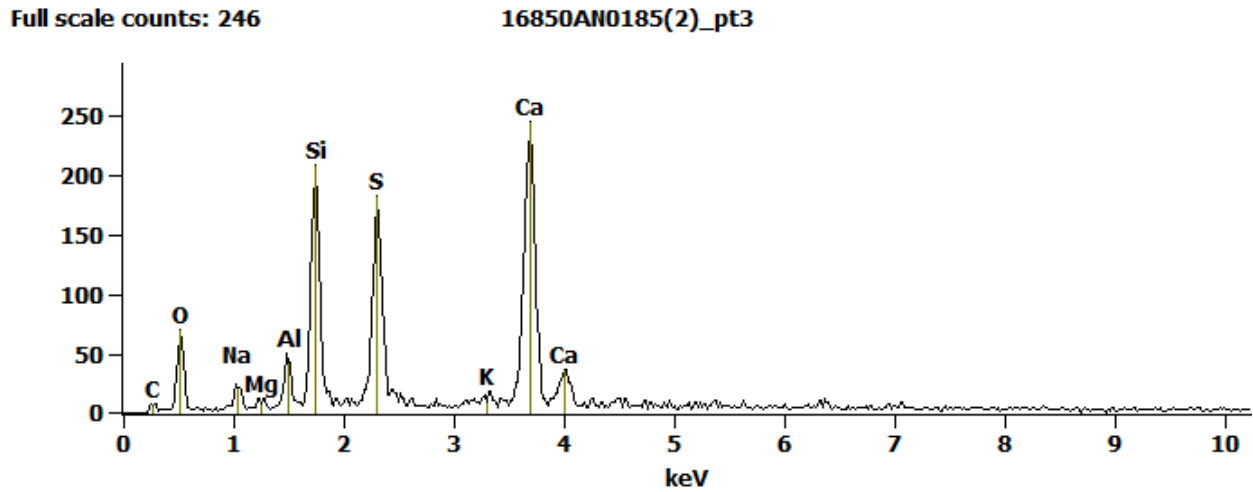
**Figure C1.** AN0185. SEM backscattered electron image of sample particulate on a carbon substrate.



**Figure C2.** AN0185. SEM-EDS spectrum from area 5 in Figure C1. Bulk chemistry.



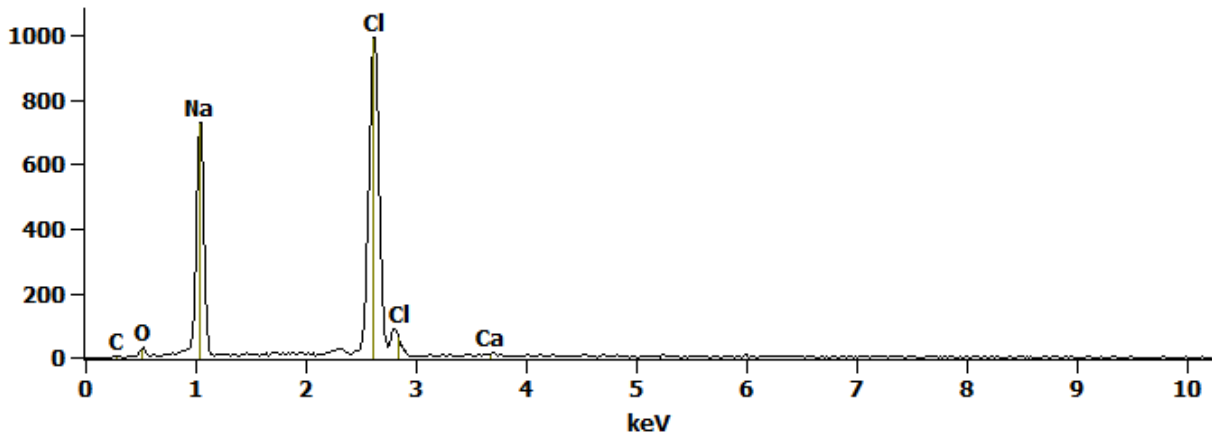
**Figure C3.** AN0185. SEM backscattered electron image of sample particulate on a carbon substrate.



**Figure C4.** AN0185. SEM-EDS spectrum from area 3 in Figure C3. Glass fiber/calcium sulfate.

Full scale counts: 991

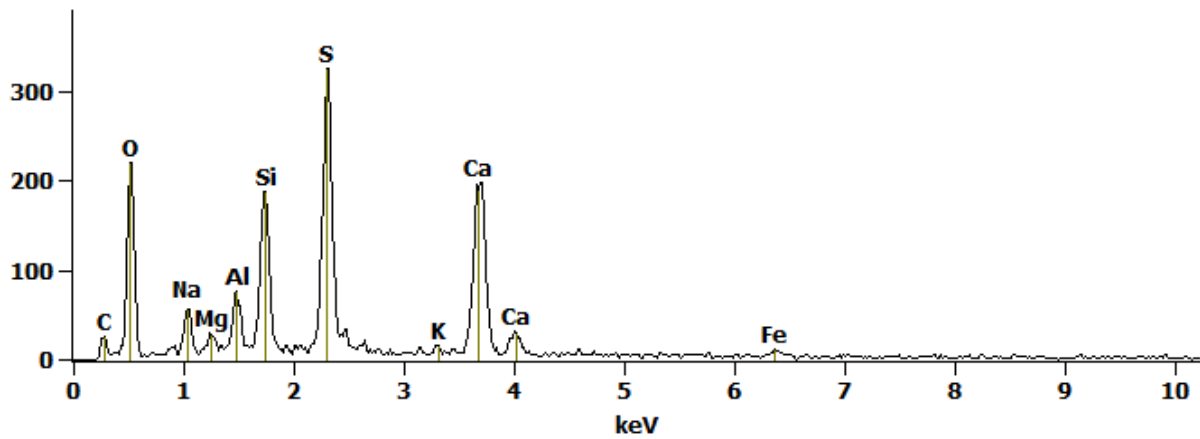
16850AN0185(2)\_pt6



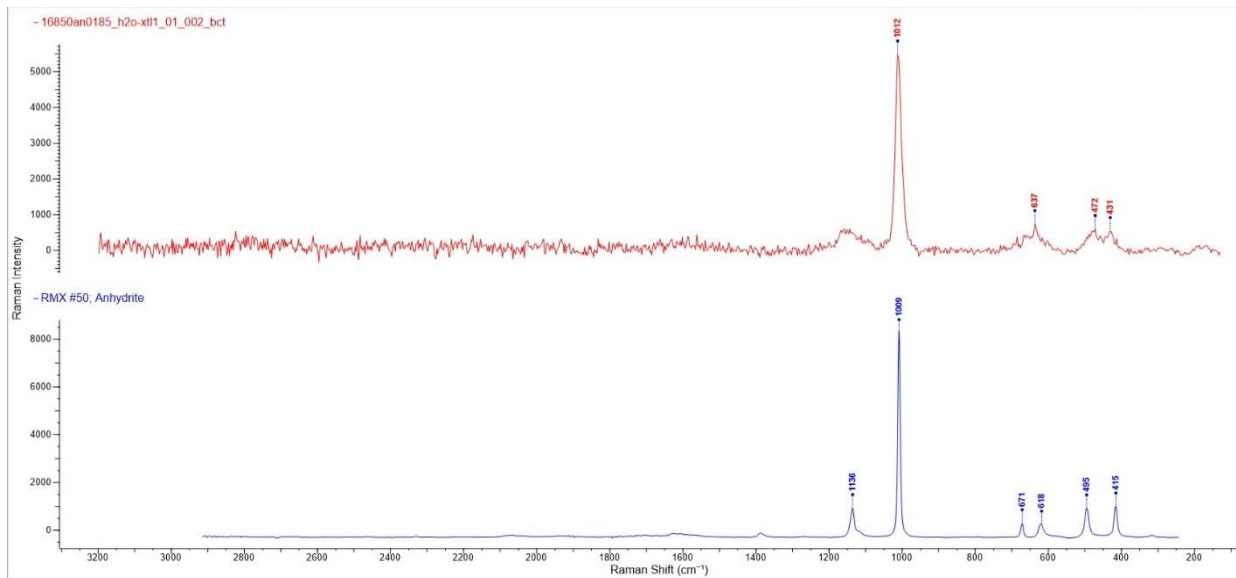
**Figure C5.** AN0185. SEM-EDS spectrum from area 6 in Figure C3.  
Sodium chloride.

Full scale counts: 325

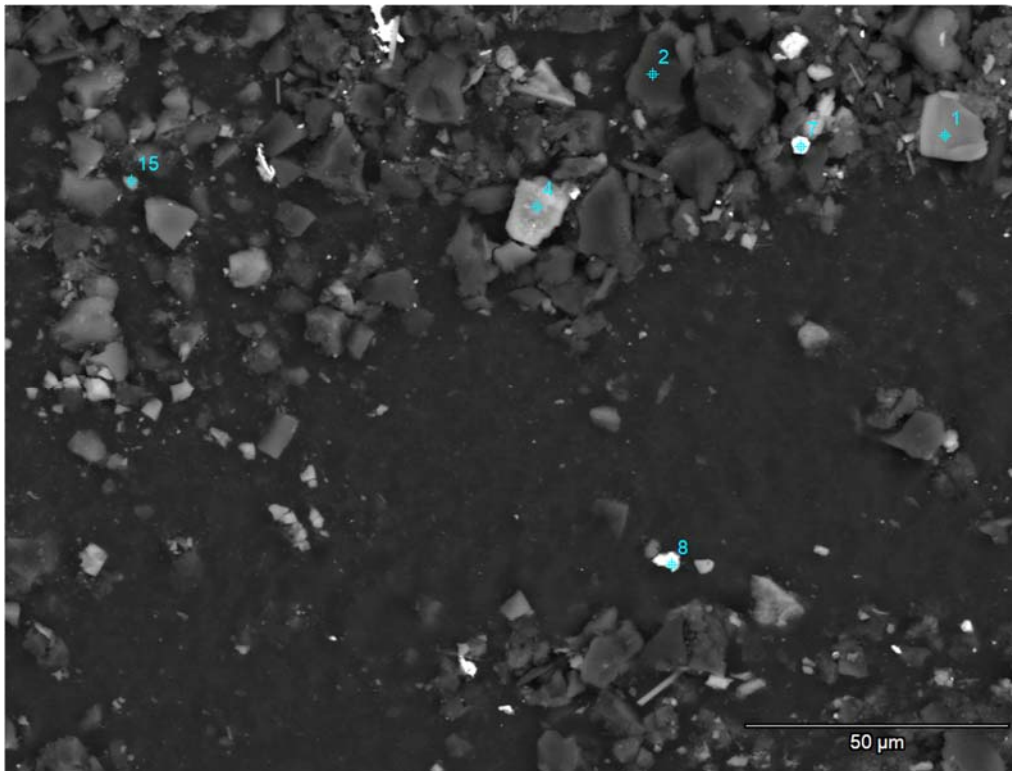
16850AN0185(2)\_pt10



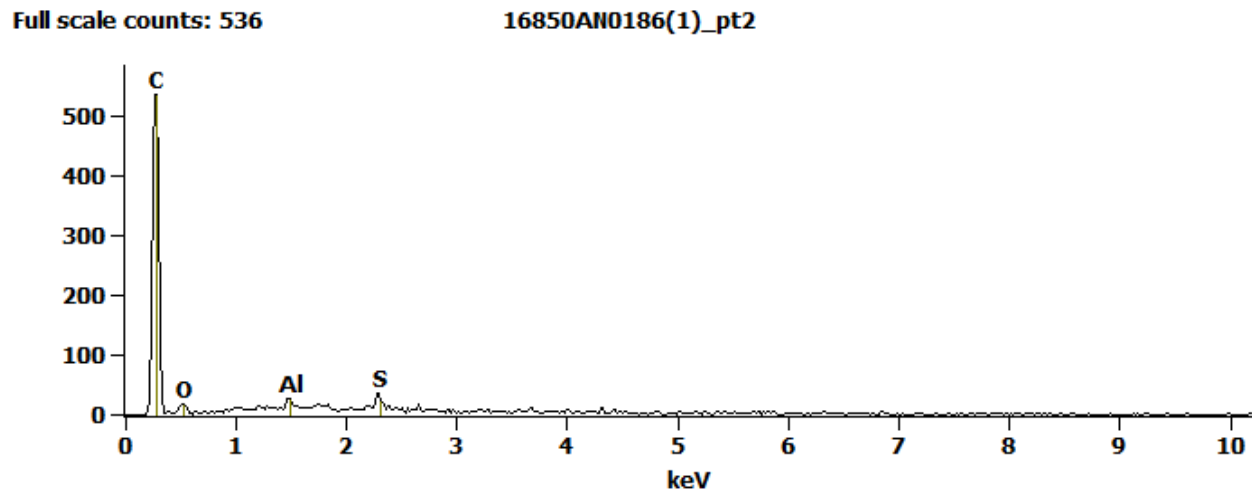
**Figure C6.** AN0185. SEM-EDS spectrum from area 10 in Figure C3.  
Calcium sulfate/glass fiber.



**Figure C7.** AN0185. CRM spectra of a DI water extract from the sample (top trace) plotted with a reference for calcium sulfate (bottom trace).



**Figure D1.** AN0186. SEM backscattered electron image of sample particulate on a carbon substrate.



**Figure D2.** AN0186. SEM-EDS spectrum from area 2 in Figure D1. Carbon-rich.

Full scale counts: 509

16850AN0186(1)\_pt15

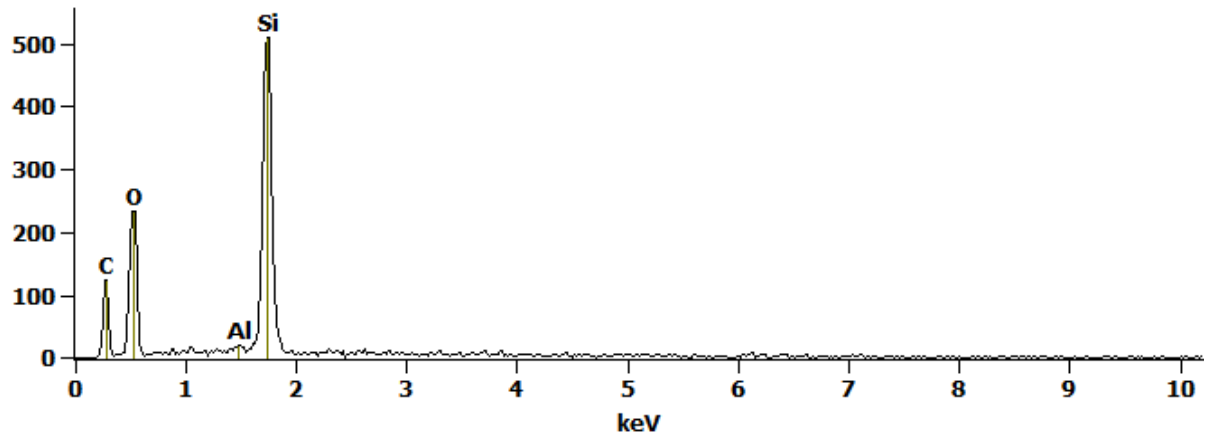


Figure D3. AN0186. SEM-EDS spectrum from area 15 in Figure D1. Silica.

Full scale counts: 2216

16850AN0186(1)\_pt1

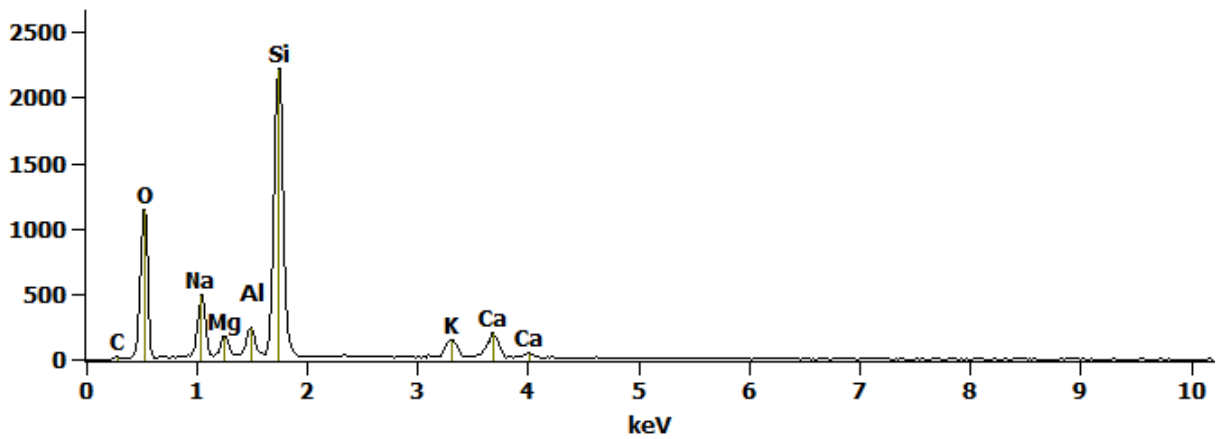
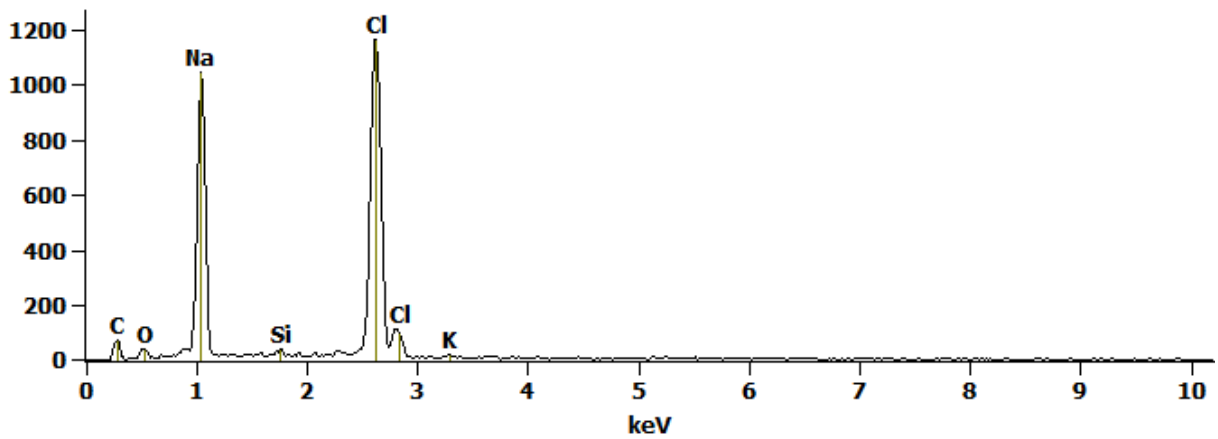


Figure D4. AN0186. SEM-EDS spectrum from area 1 in Figure D1. Aluminosilicate.

Full scale counts: 1163

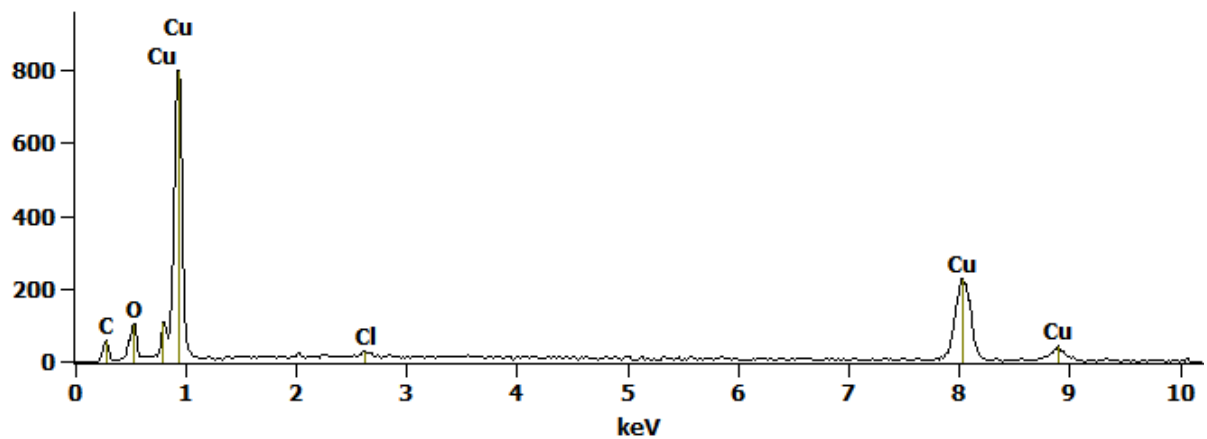
16850AN0186(1)\_pt4



**Figure D5.** AN0186. SEM-EDS spectrum from area 4 in Figure D1.  
Sodium chloride.

Full scale counts: 798

16850AN0186(1)\_pt7



**Figure D6.** AN0186. SEM-EDS spectrum from area 7 in Figure D1.  
Copper.

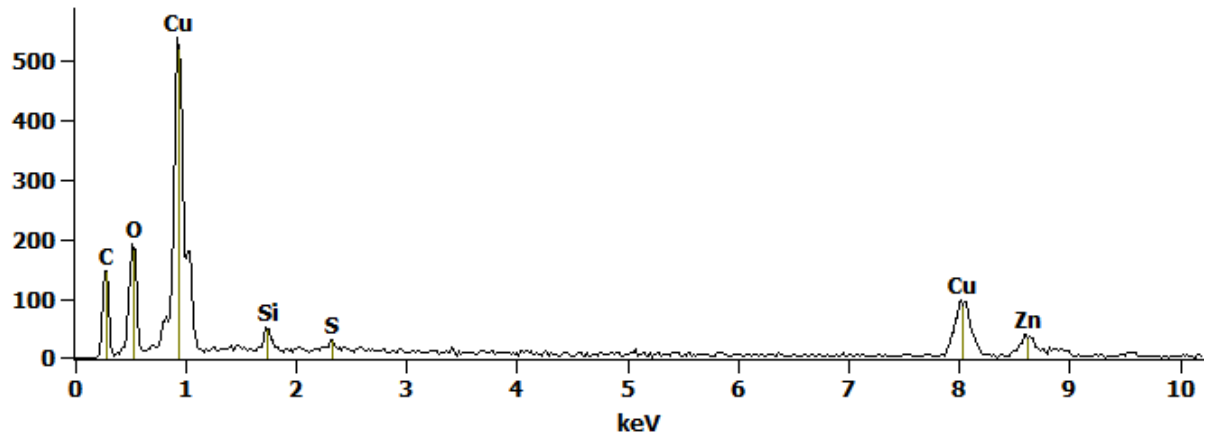


Figure D7. AN0186. SEM-EDS spectrum from area 8 in Figure D1. Copper/zinc.

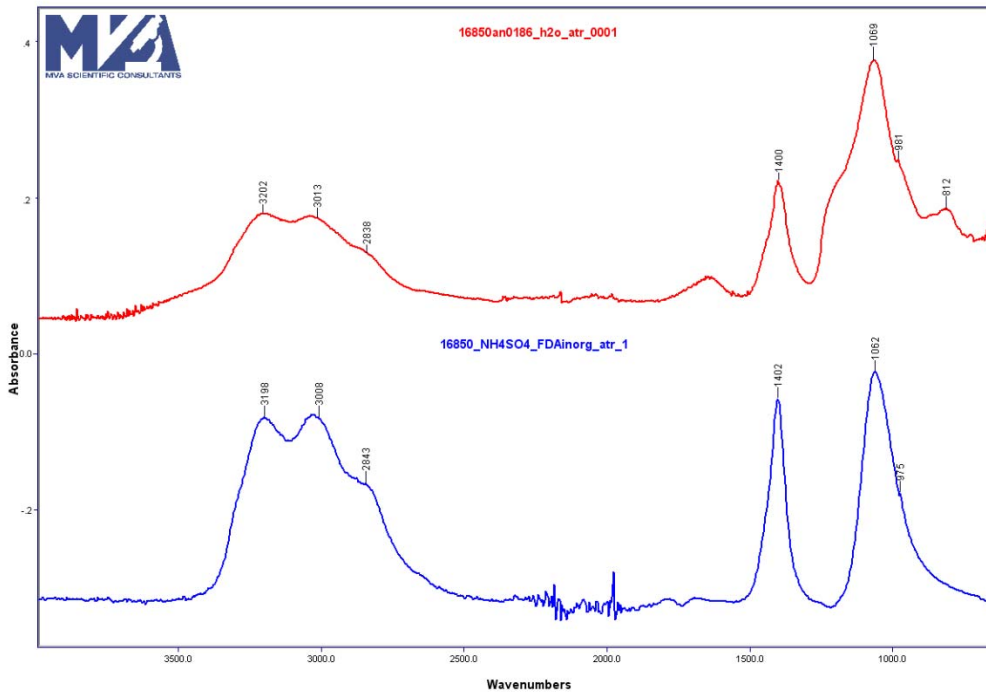
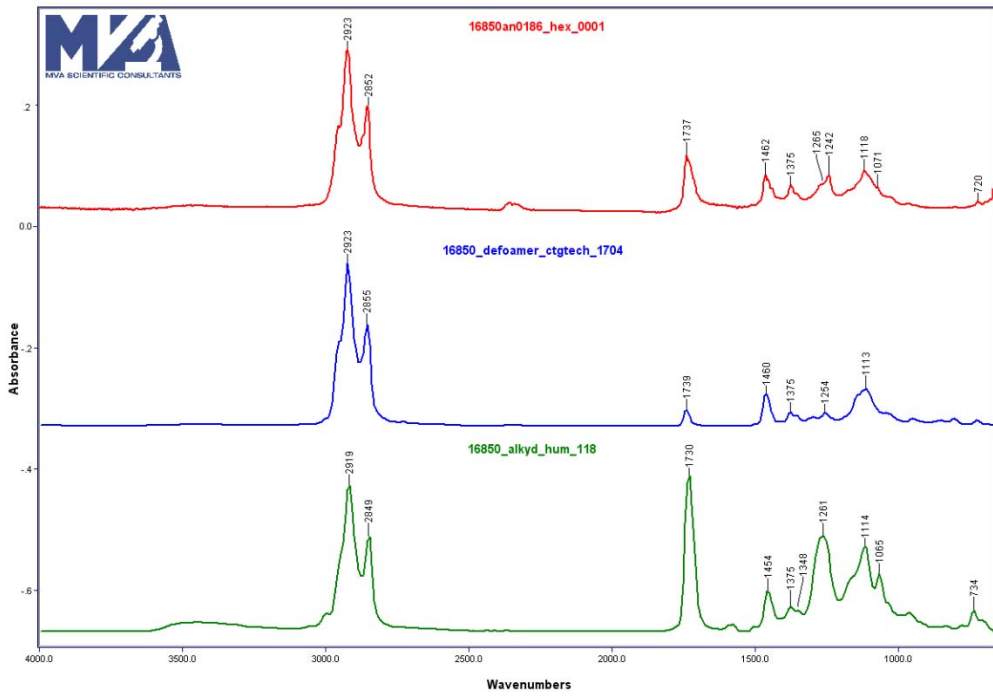
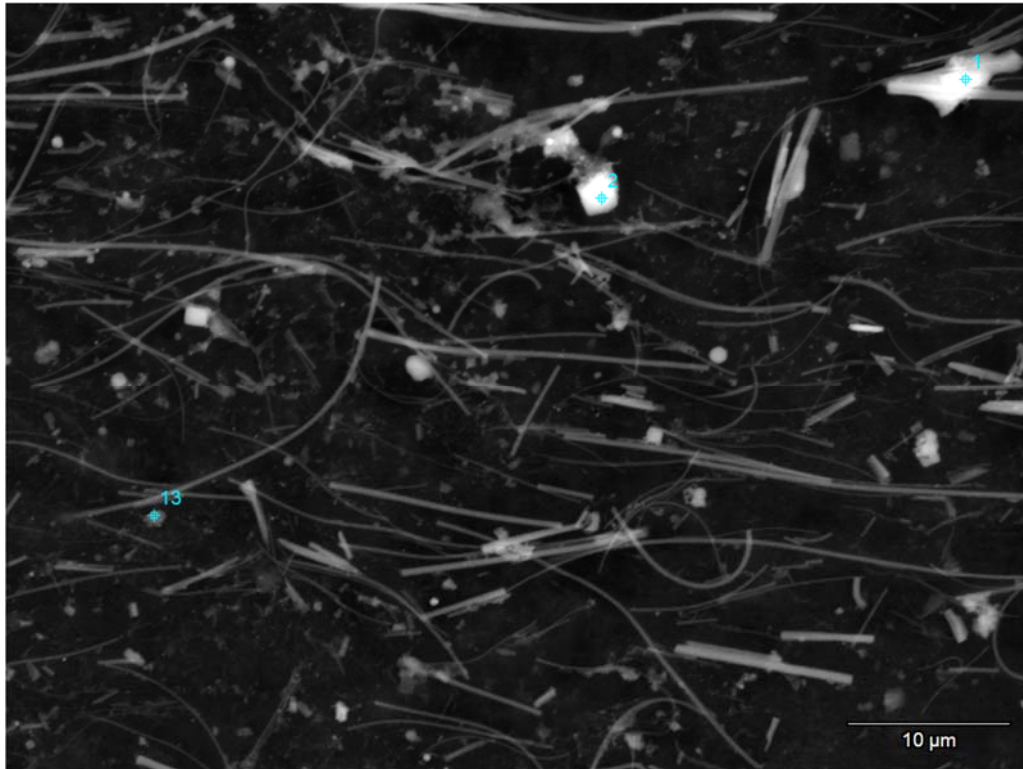


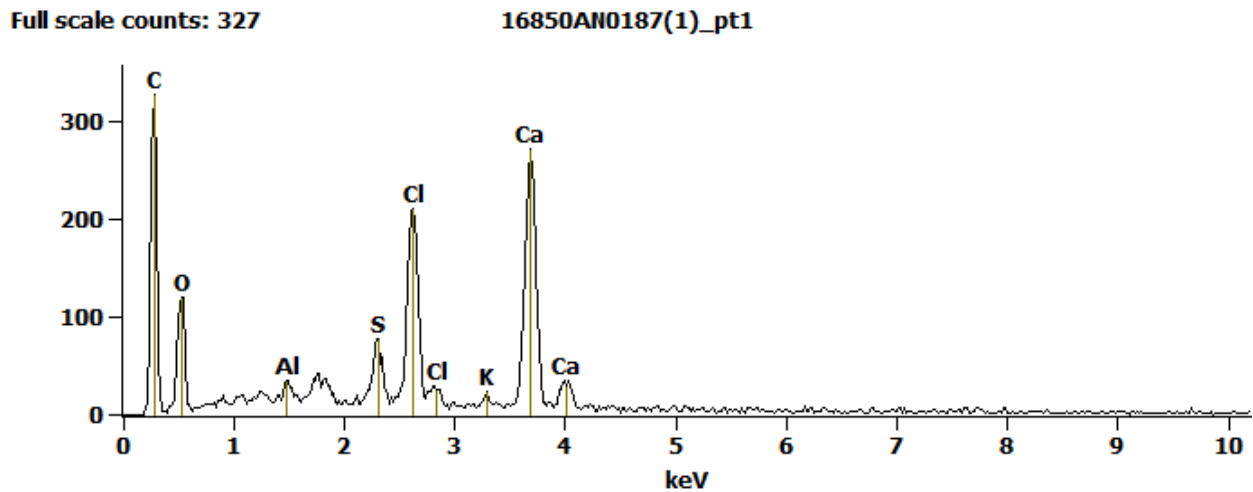
Figure D8. AN0186. FTIR spectra of a DI water extract from the sample (top trace) and an ammonium sulfate reference (bottom trace).



**Figure D9.** AN0186. FTIR spectra of a hexane extract from the sample (top trace), a defoamer reference (middle trace), and an alkyd reference (bottom trace).



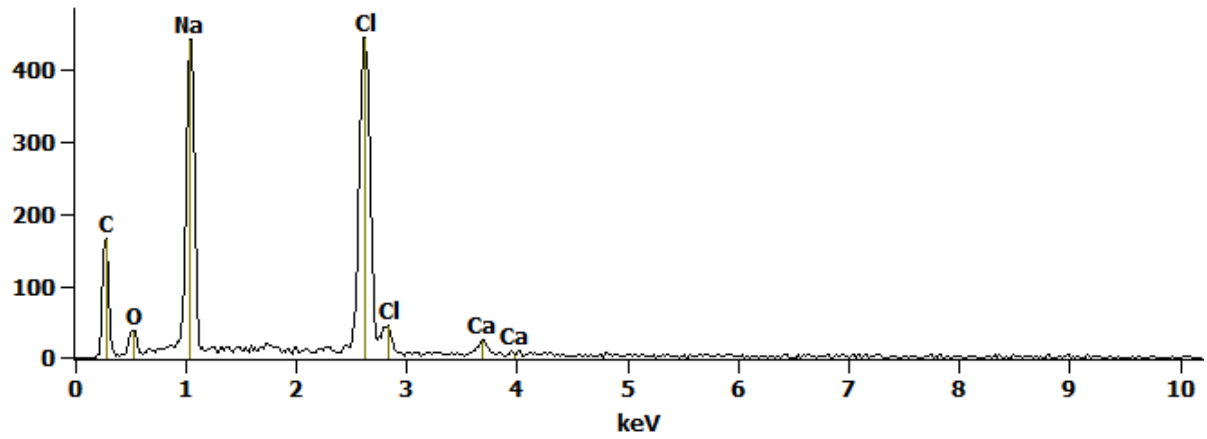
**Figure E1.** AN0187. SEM backscattered electron image of sample particulate on a carbon substrate.



**Figure E2.** AN0187. SEM-EDS spectrum from area 1 in Figure E1. Calcium chloride.

Full scale counts: 445

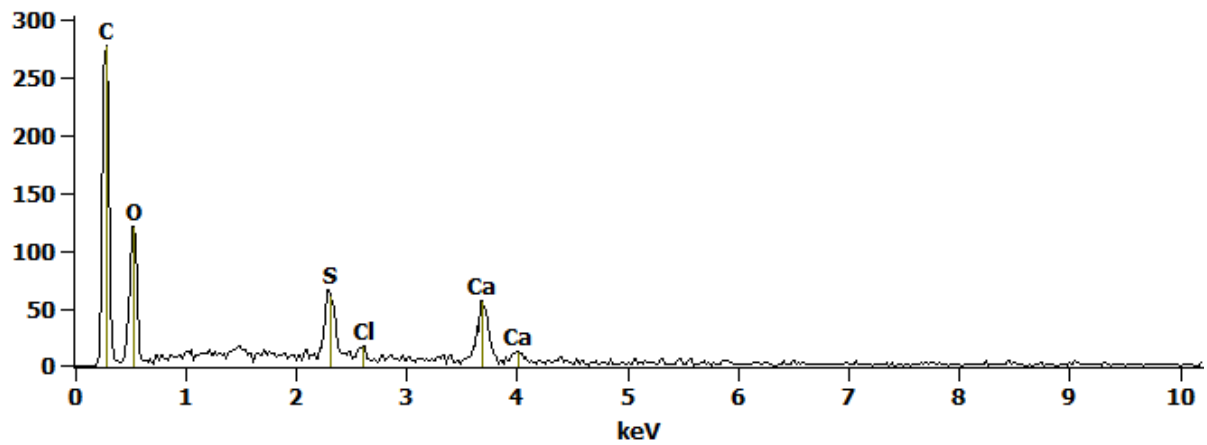
16850AN0187(1)\_pt2



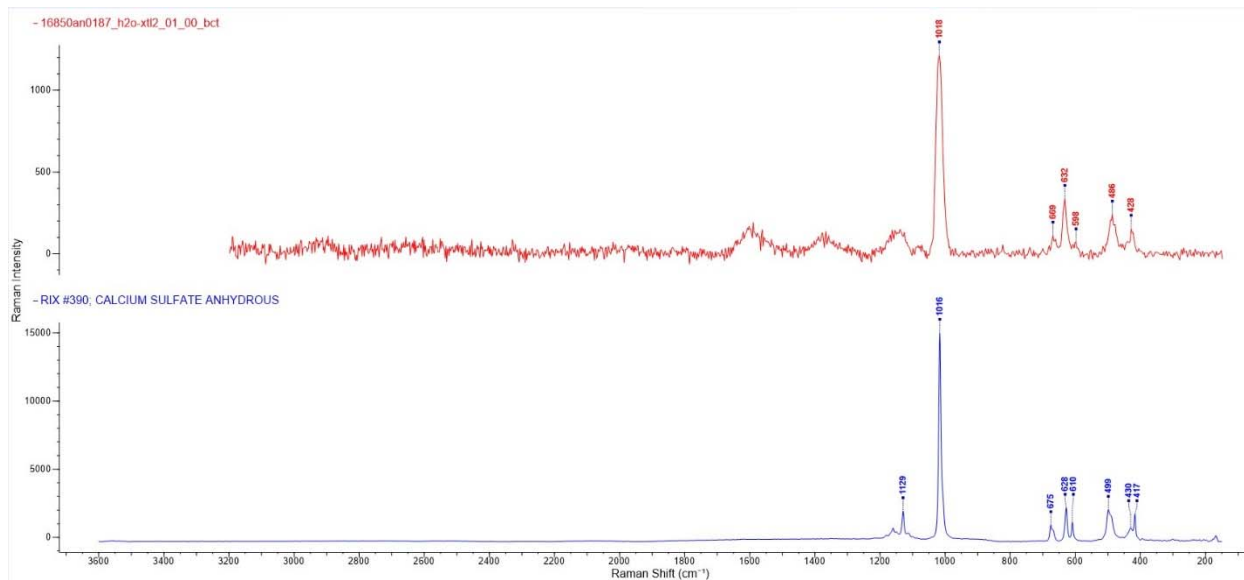
**Figure E3.** AN0187. SEM-EDS spectrum from area 2 in Figure E1.  
Sodium chloride.

Full scale counts: 278

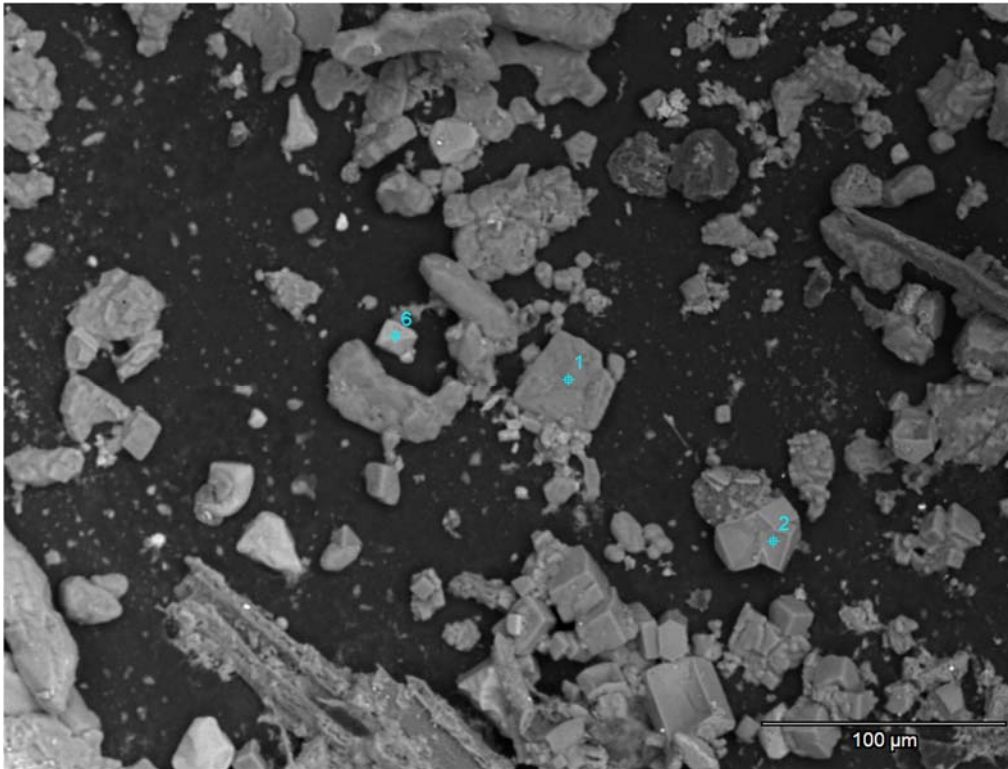
16850AN0187(1)\_pt13



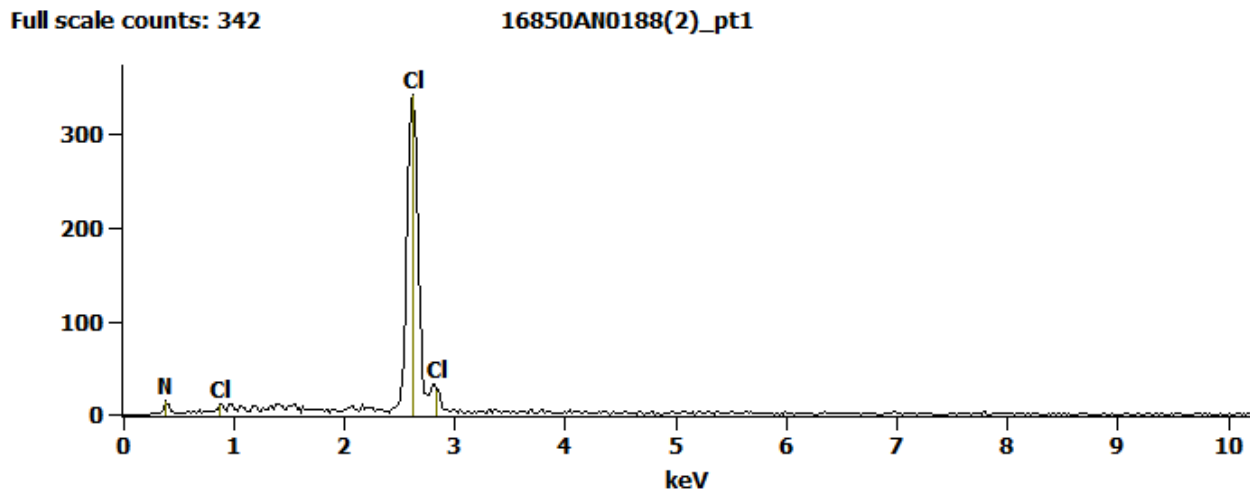
**Figure E4.** AN0187. SEM-EDS spectrum from area 13 in Figure E1.  
Calcium sulfate.



**Figure E5.** AN0187. CRM spectra of a DI water extract from the sample (top trace) plotted with a reference for calcium sulfate (bottom trace).



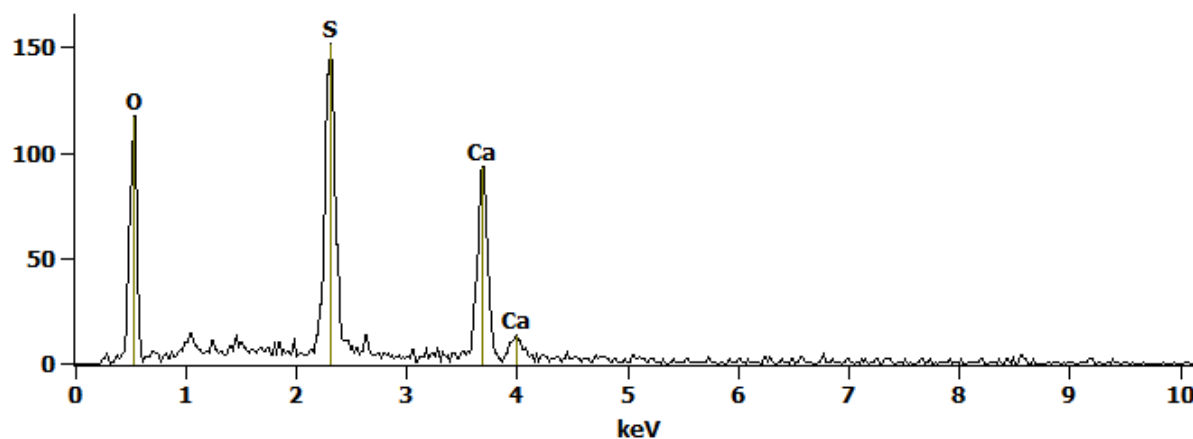
**Figure F1.** AN0188. SEM backscattered electron image of sample particulate on a carbon substrate.



**Figure F2.** AN0188. SEM-EDS spectrum from area 1 in Figure F1. Ammonium chloride.

Full scale counts: 152

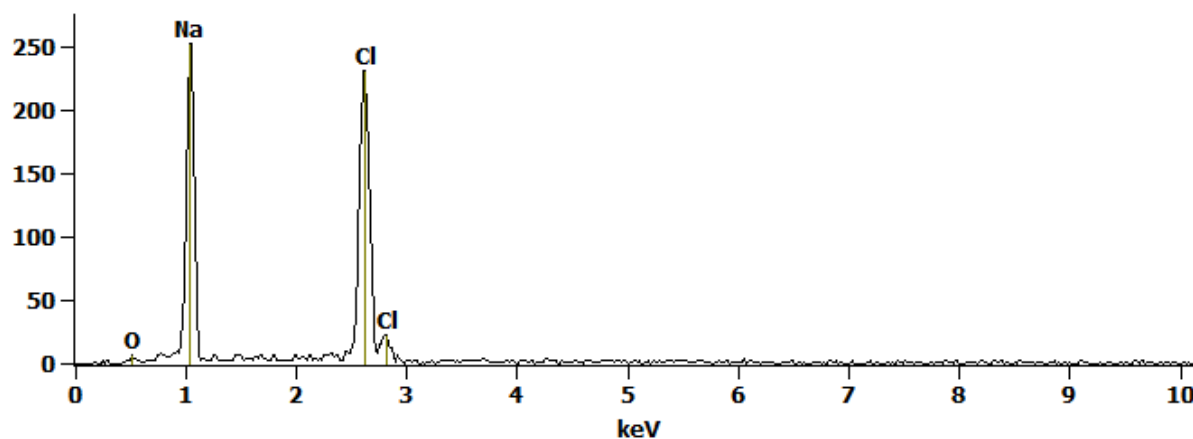
16850AN0188(2)\_pt2



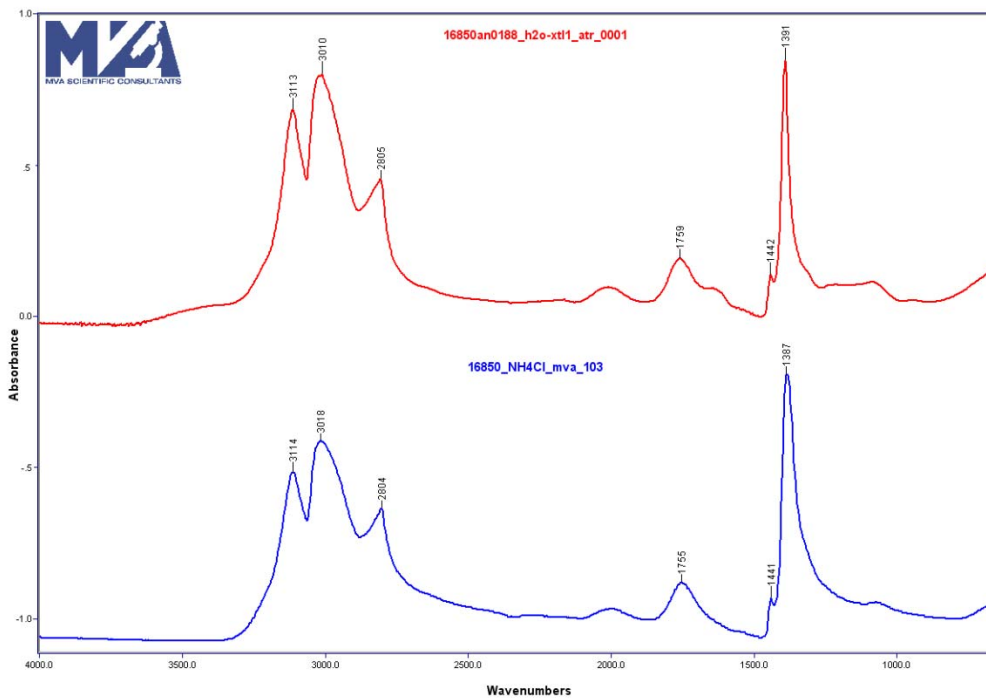
**Figure F3.** AN0188. SEM-EDS spectrum from area 2 in Figure F1.  
Calcium sulfate.

Full scale counts: 253

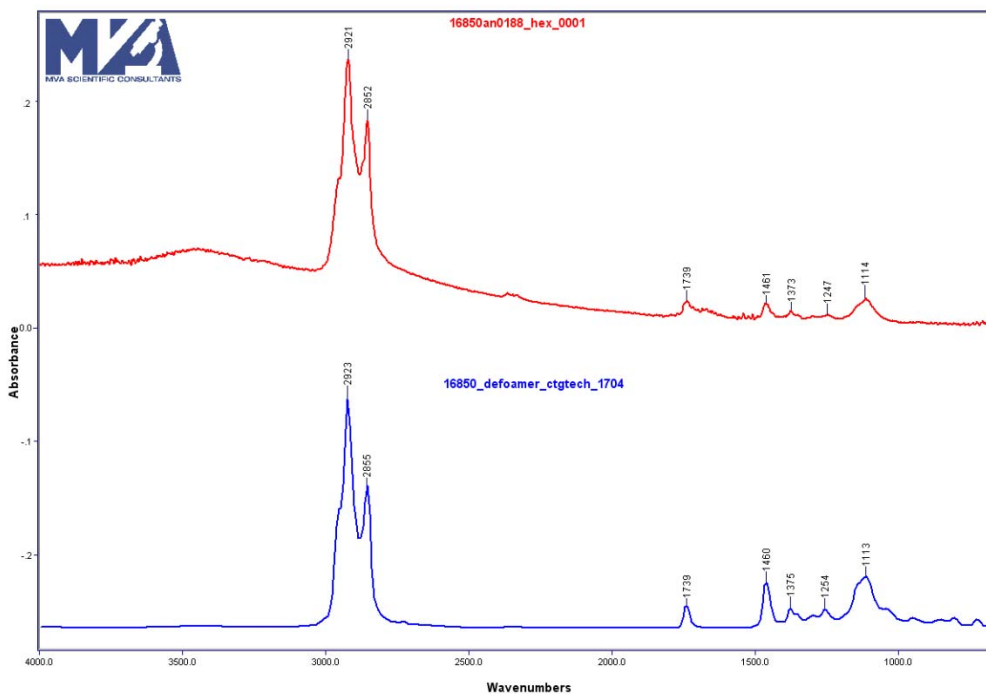
16850AN0188(2)\_pt6



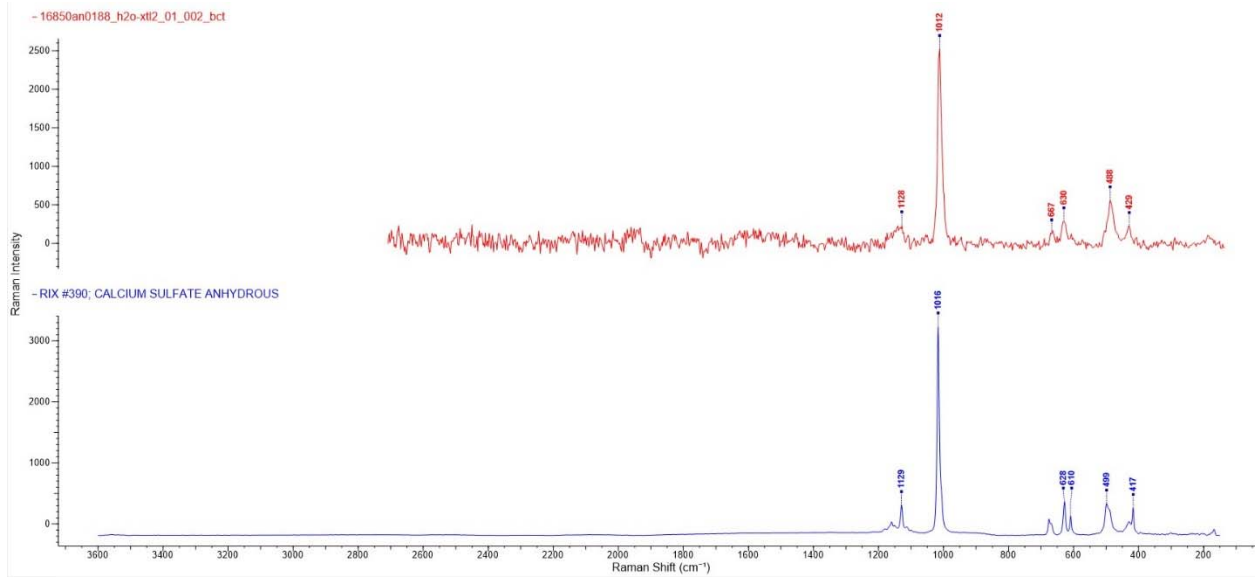
**Figure F4.** AN0188. SEM-EDS spectrum from area 6 in Figure F1.  
Sodium chloride.



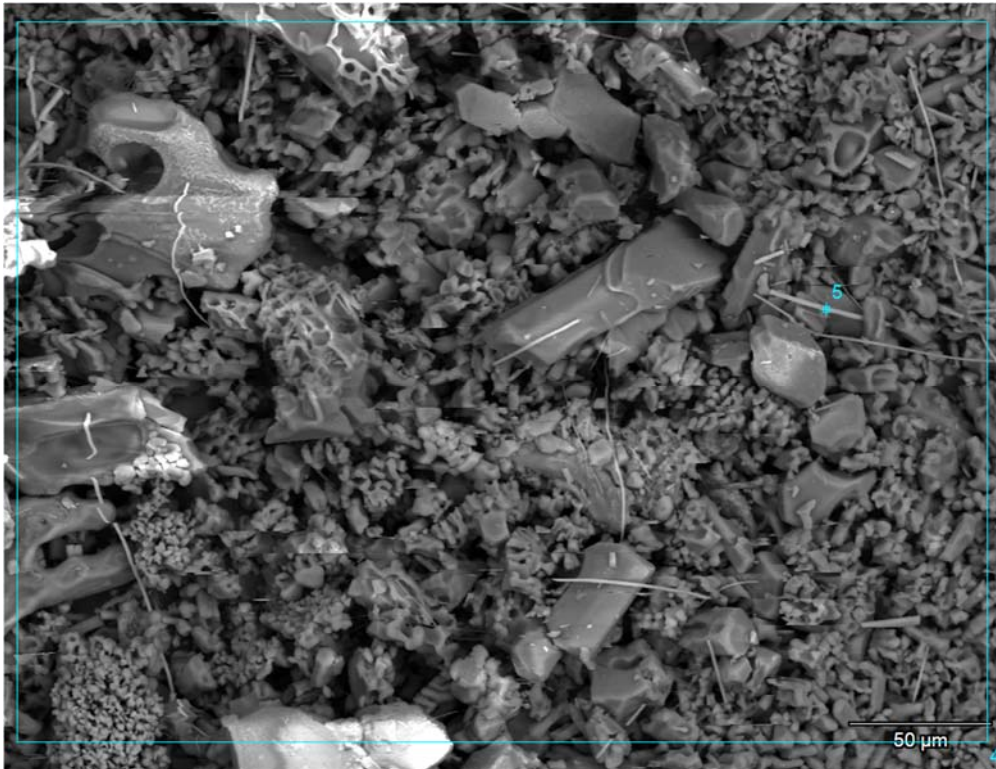
**Figure F5.** AN0188. FTIR spectra of a DI water extract from the sample (top trace) and an ammonium chloride reference (bottom trace).



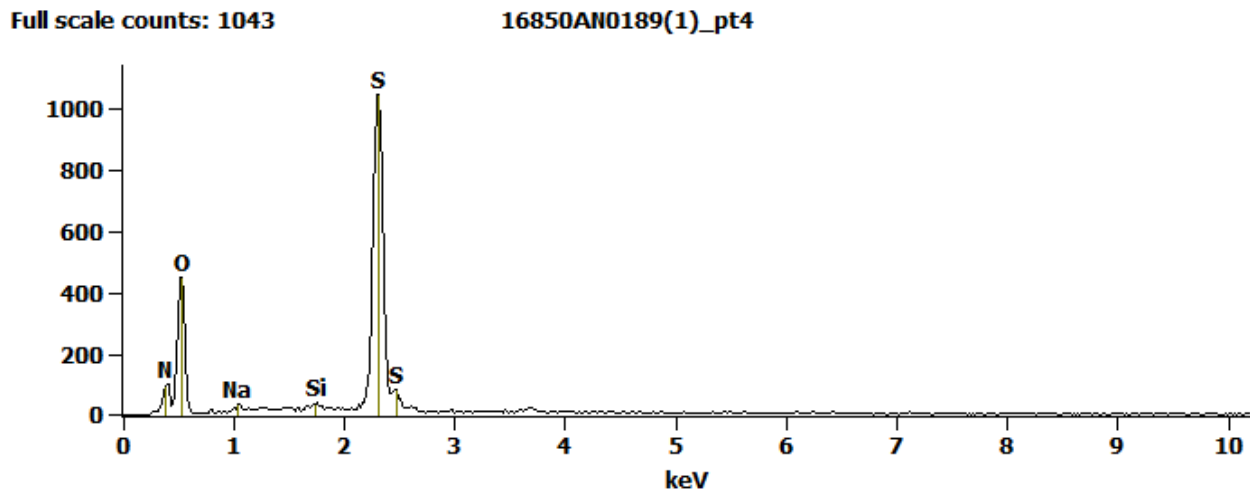
**Figure F6.** AN0188. FTIR spectra of a hexane extract from the sample (top trace) and a defoamer reference (bottom trace).



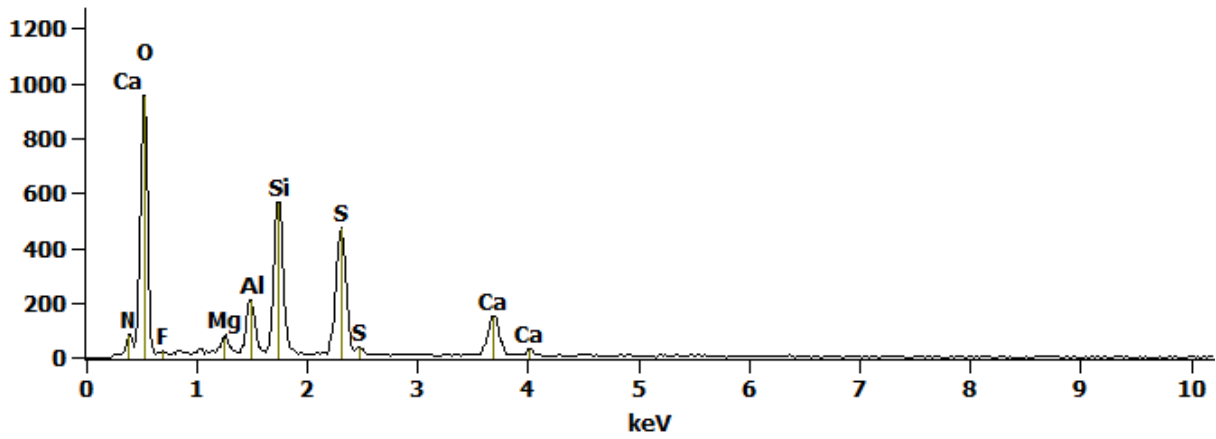
**Figure F7.** AN0188. CRM spectra of a DI water extract from the sample (top trace) plotted with a reference for calcium sulfate (bottom trace).



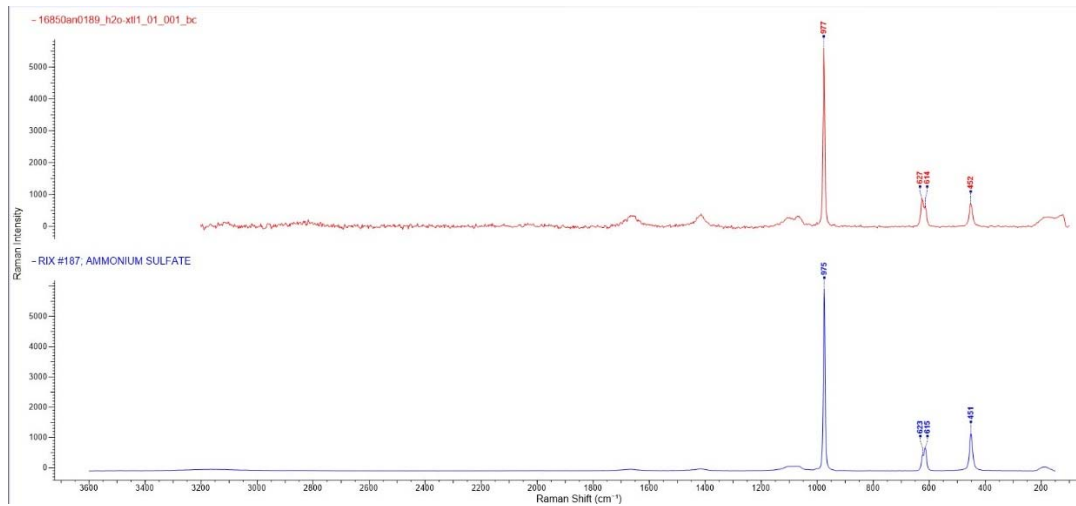
**Figure G1.** AN0189. SEM backscattered electron image of sample particulate on a carbon substrate.



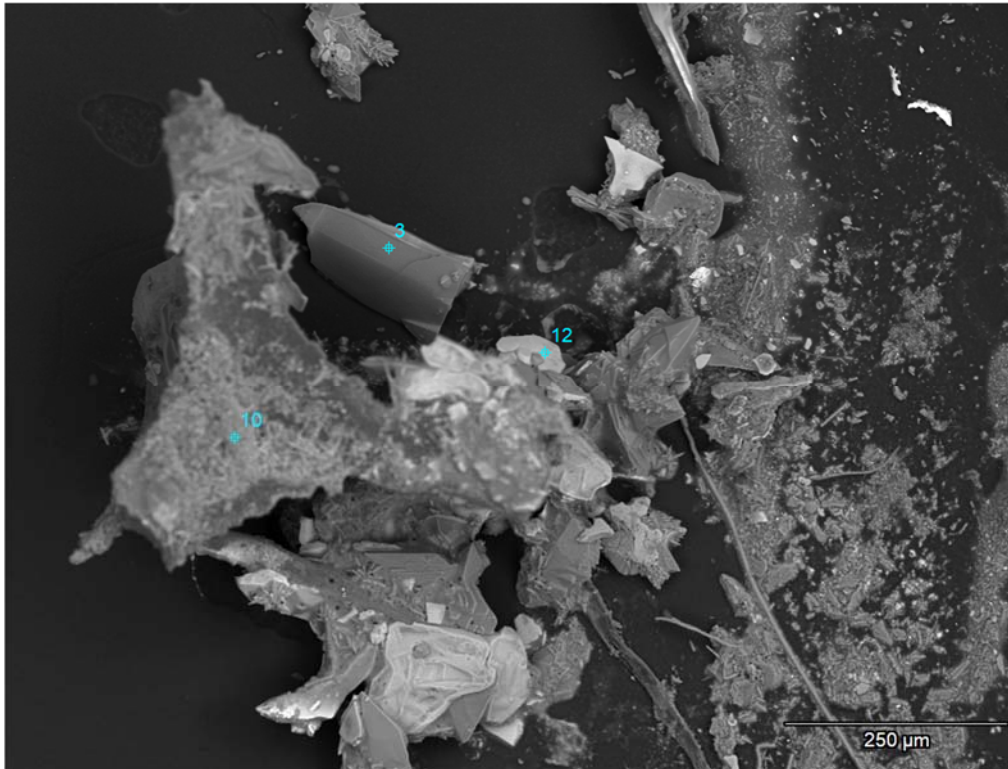
**Figure G2.** AN0189. SEM-EDS spectrum from area 4 in Figure G1. Bulk chemistry.



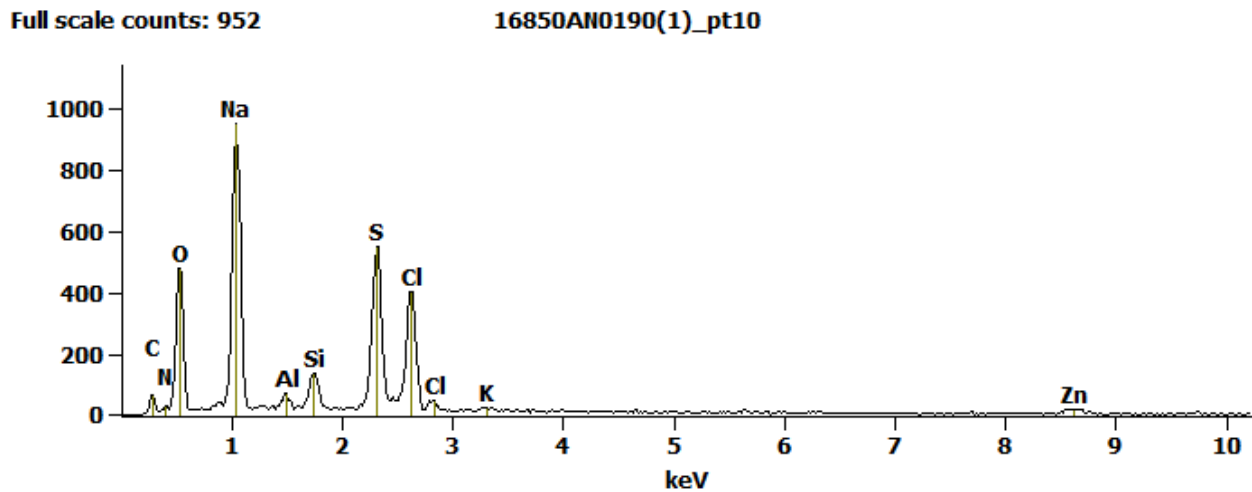
**Figure G3.** AN0189. SEM-EDS spectrum from area 5 in Figure G1. Glass fiber.



**Figure G4.** AN0189. CRM spectra of a DI water extract from the sample (top trace) plotted with a reference for ammonium sulfate (bottom trace).



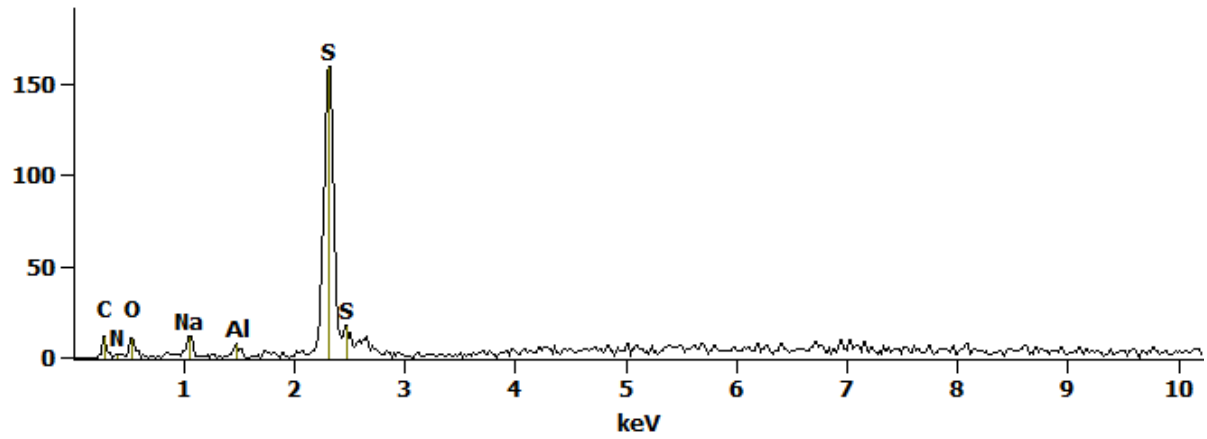
**Figure H1.** AN0190. SEM backscattered electron image of sample particulate on a carbon substrate.



**Figure H2.** AN0190. SEM-EDS spectrum from area 10 in Figure H1. Mixed phases.

Full scale counts: 160

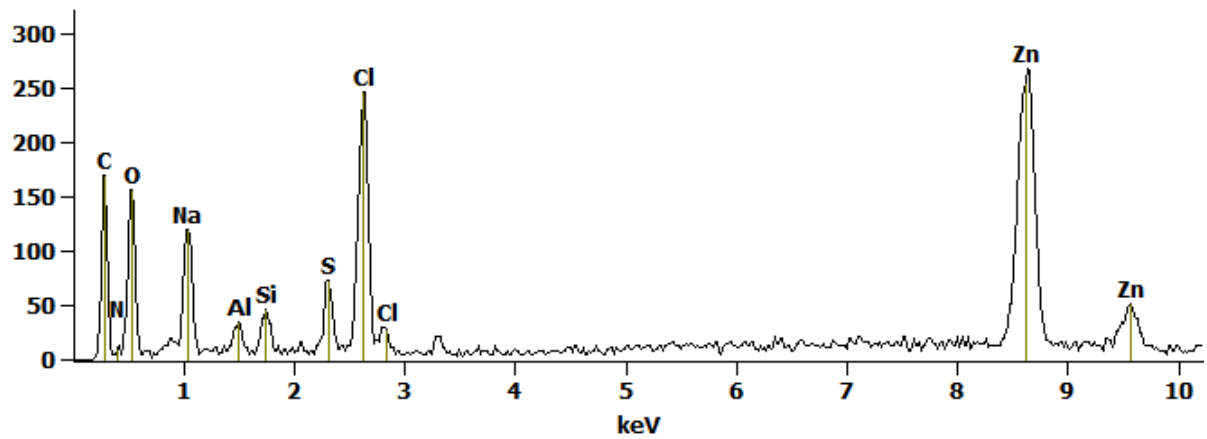
16850AN0190(1)\_pt3



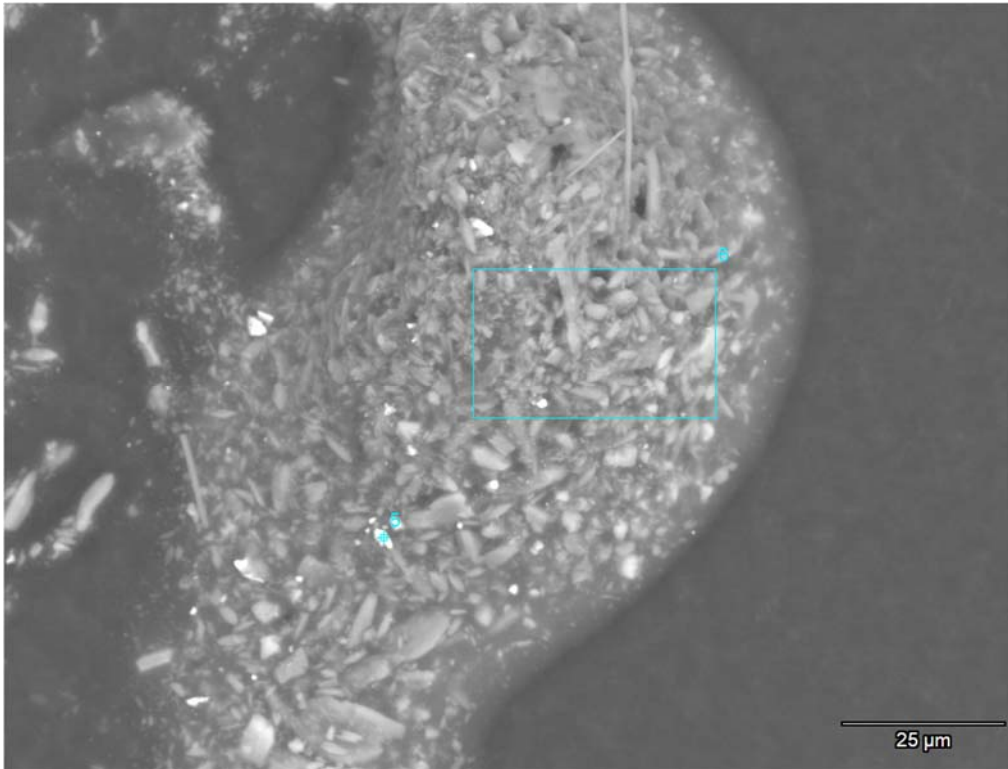
**Figure H3.** AN0190. SEM-EDS spectrum from area 3 in Figure H1.  
Ammonium sulfate.

Full scale counts: 268

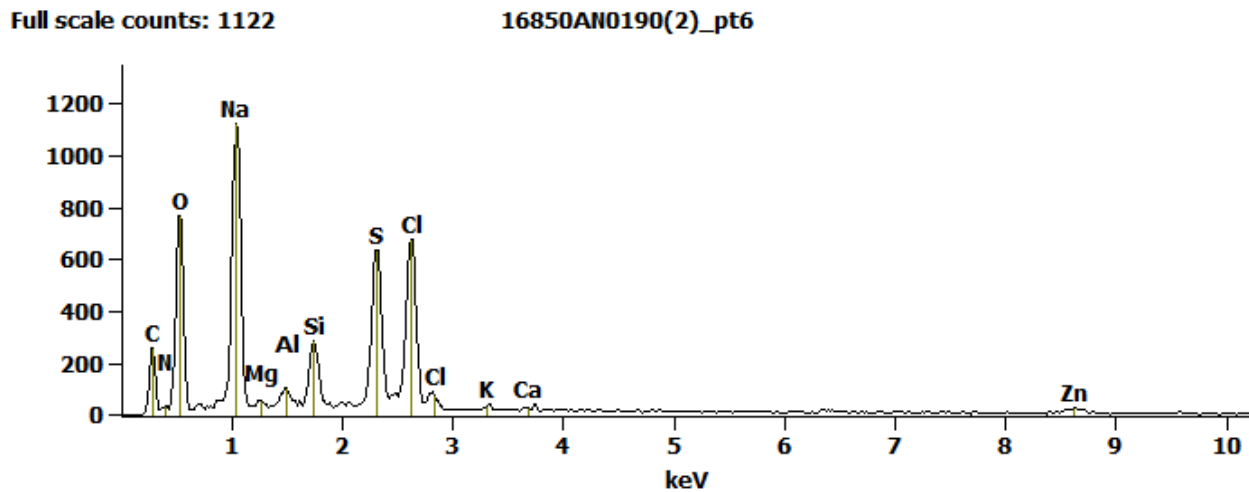
16850AN0190(1)\_pt12



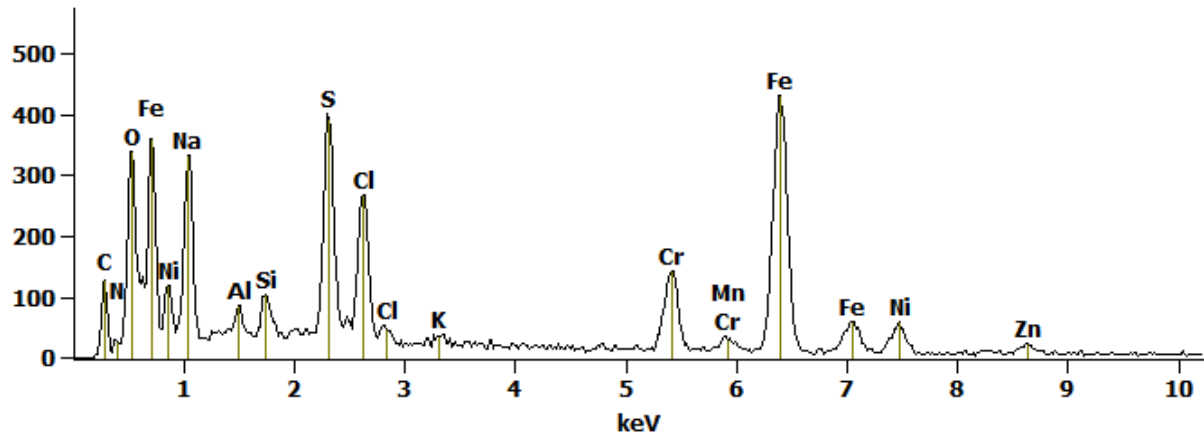
**Figure H4.** AN0190. SEM-EDS spectrum from area 12 in Figure H1.  
Mixed phases/zinc chloride.



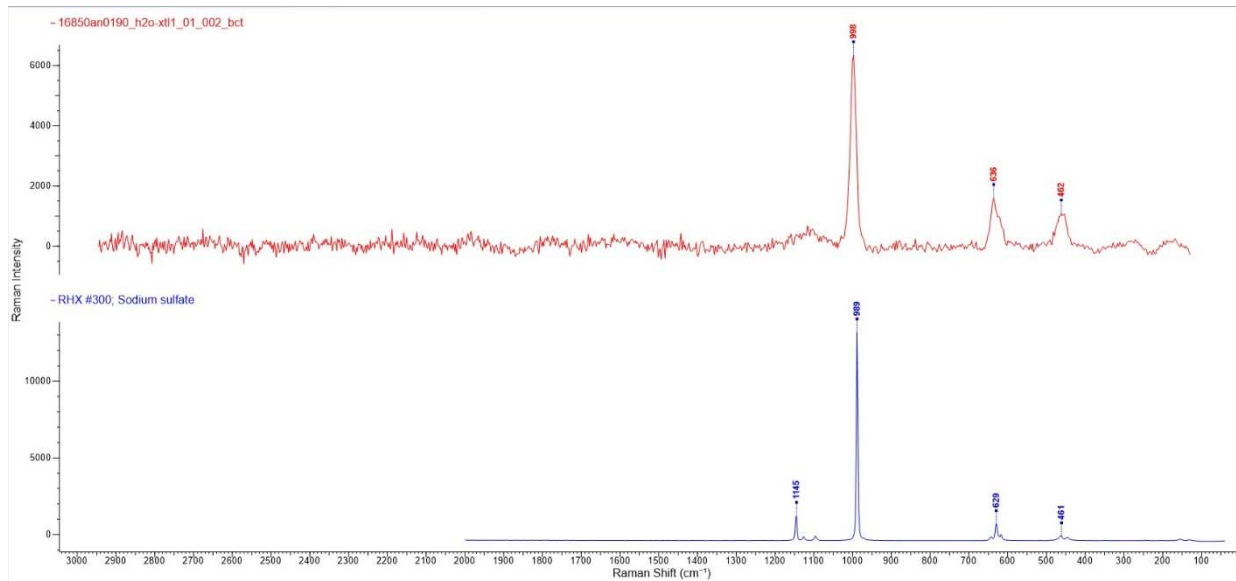
**Figure H5.** AN0190. SEM backscattered electron image of sample particulate on a carbon substrate.



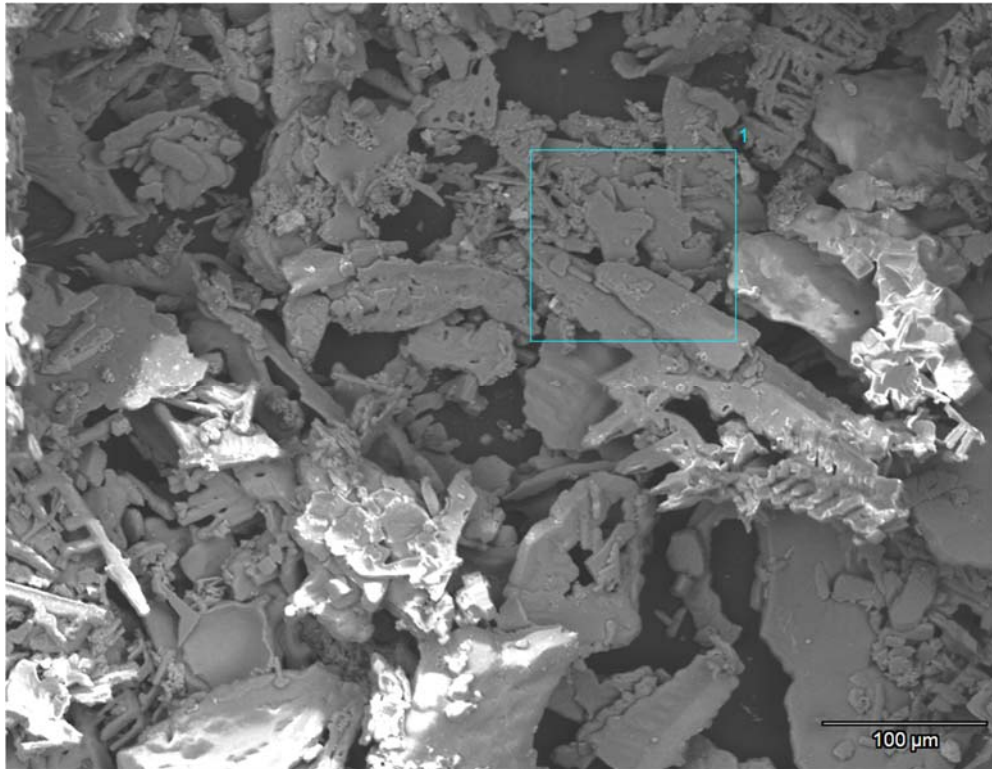
**Figure H6.** AN0190. SEM-EDS spectrum from area 6 in Figure H5. Bulk chemistry of fine crystalline material.



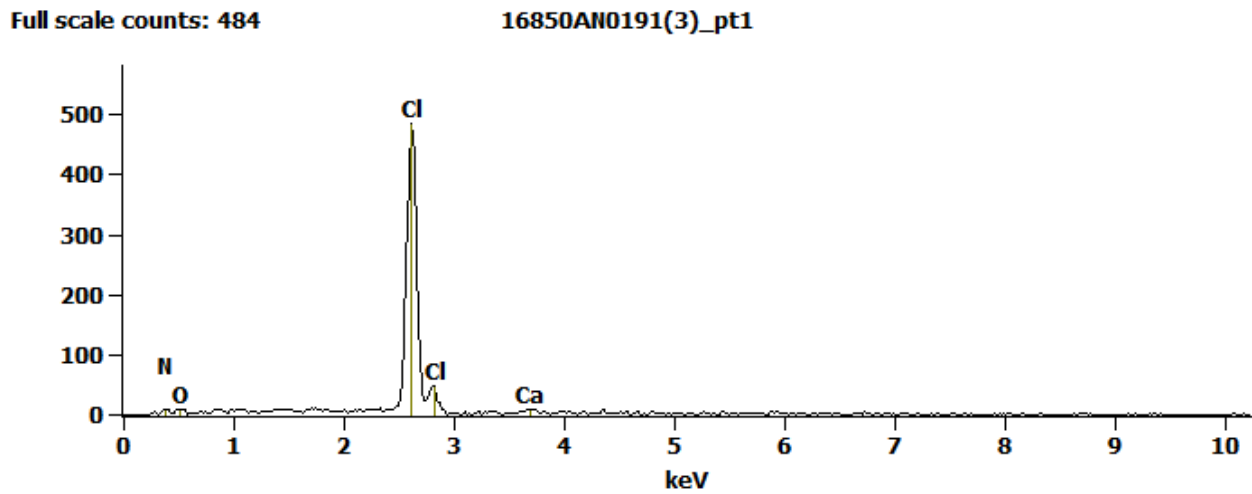
**Figure H7.** AN0190. SEM-EDS spectrum from area 5 in Figure H5. Stainless steel/stainless steel corrosion.



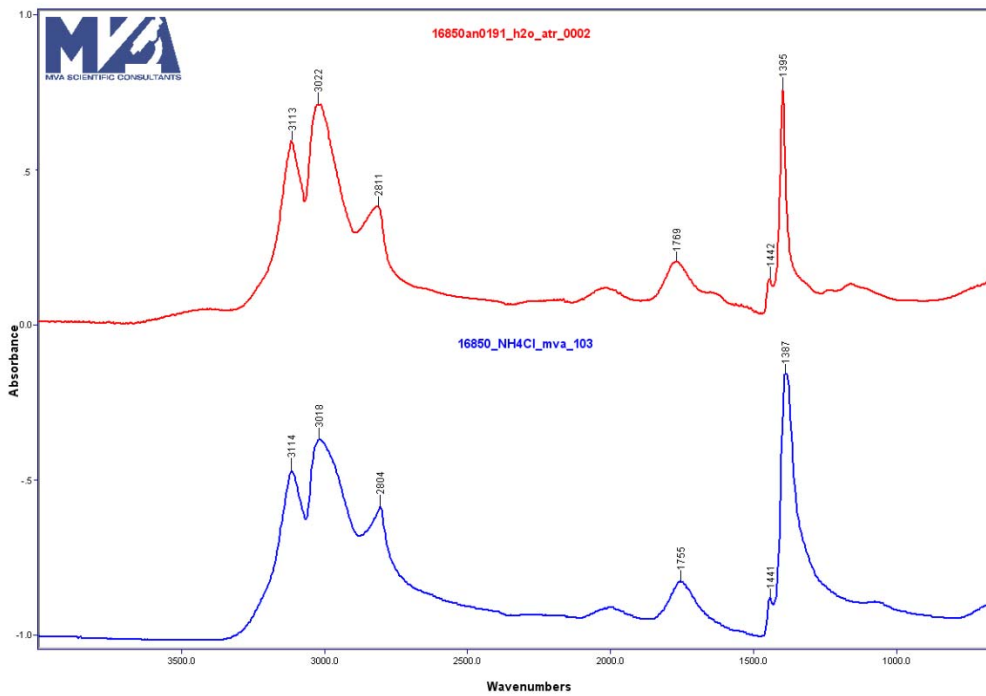
**Figure H8.** AN0190. CRM spectra of a DI water extract from the sample (top trace) plotted with a reference for sodium sulfate (bottom trace).



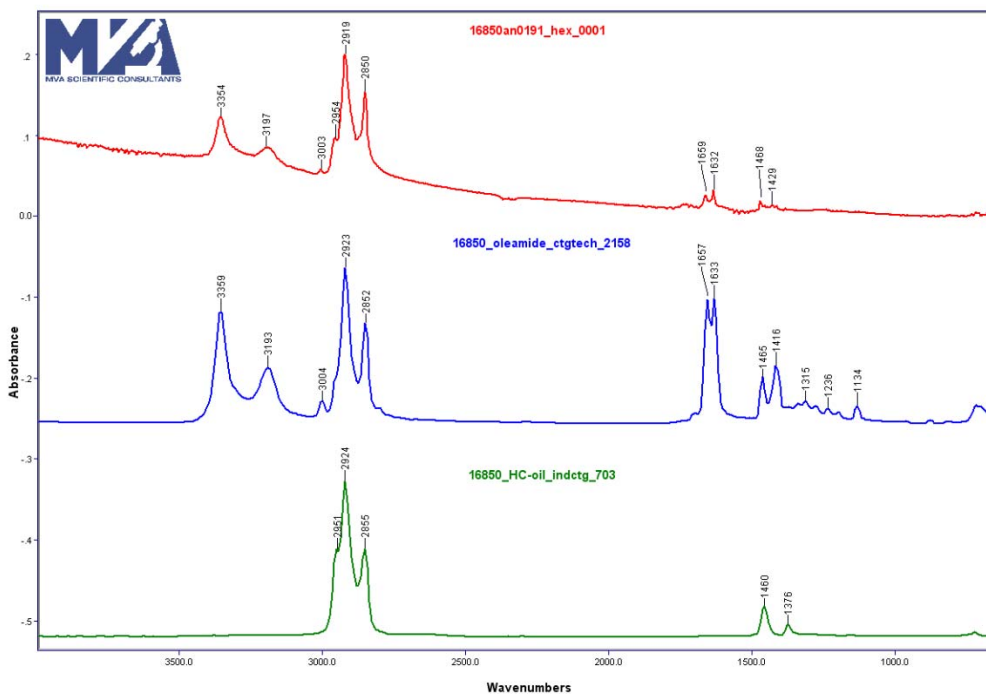
**Figure I1.** AN0191. SEM backscattered electron image of sample particulate on a carbon substrate.



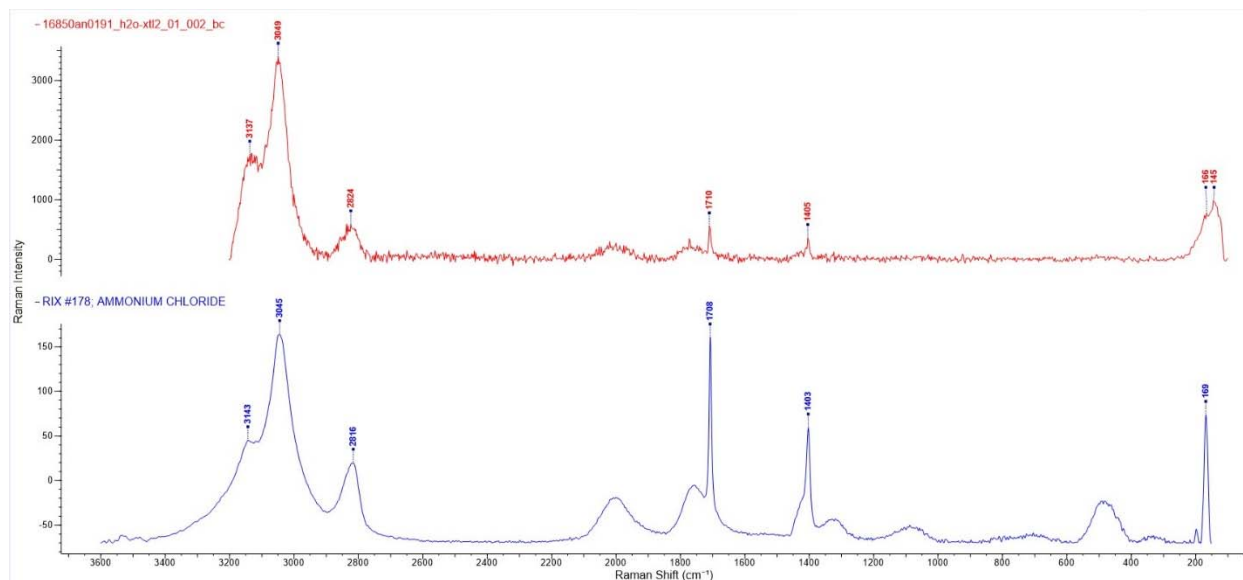
**Figure I2.** AN0191. SEM-EDS spectrum from area 1 in Figure I1. Bulk chemistry.



**Figure I3.** AN0191. FTIR spectra of a DI water extract from the sample (top trace) and an ammonium chloride reference (bottom trace).



**Figure I4.** AN0191. FTIR spectra of a hexane extract from the sample (top trace), an oleamide reference (middle trace), and a hydrocarbon oil (bottom trace).



**Figure I5.** AN0191. CRM spectra of a DI water extract from the sample (top trace) plotted with a reference for ammonium chloride (bottom trace).

### List of Common Elements

Symbol	Element
Ag	Silver
Al	Aluminum
As	Arsenic
Au	Gold
Ba	Barium
Bi	Bismuth
Br	Bromine
C	Carbon
Ca	Calcium
Cd	Cadmium
Cl	Chlorine
Co	Cobalt
Cr	Chromium
Cu	Copper
F	Fluorine
Fe	Iron
Hg	Mercury
I	Iodine
K	Potassium
La	Lanthanum
Mg	Magnesium
Mn	Manganese

Symbol	Element
Mo	Molybdenum
N	Nitrogen
Na	Sodium
Ni	Nickel
O	Oxygen
P	Phosphorus
Pb	Lead
Pt	Platinum
Rb	Rubidium
S	Sulfur
Sb	Antimony
Se	Selenium
Si	Silicon
Sn	Tin
Sr	Strontium
Th	Thorium
Ti	Titanium
U	Uranium
V	Vanadium
W	Tungsten
Zn	Zinc
Zr	Zirconium

16850

# CHAIN OF CUSTODY

Project No. or Identification MV WTEF

Client Sample ID	MVA ID*	Comments / Analytical Requests
1-1	AN0183	Filter. PSD / Chem. analysis
1-2	AN0184	Rinse. PSD / Chem. analysis
1-3	AN0185	Cond. Inorganic. Chem analysis
1-4	AN0186	Cond. organic. Chem analysis
2-1	AN0187	Filter. PSD / chem analysis
2-2	AN0188	Rinse. PSD / Chem analysis
2-3	AN0189	Cond. organic. Chem analysis
2-4	AN0190	Cond. Inorganic. Chem analysis
3-3	AN0191	Cyclone. PSD / chem analysis
4	AN0192	Bulk particulate. PSD

Relinquished by (sign): <i>ML</i>	Relinquished by (sign):
Via:	Via:
Date: Feb 13/26 Printed Name: Mark L	Date: Printed Name:
Company: Lanfranco	Company:

Received by (sign): <i>Jennifer Rangelov</i>	Received by (sign):
Date: 2/18/26 Printed Name: Jennifer Rangelov	Date: Printed Name:
Company: MVA Scientific Consultants	Company:

# Appendix G

## Principal Component Analysis Report

# Principal Component Analysis

## Methodology

Principal component analysis (PCA) is an analytical tool that can be used to reduce the number of dimensions in a large dataset into principal components that retain most of the original information conveyed by the variation in the data. This is accomplished by transforming a set of potentially correlated variables into a smaller set of variables called the principal components. As a typical step, the first two principal components can be plotted to reveal groups or clusters of samples which share similar features when considering the sources of variation extracted by the PCA.

In this analysis, PCA was used to extract the most informative features from soil samples taken from near the Waste-to-Energy Facility (WTEF) and surrounding areas to assess the extent to which other facilities may be impacted by the WTEF particulate matter. The soil samples comprise 34 metals sampled at 52 soil or dust samples across 10 locations taken October 21<sup>st</sup> and 22<sup>nd</sup>, 2025 and January 27<sup>th</sup>, 2026.

To account for the fact that metal concentration can span orders of magnitude, the concentration data was log-transformed prior to PCA to reduce the influence of high-abundance metals on the analysis. Non-detect samples were treated as the value of the MDL in the analysis.

## Results

Overall, the principal component analysis successfully decomposed the key sources of variation. Figure 1 presents the scree plot, which plots the eigenvalues of the data to show the amount of variance explained by each principal component. Overall, most of the variation in metal concentrations is captured by the first three principal components, with subsequent components adding little information. There is a relatively high correlation amongst the metals sampled, with 46% of pairwise comparisons having a Pearson correlation coefficient greater than 0.5. The first two principal components account for 53.4% and 20.1% of the variation respectively.

**Figure 1: Scree Plot, Log-transformed Concentrations**

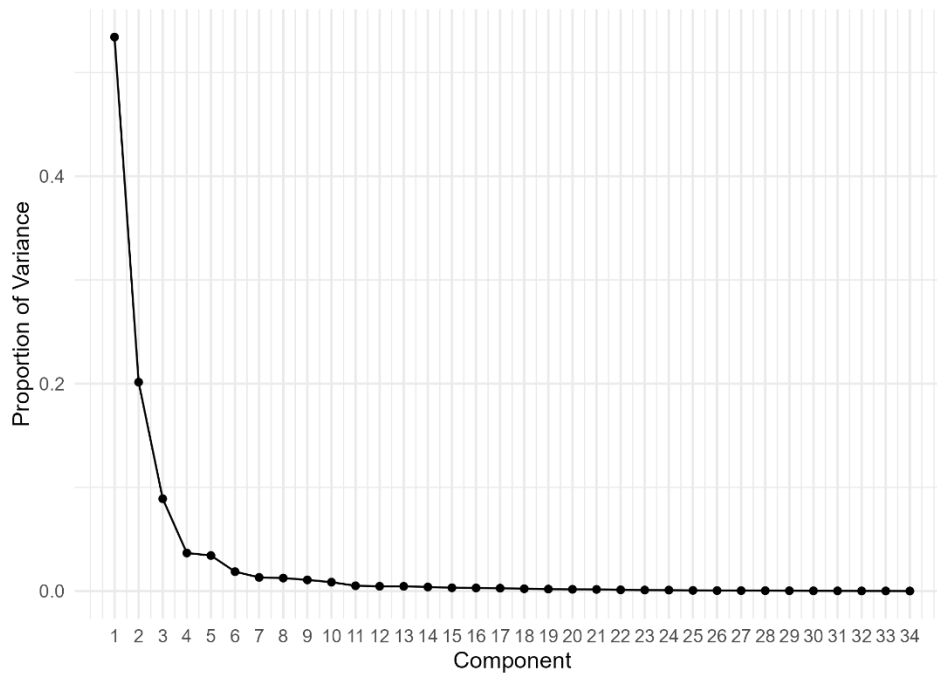


Table 1 presents the loadings (eigenvector coefficients) of the PCA for the first three principal components, which represent the contribution of each metal to the principal components. The larger magnitude loadings indicate metals which contribute more of the variation that constitutes the principal component.

**Table 1: Principal Component Loadings**

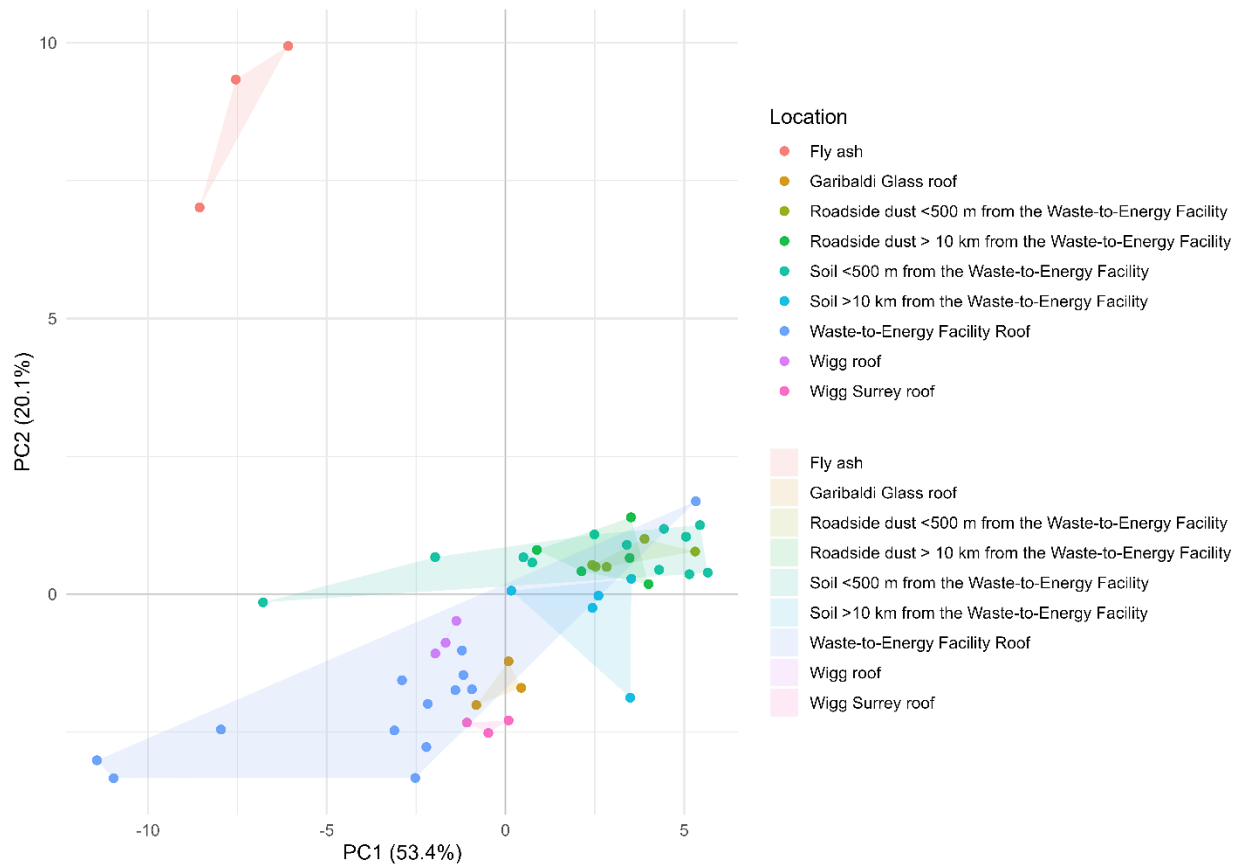
Analyte	Principal Component 1	Principal Component 2	Principal Component 3
Aluminum	-0.06	-0.30	-0.23
Antimony	-0.20	0.06	0.08
Arsenic	-0.19	0.03	-0.01
Barium	-0.20	-0.08	0.03
Beryllium	-0.09	-0.22	-0.23
Bismuth	-0.19	0.03	0.08
Boron	-0.21	0.05	0.03
Cadmium	-0.21	0.12	0.10
Calcium	-0.17	0.22	-0.07
Chromium	-0.13	-0.24	0.26
Cobalt	-0.13	-0.29	-0.05
Copper	-0.22	-0.02	0.12
Iron	-0.02	-0.35	0.16
Lead	-0.22	-0.03	0.09
Lithium	-0.17	0.03	-0.34
Magnesium	-0.10	-0.19	-0.36

Analyte	Principal Component 1	Principal Component 2	Principal Component 3
Manganese	-0.07	-0.34	0.08
Mercury	-0.21	0.10	0.00
Molybdenum	-0.17	-0.16	0.26
Nickel	-0.15	-0.24	0.17
Phosphorus	-0.20	-0.06	0.00
Potassium	-0.17	0.19	-0.20
Selenium	-0.22	0.03	-0.06
Silver	-0.22	0.04	0.02
Sodium	-0.15	0.25	-0.14
Strontium	-0.17	0.21	-0.08
Thallium	-0.21	-0.02	-0.11
Tin	-0.22	0.06	0.07
Titanium	-0.05	-0.07	-0.43
Tungsten	-0.21	-0.07	0.13
Uranium	-0.20	0.00	-0.01
Vanadium	-0.04	-0.29	-0.30
Zinc	-0.20	0.10	0.12
Zirconium	-0.12	0.10	-0.03

The first principal component loadings were uniformly negative and of similar magnitude across nearly all metals, indicating that this principal component represents overall metal abundance rather than any distinct compositional pattern. In contrast, the second principal component had loadings with larger negative magnitudes for aluminum, manganese, iron, vanadium, cobalt, nickel, and chromium, and larger positive magnitudes for sodium, calcium, strontium, and potassium. The differences in loadings across the metals indicate that the second principal component captures variation in the patterns of observed metals. The largest correlations among the metals influencing the second principal component were generally found within the group of metals with the most negative loadings and within the group of metals with the most positive loadings, rather than between the two groups.

Figure 2 plots the first two principal components, with samples colour coded by location. The sample locations are grouped using the convex hull that contains all the points associated with a location.

**Figure 2: Principal Component Analysis, Log-transformed Concentrations**



The primary result of the PCA is that the Fly Ash samples (HS-49, HS-50, HS-51) differ strongly from all other samples due to their exceptionally high concentrations of calcium, potassium, sodium, strontium, lead, zinc, copper, and molybdenum. These concentrations are often an order of magnitude greater than those in samples collected at other locations. As a result, the Fly Ash samples have strongly negative PC1 scores, indicating high overall metal abundance, (reflecting their higher overall metal load) although several WTEF roof samples have even more negative PC1 scores, and the Fly Ash samples have the most positive PC2 scores by a large margin (driven by extreme enrichment in specific elements). Together, these features place all Fly Ash samples in a distinct cluster in PCA space, clearly separated other samples collected regardless of distance from the WTEF.

Overall, the results show all locations sampled tended to have similar variation in terms of the overall abundance and pattern of metals sampled apart from the three Fly Ash samples, which were more negative in the first principal component and much more positive in the second principal component.