FINAL

FIRING RANGES 3 AND 4
REMOVAL ACTION WORK PLAN

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
PLUM BROOK STATION
SANDUSKY, OHIO

Prepared for:

NASA Glenn Research Center
Plum Brook Station
3899 E. Scheid Road
Sandusky, Ohio 44870

Prepared by:

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Twinsburg, Ohio 44087

July 24, 2020

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LIST OF ACRONYMS AND ABBREVIATIONS

°C	Degrees Celsius
°F	Degrees Fahrenheit
µg/m^3	Micrograms per Cubic Meter
µg/L	Micrograms per Liter
95UCL	95 Percent Upper Confidence Limit
AM	Action Memorandum
AOC	Area of Concern
ARAR	Applicable or Relevant and Appropriate Requirement
Arrowhead	Arrowhead Contracting, Inc.
bgs	Below Ground Surface
BMP	Best Management Practice
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
cm	Centimeter
CoC	Chain-of-Custody
COC	Chemical of Concern
COMETS	Construction, Maintenance, Environmental, and Testing Services
COR	Contracting Office Representative
cPAH	Carcinogenic Polycyclic Aromatic Hydrocarbon
CQAP	Construction Quality Assurance Plan
dbh	Diameter at Breast Height
DI	Deionized
DO	Dissolved Oxygen
DOT	U.S. Department of Transportation
ECCL	Erie County Conservation League
EMO	Environmental Management Office
EPC	Exposure Point Concentration
ESE	Environmental Science and Engineering
ESV	Ecological Screening Value
EU	Exposure Unit
FANS	Firelake-Arrowhead NASA Services
FE	Federal Endangered
FF-200	Free Flow 200®
FM	Field Manager
FT	Federal Threatened
FTP	Field Technical Procedure
GRC	John H. Glenn Research Center
H&S	Health and Safety
HASP	Health and Safety Plan
ID	Identification
IDW	Investigation-Derived Waste
IEUBK	Integrated Exposure Uptake Biokinetic Model for Lead in Children
LCS	Laboratory Control Sample
LDPE	Low-Density Polyethylene
LDR	Land Disposal Restriction
M&TE	Measuring and Testing Equipment
mg/kg	Milligram per Kilogram
mg/L	Milligram per Liter

LIST OF ACRONYMS AND ABBREVIATIONS (Continued)

mg/m^3	Milligram per Cubic Meter
mL/min	Milliliter per Minute
MS	Matrix Spike
MSD	Matrix Spike Duplicate
mV	Millivolt
NACA	National Advisory Committee for Aeronautics
NASA	National Aeronautics and Space Administration
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NCR	Non-Conformance Report
NPDES	National Pollutant Discharge Elimination System
NTCRA	Non-Time Critical Removal Action
NTU	Nephelometric Turbidity Unit
ODNR	Ohio Department of Natural Resources
Ohio EPA	Ohio Environmental Protection Agency
OHPO	Ohio Historical Preservation Office
ORC	Ohio Revised Code
ORP	Oxidation-Reduction Potential
OSHA	Occupational Safety and Health Administration
OUPS	Ohio Utility Protection Services
PA	Preliminary Assessment
PAH	Polycyclic Aromatic Hydrocarbon
PBOW	Plum Brook Ordnance Works
PBS	Plum Brook Station
PCB	Polychlorinated Biphenyl
PM	Project Manager
POC	Point of Contact
PPE	Personal Protective Equipment
PRG	Preliminary Remediation Goal
PVC	Polyvinyl Chloride
QA	Quality Assurance
QAAP	Quality Assurance Administrative Procedure
QAPP	Quality Assurance Project Plan
QC	Quality Control
QCP	Quality Control Plan
RA	Removal Action
RAO	Removal Action Objective
RCI	Reactivity, Corrosivity, and Ignitability
RCRA	Resource Conservation and Recovery Act
RG	Remediation Goal
RSE	Removal Site Evaluation
RSL	Regional Screening Level
SAIC	Science Applications International Corporation
SARA	Superfund Amendments and Reauthorization Act
SI	Site Investigation
SL	Screening Level
SOR	Sum-of-Ratios
SOW	Statement of Work
SSHO	Site Safety and Health Officer

LIST OF ACRONYMS AND ABBREVIATIONS (Continued)

SVOC	Semivolatile Organic Compound
SWPPP	Stormwater Pollution Prevention Plan
TCLP	Toxicity Characteristic Leaching Procedure
THQ	Target Hazard Quotient
TM	Technical Monitor
TNT	2,4,6-Trinitrotoluene
TR	Target Risk
URS	URS Corporation
USACE	U.S. Army Corps of Engineers
USEPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
VAP	Voluntary Action Program
VOC	Volatile Organic Compound
VSI	Visual Site Inspection
WM	Waste Management
XRF	X-Ray Fluorescence
yd^3	Cubic Yards

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1. INTRODUCTION

The National Aeronautics and Space Administration (NASA) John H. Glenn Research Center (GRC) has contracted Firelake-Arrowhead NASA Services (FANS) to execute the statement of work (SOW) titled "Firing Ranges 3 and 4 – Removal Action Implementation." Arrowhead Contracting, Inc. (Arrowhead) and Leidos are subcontracted to FANS to execute the removal action (RA) and provide environmental consulting, respectively. This work is being performed under a time and materials price basis under Prime Contract No. 80GRC018C0022 (Construction, Maintenance, Environmental, and Testing Services [COMETS] Contract), Subcontract No. FA8-1-S1, Task Order E117.

The work performed under this contract is for the completion of a non-time critical removal action (NTCRA) under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) at Firing Ranges 3 and 4 located at NASA Plum Brook Station (PBS) in Sandusky, Ohio. The project includes three tasks from Phase 1 and five tasks from Phase 2. Leidos will work collaboratively with Arrowhead to complete the tasks. The project includes:

- Phase 1
  - Task 1 – Provide Technical Support for Community Outreach
  - Task 2 – Delineate Wetlands
  - Task 3 – Develop an Action Memorandum (AM)
- Phase 2
  - Task 4 – Develop an RA Work Plan
  - Task 5 – Develop Health and Safety Plans (HASPs) and Quality Control Plans (QCPs)
  - Task 6 – Implement RA
  - Task 7 – Produce an RA Completion Report
  - Task 8 – Abandon the Groundwater Monitoring Well.

Task 1 concluded with the submittal of the Final Firing Ranges 3 and 4 Removal Site Evaluation (RSE) Report (hereafter referred to as the RSE Report) (Leidos 2019) to the Administrative Record and publication of the notice of availability with public comment period from January 17 through February 17, 2020. No comments were received during the public comment period. Task 2 was completed in November 2019 and is documented in the Final Wetland and Other Waters Delineation Report (EnviroScience 2020). Task 3 was completed in April 2020 and is documented in the Final Action Memorandum for Firing Ranges 3 and 4 Removal Action (Leidos 2020).

1.1 PURPOSE

The purpose of this RA Work Plan is to detail implementation of the RA specified in the RSE Report (Leidos 2019), which includes:

- Site preparation activities,
- Onsite stabilization of lead-impacted soils,
- Confirmation of stabilization of lead-impacted soils,
- Removal and disposal of blast wall debris,

- Excavation and disposal of contaminated soils,
- Verification of removal activities,
- Backfilling and grading excavated areas, and
- Site restoration activities.

1.2 SCOPE

The scope of this RA Work Plan is to remove the blast wall and then excavate, stabilize (if necessary), and dispose of an estimated 675 tons of soil contaminated with chemicals of concern (COCs) that pose a threat to human health and the environment. These COCs include antimony; arsenic; lead; and the carcinogenic polycyclic aromatic hydrocarbons (cPAHs) benz(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, dibenz(a,h)anthracene, and indeno(1,2,3-cd)pyrene. The results of the 2006 and 2015 Site Investigations (SIs) and the RSE sampling activities conducted in January 2017 were used to define the horizontal and vertical extent of impacted soils for eight COCs identified during the RSE (Leidos 2019). COCs above remediation goals (RGs) (residential regional screening levels [RSLs] or background screening levels [SLs]) range in depth from 0 to 2 feet and are primarily located within the blast wall soils and underlying soils, and in "hot spot" locations within the target area of Firing Range 4 and the shooting area of Firing Range 3.

Impacted soils will be stabilized to render the soils non-hazardous (if necessary), removed, and transported to an offsite waste disposal facility (Erie County Landfill) approved by NASA GRC.

Three types of sampling will be conducted to achieve the remediation objectives and goals:

- Confirmation of soil stabilization,
- Verification of soil removal, and
- Verification that groundwater is not impacted with soil COCs.

Confirmation sampling will be conducted to verify the success of the soil stabilization activities (if necessary) in rendering soils non-hazardous and confirming the suitability of disposing of stabilized soils in a permitted Subtitle D disposal facility (Erie County Landfill). Samples will be analyzed for toxicity characteristic leaching procedure (TCLP) concentrations of lead. Stabilized soils that remain characteristically hazardous for lead or that fail waste disposal facility criteria (e.g., land disposal restrictions [LDRs]) will be retreated and sampled prior to disposal.

Certification sampling will be conducted to ensure that all impacted soils above RGs have been removed. The samples will be analyzed for total concentrations of antimony, arsenic, lead, and cPAHs (benzo[a]anthracene, benzo[a]pyrene, benzo[b]fluoranthene, dibenz[a,h]anthracene, and indeno[1,2,3-cd]pyrene). Verification sample locations with soil COC concentrations greater than RGs will be further excavated and sampled until RGs are attained. X-ray fluorescence (XRF) field screening may be used to guide the lead-impacted soil excavations and verification sample locations. Excavated areas will be regraded in accordance with this RA Work Plan. Following excavation and site restoration, a groundwater monitoring well will be installed within the blast wall footprint, developed, and sampled to determine if groundwater contamination is present.

1.3 SITE DESCRIPTION

PBS is located in southern Erie County, Ohio, approximately 3 miles south of Sandusky, Ohio, and approximately 50 miles west of NASA GRC at Lewis Field in Cleveland, Ohio (**Figure 1**). The PBS facility

encompasses approximately 6,470 acres (Leidos 2018) and is depicted in two adjacent U.S. Geological Survey (USGS) 7.5-minute series topographic maps: Sandusky Quadrangle (northern portion of facility) and Kimball Quadrangle (southern portion of facility). Most of PBS is in Perkins and Oxford Townships, with some lands in Huron and Milan Townships. The site boundaries are Bogart Road to the north, Mason Road to the south, U.S. Highway 250 to the east, and County Road 43 to the west. The northernmost point is at latitude 41°23'39"N and the southernmost point is at 41°20'04"N. The westernmost point is at longitude 82°43'12"W and the easternmost point is at 82°38'39"W (MK 1994).

PBS is located in an area known for its agricultural productivity and is bordered by farmland, some of which NASA leases to local farmers. The area surrounding PBS is largely rural and agricultural, with some recent development. Some food processing facilities, including dairy and meat processing operations, are located in the area. Tourism and recreation are important economic influences in the Sandusky area. The Erie County Perkins School District currently uses certain former NASA facilities, located near the former PBS main gate on Columbus Avenue and outside the fenced area, for transportation and storage purposes. Intensive commercial development, consisting of highway-oriented uses (e.g., motels, restaurants, and service stations) and shopping malls, predominate immediately to the north and east along U.S. Highway 250 and its intersections with Bogart Road and State Highway 2 in Sandusky. A U.S. Army Reserve Center is located adjacent to the southeastern corner of the property, just off Mason Road (Leidos 2018).

An 8-foot security fence surrounds approximately 5,845 acres of PBS (Leidos 2018). Most of the land at PBS consists of forestland and old fields with several streams that run across the property. An estimated 75 percent of NASA's property at PBS is considered unused. The remaining land is used for offices, test facilities, roads, and infrastructure. Public access is restricted at PBS, and access to the site is obtained through the security guard house on East Scheid Road, which was constructed in 2016. Armed guards staff the guard house 24 hours per day (Leidos 2016c). The former main gate located on Columbus Avenue is only open for emergency access by Perkins Township Police and the Fire Departments, and exiting traffic at peak afternoon hours. During each 8-hour shift, a security guard patrols the inside perimeter road (Patrol Road) of the facility. Persons gain access to the station by showing the guard a badge that authorizes entry.

1.4 PLUM BROOK STATION HISTORY

PBS is operated as a satellite facility (or component installation) of NASA GRC. Use of PBS by the federal government began in 1941 when the U.S. Army established the Plum Brook Ordnance Works (PBOW) for the manufacture of munitions and related materials, including 2,4,6-trinitrotoluene (TNT), dinitrotoluene, and pentolite (MK 1994). The PBOW facility consisted of 9,009 acres inland; 1.35 acres for 2 pumping stations on Lake Erie; and approximately 700 buildings. Munitions were produced from 1941 to 1945, after which buildings and production lines were decontaminated and decommissioned. Between 1941 and 1945, more than 1 billion pounds of ordnance are estimated to have been manufactured.

In 1956, the National Advisory Committee for Aeronautics (NACA, later NASA) obtained 500 acres in the northern portion of the site for construction of a nuclear test reactor (MK 1994). This reactor was the first of 15 test facilities that NASA eventually constructed and operated from 1958 to 1973. Between 1958 and 1960, NASA demolished hundreds of buildings, renovated approximately 41 buildings, and used 99 magazines (Gray & Pape 2008). In 1963, NASA acquired an additional 6,000 acres of PBOW and took control over what is currently referred to as PBS (MK 1994). From 1967 through 1971, NASA purchased approximately 2,000 acres outside the fence line from local farmers as a "buffer."

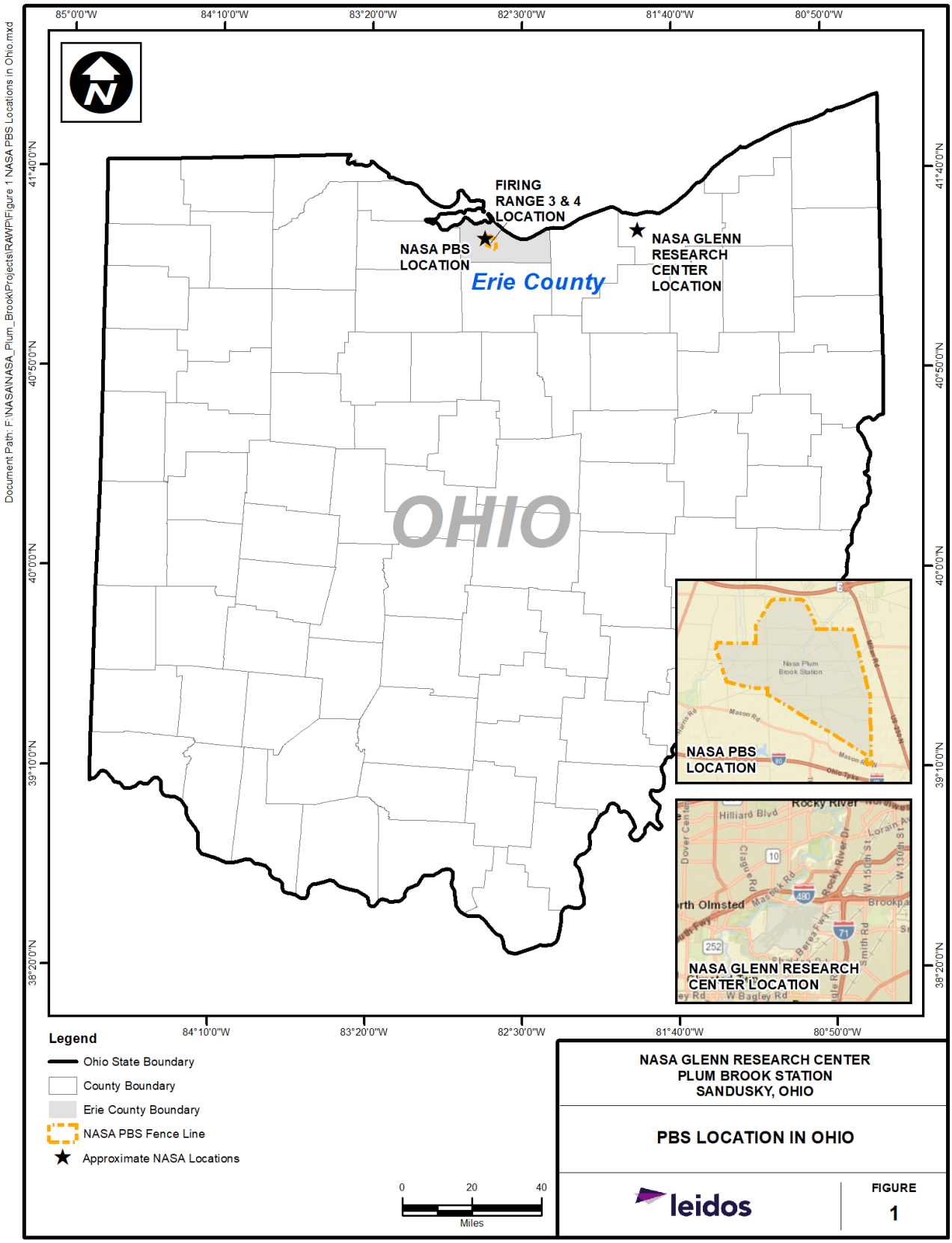

Figure 1. PBS Location in Ohio

On April 18, 1978, NASA declared approximately 2,152 acres of the former PBOW as excess. This excess included approximately 1,500 acres outside the fence that were sold as farmland (Leidos 2018). The 46 acres outside the fence in the northeastern corner of the former PBOW facility near the former main gate guard house on Columbus Avenue were conveyed to the Perkins Township Board of Education for use as a bus transportation area. In addition, the 2,152 acres of PBOW declared as excess included a 604-acre parcel in the western part of the fenced area known as "Parcel 59." Although it was declared excess, this area was not transferred and remains under NASA control. However, three parcels have since been transferred, including Parcel 4 (3.0951 acres) in March 2016; Parcel 63 (Former Taylor Road Wastewater Treatment Plant, 11.5 acres) in June 2016; and Rye Beach Pump Station (1.35 acres) in December 2014 (Leidos 2018). NASA presently controls approximately 6,740 acres, including approximately 5,845 acres within the fence line and 895 acres outside the fence, which were leased for agricultural purposes (Leidos 2018).

NASA currently operates PBS as a space research facility in support of GRC. Most of the aerospace testing facilities built in the 1960s at PBS have been demolished or are currently on standby or inactive status. Additional tenants at PBS include the U.S. Department of Agriculture, U.S. Department of the Interior, Federal Bureau of Investigation, and Ohio Air National Guard. The Preliminary Assessment/Visual Site Inspection (PA/VSI) Report (TechLaw 1998) contains additional information on the site history.

1.5 FIRING RANGES 3 AND 4 DESCRIPTION AND HISTORY

Firing Ranges 3 and 4 are located north of and adjacent to a railroad spur near the south-central portion of PBS (**Figure 2**). This railroad spur was used for TNT loading onto railcars during the active operation of PBOW from 1941 to 1945. The railroad spur at this location joined the Baltimore and Ohio Railroad west of the facility fence line. During operation, a blast wall protected workers while the railcars were being loaded and unloaded with potentially explosive or highly reactive materials (e.g., munitions). The blast wall is constructed of a wood exterior and is approximately 20 feet high, 12 feet wide at the base, and approximately 5 feet wide at the top. The interior of the wall was filled with soil to provide additional mass to deflect and absorb the force of a blast (URS 1996). The U.S. Army Corps of Engineers (USACE) Huntington District determined that no further investigation is required for activities associated with this former PBOW railcar loading area.

Firing ranges at PBS have been used at various times since the mid-1960s and are no longer active at the facility. The bullet impact areas for Firing Ranges 3 and 4 share the same blast protection wall that was used for railcar loading. Both ranges currently contain small trees and brush, and the blast wall has deteriorated.

Firing Range 3 used the southern face of the former blast wall as a backstop. The western side of this 150-foot-long blast wall was used extensively for qualifying. After Firing Range 3 was abandoned, the other side of the blast wall was used as a backstop for Firing Range 4. Due to concern that bullets from Firing Range 4 could penetrate the decaying wall, a 20- by 20-foot pile of dirt was placed in front of the southern face of the blast wall as a safety precaution, thus burying the back and target areas of Firing Range 3 (URS 1996).

Firing Range 4 was established in 1982 and shared the opposite side of the blast wall used by Firing Range 3 (URS 1996). This was the most extensively used firing range at PBS. The entire 150-foot length of the wall has served as a backstop or target area. The western side of the wall contains shooting areas at 50, 75, and 100 feet, and the rest of the wall contains shooting areas at 50 and 75 feet. Much of the blast wall has failed due to the large number of bullets fired into it. The soil contained within the blast wall has spilled out and collected on the ground surface. A pile of soil was placed against the southern side of the blast wall at Firing Range 3 to shore up the blast wall (Leidos 2016b).

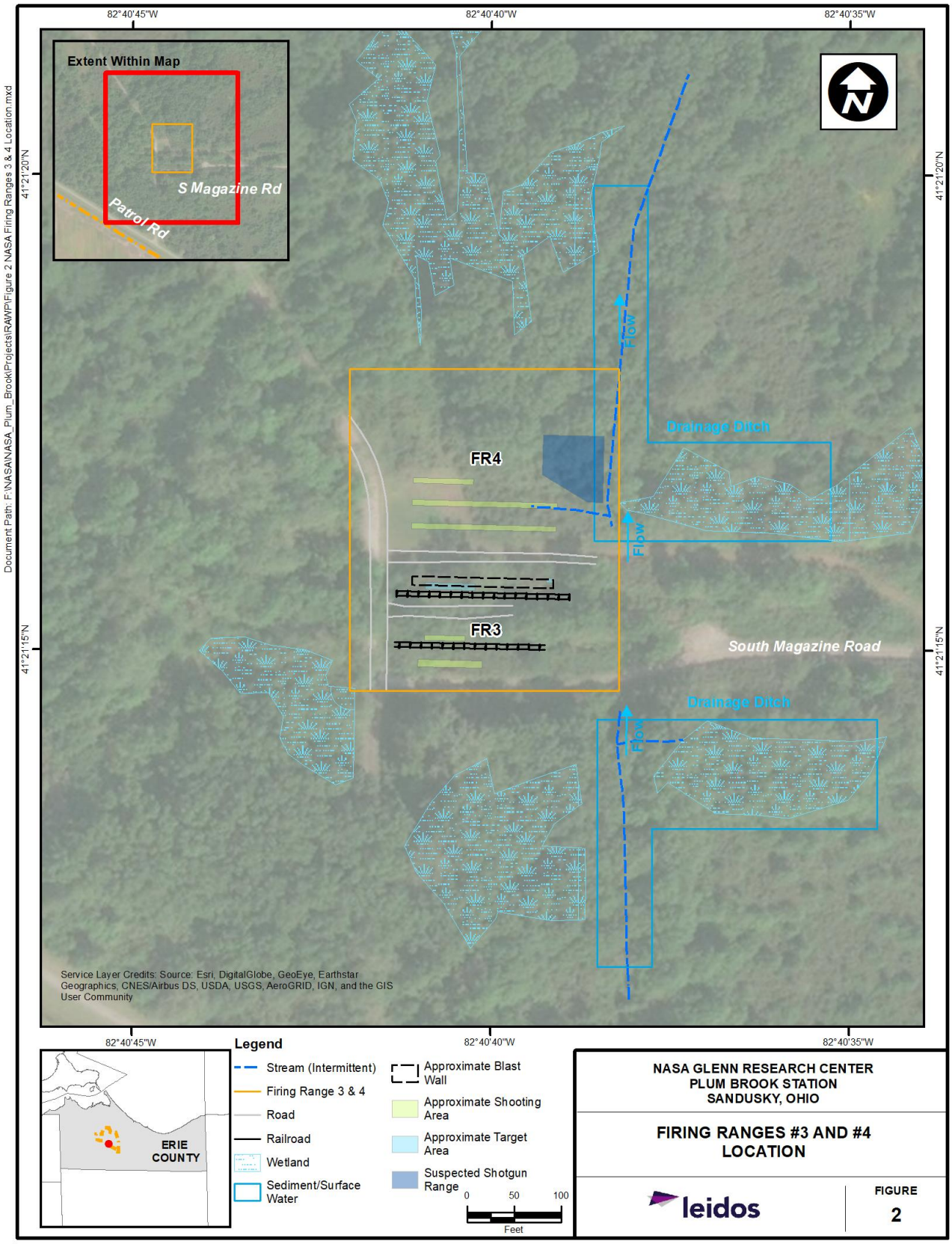

Figure 2. Firing Ranges 3 and 4 Location

During the 2006 investigation, an additional suspected shotgun range was identified at Firing Range 4. It is unclear whether the range was used as a trap or skeet range. The range is believed to be located immediately to the northeast of Firing Range 4, and an unnamed tributary to Plum Brook flows through the firing range (Leidos 2016b).

1.6 PROJECT MANAGEMENT

NASA GRC is the lead entity for this remedial project and is responsible for its implementation. NASA and the Ohio Environmental Protection Agency (Ohio EPA) have agreed to address further investigations and remediation at Firing Ranges 3 and 4 under CERCLA. Furthermore, Ohio EPA will not provide concurrence for any work conducted under this project. However, Ohio EPA will receive courtesy copies of project deliverables for the property Administrative Record. FANS will be responsible for managing the overall COMETS program. Arrowhead is the remedial subcontractor responsible for implementing this RA Work Plan, with environmental and technical support from Leidos. **Figure 3** is an organizational chart for implementation of the RA Work Plan. Key personnel responsibilities are summarized in the following sections.

1.6.1 NASA GRC Technical Monitor

The NASA Technical Monitor (TM) is responsible for the overall management and quality of implementing this RA Work Plan. This individual will ensure all project goals and objectives are met in a high-quality and timely manner. The NASA TM will coordinate with the FANS Program Manager, Arrowhead Project Manager (PM), and Leidos PM to address any quality assurance (QA) and non-conformance issues for this RA. The NASA TM also will have stop work authority.

1.6.2 NASA Construction Manager

The NASA Construction Manager provides day-to-day coordination and communication between the contractor and the NASA TM. The NASA Construction Manager will serve as the onsite point of contact (POC) for contractors for all issues that affect NASA. The assigned NASA Construction Manager will supervise construction; ensure the quality of work; ensure safe working conditions that are in compliance with the approved HASPs; assist in permits, outages, and badging; and track submittals. The NASA Construction Manager will organize the preconstruction meeting and witness daily safety and excavation permit briefings. This individual also will have stop work authority.

1.6.3 FANS COMETS Program Manager

The FANS Program Manager is responsible for the overall execution of the COMETS contract. The FANS Program Manager will serve as the POC for the NASA Contracting Officer Representative (COR). The FANS Program Manager is responsible for completing the program in accordance with the contract and regulatory requirements. The FANS Program Manager will accept or reject change requests based on specifications outlined in this RA Work Plan.

1.6.4 Leidos Environmental Program Manager

The Leidos COMETS Environmental Program Manager is responsible for the overall execution of environmental task orders under the COMETS contract and will be a POC to FANS and NASA. The Leidos Program Manager will manage the overall cost and schedule performance and will provide oversight on technical issues pertaining to implementing this RA Work Plan. The Program Manager will provide oversight to ensure all contractual requirements are properly satisfied; identify and prepare change requests for the project's scope of work, schedule, or budgetary baselines; and provide final resolution of any conflict identified during project performance.

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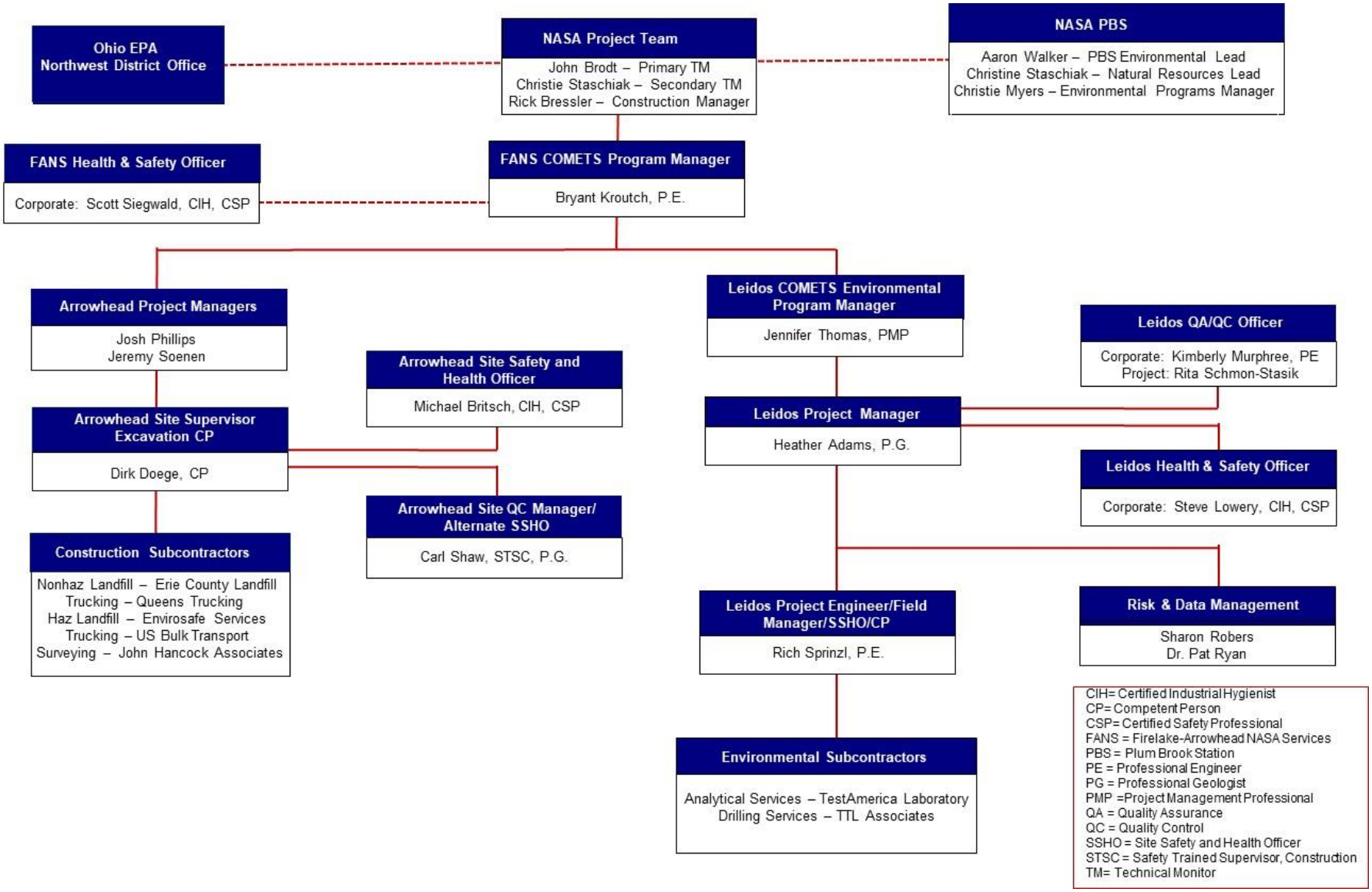

Figure 3. Organizational Chart for Implementation of the Firing Ranges 3 and 4 RA Work Plan

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1.6.5 Leidos Project Manager

The Leidos PM manages the overall performance and quality of implementing Leidos' task under this RA Work Plan. The PM also is responsible for coordinating schedules, tracking costs, and preparing submittals. The Leidos PM oversees the Leidos Field Manager (FM) and other project personnel in meeting project goals and objectives in a high-quality and timely manner. This individual reports to the Leidos Environmental Program Manager. In coordination with the Leidos FM and the Leidos QA/Quality Control (QC) Officer, the Leidos PM will address issues including identification of non-conformances and verification of RA.

1.6.6 Leidos Project Engineer/Field Manager

The Leidos Project Engineer/FM coordinates and manages onsite operations in accordance with the approved RA Work Plan, which includes providing QC oversight of Arrowhead and subcontractor activities, documenting and reporting field changes, and coordinating and controlling emergency response actions. The Leidos FM also will support the Leidos PM in coordinating schedules, tracking costs, and preparing submittals. The Leidos FM also will serve as the Site Safety and Health Officer (SSHO) for Leidos' onsite activities and will communicate health and safety (H&S) information to the Leidos H&S Manager. The Leidos Project Engineer/FM is responsible for ensuring the project is executed in accordance with applicable engineering and environmental regulations, requirements, and procedures of the State of Ohio and NASA.

1.6.7 Leidos Quality Assurance/Quality Control Officer

The Leidos QA/QC Officer will coordinate with the Leidos PM and FM to ensure the requirements of the RA Work Plan, Construction Quality Assurance Plan (CQAP), and Leidos QCP are achieved for Leidos' activities, and inspections are conducted in accordance with the CQAP (Section 8).

The Leidos QA/QC Officer also will provide QC of sampling and sample handling (including sample custody, field testing, and coordinating QA/QC of the laboratory), and ensure the required submittals are on time and of high quality. The Leidos QA/QC Officer is responsible for reviewing and approving variances during field activities before work continues; approving, evaluating, and documenting the disposition of Non-Conformance Reports (NCRs); and designing and supervising the implementation of audit/surveillance plans. The Leidos QA/QC Officer reports directly to the Leidos PM and will inform the Leidos PM and Leidos FM of all information and decisions reported.

1.6.8 Leidos Health and Safety Manager

The Leidos H&S Manager will establish H&S policies and procedures supporting project and office activities and verify safe work practices/conditions. The Leidos H&S Manager reports directly to the Leidos PM and will inform the Leidos PM and Leidos FM/SSHO of all information and decisions reported.

1.6.9 Arrowhead Project Manager

The Arrowhead PM manages the overall performance and quality of implementing this RA Work Plan. The Arrowhead PM also is responsible for coordinating schedules, tracking costs, and preparing submittals. The Arrowhead PM oversees the Arrowhead Site Supervisor in meeting project goals and objectives in a high-quality and timely manner and reports to the FANS Program Manager. In coordination with the Arrowhead Site QC Manager, Arrowhead Site Supervisor, Leidos PM, and Leidos FM, the Arrowhead PM will address issues including identification of non-conformances and verification of RA.

1.6.10 Arrowhead Site Supervisor

The Arrowhead Site Supervisor will implement specific contracted components of this RA Work Plan. The Arrowhead Site Supervisor is responsible for the proper performance of specified remedial activities in accordance with this RA Work Plan, adherence to QA/QC field procedures, implementation of the HASP, coordination of field personnel activities, and field documentation. The Arrowhead Site Supervisor reports directly to the Arrowhead PM.

1.6.11 Arrowhead Site Safety and Health Officer

The Arrowhead SSHO is responsible for implementing and confirming that H&S procedures designed to protect personnel are followed strictly throughout the field activities conducted for this project. The SSHO will have the authority to halt fieldwork if H&S issues arise that are not immediately resolvable in accordance with the HASP. The SSHO reports to the Arrowhead Site Supervisor and the Arrowhead PM. The Arrowhead Site Supervisor may serve as the SSHO.

1.6.12 Arrowhead Site Quality Control Manager

The Arrowhead Site QC Manager will coordinate with the Arrowhead PM and Site Supervisor to ensure the requirements of the RA Work Plan, CQAP, and Arrowhead QCP are achieved for removal activities and inspections are performed in accordance with the CQAP (Section 8).

The Arrowhead Site QC Manager is responsible for reviewing and approving variances during field activities before work continues, and approving, evaluating, and documenting the disposition of NCRs. The Arrowhead Site QC Manager also will ensure the required submittals are on time and of high quality. The Arrowhead Site QC Manager reports directly to the Arrowhead PM and will inform the Arrowhead PM and Arrowhead Site Supervisor of all information and decisions reported.

1.7 PREVIOUS ACTIVITIES

This section summarizes historical information and previous activities supporting the evaluation and determination of the disposition of Firing Ranges 3 and 4.

1.7.1 Preliminary Assessments

In 1991 and 1992, Science Applications International Corporation (SAIC) conducted a PA (SAIC 1991) and a PA Supplement (SAIC 1992) at NASA GRC. The Firing Range was 1 of 73 areas of concern (AOCs) identified during these assessments.

Multiple environmental investigations have been conducted at NASA PBS and the former PBOW for numerous sites across the facility. These investigations provided limited information on Firing Ranges 3 and 4 and no environmental sample analytical results. These reports included:

- The PBS PA (SAIC 1991), which SAIC conducted in accordance with U.S. Environmental Protection Agency (USEPA) regulations and guidance promulgated under CERCLA/Superfund Amendments and Reauthorization Act (SARA) authority to determine if any release of hazardous substances from the facility posed a potential threat to human health and the environment. The PA included recommendations for further investigations for 13 Operable Units but did not include a recommendation for Firing Ranges 3 and 4.
- In 1996, URS Corporation (URS) prepared the Work Plan for SI of PBS Firing Ranges (URS 1996), which provided information on the physical setting and history of Firing Ranges 3 and 4.

- The PA/VSI Report for NASA PBS (TechLaw 1998) presented cursory information on Firing Ranges 3 and 4 and included a history of the operations at PBS and regulatory actions. The PA/VSI also included recommendations for further investigation for 20 solid waste management units.

1.7.2 Site Investigation

The first investigations that provided detailed information on Firing Ranges 3 and 4 were the SIs conducted by SAIC in 2006 and by Leidos (formerly SAIC) in 2015. The SI was conducted under two separate field investigations, as described in the *Site Investigation of NASA GRC Plum Brook Station Firing Ranges Sampling and Analysis Plan* (SAIC 2006) and the *Multi-Site Characterization Sampling and Analysis Plan* (SAIC 2011). Leidos completed the 2015 investigation to address data gaps identified from the initial investigation completed in 2006; the results are presented in the *NASA Plum Brook Station Firing Range Site Investigation Report, Revision 1* (Leidos 2016a).

This revision of the SI concluded that due to the need to determine the nature and extent of contamination in soils, sediment, and surface water at Firing Ranges 3 and 4, further evaluation (i.e., a Remedial Investigation or RSE) should be conducted.

1.7.3 Removal Site Evaluation

The RSE Report (Leidos 2019) presented the results from the 2006 and 2015 SIs and the 2017 RSE activities at Firing Ranges 3 and 4. Leidos conducted the RSE to assess the potential threat to human health and the environment and to determine if a need for further action exists. The RSE Report documented the historical and 2017 sampling results, the streamlined human health and ecological risk assessments, the basis for RA, and the recommended RA to attain unrestricted reuse conditions at Firing Ranges 3 and 4.

Leidos conducted the RSE sampling event in January 2017 in accordance with the *Multi-Site Remedial Investigation Sampling and Analysis Plan* (Leidos 2016b).During this effort, Leidos collected three surface water, five sediment, five soil, and two groundwater samples, including three duplicates (one each for surface water, sediment, and soil). Sample locations were selected based on SI analytical results in order to further evaluate potential risk to ecological receptors and human health and further define the extent of contamination. Surface water and sediment samples were analyzed for metals and polycyclic aromatic hydrocarbons (PAHs). Soil samples were analyzed for lead and/or PAHs. A limited number of groundwater samples were collected from temporary monitoring wells during the RSE and are not reflective of groundwater conditions at PBS. Streamlined risk assessments were conducted in accordance with the USEPA guidance for conducting NTCRAs. The surface water, sediment, and soil SI and RSE sample analytical results and streamlined risk assessment conclusions provided evidence to conclude that the nature and extent of contamination at Firing Ranges 3 and 4 have been defined sufficiently for these media (Leidos 2019).

1.7.3.1 Surface Water

As presented in the *Multi-Site Remedial Investigation Sampling and Analysis Plan* (Leidos 2016b), four surface water samples were proposed for sampling. However, sections of the ditches at two sample locations were dry, and Leidos could not collect surface water samples. These eastern segments of the ditches are believed to hold only water intermittently during times of heavy precipitation. Samples collected during the RSE were analyzed for metals (USEPA SW-846 Methods 6020 and 7470) and PAHs. SI and RSE surface water sample results were compared to background levels and the USEPA RSL values for tap water, USEPA Maximum Contaminant Levels, and Ohio Water Quality Standards for drinking and non-drinking water exposures. The streamlined human health evaluation and streamlined ecological evaluation

concluded that no COCs requiring remediation were present in surface water at Firing Ranges 3 and 4 (Leidos 2019).

1.7.3.2 Sediment

Sediment samples collected during the RSE were analyzed for metals (USEPA SW-846 Methods 6020 and 7470) and PAHs. SI and RSE sediment sample results were compared to Ohio Sediment Reference values, USEPA residential soil RSL values, and USEPA ecological screening values (ESVs). The streamlined human health evaluation and streamlined ecological evaluation concluded that no COCs requiring remediation were present in sediment at Firing Ranges 3 and 4 (Leidos 2019).

1.7.3.3 Soil

Soil samples collected during the RSE were analyzed for lead and/or PAHs. SI and RSE sample results were compared to PBS-specific background values, USEPA residential RSLs, and USEPA ESVs. The soil at Firing Ranges 3 and 4 was aggregated into three Exposure Units (EUs) based on past use for the streamlined human health evaluation and ecological evaluation. The three EUs included the Firing Range 3 Shooting Area, Firing Range 4 Shooting Area, and Firing Ranges 3 and 4 Target Areas.

At the Firing Range 3 Shooting Area EU, the streamlined human health evaluation concluded that lead concentration (71,800 milligrams per kilogram [mg/kg]) in one sample exceeded the RSL (400 mg/kg). This high concentration may represent a "hot spot," and lead is a COC for remediation at this location. Some cPAHs were detected above RSLs at a sample location from a former railbed and three locations along the edge of the former asphalt/gravel drive. These cPAH concentrations are associated with the slag used as railroad ballast and asphalt, road dust, and vehicle exhaust, and were not identified as COCs requiring remediation at the Firing Range 3 Shooting Area EU. The streamlined ecological evaluation concluded that no direct remediation of soil was necessary to protect ecological receptors at the Firing Range 3 Shooting Area EU. However, human health removal of the lead concentration (71,800 mg/kg) in one sample from the Firing Range 3 Shooting Area EU would secondarily protect ecological receptors (Leidos 2019).

At the Firing Range 4 Shooting Area EU, the streamlined human health evaluation concluded that lead in one sample slightly exceeded the RSL; however, the 95 percent upper confidence level (95UCL) concentration for the shooting area is less than the RSL, and lead was not identified as a COC requiring remediation at this location. Benzo(a)pyrene was detected above its RSL in 1 of 43 samples in the shooting area. This sample was collected near a former railbed and is likely associated with the slag used as railroad ballast. The 95UCL concentration of benzo(a)pyrene in the shooting area (0.27 mg/kg) is below the RSL (1.1 mg/kg), and benzo(a)pyrene was not identified as a COC requiring remediation at this location. The streamlined ecological evaluation concluded that no direct remediation of soil was necessary to protect ecological receptors at the Firing Range 4 Shooting Area EU (Leidos 2019).

At the Firing Ranges 3 and 4 Target Area EU, the streamlined human health evaluation concluded that lead concentrations in 17 samples along the northern side of the blast wall exceeded the RSL (400 mg/kg), ranging from 767 to 44,000 mg/kg. Lead is a COC requiring remediation in this area. Several cPAHs were detected above RSLs in up to 17 samples collected along the northern side of the blast wall. These cPAHs are COCs that require remediation in this area. Arsenic and antimony also were detected above background SLs and RSLs in several samples. All of these samples contain other COCs (i.e., lead and/or cPAHs) that require remediation; therefore, arsenic and antimony will be addressed as part of the remediation for other COCs. The streamlined ecological evaluation concluded that no direct remediation of soil was necessary to protect ecological receptors at the Firing Ranges 3 and 4 Target Area EU. However, human health removal

of lead and benzo(a)pyrene from the Firing Ranges 3 and 4 Target Area also would secondarily protect ecological receptors (Leidos 2019).

1.7.3.4 Groundwater

As presented in the *Multi-Site Remedial Investigation Sampling and Analysis Plan* (Leidos 2016b), two temporary monitoring wells were installed at Firing Ranges 3 and 4 to determine if contamination is present in groundwater. Two pilot borings were installed to 10 feet below ground surface (bgs) into unconsolidated soils using a Geoprobe®. No saturated zones were identified in the boring logs. Temporary wells consisting of 1-inch polyvinyl chloride (PVC) with 5-foot screens were installed in the boreholes. The wells were dry when inspected the day after installation, and 10 days were allowed for groundwater to accumulate before sampling was attempted Samples collected during the RSE were analyzed for lead (filtered and unfiltered) and PAHs. Extremely low yield and high turbidity were observed during sampling. Insufficient groundwater did not allow proper development and purging for sampling. Due to the uncertainty of the groundwater data obtained during the RSE, groundwater sampling results were not evaluated in the streamlined risk assessments. The limited quantity and poor quality (high turbidity) of groundwater encountered in the unconsolidated lithology at Firing Ranges 3 and 4 appear to be consistent with previous groundwater findings at other sites at NASA PBS. Groundwater is not considered to be a separate medium for ecological receptors as they are unlikely to come into contact with groundwater except in instances where the groundwater daylights to surface water. The selected RA includes verification groundwater sampling to determine whether soil contamination from COCs at Firing Ranges 3 and 4 has impacted groundwater (Leidos 2019).

1.7.4 Removal Site Evaluation Removal Action Recommendations

In accordance with the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), an RA is selected when one or more of eight criteria (as listed in Section 300.415[b][2][i–viii]) are satisfied. At Firing Ranges 3 and 4, the actual or potential exposure to contaminated soil in and around the blast wall creates the site conditions that satisfy three criteria listed in the NCP. The RSE recommended an RA to minimize the risk and hazard associated with soil contamination (primarily lead and five cPAHs) in and around the blast wall at Firing Ranges 3 and 4 to protect human and ecological receptors.

The RSE human health risk evaluation identified eight COCs in soil: antimony; arsenic; lead; and five cPAHs, including benz(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, dibenz(a,h)anthracene, and indeno(1,2,3-cd)pyrene. No direct remediation of soil was recommended to protect ecological receptors. However, removal of lead and benzo(a)pyrene for human health receptors also would secondarily protect ecological receptors. These COCs formed the basis for evaluation of soil remedial activities within the framework of the RSE.

The RSE identified and evaluated potential RA alternatives to reduce or eliminate soil contamination at Firing Ranges 3 and 4 and selected the RA alternative. The selected RA is to remove soil in and around the blast wall at concentrations that exceed USEPA residential RSLs (USEPA 2019) or background SLs (IT 1998), thereby allowing potential future unrestricted reuse at Firing Ranges 3 and 4.

The removal action objective (RAO) identified in the RSE is to minimize the risk and hazard associated with soil contamination (primarily lead and cPAHs) in and around the blast wall at Firing Ranges 3 and 4 to protect human and ecological receptors.

To meet the RAO, the RSE recommended an RA consisting of removing the blast wall structure and removing soil in and around the blast wall, and additional excavation of six isolated “hot spot” locations (F3S-SS006, F4S-0031, F4T-SB002, F4T-SB006, F4T-SB007/F4T-SB009/F4T-SB010, and F4T-SB008).

The selected RA also includes verification groundwater sampling to determine whether soil contamination from COCs in soil at Firing Ranges 3 and 4 has impacted groundwater (Leidos 2019).

1.7.5 Firing Ranges Removal Action Kick-Off Meeting

On October 29, 2019, a kick-off meeting was conducted to discuss major elements of the RA approach, including:

- CERCLA NTCRA process;
- Overview of Firing Ranges 3 and 4 location on PBS and features;
- Previous investigations;
- COCs and the extent of contamination; and
- Recommended RA, construction approach, site restoration, and confirmation and verification sampling.

Representatives from NASA GRC, Leidos, and Arrowhead attended the kick-off meeting. The results of the discussions and decisions agreed to during the meeting are presented in this RA Work Plan, where appropriate.

1.8 RA WORK PLAN ORGANIZATION

The Firing Range RA Work Plan is composed of a Work Plan and design drawings. The remaining sections of the Work Plan are structured as follows:

- Section 2 presents the COCs in soils;
- Section 3 discusses construction mobilization and site preparation;
- Section 4 describes soil stabilization, excavation, and removal activities;
- Section 5 details stabilization confirmation and verification sampling approaches;
- Section 6 discusses waste characterization and disposal activities;
- Section 7 presents the site restoration activities;
- Section 8 presents CQAP and construction completion documentation requirements;
- Section 9 presents the reporting requirements and project schedule; and
- Section 10 lists the references used in preparing this document.
- Attachments:
  A. Waste Characterization Results
  B. Regulatory Notifications
  C. Design Drawings
  D. NASA GRC Specifications
  E. Health and Safety Plans.

2. COCs IN FIRING RANGE SOILS

This section summarizes the results and conclusions of analyses performed during and after submittal of the RSE Report (Leidos 2019), including:

- COC extent delineation using SI and RSE surface water, sediment, and soil samples;
- Insufficient groundwater samples for evaluation;
- Soil Pre-Stabilization Study; and
- Waste characterization sampling.

2.1 COC EXTENT DELINEATION

As presented in Section 1.7, the streamlined human health risk and ecological evaluations concluded that no COCs that require remediation are present in sediment and surface water at Firing Ranges 3 and 4; however, COCs that require remediation were detected in soil at Firing Ranges 3 and 4. Lead was detected at concentrations ranging from 1.3 to 310 micrograms per liter (µg/L) in all eight surface water samples. Lead was not identified as a COC in surface water based on the weight-of-evidence presented in the RSE Report (Leidos 2019), specifically for the sample collected in 2015 at location FR34-SDSW-001. The streamlined ecological evaluation concluded that no direct remediation of soil is necessary for protection of ecological receptors at Firing Ranges 3 and 4; however, removal of soil with human health SL exceedances for lead and benzo(a)pyrene would secondarily protect ecological receptors (Leidos 2019). Soil at the firing ranges was aggregated based on past use into three EUs:

- Firing Range 3 Shooting Area,
- Firing Range 4 Shooting Area, and
- Firing Ranges 3 and 4 Target Area.

Figure 4 shows the soil samples collected at each of these EUs. The horizontal and vertical extent of COC-impacted soils at Firing Ranges 3 and 4 were determined using soil samples collected during the 2006 and 2015 SIs and the 2017 RSE and comparing to risk-based SLs, as described in Section 1.7.2.3.

At the Firing Range 3 Shooting Area EU, lead (71,800 mg/kg) in one sample (F3S-SS006) exceeded the RSL (400 mg/kg) at a sample depth of 0 to 0.5 feet bgs. This high concentration represents a “hot spot,” and lead is a COC for this location. Some cPAHs were detected above RSLs at one sample location (F3S-SB004) at a sample depth of 0 to 1 foot bgs from a former railbed and at three locations (F3T-SB001, F3T-SB002, and F3T-SB003) and sample depths of 0 to 2 feet bgs along the edge of the former asphalt/gravel drive. These cPAH concentrations are associated with the slag used as railroad ballast and asphalt, road dust, and vehicle exhaust, and were not identified as COCs requiring remediation at the Firing Range 3 Shooting Area EU (Leidos 2019).

At the Firing Range 4 Shooting Area EU, lead (430 mg/kg) in one sample (F4S-SS020) exceeded the RSL (400 mg/kg) at a sample depth of 0 to 0.5 feet bgs. This concentration is close to the RSL, and the 95UCL concentration for the shooting area (74.6 mg/kg) is less than the RSL. Lead was not identified as a COC requiring remediation at this location.

The cPAH benzo(a)pyrene was detected above its RSL in 1 of 43 samples (F4S-SB013) collected at a sample depth of 0 to 1 foot bgs in the shooting area. No other cPAHs were detected above RSLs but several contributed to a sum-of-ratios (SOR) greater than 1; therefore, this discussion is limited to benzo(a)pyrene but applies to all five of the cPAHs (benz[a]anthracene, benzaldehyde, benzo[a]pyrene, benzo[b]fluoranthene, and dibenz[a,h]anthracene) identified in the SOR. The cPAHs were not identified as COCs requiring remediation based on the weight-of-evidence presented in the RSE Report (Leidos 2019).

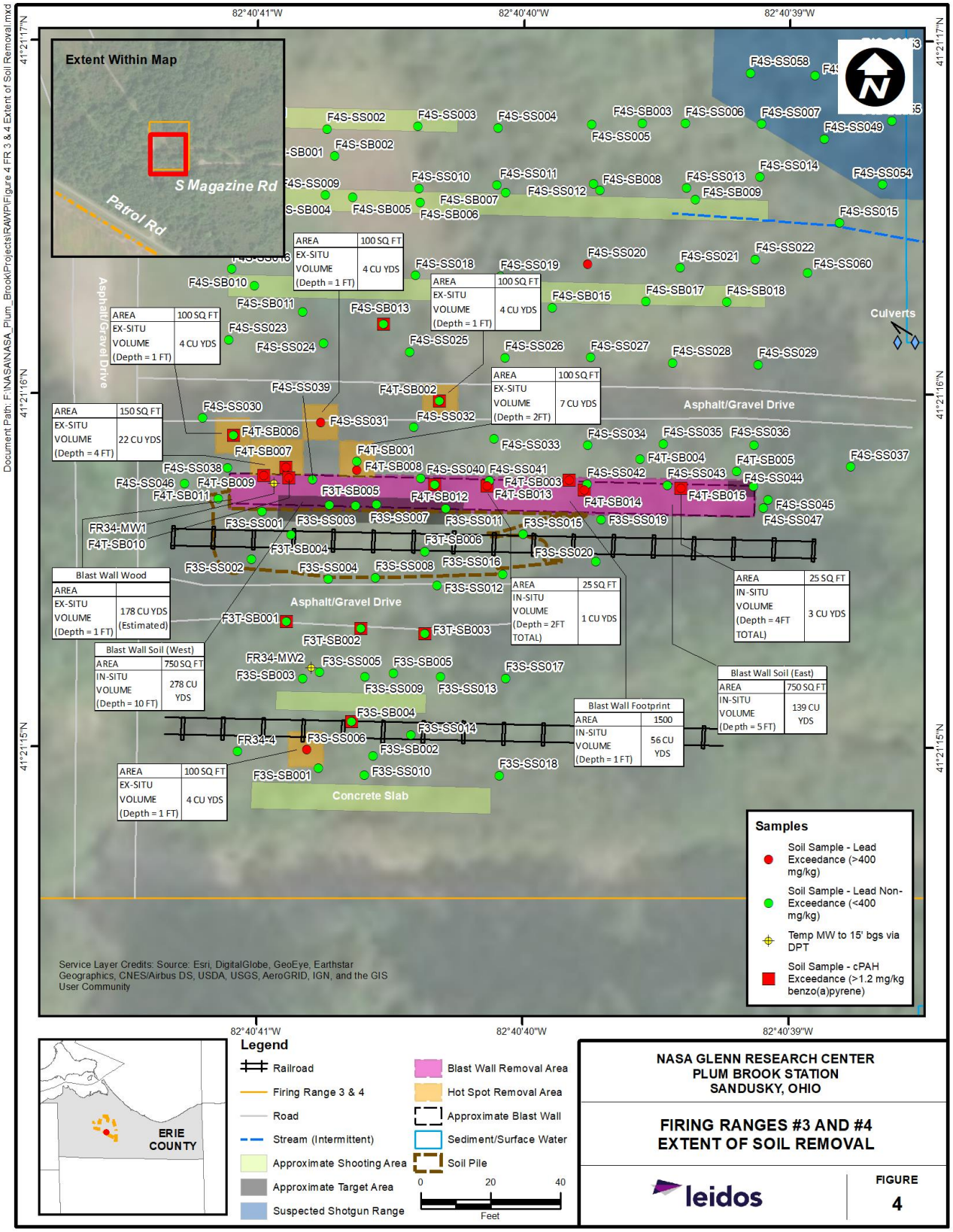

Figure 4. Firing Ranges 3 and 4 Extent of Soil Removal

At the Firing Ranges 3 and 4 Target Area EU lead is a COC requiring remediation, lead concentrations in 16 samples collected along the northern side of the blast wall exceed the RSL (400 mg/kg), ranging from 767 to 44,000 mg/kg at the following locations:

- F4T-SB003, 0 to 1 foot bgs;
- F4T-SB007, 0 to 1 foot bgs;
- F4T-SB008, 1 to 2 feet bgs;
- F4T-SB009, 0 to 1, 1 to 2, 2 to 3, and 3 to 4 feet bgs;
- F4T-SB010, 0 to 1, 1 to 2, 2 to 3, and 3 to 4 feet bgs;
- F4T-SB013, 0 to 1 and 1 to 2 feet bgs;
- F4T-SB014, 0 to 1 foot bgs; and
- F4T-SB015, 2 to 3 and 3 to 4 feet bgs.

Arsenic was detected above the background SL in three samples collected at two locations at concentrations ranging from 48.5 to 55 mg/kg (F4T0SB010, 0 to 1 and 2 to 3 feet bgs and F4T-SB012, 2 to 3 feet bgs). Both of these locations contain other COCs requiring remediation (i.e., lead and/or cPAHs); therefore, these elevated concentrations of arsenic will be addressed as part of the remediation for other COCs.

The antimony concentrations in eight samples collected at five locations exceed the RSL (31 mg/kg), ranging from 38.4 to 1,130 mg/kg (F4T-SB003, 0 to 1 foot bgs; F4T-SB010, 0 to 1, 1 to 2, and 2 to 3 feet bgs; F4T-SB013, 0 to 1 foot bgs; F4T-SB014, 0 to 1 foot bgs; and F4T-SB020, 2 to 3 and 3 to 4 feet bgs). Co-located lead concentrations in these samples range from 1,100 to 44,000 mg/kg; therefore, the elevated concentrations of antimony will be addressed as part of the remediation for lead in this area.

Benzo(a)pyrene was detected above its RSL in all samples in which any of the cPAHs were detected above RSLs; therefore, this discussion is limited to benzo(a)pyrene but applies to all five of the cPAHs (benz[a]anthracene, benzo[a]pyrene, benzo[b]fluoranthene, dibenz[a,h]anthracene, and indeno[1,2,3-cd]pyrene) identified as COCs. The benzo(a)pyrene concentrations in 10 samples (F4T-SB002, F4T-SB003, F4T-SB006, F4T-SB007, F4T-SB009, F4T-SB010, F4T-SB012, F4T-SB013, F4T-SB014, and F4T-SB015) along the northern side of the blast wall exceed the RSL (1.1 mg/kg), ranging from 1.5 to 39 mg/kg. The depth of cPAH contamination was limited to 0 to 1 foot bgs at all locations except F4T-SB009, F4T-SB010, and F4T-SB015, where contamination was detected to a depth of 4 feet bgs. These cPAHs are COCs that require remediation for this area (Leidos 2019).

Using the results of the COC extent delineation based on risk-based evaluations, the extent of soil removal was calculated; **Figure 4** depicts the areas. Note that some of the exceedance locations shown in **Figure 4** (F3S-SB004, F3T-SB001, F3T-SB002, F3T-SB003, F4S-SB013, and F4S-SS020) are not targeted for removal based on the detailed risk evaluation results presented in the RSE Report (Leidos 2019). **Table 2-1** presents the estimated volumes of soil to be removed within the blast wall and "hot spot" locations, as well as the blast wall wooden barricade.

2.2 INCOMPLETE GROUNDWATER EVALUATION

As discussed in Section 1.7, limited groundwater samples were collected from the temporary monitoring wells during the RSE and are not reflective of groundwater conditions at PBS. Following excavation and removal activities, verification groundwater sampling will be conducted within the blast wall footprint.

Table 2-1. Summary of Estimated Soil Volumes and Associated Weights

Waste Material	Area (ft^2)	Height/Depth (ft)	In Situ Volume (ft^3)	In Situ Volume (yd^3)	Weight[a] (tons)
Blast wall – wooden barricade	240	20	4,800	178	89
Blast wall soil (western side)	750	10	7,500	278	375
Blast wall soil (eastern side)	750	5	3,750	139	187
Soil below blast wall barricade	1,500	1	1,500	56	75
Soil hot spot excavation (F4T-B007)[b]	150	1	150	6	8
Soil hot spot excavation (F4T-SB002)	100	1	100	4	5
Soil hot spot excavation (F4T-SB001 and F4T-SB008)	100	2	200	7	10
Soil hot spot excavation (F4T-SB006)	100	1	100	4	5
Soil hot spot excavation (F4S-SS031)	100	1	100	4	5
Soil hot spot excavation (F3S-SS006)	100	1	100	4	5
Total Wood Debris					89
Total Soil					675

[a] Assumed density of soil at 1.35 tons/yd^3 and density of wood at 0.5 tons/yd^3.
[b] F4T-SB009, F4T-SB010, F4T-SB013, and F4T-SB015, included in the RSE estimates, will be removed as part of the blast wall soil removal.

ft = feet
ft^2 = square feet
ft^3 = cubic feet
RSE = Removal Site Evaluation
yd^3 = cubic yard

One semi-permanent, 2-inch-diameter bedrock monitoring well, up to 50 feet deep, will be installed at the location of F4T-SB010 (within the blast wall footprint), which exhibited the highest historical lead concentration (44,000 mg/kg) in soil (Section 5.3). One round of groundwater samples will be collected for analysis of lead, arsenic, antimony, and PAHs. The verification groundwater results will determine whether groundwater has been impacted above residential RSLs from historical leaching of soil contamination to groundwater and will be reported in the RA Completion Report (Task 7). If contamination is detected, a second seasonal round of sampling will be conducted.

2.3 SOIL PRE-STABILIZATION STUDY

The RSE determined that onsite stabilization of excavated lead-impacted soils was the most effective and economical method to render the soil non-hazardous for disposal under Soil Disposal Option 1, if necessary (Leidos 2019). On November 20, 2019, approximately 10 pounds of soil were collected as one five-part composite sample from the entire span of the blast wall suspected to be characterized as hazardous for disposal. This composite sample was submitted to KEMRON Environmental Services, Inc., for untreated analyses. A split sample (FR34-BT002) was analyzed by EnviroBlend®/URSUS Laboratory. The untreated sample was analyzed for physical properties (**Table 2-2)** and analytical characterization results for total lead and TCLP lead (**Table 2-3)**.

Table 2-2. Untreated Material Characterization Testing Results

Testing	Test	Unit	Sample
			FR34-BT001
Material pH	USEPA Method 9045	S.U.	4.73
Unit Weight – Average Bulk Density	ASTM D7263	pcf	114.7
Moisture Content	ASTM D2216		
ASTM Moisture Content		%	27.45
Percent Solids		%	78.46
Paint Filter	USEPA Method 9095		Pass

ASTM = ASTM International
FR = Firing Range
pcf = Pounds per Cubic Foot
S.U. = Standard Unit
USEPA = U.S. Environmental Protection Agency

Table 2-3. Untreated Analytical Characterization, Total Lead and TCLP Lead

Parameters	Units	FR34-BT001*	FR34-BT002*
		Result	Result
Total Lead (SW-6010)	mg/kg	217	6,200
TCLP Lead (SW-1311/SW-6010)	mg/L	0.575	1.74
TCLP Final Leachate pH	S.U.	4.92	4.87

*****FR34-BT001 was analyzed by KEMRON Environmental Services, Inc.; FR34-BT002 was analyzed by EnviroBlend®/URSUS Laboratory.

FR = Firing Range
mg/kg = Milligrams per Kilogram
mg/L = Milligrams per Liter
S.U. = Standard Unit
TCLP = Toxicity Characteristic Leaching Procedure

Based on the analytical characterization results of sample FR34-BT001, the TCLP lead concentration of 0.575 milligrams per liter (mg/L) is less than the maximum concentration for toxicity characteristic regulatory level for lead of 5.0 mg/L. Therefore, the lead-impacted soil from Firing Ranges 3 and 4 does not require amendment and can be disposed of offsite at the Erie County Landfill as non-hazardous waste. However, additional waste characterization sampling was conducted for the wooden barricade of the blast wall and the lead-impacted soil prior to the RA, as discussed in Section 2.4.

2.4 WASTE CHARACTERIZATION SAMPLING IN SUPPORT OF FIRING RANGES 3 AND 4 REMOVAL ACTION

Prior to initiating removal of the blast wall, waste characterization sampling was conducted for the wooden barricade of the blast wall, the soil contained within the blast wall, and isolated "hot spots." A five-part composite sample was collected from the soil inside the barricade at a frequency of one sample per 100 cubic yards (yd^3) (total of four samples anticipated) for laboratory analysis to make a hazardous waste determination. The analyses included TCLP semivolatile organic compounds (SVOCs); TCLP volatile organic compounds (VOCs); TCLP Resource Conservation and Recovery Act (RCRA) metals plus mercury; TCLP pesticides; TCLP herbicides; RCRA metals plus mercury; VOCs; SVOCs; polychlorinated biphenyls (PCBs); and reactivity, corrosivity, and ignitability (RCI) analysis. Two samples were collected from 0 to 2 and 2 to 4 feet bgs laterally into the western and eastern ends of the blast wall, for a total of four samples. The two Firing Range 4 "hot spots" with PAH-impacted soil were grouped together and included

one five-part composite collected from 0 to 1 foot bgs. The remaining three Firing Range 4 "hot spots" were grouped together and included one five-part composite collected from 0 to 1 foot bgs. The Firing Range 3 Shooting Area EU "hot spot" included one five-part composite sample collected from 0 to 1 foot bgs due to it containing the maximum concentration of lead (71,800 mg/kg). **Figure 5** shows the waste characterization boring locations. The soil samples were collected with a decontaminated hand auger and mixed in a disposable foil pan. One composite sample also was collected from the wooden barricade to determine whether the wood debris is considered hazardous. Hand tools were used to scrape or cut wood fragments from the blast wall. The offsite laboratory required particle size reduction.

Leidos collected waste characterization samples on January 23, 2020. The results indicated that the "hot spot" soils and the western half of the blast wall (2- to 4-foot interval) were non-hazardous and will not require onsite stabilization (Attachment A). Results for the western half of the blast wall soils (0- to 2-foot interval), eastern half of the blast wall soils (both 0- to 2- and 2- to 4-foot intervals), and blast wall wood debris indicated hazardous concentrations for TCLP lead (Attachment A). **Table 2-4** presents the concentrations of total lead and TCLP lead and whether stabilization will be required. **Figure 5** shows the TCLP lead results.

The wood was determined to be hazardous, so it will be directly disposed of offsite at a RCRA Subtitle C facility, such as the Envirosafe Services of Ohio, Inc., facility in Oregon, Ohio, which is approximately 60 miles from NASA PBS.

Since a large portion of the soil inside the blast wall was determined to be hazardous due to TCLP results, additional evaluation was conducted as to soil stabilization with a suitable amendment (e.g., phosphate amendment). As part of the NASA Erie County Conservation League (ECCL) Firing Range Stabilization Study (Attachment A; KEMRON 2019), preliminary stabilization treatments were conducted using three primary reagents, including Free Flow 200® (FF-200), Calciment, and EnviroBlend® CS for similar lead-impacted soils from another firing range at PBS. Bench-scale laboratory test results from the NASA ECCL Firing Range Stabilization Study were evaluated to determine the approximate amendment needs (i.e., type and quantity of amendment) to stabilize the soil at Firing Ranges 3 and 4 such that subsequent TCLP results would render a non-hazardous waste determination for the soil. **Table 2-4** presents the approximate dosage rates for Calciment and Enviroblend® CS to stabilize the hazardous soils at the blast wall.

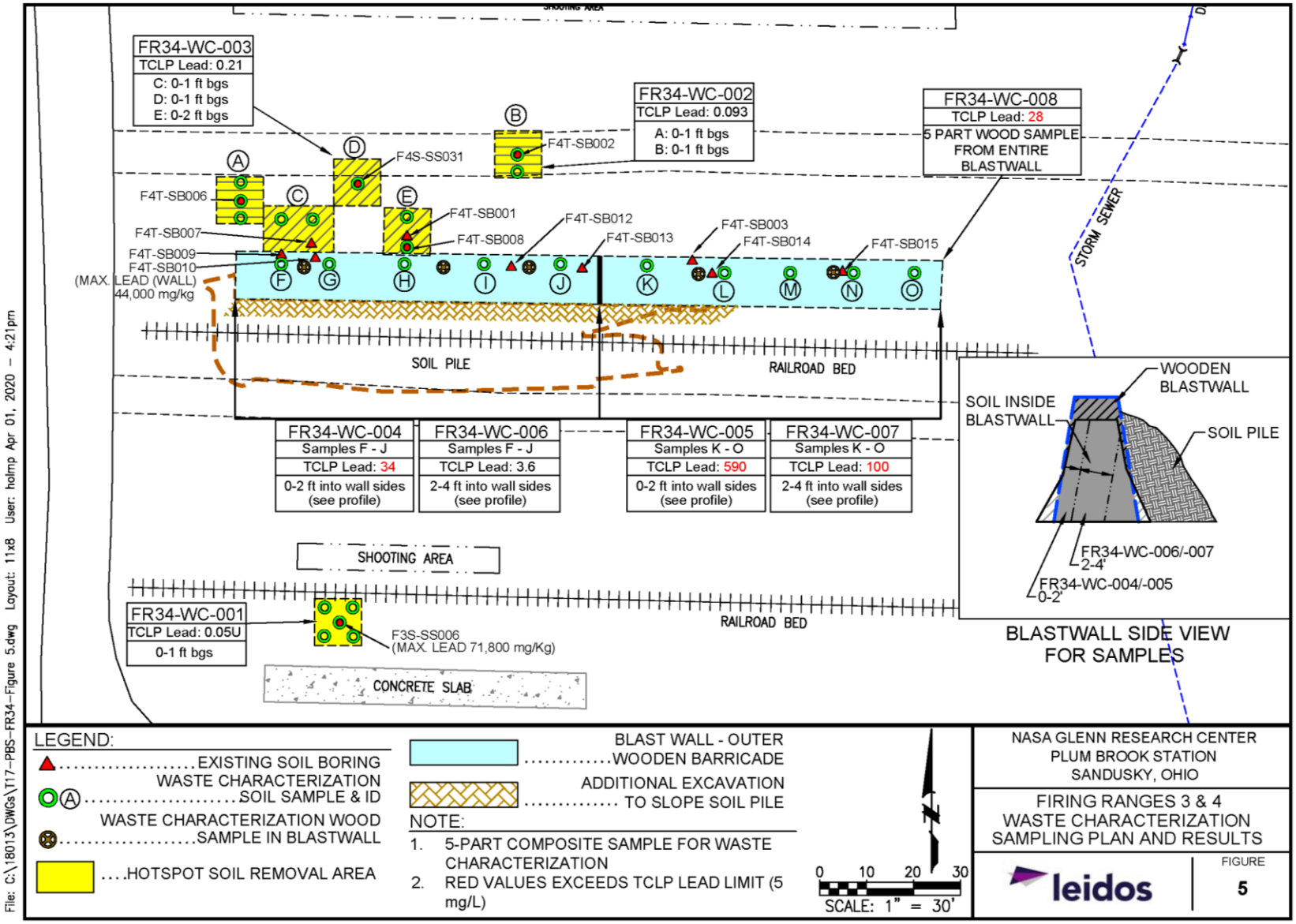

Figure 5. Waste Characterization Sampling Plan and Results

Table 2-4. Summary of Waste Characterization Results (Total Lead and TCLP Lead)

Sample	Parameter	Result	Unit	Description of Sample Location	Stabilization
FR34-WC-001	TCLP Lead	<0.05	mg/L	F3S-SS006 hot spot	No stabilization required.
FR34-WC-001	Lead	28	mg/kg	F3S-SS006 hot spot	
FR34-WC-002	Lead	350	mg/kg	F4T-SB002/SB006 hot spot	
FR34-WC-002	TCLP Lead	0.093	mg/L	F4T-SB002/SB006 hot spot	No stabilization required.
FR34-WC-003	TCLP Lead	0.21	mg/L	F4T-SB007/SS031/SB001/SB008 hot spot	No stabilization required.
FR34-WC-003	Lead	160	mg/kg	F4T-SB007/SS031/SB001/SB008 hot spot	
FR34-WC-004	Lead	**750**	mg/kg	Blast wall soil, western half, 0 to 2 feet bgs	
FR34-WC-004	TCLP Lead	**34**	mg/L	Blast wall soil, western half, 0 to 2 feet bgs	Stabilize with Calciment (4-6%) or Enviroblend (3%).
FR34-WC-005	TCLP Lead	**590**	mg/L	Blast wall soil, eastern half 0 to 2 feet bgs	Stabilize with Calciment (6-8%) or Enviroblend (3%).
FR34-WC-005	Lead	**4,500**	mg/kg	Blast wall soil, eastern half, 0 to 2 feet bgs	
FR34-WC-006	TCLP Lead	3.6	mg/L	Blast wall soil, western half, 2 to 4 feet bgs	No stabilization required.
FR34-WC-006	Lead	86	mg/kg	Blast wall soil, western half, 2 to 4 feet bgs	
FR34-WC-007	TCLP Lead	**100**	mg/L	Blast wall soil, eastern half 2 to 4 feet bgs	Stabilize with Calciment (6%) or Enviroblend (3%).
FR34-WC-007	Lead	**1,900**	mg/kg	Blast wall soil, eastern half, 2 to 4 feet bgs	
FR34-WC-008	TCLP Lead	**28**	mg/L	Blast wall wood	Direct hazardous waste disposal.
FR34-WC-008	Lead	**5,300**	mg/kg	Blast wall wood	

Bold exceeds residential RSL (400 mg/kg).
Red value exceeds TCLP limit (5 mg/L).

bgs = Below Ground Surface
mg/kg = Milligrams per Kilogram
mg/L = Milligrams per Liter
TCLP = Toxicity Characteristic Leaching Procedure

3. CONSTRUCTION MOBILIZATION

This section describes construction mobilization and site preparation activities required to implement this RA Work Plan. Attachment C (Drawings C-3, C-4, and C-5) detail associated requirements and are referenced throughout this section.

The contractors responsible for implementing construction and sampling activities will be required to prepare a HASP in accordance with the NASA GRC requirements and Occupational Safety and Health Administration (OSHA) guidelines. NASA GRC's Safety Office will review and approve the HASP prior to initiation of remedial activities and provide the final HASP prior to initiation of remedial activities.

3.1 PERMIT AND NOTIFICATION REQUIREMENTS

NASA has authority under CERCLA Section 104 and Executive Order 12580 as the lead agency to conduct a response action. Therefore, per CERCLA Section 121(e), NASA is not required to obtain local, state, or federal permits. However, NASA will coordinate and consult with the permitting authorities to facilitate the identification and compliance of federal and state applicable or relevant and appropriate requirements (ARARs). Any of the submittals listed below will be sent to the permitting authority as coordination and consultation , and the correspondence will clearly state that this is not a permit application. Based on a review of applicable requirements, the following notifications and consultations are required prior to the RA:

- Ohio EPA and USACE requirements for Wetlands (NASA will follow a Section 404 permit "equivalency" process for wetlands);
- Consultation with the U.S. Fish and Wildlife Service (USFWS), if tree clearing needs to be conducted within the restricted time frame;
- Ohio State Historical Preservation Office (NASA will complete Section 106 Form and Native American consultation); and
- NASA GRC Excavation Permit.

3.1.1 U.S. Army Corps of Engineers Requirements

Section 404 of the Clean Water Act (33 United States Code 1344) authorizes the Secretary of the Army, acting through USACE, to issue permits for the discharge of dredged or fill material into the waters of the United States at specified disposal sites. However, the removal area extents will not affect the nearby unnamed tributary to Plum Brook or delineated wetlands. Therefore, consultation with USACE is not required for this project.

3.1.2 Endangered Species Protection

Section (h) Endangered Species Protection of 40 Code of Federal Regulations (CFR) 6.302 prohibits federal agencies from jeopardizing threatened or endangered species or adversely modifying habitats essential to their survival. In 2016, EnviroScience conducted floristic and faunal surveys at NASA GRC (EnviroScience 2017). No federally listed species or Ohio listed species were identified at Firing Ranges 3 and 4. However, Firing Ranges 3 and 4 lie within the range of the Indiana bat (*Myotis sodalis*), a federally listed endangered species, and the northern long-eared bat (*Myotis septentrionalis*), a federally listed threatened species.

Trees within the limits of construction require felling to facilitate soil excavation and removal activities at Firing Ranges 3 and 4, which could potentially affect wildlife habitat, including that of the Indiana bat and

northern long-eared bat. Consequently, NASA GRC coordinated with USFWS to determine the appropriate disposition of potential bat roosting trees (Attachment B). USFWS stated that summer habitat requirements for the species are not well defined, but believe the following are important:

- Dead or live trees and snags with peeling or exfoliating bark, split tree trunk and/or branches, or cavities, which may be used as maternity roost areas;
- Live trees (such as shagbark hickory), which have exfoliating bark; and
- Stream corridors, riparian areas, and upland woodlots, which provide forage sites.

To protect the critical habitat for two bat species, the Indiana bat (Federal Endangered [FE]) and the northern long-eared bat (Federal Threatened [FT]), the NASA TM has requested tree clearing should take place outside the restricted time frame of April 1 through September 30. Clearing of trees equal to or greater than 3 inches diameter at breast height (dbh) within the restricted time frame will not occur. Arrowhead performed the tree clearing and additional brush clearing at Firing Ranges 3 and 4 in January 2020 to comply with USFWS requirements. Approximately 14 trees equal to or greater than 3 inches dbh were felled to remove potential roosting trees and assist in the soil excavation and removal activities. Section 3.2.3 addresses the final disposition of the tree segments.

3.1.3 Protection of Historic Properties Ohio State Historical Preservation Office Consultation

On March 2, 2020, NASA completed an Ohio Historical Preservation Office (OHPO) Section 106 Form outlining the RA (for disturbing ground where no archaeological surveys have been conducted) and the determination of no effect on historic properties. This form was sent to OHPO for their review and concurrence. The OHPO concurrence letter, dated April 19, 2020, concurred with NASA's findings that the RA will have no adverse effect on historic properties. A copy of the OHPO concurrence letter is included in Attachment 1 of the Final Action Memorandum for Firing Ranges 3 and 4 Removal Action (Leidos 2020).

In addition, NASA completed Native American consultations for ground-disturbing activity at Firing Ranges 3 and 4. The RA may begin once NASA receives responses, or 30 calendar days have passed without a response or request for extension. Documentation of the Native American consultations are included in Attachment 1 of the Final Action Memorandum for Firing Ranges 3 and 4 Removal Action (Leidos 2020). With any ground-disturbing activity, the potential of an inadvertent discovery of human remains or funerary objects exists. If such items are encountered during the RA, excavation will immediately stop and the NASA Cultural Resources Manager and NASA TM will be notified. Excavation will not resume until the NASA Cultural Resources Manager releases the site.

3.1.4 Ohio EPA Requirements

The total area of construction within Firing Ranges 3 and 4 is approximately 0.58 acres, which does not require NASA GRC to develop a site-specific Stormwater Pollution Prevention Plan (SWPPP) under Ohio EPA National Pollutant Discharge Elimination System (NPDES) Construction Stormwater Permit No. OHC000005. However, Attachment C (Drawings C-4 and C-8) present the best management practices (BMPs) to follow prior to RA activities, if warranted by site conditions.

3.1.5 NASA GRC Requirements

The contractor will notify NASA PBS employees of pending construction efforts, including firewood staging. Coordination with and notification to NASA PBS Security and Waste Management (WM) will be arranged prior to the start of field activities. Finally, a NASA excavation permit will be obtained prior to

each phase of field activities (tree clearing separate from RA). As part of the RA excavation permit process, the contractor will provide qualifications for at least two excavation competent persons.

NASA GRC will manifest all waste shipments in accordance with Chapter 20 (Handling, Reuse, and Disposal of Soil) of NASA GRC's *Environmental Programs Manual*.

3.2 SITE PREPARATION

The contractor must perform site preparation prior to the start of excavation activities at the site. Site preparation activities consist of several elements designed to maximize access to the site and prevent migration of soil during excavation. Site preparation requirements include:

- Utility survey and clearance,
- Establishing site controls and site access,
- Installing stormwater controls, and
- Setting up construction support facilities (as applicable).

3.2.1 Site Control and Access

NASA PBS traffic rules will be strictly obeyed. NASA PBS roads will not be blocked, and traffic will be maintained on at least half of the roadway width at all times. The NASA TM and NASA Construction Manager must grant approval prior to the start of any activity that will obstruct traffic. The contractor will not interfere with the peak traffic flows during normal operations at NASA PBS without notification to and approval by the NASA TM.

3.2.2 Construction Support Facilities

Construction support facilities for this RA may include:

- Sanitary facilities,
- Water storage tank (if needed),
- Equipment trailer, and
- Equipment staging area.

Attachment C (Drawings C-4 and C-5) detail the location of these support facilities.

3.2.3 Clearing

Clearing activities will be required to facilitate equipment access and soil removal (Attachment C, Drawing C-4). Clearing will primarily involve felling and removing trees that are equal to or greater than 3 inches dbh prior to the restricted time (between April 1 and September 30) to protect the critical habitat for two bat species (Indiana bat [FE] and northern long-eared bat [FT]). The trees are primarily located on and around the blast wall. The tree clearing and additional brush clearing was conducted in January 2020.

Felled large tree segments will be cut to short firewood sections (i.e., 2 to 3-foot length) and transferred to the designated firewood staging area (Attachment C, Drawing C-9). Smaller tree segments will be recycled into chipped wood mulch product and left onsite as ground cover. Tree stumps and associated roots within the remedial construction footprint will be placed in a haul truck with impacted soils (Attachment C, Drawing C-5).

3.2.4 Utilities

The contractor will coordinate with NASA to obtain the required utility clearance and excavation permit prior to commencing intrusive field activities. NASA will be responsible for underground utility clearance for excavation, sample locations, and monitoring well locations on NASA PBS property. Ohio Utility Protection Services (OUPS) will not need to be contacted prior to commencing intrusive work because the entire work site is on NASA PBS property

In the event the contractor discovers unmarked utilities during remedial activities, construction activities will stop immediately and remedial activities will be reassessed. The NASA TM, NASA Construction Manager, and Arrowhead Site Supervisor will be notified immediately. NASA PBS personnel will determine the disposition of the discovered utility and will make a joint determination regarding the continuation of remedial activities. If the discovery of unmarked utilities results in a change to the scope, objectives, or schedule of this RA, the NASA GRC COR, NASA TM, FANS Program Manager, Arrowhead PM, and Leidos PM will work to find an agreement on the proposed revisions and/or corrective actions. NASA GRC will issue concurrence before reinitiating work.

3.3 STORMWATER POLLUTION PREVENTION

The estimated disturbed construction area is 0.58 acres; therefore, a site-specific SWPPP is not required for this site since it is less than 1 acre in size. However, the contractor will install stormwater run-on and runoff controls prior to initiating remedial activities, as detailed in Attachment C (Drawings C-4 and C-8). BMPs will be followed, and the excavation area will be protected against stormwater run-on and runoff. Erosion and sedimentation controls will include both non-structural and structural BMPs. Non-structural BMPs at the project site will include:

- Minimizing disturbance,
- Phasing of construction operations, and
- Maintaining good housekeeping practices.

Structural BMPs at the site will include:

- Silt fence (or wattles),
- Temporary stabilization measures, and
- Earthen berms.

In addition, to minimize the potential for erosion and sediment runoff, no work will be conducted during periods of inclement weather, as determined by the NASA TM or designee. The open excavations and disturbed blast wall soils will be covered with plastic sheeting during inclement weather. The excavation areas will be opened and regraded as quickly as possible during construction activities. Any water that accumulates in an excavation and contacts impacted or stabilized soils will be classified as “Excavation Water.” Excavation water will be allowed to infiltrate and/or evaporate within the excavation areas, if possible. If infiltration and/or evaporation is not possible due to the potential to affect excavation activities, Arrowhead, Leidos, and NASA GRC will evaluate alternate forms of removal (i.e., pump to frac tank for storage). Non-contact stormwater accumulated on top of plastic sheeting will be pumped through the installed sediment controls or bag filter to the ground. Erosion/sedimentation control features will remain in place until completion of restoration activities. The Arrowhead Site Supervisor or designee will inspect the stormwater controls weekly and document the findings on the GRC stormwater inspection checklist (or similar). Stormwater controls also will be inspected within 24 hours of a 0.5-inch storm event or 2-inch snowmelt. These inspections will be performed in accordance with the CQAP (Section 8). NASA also will

conduct a monthly stormwater controls inspection and inform the Arrowhead Site Supervisor if any corrective action is required.

If discolored (i.e., red) water is observed in any excavation, the contractor will immediately notify the NASA TM and Leidos PM.

Arrowhead and earth worker subcontractors are required to complete the NASA-administered Erosion and Sediment Control training.

3.4 DUST AND WIND CONTROLS

All excavations, haul routes, permanent access roads, waste areas, and all other work areas within the project boundaries will be maintained free from dirt that could cause a hazard or nuisance. Dust generation activities may occur during excavation, material handling, and truck transportation (on paved and board roads). A dust monitor, such as a DustTrak™ or MiniRAM™ (or equivalent), will be used to monitor fugitive dust during soil excavation, soil stabilization mixing, and screening (the HASP provides additional information). Dust control will be maintained by keeping traffic on improved roads, maintaining a 10-mile per hour speed limit on roads near the project site, and application of water, as required. If fugitive dust exceeds calculated action limits for respirable dust (i.e., greater than or equal to 0.34 milligrams per cubic meter [mg/m^3] for the Firing Ranges 3 and 4 target areas and 0.21 mg/m^3 for the Firing Range 3 Shooting Area EU, for more than 1 continuous minute), water spraying/misting will be used for dust control, as required by the HASP. These action limits were calculated using the OSHA permissible exposure limit for lead of 50 micrograms per cubic meter ($\mu g/m^3$). Water used for dust control will be clean (i.e., obtained from onsite sources with approval of the NASA TM or potable water obtained from an offsite source). The use of additives will not be permitted.

During instances of high winds resulting in excessive dust, NASA GRC reserves the right to require additional dust control measures or to stop work. The Arrowhead SSHO will be responsible for dust monitoring by a DustTrak™ or MiniRAM™ (or equivalent) and by visual indications. During soil excavation, soil screening, soil loading, and soil mixing, dust monitoring using a MiniRAM™ will be performed for each work area continuously. In addition, the Arrowhead SSHO will conduct visual inspections daily, at a minimum, for visible fugitive dust emissions during normal representative operating conditions.

3.5 GOOD HOUSEKEEPING

Good housekeeping practices are designed to maintain a clean and orderly work environment and will include, at a minimum:

- Regularly pick up and dispose of garbage and waste material;
- Routinely inspect for leaks or conditions that could lead to discharges of petroleum or chemicals, or contact of stormwater, with raw materials, intermediate materials, waste materials, or products;
- Perform preventive maintenance on equipment to ensure its proper operation and to detect any potential leaks before they occur; and
- Ensure that employees, contractors, and/or subcontractors understand spill cleanup procedures, and establish storage areas away from direct traffic routes to prevent accidental spills.

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4. SOIL EXCAVATION, STABILIZATION, AND REMOVAL ACTIVITIES

This section describes soil excavation, stabilization, and removal activities that will be conducted in support of this RA Work Plan at Firing Ranges 3 and 4:

- Removal of wooden blast wall;
- Excavation of impacted soils inside the blast wall and spill piles, and target area "hot spots";
- Stabilization of lead-impacted soils (if necessary), removal, and load-out activities;
- Surveying; and
- Equipment decontamination.

Attachment C (Drawings C-3 through C-7) detail requirements for performing thee above-listed activities and are referenced as appropriate throughout this section. Section 6 discusses the transportation and disposal of impacted and stabilized soils. Confirmation sampling (if necessary) will be conducted in accordance with Section 5.1 prior to verification sampling. Verification sampling will be conducted in accordance with Section 5.2 prior to backfilling the excavation areas.

Arrowhead will implement the removal activities and bear responsibility for the excavation, stabilization, characterization, disposal of impacted/stabilized soils, backfill, and/or restoration activities. NASA GRC will oversee these activities. Implementation of these activities will meet the requirements of this RA Work Plan and associated HASP. In addition, all excavation and soil removal activities will be consistent with state and federal environmental laws and regulations.

If unexpected site conditions or materials are encountered during any phase of the remedial activities, construction activities will stop immediately to be reassessed in accordance with the HASP. The NASA TM, NASA Construction Manager, and Arrowhead Site Supervisor immediately will be notified about the situation. The conditions will be assessed and a joint determination made regarding continuation of remedial activities. Work will not resume until the NASA COR grants approval. If the discovery results in a change to the scope, objectives, or schedule of this RA Work Plan, the NASA TM will notify the Arrowhead PM and Leidos PM for concurrence on proposed revisions and/or corrective actions.

If artifacts (e.g., Early American) are unearthed, excavation will stop, the contractor will contact the NASA TM, and excavation will not begin again until a NASA Cultural Resources Manager releases the area.

4.1 NASA GRC SOIL POLICY

Excavation and soil removal activities from Firing Ranges 3 and 4 will be consistent with state and federal environmental laws and regulations, and Chapter 20 of NASA GRC's *Environmental Programs Manual*. Chapter 20 outlines the Handling, Reuse, and Disposal of Soil policy maintained and approved by NASA GRC's Environmental Management Office (EMO). The NASA GRC policy was established to:

- Evaluate the need for analyses on all soil prior to excavation;
- Minimize the volume and toxicity of waste soil generated by NASA GRC operations to the extent technically, legally, and economically possible;
- Reuse excavated soil as fill material at NASA GRC whenever possible; and
- Fulfill the requirements of solid and hazardous waste disposal facilities.

Chapter 20 of NASA GRC's *Environmental Programs Manual* does not cover backfill screening from offsite sources; therefore, NASA and Leidos have heuristically developed screening limits for backfill used at the site that were approved by the NASA GRC Soil Program and management.

4.2 EXCAVATION ACTIVITIES

This section describes the soil removal activities that will be conducted in support of this RA Work Plan, including:

- Land surveys,
- Blast wall removal,
- Excavation of impacted soil, and
- Equipment decontamination.

Excavation limits at each of the excavation areas will be constructed within a tolerance of greater than 0.5 feet except where dimensions or grades are shown or specified as minimum. Grading will be performed to maintain slopes and drainage. Excavation of any area or staging of backfill, stabilization agent, or stabilized soils will be implemented to result in the minimum detrimental effects to natural environmental conditions (e.g., prevent sediment runoff to nearby drainage ditches).

The Arrowhead Site Supervisor will work with the excavator operators to determine the best positions for locating construction equipment, based on the area being excavated. During excavation, care will be taken to not drop soils outside the excavation areas, overfill trucks, or drop soil onto the sides of the truck or the ground. Loaded trucks and the surrounding area will be inspected for spilled soils. Spilled soils will be immediately collected for load-out. The contractor will use "careful loading" practices, such as:

- Haul trucks will be staged as close as practicable to materials being excavated, and the contractor will spread plastic sheeting on the ground to catch loose soils.
- The excavator operator will stage impacted/stabilized soils within the excavation (or stabilized soil staging area) in close proximity to the haul trucks. This will minimize carrying distances and separate compacted/clods of soils, thereby ensuring a more fluid transfer from the bucket into the haul trucks.
- The operator will shake the excavator bucket within the excavation to level the bucket's contents and dislodge any loose soils that could fall during transfer to the haul truck.
- The excavator bucket will be positioned within the excavations or stabilized soil staging area during excavator relocation to ensure any spillage occurs in the excavation/staging areas.
- The operator will lower the excavator/front-end loader bucket into the haul truck to minimize the vertical fall of soils during transfer. A spotter may be used to ensure the bucket's position is optimal.

Throughout excavation activities, the contractor will manage water accumulating in the excavation in accordance with Section 3.3. Plastic sheeting will be used to cover the open excavations and stabilized soil staging area at the end of each day and during inclement weather. If the contractor observes discolored (e.g., red) water in any excavation, the NASA TM and Leidos PM will be notified immediately.

While performing all work under this RA Work Plan, the contractor will not allow either on- or off-road haul trucks to track soil/mud onto NASA PBS roadways or public roadways. The contractor will inspect all of the haul trucks within the inspection area before release to PBS roads and public roads. Soil removed from the haul trucks will be collected and disposed of with the excavated soils. All on-road haul trucks will

be covered while soils are transported to the disposal facility, and all transportation requirements (e.g., labeling and placards) will be followed.

4.2.1 Establishing Limits of Excavation

Land surveys will establish the horizontal limits of excavation. Excavation limits will be demarcated in accordance with Attachment C (Drawing C-3). Based on these limits, an estimated 675 tons (502 yd^3) of impacted soils require removal.

4.2.2 Blast Wall Removal Activities

Blast wall removal activities will begin after construction site set-up and clearing has occurred. Any remaining light fixtures will be assessed for potentially containing fluorescent lights and PCB ballast. Fluorescent lights and ballast will be carefully removed and transferred to NASA WM. The blast wall removal will begin with removal of the wooden barricade along the entire length of the blast wall. The appropriate equipment (e.g., excavator with hydraulic extension, skid steer) will be mobilized to the site for the removal activities. All hazardous wood debris waste generated from the removal activities will be disposed of at the Envirosafe Services of Ohio, Inc., facility in Oregon, Ohio, which is approximately 60 miles from NASA PBS. The wooden planks/logs will be removed and cut to manageable size (less than 4 feet in length, as per requirements of Envirosafe Services of Ohio, Inc.) so they can be easily loaded into dump trucks for offsite disposal. Barring any unexpected events, removal and disposal of the wooden barricade will be completed within 1 week. Based on the dimensions of the blast wall, approximately 89 tons of wood debris will be generated for offsite disposal.

4.2.3 Blast Wall Soil Excavation, Stabilization, Removal, and Load-Out Activities

Following removal of the wooden barricade, the soil contained within the blast wall will be excavated, stabilized (if necessary)/staged, and ultimately loaded into dump trucks for offsite disposal. If the subarea of soil was determined to be non-hazardous, it can be direct loaded into on-road dump trucks for immediate transport to an approved disposal facility, such as Erie County Landfill. Based on the surface contours map for the blast wall (Leidos 2016b), it is estimated that the western portion of the blast wall (75 feet in length at Firing Range 3) has been filled up with soil to approximately 10 feet in height, and the eastern portion of the blast wall (75 feet in length at Firing Range 4) has been filled up to approximately 5 feet in height. The estimated removal quantities include the soil contained within and spilled out of the wooden barricade and excavation of soil from 0 to 1 foot bgs under the footprint of the blast wall (Leidos 2019) (Attachment C, Drawings C-3 and C-5). The soil concentrations exceeding the residential RSLs are primarily limited to the target area (i.e., the blast wall and its immediate vicinity). The blast wall removal activities will generate approximately 637 tons of soil.

If stabilization is necessary, the contractor will construct stabilization agent staging areas in the laydown area to allow easy access to the agent while stabilizing soils (Attachment C, Drawings C-4 and C-5). The stabilization agent will be staged in a relatively flat and level area. If the agent is in a solid form, a clean, covered roll-off box will be used to stage the agent. The contractor also may construct a wooden box that can be covered with a tarp. The stabilization agent will be unloaded at the soil staging area and moved to the agent staging areas with a front-end loader or similar. The contractor will cover the staging areas at the end of each day and during inclement weather.

Approved soil stabilization agents consist of Calciment® or EnviroBlend®. Additional information on Calciment® and EnviroBlend® is contained in Attachment A. The contractor may use an equivalent stabilization agent, provided the proposed product is demonstrated to be as effective as Calciment® or EnviroBlend®. The contractor must provide technical specifications and treatability results using firing

range soils to NASA GRC and Leidos at least 30 days prior to construction activities. NASA GRC must grant written approval prior to use of the proposed equivalent product onsite.

Stabilization may be required during the RA. The steps of the stabilization process at each subarea of the blast wall and underlying footprint are summarized below:

1. Impacted soils will be excavated and placed within a subarea of the blast wall footprint.
2. The soils will be mixed with stabilization agent at recommended dosage rates (**Table 2-4**) using an excavator. The contractor will regulate dosage rates by excavator bucket counts or similar methods. Mixing will continue until the stabilization agent is thoroughly incorporated into the soil per the manufacturer's specifications and recommendations. No curing time is associated with Calciment® or EnviroBlend® stabilization agents.
3. Steps 1 and 2 will continue until the subarea reaches capacity.
4. When a subarea is sufficiently full to warrant load-out, stabilization confirmation sampling will be conducted. A sample of treated material will be obtained from the approximate center of the subarea. The sample will be collected through the vertical extent of the treated material in the subarea using an acetate liner or hand auger. The sample will be homogenized to ensure a representative composite sample is obtained. The sample will be shipped to a licensed offsite analytical laboratory for TCLP analysis for lead, arsenic, and antimony.
5. If confirmation sampling results indicate treated soils have met the appropriate remedial values for disposal as non-hazardous waste, the treated soils within the subarea will be transferred to the Stabilized Soil Staging Area. If confirmation samples from a subarea indicate treatment is inadequate, the soils within the subarea will be re-treated and resampled.
6. The emptied subarea may be reused for additional soil treatment, with Steps 1 through 5 repeated, as required.

The contractor will perform land surveys or other depth measurements, as required, to monitor and direct the progress of excavation activities. When required excavation depths have been attained and load-out of all treated soils is complete, verification sampling will be conducted to confirm all impacted soils above RGs have been removed, as described in Section 5.2.

Once confirmation samples have determined the stabilized soils are non-hazardous, an excavator or front-end loader will load-out stabilized soils into on-road haul trucks for transportation to the approved disposal facility. On-road haul trucks will be staged on the unnamed road along the western side of the project site. The on-road trucks will use a construction entrance adjacent to the stabilized soils staging area.

Upon completing the excavation, stabilized soil removal, and verification sampling activities, the contractor will backfill the excavation to match the existing grades surrounding the blast wall. Soils used for backfill will comply with Chapter 20 of NASA GRC's *Environmental Programs Manual*; NASA GRC Specification 31 00 00.98, *Earthwork* (Attachment D); the backfill screening limits developed by the project team; and all applicable regulations and guidance. After all stabilized soils have been loaded out of the stabilized soils staging area, approximately 6 inches of the soil floor will be scraped and live-loaded directly into on-haul trucks for disposal.

4.2.4 Hot Spot Excavation Activities

The isolated "hot spot" locations (F4T-SB006, F4T-SB007, F4T-SB001, F4T-SB008, F4S-SS031, and F3S-SS006) will be remediated once the excavation activities at the blast wall have been completed. The PAH-impacted soil from the two "hot spot" excavations (F4T-SB002 and F4T-SB006) at the Firing Range 4 target area are characterized as non-hazardous., Since the "hot spot" areas are close to the former asphalt

drive, soil from these excavations will be direct loaded into haul trucks for shipment to the licensed and NASA GRC-approved Subtitle D disposal facility (Erie County Landfill). Wood boards (or mats) will be used, if necessary, to extend across "hot spot" excavations to facilitate direct loading into the on-road haul trucks (Attachment C, Drawing C-4). The hot spot locations (approximately 60 tons) will be excavated and direct loaded into the on-road haul trucks.

4.3 SURVEYING

Land surveys will be conducted prior to initiation of excavation activities to establish surface elevations and demarcate areas to be excavated using the limits of excavation coordinates defined in Attachment C (Drawing C-3). The contractor will use depth controls to verify that excavation depths have been achieved. The contractor also will conduct land surveys of the final excavated grades. Horizontal and vertical measurement accuracy will be +/- 0.1 foot. Upon completion of all surveys, the contractor will submit documentation of the extent, elevation, and grades to the Arrowhead Site Supervisor and Leidos FM for inclusion in the RA Completion Report.

4.4 DECONTAMINATION

Contact with impacted soils will be actively minimized and measures will be taken to prevent tracking of material from the excavation. Equipment used to excavate impacted soils will be decontaminated prior to contact with other materials and/or prior to demobilization offsite. Equipment that comes into direct contact with impacted soils will be decontaminated as described below:

- The excavator bucket will be placed over an on-road haul truck or over the Soil Stabilization Area. (Note: Only limited amounts of liquids [i.e., less than 30 gallons per time] will be used for decontamination activities performed over haul trucks or the Soil Stabilization Area.) Decontamination liquids will not change the chemical profile of the waste (i.e., addition of solvents or pH). Decontamination liquids will be mixed with sufficient soil to avoid free liquids from leaking from the haul truck.
- Other small equipment will be placed within a portable PVC container (e.g., molded portable swimming pool).
- All loose soil will be removed using a stiff-bristle brush or other device to dislodge visible soil.
- Equipment will be steam cleaned using potable water, if the contractor deems it to be necessary.
- Equipment will be allowed to air-dry as long as possible.
- Equipment will be placed on clean plastic if immediate use is anticipated or wrapped in plastic to prevent contamination if longer-term storage is required.
- Loose soils and wash water will be mixed with soils to avoid free liquids and placed into a haul truck for disposal (decontamination liquids will consist of less than 30 gallons per truck and will not change the chemical profile of the waste).

If necessary, the contractor will construct a decontamination pad onsite using timbers and a 6-mil low-density polyethylene (LDPE) liner, or similar. The integrity of the decontamination pad will be inspected daily and polyethylene liner/timbers will be replaced as necessary.

At the end of each day, the contractor will park and maintain the excavator bucket in an excavation. If this is not feasible, the bucket will be wrapped with 6-mil LDPE sheeting and bound using duct tape and/or wire in manner sufficient to prevent accidental loss during overnight/weekend weather conditions.

Upon completion of all work and verification sampling, the excavator bucket and lower boom (if it contacted waste material) will be decontaminated following the procedure listed above. After the final decontamination, the portable PVC container also will be disposed of with a soil/decontamination water mix. Because the rest of the excavator has not been in contact with any hazardous materials, all soil remaining on the equipment will be removed from the machine using track spades, brooms, or other suitable devices. This soil will be incorporated back into the final overburden used to restore the site. Prior to release of construction equipment from the site, the SSHO or designee will visually inspect the construction equipment, paying attention to the:

- Tires and wheels or tracks (as applicable);
- Undercarriage (e.g., frame, axles);
- Exterior surfaces (including steps, running boards);
- Engine compartment; and
- Operator compartment.

If, during excavation activities, information becomes available or site conditions indicate the excavator tracks contacted impacted soils, the contractor will construct a decontamination pad and the excavator will be decontaminated prior to release from the site. If required, the decontamination pad will be constructed (using the portable containment system) as near as possible to the "finish" location of the excavator, within the limits of construction (Attachment C, Drawing C-4). Decontamination of the excavator will include the use of steam cleaning devices, pressurized water sprays, biodegradable detergent solutions, and/or hand cleaning. The contractor will collect, containerize, characterize, and properly disposed of all wash water and solids generated during excavation activities (Sections 6.2 and 6.3).

5. STABILIZATION CONFIRMATION AND VERIFICATION SAMPLING

This section details confirmation and verification sampling to be conducted onsite in support of RA activities. Confirmation sampling is conducted to confirm that soils treated with stabilization agents (if necessary) have been rendered non-hazardous and meet the disposal facility's waste acceptance criteria. The objective of verification sampling is to confirm the removal of all impacted soils above RGs. Attachment C (Drawing C-6) details the confirmation and verification sampling activities, which are described below. Sampling procedures will follow the requirements outlined in this section and in the Sampling Quality Assurance Project Plan (QAPP) (Section 5.5).

5.1 CONFIRMATION SAMPLING

The contractor will conduct confirmation sampling (if necessary) to verify stabilized soils have been adequately treated. The number of confirmation samples required is a frequency of 1 per 100 yd^3. The blast wall footprint will be divided into subareas (approximately 100 yd^3) to facilitate confirmation sampling and allow soils from specific AOCs (including "hot spots") to be segregated and managed separately. **Table 5-1** presents the number of confirmation samples to be collected per excavation area.

Table 5-1. Summary of Confirmation Samples

Area Location	No. of Confirmation Samples
Blast wall	5
Hot spot excavations	1

If confirmation samples from a subarea indicate treatment is inadequate (i.e., stabilized soils remain characteristically hazardous for lead or fail the disposal facility's waste acceptance criteria), the contractor will re-treat the soils within the subarea, as described in Section 4.2.3. If the results indicate stabilized soils are non-hazardous and meet the disposal facility's waste acceptance criteria, the soils will be removed from the blast wall subarea for hauling to the Stabilized Soil Staging Area and subsequently to a licensed offsite disposal facility, as outlined in Section 4.2.3 and in accordance with Section 6.2.1.

5.1.1 Confirmation Sampling Method

The contractor will collect one confirmation sample from the approximate center of each subarea by advancing an acetate liner through the vertical extent of the stabilized soil. If the liner cannot be advanced, hand augers will be employed. Treated soils collected in the acetate liner and/or hand auger will be homogenized using a stainless steel bowl and spoon to ensure a representative composite sample is obtained. Soil samples will be appropriately containerized and shipped to a licensed offsite analytical laboratory for TCLP analysis of lead, arsenic, and antimony, as detailed in Section 5.5.1. Soils not containerized for laboratory analysis will be returned to the subarea from where they were collected.

Investigation-derived waste (IDW) (e.g., decontamination liquids) generated during confirmation sampling activities will be disposed of in accordance with Section 6.2. Equipment decontamination will follow the procedures outlined in Section 5.4.

5.2 VERIFICATION SAMPLING

Following excavation activities at the blast wall and the isolated "hot spot" locations, the contractor will conduct verification sampling to ensure that all impacted soils above RGs have been removed. The number

of required soil samples for verification sampling was calculated using USEPA's *Methods for Evaluating the Attainment of Cleanup Standards* (USEPA 1989), as presented in **Table 5-2**. In general, the sample locations will be collected at a rate of one sample per 25 feet for the walls and floor of the blast wall. The "hot spot" samples will be collected at a rate of one sample per excavation wall and floor.

Table 5-2. Summary of Verification Samples for Excavation Areas

Area	Number of Sampling Locations*		
	Excavation Floor	**Excavation Walls**	**Total**
Blast Wall			
Blast wall footprint	6	15	21
Hot Spot Excavations			
Soil hot spot excavation (F4T-SB009, F4T-SB010, and F4T-SB007)	1	4	5
Soil hot spot excavation (F4T-SB002)	1	4	5
Soil hot spot excavation (F4T-SB001, F4T-SB008)	1	4	5
Soil hot spot excavation (F4T-SB006)	1	4	5
Soil hot spot excavation (F4S-SS031)	1	4	5
Soil hot spot excavation (F3S-SS006)	1	4	5
Soil staging area footprint	2	0	2
Remaining soil pile sidewall	5/0	0/0	5

*Samples will be screened with X-ray fluorescence where lead is a chemical of concern. Quantities are based on one floor or wall sample per approximately 25 feet.

The contractor will obtain verification soil samples from the approximate locations shown in Attachment C (Drawing C-6) and analyze the samples with an X-ray fluorescence (XRF) analyzer where lead is a COC. However, final verification sample locations will depend on actual field observations. If XRF results are greater than 411.6 mg/kg, the Arrowhead Site Supervisor will direct additional excavation activities. If lead is detected in the XRF sample at a concentration less than 411.6 mg/kg (see Section 5.2.2), a licensed offsite analytical laboratory will analyze the verification sample. Verification sample locations exhibiting COC concentrations greater than RGs specified in **Table 5-3** will be further excavated laterally or vertically. The limits of contamination will be delineated based on the relative location of the sample (i.e., excavation floor or wall) and verification results at adjacent sample locations.

At each sample location where RGs have been exceeded, the contractor will establish an impacted area by circumscribing an area halfway between the elevated sample location and the nearest non-elevated sampling points (approximately 5 feet). This impacted area will be excavated an additional 1 foot in depth. Three verification samples will be obtained from the newly excavated area and analyzed. The sampling/excavation process will continue until verification samples indicate RGs have been achieved or bedrock is reached.

The RG for lead was conservatively set at the residential soil RSL of 400 mg/kg. The Integrated Exposure Uptake Biokinetic Model for Lead in Children (IEUBK) used to calculate the RSL recommends use of the arithmetic average concentration as the exposure point concentration (EPC) for lead in soil. Therefore, remediation will be considered complete if the arithmetic average lead concentration in an area is less than 400 mg/kg after remediation. The RGs for cPAHs were conservatively set at the residential soil RSL for each cPAH. Remediation will be considered complete if the calculated EPC of each cPAH in an area is less than the RG after remediation. In order to attain the RGs for antimony or arsenic, the average COC concentration within each EU must be below the 2019 residential RSL or background SL.

Table 5-3. Remediation Goals for Soils at Firing Ranges 3 and 4

COC	Remediation Goal (mg/kg)
Antimony	31[a]
Arsenic	36.5[b]
Lead	400[c]
Benz(a)anthracene	11[a]
Benzo(a)pyrene	1.1[a]
Benzo(b)fluoranthene	11[a]
Dibenz(a,h)anthracene	1.1[a]
Indeno(1,2,3-cd)pyrene	11[a]

[a] The RG for antimony and cPAHs are set at the residential soil RSLs (USEPA 2019). The EPC concentration will be calculated for each area.
[b] Cancer (6.8 mg/kg) and non-cancer (35 mg/kg) RSLs for arsenic are less than the background criteria (36.5 mg/kg); therefore, the background concentration for arsenic is used as the RG. The average EPC concentration will be calculated for each area.
[c] The arithmetic average lead concentration for each area <400 mg/kg is used as the RG. Lead RG correlates to XRF RG of 411.6 mg/kg.

COC = Chemical of Concern
cPAH = Carcinogenic Polycyclic Aromatic Hydrocarbon
EPC = Exposure Point Concentration
mg/kg = Milligrams per Kilogram
RG = Remediation Goal
RSL = Regional Screening Level
XRF = X-Ray Fluorescence

5.2.1 Verification Sampling Method

The contractor will collect verification samples at the approximate locations shown in Attachment C (Drawing C-6). Locations accessible to field personnel will be collected using stainless steel spoons, hand augers, or acetate liners. Locations inaccessible to field personnel will be sampled remotely using an excavator bucket and lowered to field personnel to collect samples with stainless steel spoons. Between uses, the stainless steel spoons or hand augers will undergo decontamination (Section 5.4). The spoons/hand augers will be allowed to air-dry and wrapped in aluminum foil until they are needed again.

Verification samples collected from the excavation floor will be obtained from the upper 6 inches of soil at each location. For samples collected from the excavation walls, an aliquot of soil will be collected from the midpoint of the wall. The collected soil samples will be placed in a stainless steel bowl and homogenized using a stainless steel spoon. Soil samples will be analyzed using an XRF analyzer and by a licensed offsite analytical laboratory if lead is less than 411.6 mg/kg (see Section 5.2.2). Verification soil samples will be collected for analysis of lead, arsenic, antimony, and/or PAHs at each excavation location.

As indicated in Attachment C (Drawing C-6), samples collected from excavation walls and excavation floor locations will be submitted for laboratory analysis to ensure all impacted soils are removed from the site. All locations to be measured using XRF will provide valuable, near real-time results for planning and conducting additional excavation and verification sampling, if required.

5.2.2 XRF Analysis of Soil Samples

The concentration of lead in verification soil samples may be measured using a portable XRF analyzer manufactured by Innov-X Systems, ThermoScientific Niton, or similar to help guide the excavation

process. The portable XRF analyzer employs a miniature X-ray tube to measure metal concentrations for 30 different metals (including antimony, copper, and lead).

The XRF analyzer is capable of providing reliable lead concentration measurements through the use of a sample preparation method to reduce the inherent variability of soil samples. This preparation method consists of the following steps:

1. Collect 4 ounces of composited verification sample.
2. Dry the sample in a foil tray in a convection oven for 30 minutes at 400 degrees Fahrenheit (^{o}F), if saturated.
3. Place the dried soil in a plastic sample bag.
4. Break the soil clods or clumps. Take care to remove large or non-representative debris (e.g., rocks, vegetation, metal fragments, skeet fragment, and concrete) from the sample.
5. Place the sample bag on the XRF analyzer stand or field table.
6. Conduct a measurement of the soil for the prescribed time interval in the equipment manual.

During the 2006 Firing Ranges SI (Leidos 2016b), XRF results from 148 soil samples were correlated with analytical data to determine the accuracy of this technology and the potential effects of site-specific conditions on results. The resulting XRF measurements were evaluated against corresponding laboratory results to generate the relationship presented in **Figure 6**. The correlation coefficient (i.e., R value) equals 0.9045, indicating a relatively strong relationship between the log-transformed results. The observed slope of the regression line (1.14) demonstrates that the observed mean XRF result is comparable to the laboratory analytical result. The p-value is less than 0.01, indicating a statistically significant relationship at greater than 99 percent confidence. The correlation indicated that at the lead RG of 400 mg/kg, an XRF measurement of 411.6 mg/kg for lead would be conservatively used as the XRF RG.

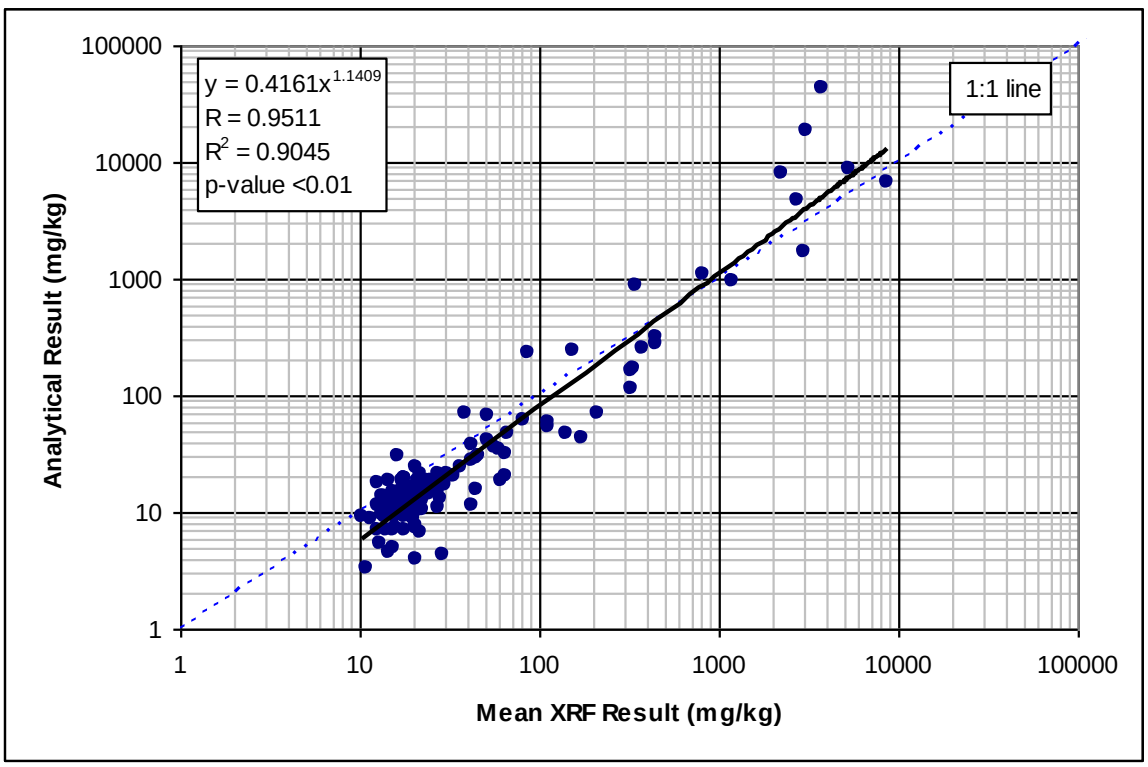

Figure 6. XRF Lead Results versus Laboratory Analytical Lead Results (2006 SI)

The XRF instrument will be calibrated and samples will be analyzed per the manufacturer's instructions. Field personnel who are experienced in the use of similar instrumentation and specifically trained in the safety and use of this instrument will operate the analyzer. Soil samples will be analyzed for a duration recommended by the manufacturer (typically up to 60 seconds). The XRF analysis may be repeated (to reduce the inherent variability of soil samples), rotating the sample bag after each measurement. After the samples have been analyzed, they will be retained until it is determined which samples (XRF readings for lead are below 411.6 mg/kg) will be sent to the laboratory for confirmatory analysis.

5.3 VERIFICATION GROUNDWATER SAMPLING

Following excavation and restoration activities at the blast wall and the isolated "hot spot" locations, Leidos will conduct verification groundwater sampling to ensure that historical operations at Firing Ranges 3 and 4 have not impacted groundwater at the site. The temporary monitoring wells installed during the RSE field activities in January 2017 did not yield sufficient water for representative sampling and, consequently, did not provide accurate or representative sampling results. Thus, a semi-permanent 2-inch monitoring well will be installed at location F4T-SB010 (within the blast wall footprint), which exhibited the highest historical lead concentration (44,000 mg/kg) in soil. Based on historical bedrock groundwater depths ranging from 41.1 to 43.37 feet bgs at bedrock monitoring well location BED-MW-26 (USACE 2011), located on South Patrol Road, just south of Firing Ranges 3 and 4, it is estimated that a well depth of 50 feet bgs will be adequate. Upon installation and well development, at least one groundwater sample will be collected from the monitoring well for analysis of lead and PAHs (additional filtered samples will be collected if turbidity is greater than 50 nephelometric turbidity units [NTUs]). The verification groundwater sampling will determine whether groundwater has been impacted above residential RSLs from historical leaching of soil contamination to groundwater.

5.3.1 Installation of Monitoring Wells

Semi-permanent monitoring well installation will be completed in accordance with Ohio EPA's *Technical Guidance Manual for Ground Water Investigations – Chapter 7: Monitoring Well Design and Installation* (Ohio EPA 2008). Following characterization of soil lithology, a monitoring well will be installed at the borehole near location F4T-SB010. Due to the shallow bedrock (estimated average bedrock depth of 4 to 5 feet bgs), a hollow-stem auger with air rotary capabilities, air rotary drilling rig, or similar will be used for completion of the monitoring well installation. The monitoring well will be composed of new, pre-cleaned, 2-inch-diameter, Schedule 40 PVC with 5- or 10-foot screened sections and a slot size of 0.010 inch. The field geologist will determine screen length based on the thickness of the saturated unit and aquifer conditions but will not exceed 10 feet in length. Pre-packed screen sections may be used for monitoring wells but are not required.

The manufacturer will supply all new monitoring well construction materials, and the subcontracted drilling company will deliver these materials. All PVC screens, casings, and fittings will conform to National Sanitation Foundation/American National Standards Institute Standard 14 for potable water usage. The screened section will be set at a depth to intercept the bedrock water table (estimated up to 50 feet bgs). A Leidos supervisory geologist will be present during all monitoring well installation activities and will maintain the monitoring well installation log. The final depth to the top of the filter pack, bentonite seal, and grout surface will be measured directly with a weighted tape and recorded on the associated well construction diagram. Leidos Field Technical Procedure (FTP)-1215 will be used as a procedural reference for monitoring well construction diagrams. Granular filter pack material (#5 or #7 sand) used for the monitoring well will be placed around the well screen by pouring the sand in the annulus between the screen and the borehole wall. Sand placement will be measured continuously using a weighted tape to prevent bridging. The filter pack will extend from the bottom of the borehole to approximately 3 feet above the top of the well screen depending on the final well construction depth. For wells less than or equal to 10 feet in

depth a filter pack will not exceed 1 foot above the top of the well screen. If warranted, 6 inches of sand will be placed under the bottom of the well screen to provide a firm footing.

A bentonite seal will be installed above the sand pack. Bentonite pellets or chips will be poured into the annular space above the sand pack to form a seal. The bentonite will be emplaced to 2 feet bgs without allowance for swelling during hydration. The bentonite pellets will be hydrated with potable water. The PVC casing will be cut to the appropriate depth and fitted with a watertight compression casing cap to prevent infiltration of surface water. Since a semi-permanent well will be installed within the completed soil removal area, surface completion will not be completed, since the well will most likely be abandoned shortly following the RA. Any semi-permanent well can be converted to a permanent well by installing a proper above-grade completion, if requested by the NASA TM. For permanent monitoring well above-grade completion, a protective iron/steel casing will be installed around the monitoring well the same day as initial grout placement. The protective casing will be set approximately 3 feet below grade (below the frost line) and will extend approximately 3 feet above the surface. The above-grade portion of the protective casing will be painted yellow or orange for identification. A mortar collar will be poured on the day firm grout is found in the borehole. The mortar collar will be poured within the annulus between the protective casing and the well casing from the ground surface to approximately 6 inches above the ground surface. Clean well sand will be placed in the annulus between the PVC and protective casing from the mortar collar 6 inches above ground surface to 6 inches below the top of the well casing to prevent loss of equipment. After placing the mortar collar, the remaining annulus formed between the outside of the protective casing and the borehole will be filled with concrete to ground surface. A weep hole will be installed in the outer protective casing just above the surface seal to prevent the accumulation of trapped water between the well casing and protective casing. Protective bollards are not planned to be installed. Any area disturbed during monitoring well installation will be repaired and reseeded, as described in Section 7.

The drilling subcontractor will submit a well log form to the Ohio Department of Natural Resources (ODNR) within 30 days (per Ohio Revised Code [ORC] 1521.05).

Water will be used for the following purposes during monitoring well installation:

- Installation of granular filter pack or bentonite, if necessary due to potential bridging; and
- Hydration of bentonite seals.

A field blank sample will be collected from all water sources used during field activities if current analytical data cannot be provided to ensure the source is free of contaminants. Field personnel will be responsible for transport and storage of the water required for the needs of the investigation in a manner to avoid the chemical contamination or degradation of the water once obtained. Three times the amount of any water used during installation will be removed as part of well development activities.

5.3.2 Monitoring Well Survey

Leidos will have a licensed surveyor in the State of Ohio survey the semi-permanent groundwater monitoring well. The subcontractor will provide horizontal and vertical coordinates for the site monitoring well; elevations are required from the top of well casing, inside the protective well housing, and at the ground surface. The horizontal coordinates will be determined to within 0.1 foot. Horizontal coordinates will be in the Ohio State Plane coordinate system. The vertical coordinates will be based on the North American Datum of 1983 (elevation) and will be determined to within 0.01 foot for well casing. Topographic elevations will be within 0.05 feet. The subcontractor will submit the surveyed well coordinates and elevations in a survey report to Leidos.

5.3.3 Monitoring Well Development

Monitoring well development will be completed after a minimum of 48 hours following well installation for each newly installed monitoring well using the pump and surge method with a whaler pump or similar, or a bailer. Each well will be developed to ensure that fine-grained particles are removed from the well per the *Ohio EPA's Technical Guidance Manual for Ground Water Investigations – Chapter 8* (Ohio EPA 2009). Well development will proceed until each of the following criteria is achieved:

- The sediment thickness remaining within the well is less than 0.1 foot or less than 1 percent of the well screen.
- Indicator parameters have stabilized for three consecutive readings. Water quality parameter stabilization is defined as within the following ranges:
  - pH ± 0.1 standard units;
  - Temperature ± 0.5 degrees Celsius (°C);
  - Conductivity ± 3 percent;
  - Dissolved oxygen (DO) ± 10 percent or ± 0.2 mg/L, whichever is greater;
  - Oxidation-reduction potential (ORP) ± 10 millivolts (mV); and
  - Turbidity ± 10 percent or less than 10 NTUs.
- Where the turbidity reading is greater than 10 NTUs, if the turbidity measurement has not changed over three consecutive readings, the turbidity parameter will be considered satisfied.
- Three times the amount of any water utilized during well installation is removed.
- A minimum of five times the standing water volume in the well has been achieved or the well is dry.

5.3.4 Water Level Measurement

The static water level measurements will be made using an electronic water level indicator. The depth to groundwater will be measured from a consistent measuring point, which will be surveyed and permanently marked on each monitoring well. Initially, the indicator probe will be lowered into each monitoring well until the alarm sounds and/or the indicator light illuminates. The probe then will be withdrawn several feet and slowly lowered again until the groundwater surface is contacted, as noted by the alarm and/or indicator light. All probe cords used for measurement will be incrementally marked at 0.01-foot intervals. Water level measurements will be recorded to the nearest 0.01 foot.

The static water level measurement procedure will be repeated two or three times to ensure that the water level measurements are consistent (within 0.01 foot). If this is the case, then the first measured level will be recorded in the field logbook as the depth to groundwater. If this is not the case, the procedure will be repeated until consistent readings are obtained from three consecutive measurements. Water levels will be measured at each site, in as close a time frame as possible, before any groundwater samples are collected.

5.3.5 Groundwater Sampling

Groundwater monitoring wells will be sampled using the low-flow drawdown method in accordance with the Ohio EPA's *Technical Guidance Manual for Ground Water Investigations – Chapter 10: Ground Water Sampling* (Ohio EPA 2012). The purpose of the low-flow sampling procedure is to obtain groundwater samples that represent the source from which they are collected and to minimize sampler exposure to potential groundwater contaminants.

Prior to purge and sample activities, static water level measurements will be taken with an electronic water level indicator using the procedures outlined in Section 5.3.3. Each monitoring well will be purged prior to sample collection using a peristaltic pump. The pump tubing will be positioned near the middle of the screened interval of the well to ensure that standing water is removed and fresh formation water is drawn into the well. Low-flow purging techniques will be used in conjunction with a flow-through cell to measure the following water quality parameters: pH, temperature, specific conductivity, DO, ORP, and turbidity. Water quality measurements and water level drawdown will be recorded every 3 to 5 minutes. The flow rate must not exceed the recharged rate of the formation such that minimal drawdown (less than 0.3 feet) occurs during low-flow sampling and stabilization. A flow rate that ensures minimal drawdown of the water level is typically 100 to 500 millimeters per minute (mL/min) but must be adjusted to minimize drawdown. Purging will be considered complete when the indicator parameters of pH, temperature, conductivity, DO, ORP, and turbidity have stabilized for three successive measurements with the following limits:

- pH ± 0.1 standard units;
- Temperature ± 0.5°C;
- Conductivity ± 3 percent;
- DO ± 10 percent or ± 0.2 mg/L, whichever is greater;
- ORP ± 10 mV; and
- Turbidity ± 10 percent or less than 10 NTUs.

In the event that a well recharges slowly and is not capable of sustaining adequate purging (i.e., continued drawdown), the well will be purged dry, allowed to recharge, and sampled when a sufficient volume of water has entered the well, not to exceed 24 hours. A field instrument(s) appropriate for the measurement of the required water quality monitoring parameters will be employed. Operation of the instrument will be recorded in the project logbook.

Groundwater samples collected during the verification sampling event will be submitted to a fixed-base laboratory for lead and PAH analyses. If the groundwater turbidity is greater than 50 NTUs, both unfiltered and filtered samples will be submitted for laboratory analysis. The IDW generated during well development and groundwater sampling activities will be managed as detailed in Section 6.2.

5.3.6 Monitoring Well Abandonment

Monitoring wells will be abandoned in place when groundwater sample results indicate no contamination is present, in accordance with Ohio EPA's *Technical Guidance Manual for Hydrogeologic Investigations and Ground Water Monitoring*, Chapter 9, "Sealing Boreholes and Decommissioned Monitoring Wells" (Ohio EPA 2016), and the *State of Ohio Technical Guidance for Sealing Unused Wells* (State Coordinating Committee on Ground Water 1996).

Prior to abandonment, the well will be inspected, and the water level and total depth measurements will be recorded. The outer protective casing, including the flush-mount casing, well vaults, and concrete pad (if present), will be removed prior to commencement of drilling activities.

The well will be pressure grouted from the bottom of the borehole using a tremie pipe and grout pump. The grout mixture will be mechanically mixed and composed of one 94-pound bag of Type I/II Portland cement with 5 percent granular bentonite and 6 gallons of water per batch of grout mixture. The grout mixture will be placed to 3 feet bgs in the well. Surface restoration will be completed with clean soil during restoration activities. Any area disturbed during monitoring well abandonment will be repaired and reseeded, as described in Section 7. The NASA Natural Resources Manager will pre-approve the seed mixture.

If the field geologist determines that a well is compromised and in-place abandonment is no longer appropriate, the well will be abandoned using overdrilling techniques. A 20.9-centimeter (cm) (8.25-inch), hollow-stem auger will be used to overdrill the well 1 foot deeper than the original well depth to ensure complete removal of all well materials. Following overdrilling activities, the well will be pressure grouted from the bottom of the borehole using a tremie pipe and grout pump.

Waste generated during groundwater monitoring well abandonment activities will be handled and managed in accordance with Section 6.2.

A Water Well Sealing Report (ODNR form DNR 7810.12e) will be completed for the abandoned well, and the report will be submitted to ODNR and NASA. The sealing report also will be included in the RA Completion Report (Section 9.1.3).

5.4 DECONTAMINATION OF ANALYTICAL SAMPLING EQUIPMENT

All non-dedicated sampling equipment that may come into direct contact with sampled media will be chemically decontaminated. Chemical decontamination is required to ensure sample quality and to prevent potential cross-contamination.

Equipment to be chemically decontaminated includes stainless steel bowls, stainless steel spoons, and hand augers. Equipment decontamination and "Cleaning and Decontaminating Sample Containers and Sampling Equipment" are described in the Leidos FTP-400, *Equipment Decontamination*. Chemical decontamination will be conducted as follows:

- Initial wash with potable water and Alconox (or similar) detergent,
- Rinse with potable water,
- Rinse with 10 percent nitric acid solution,
- Rinse with deionized (DI) water,
- Rinse with reagent-grade isopropanol,
- Rinse with DI water, and
- Allow equipment to air-dry.

Upon completion of the above decontamination procedures, each item will be wrapped in plastic or aluminum foil to prevent subsequent contamination prior to use. Decontamination activities will be conducted in a manner that will allow for the containment and control of all waste decontamination fluids. Every effort will be made to minimize the quantity of waste fluids generated during decontamination activities. Chemical decontamination activities will be conducted at a non-contaminated location (i.e., site-specific or central staging area). Waste decontamination water from sampling equipment decontamination procedures will be transferred into U.S. Department of Transportation (DOT)-approved 55-gallon drums or other containers approved by NASA WM in accordance with Section 6.2.

Decontamination of drill rig equipment will be conducted within a temporary decontamination pad constructed at the project staging area. The decontamination pad will be designed so that all decontamination liquids are contained from the surrounding environment and can be recovered for disposal as IDW. Drilling equipment will be decontaminated after completion of the monitoring well borehole.

If hollow-stem auger drilling is used, the procedure for decontamination of drilling equipment will be as follows:

- Remove caked soil material from the exterior of augers and cutting heads using a rod and/or brush.
- Steam clean the interior and exterior of the equipment using water and a brush where steam cleaning is not sufficient to remove all soil material.
- Allow equipment to air-dry as long as possible.
- Place equipment on clean plastic if immediate use is anticipated or wrap in plastic to prevent contamination if longer-term storage is required.

5.5 SAMPLING QAPP

The following subsections outline the procedures that will ensure proper analytical methods, QC, and sample handling methods are achieved.

5.5.1 Analytical Methods

Analytical methods used to analyze samples collected during field activities and the sample quantities are presented in **Table 5-4**.

5.5.2 Level of Quality Control Effort

The QC effort for this task includes procedures for field sampling and laboratory analysis. The laboratory uses a variety of QC samples to quantitatively assess the quality of the data. The laboratory control sample (LCS) contains known concentrations of target analytes and is used to establish and monitor the laboratory's analytical process control. An LCS must be analyzed with each analytical sample batch. Matrix spike/matrix spike duplicate (MS/MSD) samples, laboratory duplicates, and surrogate spikes measure the matrix component of measurement performance, but also reflect laboratory performance. The laboratory will, at a minimum, analyze internal QC samples at the frequency specified by the analytical method.

The laboratory will analyze equipment rinse blanks, temperature blanks, field duplicate samples, and MS/MSD samples to assess the quality of the data resulting from the field sampling and analytical programs. QC samples will not be collected during waste characterization and confirmation sampling.

In the field, additional QC samples are collected to assess field sampling techniques and environmental conditions during sample collection and transportation. The types and frequencies of QC samples that will be collected and analyzed are described below.

5.5.2.1 Equipment Rinse Blank

One equipment rinse sample will be collected for a set of sampling equipment used during groundwater sampling activities, a minimum of one per seasonal event, to assess potential incidental field contamination and the integrity of the field decontamination practices. Equipment rinse samples will not be collected during excavation verification soil sampling or waste characterization sampling.

Equipment rinse samples will be collected by pouring laboratory-grade, DI water over a representative amount of disposable or decontaminated equipment (e.g., tubing, bailer). The rinse water then will be transferred to the appropriate sample bottles and submitted for laboratory analysis for the chemical analytical parameters listed in **Table 5-4**.

Table 5-4. Project Laboratory Analytical Summary

Type of Sample	Parameters	Methods	Samples
Soil Confirmation and Verification Samples			
Soil Confirmation	TCLP lead, antimony, arsenic	SW-846, 6010B	10
Soil Verification	Total lead, antimony, arsenic	SW-846, 6010C	48
	PAHs	SW-846 8270C	58
Field Duplicate (1 per 10 soil samples)	Total lead, antimony, arsenic	SW-846, 6010C	6
	PAHs	SW-846 8270C	6
MS/MSD (1 per 20 soil samples)	Total lead, antimony, arsenic	SW-846, 6010C	3
	PAHs	SW-846 8270C	3
Groundwater Samples			
Equipment Rinse	Total lead	SW-846 6010	1
	PAHs	SW-846 8270C	1
Groundwater	Total lead	SW-846, 6010	2
	PAHs	SW-846 8270C	2
Solid Waste Characterization Samples			
Excavation Soil/Wood	TCLP pesticides/herbicides	SW-846, 1311/8081A/8151A	8
	TCLP ZHE, volatile extract	SW-846, 1311	8
	TCLP Metals + nickel + mercury	SW-846, 6010B/7470A	8
	TCLP volatiles	SW-846, 8260B	8
	TCLP semivolatiles	SW-846, 8270C/1311	8
	Total RCRA metals + nickel + mercury	SW-846, 6010C/7471B	8
	PCBs	SW-846, 8082	8
	Flashpoint	SW-846 1010	8
	Total cyanide	SW-846, 9012A	8
	Total sulfide	SW846 9034	8
	Paint filter liquids test	SW-846, 9095A	8
	pH	SW-846, 9045C	8
	Total VOCs including F-Scan (F001 through F005)	SW-846, 8260C, 8015C	8
	Total SVOCs	SW-846 8270D	8
Liquid IDW Characterization Samples			
Decontamination Water and Groundwater	Total volatiles (includes F-listed VOCs)	SW-846 8260B, 8270C, 8015M, 8015B, 8240	2
	Total RCRA metals + nickel	SW-846 6010/7470A	2
	Total semivolatiles (includes F-listed SVOCs)	SW-846 8270C	2
	Total PCBs	SW-846 8082A	2
	Flash point	SW-846 1010	2
	pH	SW-846 9040	2
	Total cyanide/sulfide	SW-846 -9030/9034/9012	2
	Total pesticides/herbicides	SW-846 8081A/8151A	2

IDW = Investigation-Derived Waste
MS/MSD = Matrix Spike/Matrix Spike Duplicate
PAH= Polycyclic Aromatic Hydrocarbon
PCB = Polychlorinated Biphenyl
RCRA = Resource Conservation and Recovery Act
SVOC = Semivolatile Organic Compound
TCLP = Toxicity Characteristic Leaching Procedure
VOC = Volatile Organic Compound
ZHE = Zero Headspace Extractors

5.5.2.2 Temperature Blank

A temperature blank consists of distilled or tap water and will be included in each container (e.g., cooler) used to ship samples to the analytical laboratory in order to provide the means to assess the temperature of the samples within the sample shipment.

5.5.2.3 Field Duplicate

A field duplicate sample is a second sample collected at the same location as the original sample in order to assess the representativeness of the sample. Duplicate samples are collected simultaneously, or in immediate succession, using identical recovery techniques and treated in an identical manner during storage, transportation, and analysis. The sample containers are assigned an identification (ID) number in the field such that they cannot be identified (blind duplicate) as duplicate samples by laboratory personnel performing the analysis. One field duplicate sample will be collected for every 10 or fewer samples (10 percent).

5.5.2.4 MS/MSD

An MS/MSD is an aliquot of sample spiked with known concentrations of analytes to document the bias of a method due to sample matrix characteristics. The spiking occurs prior to sample preparation and analysis. The samples that are collected for MS/MSD analysis will be designated on the chain-of-custody (CoC). MS/MSD samples will be collected at a frequency of 1 per every 20 or fewer samples (5 percent).

5.5.3 Analytical Sample Management

Samples will be placed in laboratory-supplied containers appropriate for the intended analyses. Samples will be identified, handled, and shipped as described below.

5.5.3.1 Station and Sample Identification Numbering System

The field station and sample ID numbers are unique numbers that allow for the tracking and evaluation of each environmental sample collected during the project. The station ID number is specific to the site and sample station. The field sample ID number is medium-specific and increases consecutively throughout the entire project.

5.5.3.2 Station Identification System

Sample location stations will be recorded on the field CoC forms. The sample station will identify the areas and the specific location where the sample was collected and will consist of the following:

- Sample location area:
  - FR34: Firing Ranges 3 and 4
- Sample location type:
  - CS: Confirmation Soil Sample
  - VS: Verification Soil Sample
  - Well ID: Groundwater
  - WC: Waste Characterization.

Unlike laboratory sample ID numbers, sample station locations are not consecutive throughout the entire project and are area-specific only.

Examples of sample station locations are:

- FR34-CS-001 = Firing Ranges 3 and 4 Confirmation Soil Sample Location #1
- FR34-VS-001 = Firing Ranges 3 and 4 Verification Soil Sample Location #1
- FR34-MW3 = Groundwater Monitoring Well Station
- FR34-WC-001 = Waste Characterization Sample Location #1.

Note that multiple laboratory sample ID numbers may refer to a single sample station location. In addition, a sample station location cannot be determined from the laboratory sample ID number alone (or vice versa). This information will be included on the field and laboratory CoCs, on the sample container label, and in electronic analytical data tracking files. The depth for each soil sample also will be recorded on field and laboratory CoCs.

5.5.3.3 Sample Identification System

The laboratory sample ID number is a unique number that allows for the tracking and evaluation of each environmental sample collected during sampling activities. The laboratory sample ID number is medium-specific and increases consecutively throughout the entire project. Laboratory sample ID numbers will consist of the following:

- Project ID Code: FR34
- Sample Matrix Codes:
  - CS: Confirmation Soil
  - VS: Verification Soil
  - GW: Groundwater
  - RS: Equipment Rinse
  - WL: Liquid Waste Characterization
  - WC: Soil (or Wood) Waste Characterization
  - BT: Bench Test.
- Sample Numbers:
  - 0001 through 8999: Regular Sample
  - 9000 through 9499: Duplicate Sample.

Sample ID numbers will not be duplicated from past Firing Ranges 3 and 4 field efforts but will commence at the next available sample number.

Examples of laboratory sample ID numbers are shown in **Table 5-5**.

Table 5-5. Example Station and Sample Numbers

Station Number	Sample Number	Description
FR34-CS-002	FR34CS0002	FR3&4 Site, Confirmation Soil Boring 2, Soil Sample 2
FR34-VS-001	FR34VS0001	FR3&4 Site, Verification Soil Boring 1, Soil Sample 1
---	FR34RS0001	Equipment Rinse 1
FR34-WC-001	FR34-WC-001	Soil Waste Characterization Sample 1
FR34-BT-001	FR34-BT-001	Bench Test

FR3&4 = Firing Ranges 3 and 4

Sample location stations also will be recorded on the field CoC forms. The sample location station will identify the area and the specific location where the sample was collected. Unlike sample ID numbers, sample station locations are not consecutive throughout the entire project and are location-specific only.

5.5.3.4 Sample Containerization and Preservation

Sample containers and chemical preservation/holding time requirements for soil samples collected during the RA activities are described in the Multi-Site Remedial Investigation Sampling and Analysis Plan (Leidos 2016b). The analytical facilities will estimate and supply the specific number of containers required. Additional containers will be provided, when necessary, for the collection of field QA/QC samples (e.g., field duplicates, MS/MSDs).

The subcontract analytical laboratory also will provide the required types and volumes of chemical preservatives. Temperature preservation will be maintained at 4°C (±2°C) from sample collection through laboratory receipt by placing the samples in a cooler with wet ice and storing the samples either in coolers with ice or in a refrigerator.

5.5.3.5 Sample Labels

A sample label will be affixed to each sample container sent to the laboratory. This ID label will be completed in indelible ink with the following information:

- Project name and location;
- Field sample location;
- Field sample identification number;
- Date and time of sample collection;
- Preservative used, if any;
- Name of collector;
- Media type;
- Type of sample (grab or composite); and
- Analyses requested.

5.5.3.6 CoC and Sample Shipment Records and Procedures

Samples will be collected under CoC protocols, including use of field logbooks, sample labels, CoC forms, sample ID, and custody seals. Samples will be labeled using standard procedures, including labeling sample bottles prior to collection, completing a CoC form prior to sample shipment, and using custody seals on coolers, in accordance with the Leidos Environmental Science and Engineering (ESE) FTP-625 (CoC Procedure) and ESE FTP-1215 (Use of Logbooks).

5.5.3.7 Sample Packaging and Shipping Requirements

Environmental sample containers will be packaged in thermally insulated coolers. Sample packaging and shipping will be conducted in accordance with applicable DOT specifications. Packaging and shipping procedures to be used for samples collected during the project will include the following:

- Each sample container will be wrapped in bubble-wrap or similar protective material.
- Each sample container will be placed into a separate plastic bag that will then be sealed. As much air as possible will be squeezed from the sample container bags before sealing.

- Each sample container will be placed upright in the shipping cooler along with wet/chemical ice (when required) sealed in double plastic bags that will be placed around, among, and on top of the sample containers. For shipping with laboratory-provided couriers, the ice may be contained in single plastic bags.
- Before initial placement of samples into a rigid-body cooler, the cooler drain plug will be taped shut (inside and outside) and the cooler will be lined with a large plastic bag.
- Inert packing material will be placed into the cooler, if required, to prevent shifting of the sample containers during transport.
- All required laboratory paperwork, including laboratory CoC forms, will be placed inside a plastic bag and taped to the inside of the cooler lid. If a laboratory-provided courier is used, the paperwork will be attached to the outside of the cooler to facilitate exchange of sample custody.
- Upon completion of the packing process, the cooler lid will be sealed with duct tape and strapping tape and two signed/dated custody seals will be placed on the cooler, one across the front and one across the side.
- The commercial shipping documentation (when applicable) will be completed and attached to the top of the shipping box/cooler, which will then be transferred to the courier for delivery to the laboratory.

The individual(s) responsible for packing and shipping environmental samples may use a checklist to verify the completeness of sample shipment preparations.

All environmental samples collected during the project will be shipped as soon as possible to ensure compliance with analytical method holding times. During the time period between collection and shipment, all samples will be stored in ice-filled coolers or refrigerated (when required) and maintained in a secure area. All coolers containing environmental samples will be shipped overnight to the laboratory by commercial or laboratory courier.

5.5.4 Corrective Actions and Variances

Corrective actions may be required for two types of problems: analytical/equipment problems and non-compliance with criteria. Analytical and equipment problems may occur during sampling, sample handling, sample preparation, laboratory instrumental analysis, and data review.

Non-compliance with specified criteria and analytical/equipment problems will be documented through a formal corrective action program at the time the problem is identified. The person identifying the problem is responsible for notifying the Leidos FM and PM. When the problem is analytical in nature, information on the problem will be promptly communicated to the Leidos QA/QC Officer. Implementation of the corrective action will be confirmed in writing.

Any non-conformance or variance from the established procedures in this RA Work Plan will be identified and corrected in accordance with Leidos Quality Assurance Administrative Procedures (QAAPs) ESE A15.1 and A16.1 or established laboratory quality procedures. The Leidos FM or designee will issue a Field Change Request for variances or NCR for each non-conforming condition. If a variance is anticipated (e.g., because of a change in the field instrumentation), the applicable procedure will be revised upon approval from the Leidos PM and QA/QC Officer, and the change will be noted in the field logbooks.

Corrective actions will be implemented and documented in the field record book. No staff member will initiate corrective action without prior communication of findings through the proper channels. If corrective

actions are deemed insufficient, work may be stopped through a stop-work order issued by the Leidos PM and/or the NASA TM.

5.5.5 Field and Laboratory Instruments/Equipment

The following sections present information regarding the control, calibration, maintenance, and testing of field and laboratory instruments and equipment.

5.5.5.1 Field Instruments and Equipment

Specific preventive maintenance procedures to be followed for field equipment are those recommended by the manufacturers. These procedures are included in the technical procedures governing the use of these instruments.

Field instruments will be checked and/or calibrated before they are shipped or carried to the field. Each field instrument will be checked daily against a traceable standard or reference with a known value to ensure the instrument is in proper calibration. Calibration of measuring and test equipment will be performed in conformance with documented and approved procedures.

Instruments found to be out of calibration will be recalibrated before use in the field. If an instrument cannot be calibrated, it will be tagged for return to the supplier or manufacturer for recalibration. A back-up instrument will be used in its place. Calibration checks and calibrations will be documented on the Field Meter/Calibration Log Sheets in the Measuring and Testing Equipment (M&TE) Logbook. Any maintenance conducted on field equipment also must be documented in the M&TE Logbook.

Critical spare parts, such as batteries, will be kept onsite to minimize delays from malfunctioning instruments. Back-up instruments and equipment should be available onsite or within 1-day shipment to avoid delays in the field schedules.

5.5.5.2 Laboratory Instruments

As part of the QA/QC Program, a routine preventive maintenance program will be conducted by all investigation-associated laboratories to minimize the occurrence of instrument failure and other system malfunctions. All laboratory instruments will be maintained in accordance with manufacturer's specifications and the requirements of the specific method employed. This maintenance will be carried out on a regular, scheduled basis and will be documented in the laboratory instrument service logbook for each instrument. Emergency repair or scheduled manufacturer maintenance will be provided under a repair and maintenance contract with factory representatives or an authorized provider of such services.

6. WASTE CHARACTERIZATION AND DISPOSAL

This section describes waste characterization, transportation, and disposal activities that will be conducted in support of implementing this RA Work Plan.

6.1 WASTE TYPES

Waste generated during remedial activities will be managed to prevent the potential release of contamination. The following types of waste may be generated:

- Excavated soils (metals and PAH impacted-soils);
- IDW (general trash and personal protective equipment [PPE]);
- Vegetation;
- Demolition materials (blast wall wood and abandoned electrical/lighting posts);
- Groundwater well installation and sampling IDW (soil cuttings and development and purge water);
- Well abandonment materials (e.g., well casings, concrete, PVC);
- Other materials, including unexpected materials (e.g., drums, containers);
- Excavation water (surface and groundwater in direct contact with exposed impacted soils);
- Decontamination fluids (wash water generated during the decontamination of equipment);
- Plastic sheeting and vacuum hoses; and
- Stormwater controls (silt fence, inlet protection, and sand bags).

In general, proper waste minimization procedures will be employed to limit the volume of waste generated. These procedures will include:

- Reuse of materials that do not require decontamination,
- Minimization of the volume of decontamination fluids,
- Minimization of contact with potentially contaminated materials,
- Minimization of foot and vehicle traffic through potentially contaminated areas, and
- Use of good housekeeping practices (as discussed in Section 3.5).

6.2 WASTE CHARACTERIZATION

All waste storage containers will be of suitable size, leak proof, and constructed of materials compatible with the materials to be contained. Waste storage containers will be properly labeled prior to placement of material. Hazardous waste will be managed according to relevant RCRA requirements including, but not limited to, proper marking and labeling, approved containers, storage requirements, and documented inspections.

6.2.1 Excavated Soils

Impacted soils from the blast wall and “hot spot” excavations were sampled for waste acceptance criteria (including TCLP lead, arsenic, and antimony) prior to RA mobilization, as described in Section 2.4. Waste characterization samples were collected on January 23, 2020. Results indicated “hot spot” soils and the western half of the blast wall (2- to 4-foot interval) were non-hazardous. Results for the western half of the

blast wall soils (0- to 2-foot interval) and eastern half of the blast wall soils (0- to 2- and 2- to 4-foot intervals) indicated hazardous concentrations for TCLP lead. Soil characterized as hazardous for lead will be stabilized as described in Section 4.2.3. Stabilized soils that remain characteristically hazardous for lead or fail waste disposal facility criteria (e.g., LDRs) will be re-treated. If follow-on sampling results indicate stabilized soils are non-hazardous and meet landfill requirements, the stabilized soil will be removed from the stabilization area for transport to the Stabilized Soil Staging Area and subsequently to a licensed offsite disposal facility (Erie County Landfill). If re-treatment is not effective, soils will be treated further or disposed of at a licensed hazardous waste disposal facility. The appropriate NASA GRC personnel will review the products used in the stabilization process. The HASP will describe the use and handling of these products, and NASA GRC will approve the products prior to onsite storage and use.

The selection of disposal facilities has been in accordance with regulatory requirements and NASA GRC's internal policies and procedures with concurrence of the NASA WM and TM. The results of laboratory analyses specified by the designated disposal site will be forwarded to document the material meets the facility's waste acceptance criteria.

6.2.2 Investigation-Derived Waste

IDW, such as PPE, acetate liners, and plastic sheeting that contacted impacted material, will be mixed in with impacted soils.

6.2.3 Vegetation

Smaller trees and brush will be mulched and left onsite as ground cover. Segments of large trees will be cut into lengths no longer than 3 feet and transported to the designated firewood staging area at PBS (Attachment C, Drawing C-9), in accordance with Section 3.2.3. Tree stumps and roots within excavation footprints will be placed in the on-road haul trucks or a roll-off box with impacted soils for offsite disposal.

6.2.4 Demolition Materials

Prior to initiating removal of the blast wall, waste characterization sampling was conducted for the wooden barricade of the blast wall on January 23, 2020. A five-part composite sample was analyzed (TCLP SVOCs, TCLP VOCs, TCLP Metals, and RCI analysis) from the wooden barricade to determine whether the wood debris will be characterized as hazardous or non-hazardous. The results indicated that blast wall wood debris was hazardous for TCLP lead concentration. The wood debris will be disposed of offsite as hazardous waste at the Envirosafe Services of Ohio, Inc., facility (a RCRA Subtitle C facility) in Oregon, Ohio, approximately 60 miles from NASA PBS.

The abandoned electrical posts and conduits will be disposed of as non-hazardous construction debris. Any light fixtures will be assessed for potentially containing fluorescent lights and PCB ballast. Fluorescent lights and ballast will be removed carefully and transferred to NASA WM.

6.2.5 Groundwater Sampling and Well Abandonment Materials

Materials generated during monitoring well installation, development, sampling, and abandonment activities (e.g., development water, purge water, well casings, concrete, PVC, and soil cuttings) will be containerized and properly marked and labeled pending characterization and disposal at a solid waste facility. NASA WM will handle waste characterization and disposal, with support from Leidos.

6.2.6 Other Materials

If unexpected materials (e.g., drums, containers, and artifacts) are encountered at any point during excavation activities, all excavation work will cease immediately and workers will be cleared from the immediate area. The Arrowhead Site Supervisor will immediately inform the SSHO, Leidos FM, and NASA TM. The NASA TM will notify the NASA GRC Cultural Resources Program Manager for historical artifacts. NASA GRC personnel will direct actions following discovery of unexpected materials. NASA WM will handle waste characterization testing and disposal. Work will not resume until the NASA TM grants approval.

6.2.7 Excavation Water

Containerized excavation water (in contact with impacted soils) will be sampled and analyzed for waste characterization (TCLP SVOCs, TCLP VOCs, TCLP Metals, and RCI analysis). NASA WM will manage all subsequent waste determination, transportation, and disposal.

6.2.8 Decontamination Fluids

Water used to decontaminate construction equipment will be captured over excavated or stabilized soil within the last on-road haul truck. Water used to sample equipment will be collected, containerized, and labeled pending characterization. Containerized liquid will be sampled and analyzed for waste characterization (TCLP SVOCs, TCLP VOCs, TCLP Metals, and RCI analysis). NASA WM will manage all subsequent waste characterization, transportation, and disposal.

6.2.9 Plastic Sheeting and Pump Hoses

Plastic sheeting and pump hoses used during the RA will be disposed of with excavated soil if the soil is disposed of as waste material, and the contractor will include this material in the excavated soil profile.

6.2.10 Stormwater Controls

Stormwater control material, such as silt fencing and sand bags, will be recycled as much as possible. The contractor will dispose of non-recyclable stormwater materials as sanitary trash.

6.3 TRANSPORTATION AND DISPOSAL

The Arrowhead Site Supervisor will coordinate the management, transportation, and disposal of excavated soils and blast wall debris (e.g., wood, metal conduits) with the NASA TM and NASA WM. The Arrowhead Site Supervisor will prepare all transportation paperwork (manifests or shipping papers) in accordance with federal, state, and local regulatory requirements; disposal facility requirements; and NASA GRC policies. The Arrowhead Site Supervisor will submit a draft of the transportation paperwork containing “base” information to NASA WM for review and approval a minimum of 1 week prior to shipment of any material. The Arrowhead Site Supervisor then will complete the approved transportation paperwork in the field during excavation activities. An authorized employee of the NASA GRC EMO will sign each manifest or shipping paper prior to transportation of the material.

Excavated soils will be loaded into haul trucks and transported by licensed waste haulers to licensed offsite disposal facilities approved by NASA WM. All transportation requirements, including proper labeling and placarding, and weight limits will be followed. All manifests, shipping documents, and approval letters from the disposal facility will be provided to the NASA TM and included in the RA Completion Report.

All haul trucks will be weighed both empty and loaded at the NASA PBS truck scale (Attachment C, Drawing C-9), or portable scale, and weight information will be recorded on the transportation paperwork. The contractor will comply with NASA PBS site access protocols, including government security measures, and will allow for minor delays accordingly (Attachment C, Drawing C-9).

All other waste types (i.e., IDW, other materials, and excavation water) will be transferred to NASA WM for management and disposal. All manifests and shipping documents for these wastes also will be provided to the NASA TM and included in the RA Completion Report. The containerized wastes will be secured on a flatbed truck, or similar vehicle, for transportation to Building 9206.

7. SITE RESTORATION ACTIVITIES

This section describes the site restoration activities that will be conducted in support of the RA Work Plan. Attachment C (Drawing C-7) presents restoration plans for the Firing Ranges 3 and 4 area, including regrading and seeding disturbed areas with PBS-approved native grasses (Attachment C, Drawing C-2).

The contractor will restore the site to the required condition, as set forth in Attachment C (Drawing C-7). At a minimum, this will include:

- Removing any temporary structures/support facilities (e.g., jersey barriers, earthen berms);
- Backfilling and grading the remaining soil pile to surrounding grades;
- Applying topsoil (top 0.5 feet); and
- Applying seed/straw mulch or hydro-seeding the excavation areas and those areas affected by construction activities.

An alternative offsite borrow source will be identified for additional backfill material and topsoil. Per NASA GRC Specification 31 00 00.98, *Earthwork* (Attachment D) one 10-part composite sample will be collected by the contractor from each offsite source of backfill or topsoil used. This quantity of backfill or topsoil must come from the same source or an additional sample must be collected. The samples will be analyzed for the parameters identified in **Table 7-1**. Due to the current review and update of Chapter 20 of NASA GRC's *Environmental Program Manual*, the NASA TM, in consultation with Leidos, determined that the backfill screening criteria shall include:

- Background SLs (IT 1998),
- Ohio Voluntary Action Program (VAP) generic direct-contact soil standards (as listed in Ohio Administrative Code rule 3745-300-08), and
- USEPA RSLs (USEPA 2019) corresponding to a target risk (TR) of 1E-06 and a target hazard quotient (THQ) of 0.1.

Soil that meets the determined backfill screening criteria can be used onsite after review and approval from the NASA TM.

Table 7-1. Analytical Parameters for Borrow Source Sampling

Parameter	Methods
VOCs, TCL	SW-846 5030/8260B
SVOCs, TCL (include low-level PAHs)	SW-846 3540/8270D
Pesticides, TCL	SW-846 3540/8081A
PCBs	SW-846 3540/8082
Metals, TAL	SW-846 6020B/6010C/7471B
Explosives (nitroaromatics)	SW-846 8330B
pH	SW-846 9040/9045

PAH = Polycyclic Aromatic Hydrocarbon
PCB = Polychlorinated Biphenyl
SVOC = Semivolatile Organic Compound
TAL = Target Analyte List
TCL = Target Compound List
VOC = Volatile Organic Compound

Topsoil and backfill material will be free from subsoil, litter, and other objectionable material per NASA GRC Specification 32 92 00.98, *Turf and Grasses* (Attachment D). Topsoil will be free of material (e.g., stumps, rocks larger than 1 inch in diameter, and brush) that might be harmful to plant growth or hinder planting or maintenance operations. Backfill will not be placed if backfill is frozen or excessively wet.

After the borrow material has been approved, the excavations will be regraded in no more than 1-foot lifts per NASA GRC Specification 31 00 00.98, *Earthwork* (Attachment D). Each lift will be compacted using the excavator bucket or a sheepsfoot roller attached to the excavator boom. The excavations will be regraded to match the surrounding grade and will be mounded in the middle in an effort to prevent settling-related issues. A minimum of 6 inches of topsoil will be placed on top of the common fill and will be seeded and mulched. All disturbed areas will be seeded with PBS-approved native grasses (Attachment C, Drawing C-2) and in accordance with NASA GRC Specification 32 92 19.98, *Seeding* (Attachment D).

Erosion and sediment controls will remain in place during site restoration activities. Removal will occur when 70 percent coverage has been established in all disturbed areas with final inspection and approval from the NASA TM or designee. Any bare areas observed during post-restoration inspections will be reseeded.

8. CONSTRUCTION QUALITY ASSURANCE PLAN

This section presents the CQAP. The CQAP describes the inspection procedures and documentation required to ensure excavation, stabilization, disposal, and restoration activities occur according to the requirements of this RA Work Plan. However, Arrowhead and Leidos will have separate QCPs submitted under Task 5, which will supplement this CQAP.

Protocols for reporting test results, certifying compliance with construction requirements, correcting construction deficiencies, and documenting such corrections are provided in the QCPs and summarized below. This section also addresses the review and documentation requirements necessary to comply with the site restoration details contained herein.

8.1 RESPONSIBILITY AND AUTHORITY

8.1.1 Responsibility

The organizational chart presented in **Figure 3** outlines the management structure that will be used to implement the removal and disposal activities in accordance with this RA Work Plan. Section 1.6 described the functional responsibilities of key personnel. The assignment of personnel to each position was based on the following:

- Qualifications,
- Experience, and
- Training.

The Arrowhead Site QC Manager, Arrowhead Site Supervisor, and Leidos FM, in coordination with the NASA TM, will ensure the completed RA conforms to the RA Work Plan, design drawings, specifications, and any necessary permit conditions. The Arrowhead and Leidos PMs will verify completion of these activities.

The Arrowhead Site Supervisor will monitor excavation, stabilization, and site restoration activities. The Arrowhead Site Supervisor or designee will be onsite during work activities to ensure the fulfillment of all components of this RA Work Plan.

8.1.2 Administration and Operation

The Arrowhead Site QC Manager will administer the QA/QC organization in concert with the Arrowhead Site Supervisor. The Leidos FM and construction staff (operators and laborers) will support the Arrowhead Site Supervisor, as necessary.

All vendors supplying materials used for soil stabilization and site restoration will supply materials from manufacturing facilities with established QC programs. Results of the manufacturer QC procedures will be submitted to the Arrowhead Site QC Manager and Leidos FM/Project Engineer for review, evaluation, and documentation prior to beginning field activities.

8.2 PERSONNEL QUALIFICATIONS

All QA/QC personnel will be properly trained for their job function. The Arrowhead Site Supervisor is key to the inspection and certification program. The Arrowhead Site Supervisor will have demonstrated knowledge of specific construction practices relating to earthwork, regulations and specifications,

observation and testing procedures, and documentation procedures. The Arrowhead Site Supervisor also will be experienced in performing similar duties on previous jobs in which comparable construction activities were conducted.

8.3 DAILY PLANNING BRIEFINGS

In addition to daily tailgate safety briefings conducted in accordance with the HASP, the contractor will participate in daily planning briefings to determine the plan of action for the particular work day. This briefing will include, at a minimum, the following:

- A discussion of the planned activities for the work day,
- Planned area of excavation,
- Weather considerations,
- Deliveries,
- Transportation schedule,
- Schedule forecast, and
- Any issues that would result in an impact to the project.

This Arrowhead Site Supervisor will record the briefing with concurrence by the Leidos FM and any subcontractor.

8.4 INSPECTION ACTIVITIES

Inspections and field testing will be completed to:

- Verify lead- and PAH-impacted soil removal within defined extents has been achieved,
- Verify acceptability of materials,
- Verify the restoration activities were performed to specifications,
- Document decontamination activities,
- Prevent spills,
- Assess effectiveness of stormwater and dust generation controls, and
- Ensure all equipment remains in safe and proper working order.

The scope and frequency of each type of inspection or field test are described below.

8.4.1 Spill Control

Spill control measures will follow Chapter 8 (Spill Control) of NASA GRC's *Environmental Programs Manual*. This manual provides contingency plans for spills of potentially hazardous materials, or if drums or other containers are encountered and release potentially hazardous materials during removal or subsequent handling.

The Arrowhead Site Supervisor will conduct daily inspections to verify spill equipment is maintained and no spills have occurred. During excavation, if any visually or olfactory indicators suggest the presence of potentially impacted soils, the employee will report to the Arrowhead Site Supervisor. Upon discovery of a spill, the employee will contact NASA PBS Dispatch personnel (419.621.3222) and the Arrowhead Site Supervisor and PM. The contractor will provide all necessary onsite spill equipment (e.g., granulated clay,

absorbent blankets, PPE, shovels, and containers) to limit the spread of spill material and to containerize spilled material and spill-impacted material. The Arrowhead Site Supervisor or designee will work with NASA WM personnel to properly dispose of all spilled material. The contractor will be responsible for the cost of cleanup for spills caused by the contractor's actions and/or equipment. All onsite workers are responsible for maintaining good housekeeping practices (as discussed in Section 3.5).

8.4.2 Stormwater Control

Prior to construction activities, the Arrowhead Site Supervisor will inspect all stormwater controls (including the excavation water collection system, if necessary) and document proper placement in accordance with Attachment C (Drawing C-4). During excavation, stabilization, and removal activities, stormwater will be diverted around the excavation and staging areas using earthen berms and jersey barriers. Excavation water will be allowed to infiltrate and/or evaporate within the excavation areas if possible. If infiltration and/or evaporation is not possible due to the potential to affect excavation activities, Arrowhead, Leidos, and NASA GRC will evaluate alternate forms of removal (i.e., pump to frac tank for storage).

All employees will practice due diligence to prevent any damage to the stormwater control measures. The contractor will inspect stormwater controls on a weekly basis. NASA will conduct inspections monthly. The contractor also will inspect stormwater controls within 24 hours of a storm event (0.5 inches or greater) or 2 inches of snowmelt. The Arrowhead Site Supervisor or designee will conduct routine walkovers during normal operations to evaluate the integrity of the berms, board roads, and stormwater collection system, and the effectiveness of these controls. Any deficiencies will be immediately corrected and documented in the daily report.

8.4.3 Dust Control

Dust generation activities may occur during excavation, stabilization, material handling, and truck transportation on paved and gravel roads. Dust control will be maintained by keeping all traffic on improved roads, and application of water for dust suppression purposes as required. Water used for dust control will be clean (i.e., obtained from onsite sources with approval of the NASA TM or potable water obtained from an offsite source). The use of additives will not be permitted. Engineering controls will be implemented to minimize the potential for dust generation. The Arrowhead SSHO will conduct daily inspections and real-time dust monitoring for fugitive dust emissions during representative, normal operating conditions, as described in Section 3.4 and the HASP.

8.4.4 Survey

Upon completion of soil excavation and removal activities, the bottoms and walls of excavations will be surveyed to document actual limits and elevations (i.e., horizontal and vertical extent). The survey will be conducted by a licensed surveyor in the State of Ohio with the excavation limits included in as-built drawings in the RA Completion Report. Any deviations from plans and specifications will be noted. In addition, a licensed surveyor will survey the monitoring well installed following the excavation and restoration of the blast wall footprint.

8.4.5 Backfill, Topsoil, and Seed Material

Once excavation activities have been completed and approved by the Arrowhead Site Supervisor, in conjunction with the NASA TM, excavations will be regraded, compacted with an excavator bucket in lift thickness no more than 12 inches throughout, and the site regraded. Common fill will have a minimum of 6 inches of vegetative cover (topsoil) placed throughout the area. Regrading will be performed to match the original elevations and prevent ponding, as discussed in Section 7 and Attachment C (Drawing C-7). The

Arrowhead Site Supervisor and NASA TM will review material certifications for the backfill material, topsoil, and native seed mixture in accordance with Section 7 and Attachment C (Drawings C-2 and C-5).

8.4.6 Equipment

The contractor will inspect equipment to ensure that it is in safe and proper working condition, at a minimum, at the start of every work day. The contractor will repair equipment as necessary. The Arrowhead Site Supervisor or designee also will log inspections and maintain records for inclusion in the final RA Completion Report. Each day, the contractor will inspect and calibrate all material and testing equipment, and document this activity.

8.4.7 Decontamination

The Arrowhead Site Supervisor or designee will inspect all equipment that contacts impacted soil during removal activities prior to the equipment being moved offsite or being used in another area onsite. The Arrowhead Site Supervisor or designee will observe and document that proper decontamination techniques are used, as outlined in Section 4.4. The Arrowhead Site Supervisor or designee also will observe that the decontamination pad (if necessary) is properly constructed and used to collect decontamination water, and that wastewater is properly containerized and transferred to NASA WM.

8.5 VERIFICATION REQUIREMENTS

8.5.1 Confirmation Sampling

Confirmation sampling will be performed in accordance with Section 5.1 to verify impacted soils at the blast wall and "hot spot" excavations have been effectively stabilized (i.e., rendered non-hazardous and in compliance with the selected disposal facility's waste acceptance criteria). The Arrowhead Site Supervisor will review and approve confirmation sampling results prior to transferring stabilized soils from the Soil Stabilization Area to the Stabilized Soil Staging Area. If confirmation results indicate stabilized soils have not been adequately treated, the soils will be re-treated and sampled. If required, at the direction of the Leidos FM in conjunction with the NASA TM, additional treatment may be conducted, or soils may be loaded out for disposal as hazardous waste. Confirmation sampling results will be included in the RA Completion Report.

8.5.2 Verification of Achievement of Performance Criteria

Verification sampling will be performed in accordance with Section 5.2 to demonstrate achievement of the RGs. Verification samples will be analyzed for lead using an XRF analyzer and for all COCs by an offsite analytical laboratory.

Analytical laboratory analysis will be expedited and provided to the Leidos FM upon receipt. The Leidos FM will verify the results meet the RGs for Firing Ranges 3 and 4. The NASA TM and Arrowhead Site Supervisor will be notified of the evaluations and results. If any samples do not meet RGs, the evaluation will include a description of the additional excavation based on the approach described in Section 5.2. In coordination with the NASA TM, the identified area will be excavated in compliance with the established excavation procedures and additional verification samples collected from the area for comparison to RGs. Verification sampling results will be included in the RA Completion Report.

8.6 DOCUMENTATION

8.6.1 Field Documentation

This project will include daily inspection and quality summary reports, which the Arrowhead Supervisor will sign and date. These reports will be submitted to the Arrowhead PM, Leidos PM, Leidos FM, NASA Construction Manager, and NASA TM.

The daily reports may include:

- Summary of activities performed at the project site;
- Weather information;
- Departures from the approved RA Work Plan;
- Problems encountered during field activities;
- Equipment inspection logs;
- Subcontractor submittals; and/or
- Subcontractor certifications (e.g., H&S records, equipment training records).

The list of submittals/approvals includes, but is not limited to:

- Vegetative cover material,
- Common fill,
- Seed material,
- Disposal facility,
- Silt fencing,
- HASP,
- QCP,
- Final land survey of excavation limits and restored grades, and
- Final waste manifests for impacted soil and recycled materials.

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9. REPORTING REQUIREMENTS AND PROJECT SCHEDULE

9.1 REPORTING REQUIREMENTS

The subcontractor will provide three types of reports for this project, including:

- Daily progress reports,
- Stormwater inspection reports, and
- RA Completion Report.

9.1.1 Daily Progress Reports

The Arrowhead Site Supervisor will provide daily progress reports to the Arrowhead and Leidos PMs, NASA TM, and the NASA Construction Manager during implementation of this RA Work Plan. The progress reports will include the following:

- Description of the work performed during the reporting period and an estimate of percentage complete;
- Summaries of all findings and sampling during the reporting period;
- Summaries of all changes to the RA design during the reporting period;
- Summaries of all contacts with representatives of the local community, public interest groups, or government agencies during the reporting period;
- Summaries of all problems or potential problems encountered during the reporting period;
- Summaries of actions taken to achieve and maintain remediation standards and performance standards;
- Changes in personnel during the reporting period;
- Projected work for the next reporting period;
- Copies of daily reports, inspection reports, sampling data, and laboratory/monitoring data; and
- Copies of waste manifests and tracking log.

9.1.2 Stormwater Inspection Reports

Inspection of stormwater controls will be performed by the Arrowhead Site Supervisor or designee on a weekly basis and documented on the GRC stormwater inspection checklist (or similar). Stormwater controls also will be inspected within 24 hours of a 0.5-inch storm event or 2-inch snowmelt. These inspections will be performed in accordance with the CQAP in Section 8. The inspection reports will be submitted weekly to the NASA TM and GRC Stormwater Program Lead.

9.1.3 Completion Report

Upon completion of RA activities in accordance with this RA Work Plan, an RA Completion Report will be prepared documenting the RA activities, and all modifications to the design (necessitated by field conditions or NASA GRC), as well as the documentation of all regulatory reporting notices. Specifically, this report will document the following project tasks:

- Impacted soil removal,
- Soil stabilization (if necessary),

- WM and disposal,
- Site restoration,
- H&S,
- Construction QA material control and testing,
- As-built drawings, and
- Field changes.

A draft copy of the RA Completion Report will be produced for the NASA TM to review prior to its issuance to the Administrative Record and Ohio EPA.

9.2 PROJECT SCHEDULE

The project schedule for the NASA Firing Ranges 3 and 4 RA was completed under Task 1 and includes the following:

- RA Work Plan submittal;
- Vegetation clearing;
- Permit/notification requirements;
- Site preparation/set-up;
- Excavation, stabilization, and removal;
- Verification and confirmation sampling;
- Soil and debris disposal;
- Monitoring well installation and sampling;
- Site restoration;
- Preparation of the RA Completion Report; and
- Monitoring well abandonment.

Generally, construction activities will be conducted only during daylight hours on a 5 days per week, 9 hours per day schedule. Tree clearing will be expedited in the winter of 2020 prior to the restricted time frame. The RA will be implemented during the spring/summer of 2020.

10. REFERENCES

EnviroScience. 2017. Final Protected Species Management Strategy for NASA Glenn Research Center at Lewis Field and Plum Brook Station, Volumes I-III. Prepared with assistance from and under contract to Leidos. March.

EnviroScience. 2020. *Final Wetland and Other Waters Delineation Report, NASA Plum Brook Station, Former Firing Ranges 3 and 4 Project Located in Oxford Township, Erie County, Ohio.* Prepared by EnviroScience, under subcontract to Leidos. January 3.

Gray & Pape. 2008. *Cultural Resources Management Plan for NASA Glenn Research Center at Lewis Field and Plum Brook Station*, Project No. 05-13101, Cleveland, Ohio.

IT (IT Corporation). 1998. *Site Investigation of Acid Areas, Plum Brook Ordnance Works, Sandusky, Ohio*. December.

KEMRON (KEMRON Environmental Services, Inc.). 2019. NASA ECCL Stabilization Study, Treatability Letter Report, KEMRON Project #SH0724. December 2.

Leidos. 2016a. Final NASA Plum Brook Station Firing Range Site Investigation Report, Revision 1. April 29.

Leidos. 2016b. Final Multi-Site Remedial Investigation Sampling and Analysis Plan, National Aeronautics and Space Administration, Glenn Research Center – Plum Brook Station, Sandusky, Ohio. November.

Leidos. 2016c. Final Multi-Site Site Investigation Report, National Aeronautics and Space Administration Plum Brook Station. April 29.

Leidos. 2018. Final Environmental Resources Document for National Aeronautics and Space Administration (NASA) Glenn Research Center at Lewis Field and Plum Brook Station. Revised April.

Leidos. 2019. Final Firing Ranges 3 and 4 Removal Site Evaluation Report, National Aeronautics and Space Administration, Plum Brook Station, Sandusky, Ohio. Draft prepared in May 2017. Revised to Final in December 2019.

Leidos. 2020. Final Action Memorandum for Firing Ranges 3 and 4 Removal Action, National Aeronautics and Space Administration, Plum Brook Station, Sandusky, Ohio. April 20.

MK (Morrison–Knudsen Corporation). 1994. *Site Inspection Report, Plum Brook Station*. Boise, Idaho. January 14.

Ohio EPA (Ohio Environmental Protection Agency). 2008. T*echnical Guidance Manual for Hydrogeologic Investigations and Ground Water Monitoring – Chapter 7: Monitoring Well Design and Installation*. Revision 1. February.

Ohio EPA. 2009. Lake Erie Basin Aquatic Life and Human Health Tier I Criteria. Available online: http://www.epa.state.oh.us/dsw/wqs/index.aspx#123033405-water-quality-criteria--values.

Ohio EPA. 2012. T*echnical Guidance Manual for Hydrogeologic Investigations and Ground Water Monitoring – Chapter 10: Ground Water Sampling*. Revision 2. May.

Ohio EPA. 2016. T*echnical Guidance Manual for Hydrogeologic Investigations and Ground Water Monitoring – Chapter 9: Sealing Boreholes and Decommissioned Monitoring Wells*, Revision 3. September.

SAIC (Science Applications International Corporation). 1991. *Plum Brook Station Preliminary Assessment*. June.

SAIC. 1992. *NASA Lewis Research Center Preliminary Assessment Supplement*. Prepared for the Office of Environmental Programs NASA LRC under subcontract to Analex Corporation. September.

SAIC. 2006. Site Investigation of NASA GRC Plum Brook Station Former Firing Ranges Sampling and Analysis Plan. March.

SAIC. 2011. Multi-Site Characterization Sampling and Analysis Plan, National Aeronautics and Space Administration, Glenn Research Center-Plum Brook Station, Sandusky, Ohio. October.

State Coordinating Committee on Ground Water. 2015. *State of Ohio Regulations and Technical Guidance for Sealing Unused Water Wells and Boreholes.* Ohio Water Resources Council. March.

TechLaw. 1998. Preliminary Assessment/Visual Site Inspection Report for NASA Plum Brook Station. August.

URS (URS Corporation). 1996. Work Plan for Site Investigation of Plum Brook Station Firing Ranges. February 12.

USACE (U.S. Army Corps of Engineers). 2011. *Groundwater Monitoring Well Report 2010-2011, Long-Term Monitoring/Maintenance Services for Groundwater Monitoring Wells, Plum Brook Ordnance Works, Sandusky, Ohio*. Prepared for the USACE Huntington District by TMG Services. June.

USEPA (U.S. Environmental Protection Agency). 1989. *Methods of Evaluating the Attainment of Cleanup Standards, Vol 1: Soils and Solid Media*. USEPA Office of Policy, Planning and Evaluation, Statistical Policy Branch, Washington, DC. February.

USEPA. 2016. *Regional Screening Level Table dated June 2016*. Washington, DC. Available online: https://www.epa.gov/risk/regional-screening-levels-rsls-generic-tables-may-2016.

USEPA. 2019. EPA Regional Screening Level (RSL). U.S. Environmental Protection Agency, Washington, DC. Available online at: https://www.epa.gov/risk/regional-screening-levels-rsls-generic-tables, May.

ATTACHMENT A. WASTE CHARACTERIZATION RESULTS

Attachment A.1. KEMRON Untreated Characterization Results

Attachment A.2. EnviroBlend® Untreated Characterization Results

Attachment A.3. Waste Characterization Results

Attachment A.4. KEMRON ECCL Firing Range Treatability Study

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Attachment A.1

KEMRON Untreated Characterization Results

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LEIDOS, INC.
NASA PBS FIRING RANGES 3 & 4 LEAD STABILIZATION STUDY
PROJECT No. SH0734

Table 1

Untreated Material Characterization Testing

TESTING	TEST	UNIT	SAMPLE
			FR34-BT001
Material pH	EPA Method 9045	S.U.	4.73
Unit Weight	ASTM D7263		
Average Bulk Density		pcf	114.7
Moisture Content	ASTM D2216		
ASTM Moisture Content		%	27.45
Percent Solids		%	78.46
Paint Filter	EPA Method 9095		PASS

Notes
%= Percent
pcf = pounds per cubic foot
S.U. = Standard Units

LEIDOS, INC.
NASA ECCL STABILIZATION
PROJECT No. SH0724

TABLE 2

Untreated Analytical Characterization
Total Lead and TCLP Lead

Parameters	Units	FR34-BT001		
		Result	Qual.	MDL
Total Lead 6010				
Lead	mg/kg	**217**	F2 V	0.268
TCLP Lead 1311/6010				
Lead	mg/L	**0.575**		0.00750
TCLP Final Leachate pH				
pH	S.U.	**4.92**		

Notes:
mg/kg = milligram per kilogram
mg/L = milligram per Liter
S.U. = Standard Units
MDL = Method Detection Limit
F2 = MS/MSD RPD exeeds control limits
V = Serial Dilution exceeds control limits

eurofins | Environment Testing TestAmerica

ANALYTICAL REPORT

Eurofins TestAmerica, Chicago
2417 Bond Street
University Park, IL 60484
Tel: (708)534-5200

Laboratory Job ID: 500-174463-1
Client Project/Site: NASA PBS Firing Ranges 3&4
Revision: 1

For:
Kemron Environmental Services, Inc.
1359A Ellsworth Industrial Blvd.
Atlanta, Georgia 30318

Attn: Tomecia Bradley

Therese Hargraves

Authorized for release by:
12/16/2019 4:54:11 PM
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(708)793-3461
therese.hargraves@testamericainc.com

Designee for

Eric Lang, Manager of Project Management
(708)534-5200
eric.lang@testamericainc.com

LINKS

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

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

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

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Job ID: 500-174463-1

Laboratory: Eurofins TestAmerica, Chicago

Narrative

Job Narrative
500-174463-1

Comments
No additional comments.

Receipt
The sample was received on 12/4/2019 9:40 AM; the sample arrived in good condition, properly preserved and, where required, on ice.
The temperature of the cooler at receipt was 0.7º C.

Receipt Exceptions

Revised Report - Per client request, TCLP extraction log added to report.

Metals
No analytical or quality issues were noted, other than those described in the Definitions/Glossary page.

Detection Summary

Client: Kemron Environmental Services, Inc.
Project/Site: NASA PBS Firing Ranges 3&4

Job ID: 500-174463-1

Client Sample ID: FR34-BT001

Lab Sample ID: 500-174463-1

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Lead	217	F2 V	0.581	0.268	mg/Kg	1	☼	6010C	Total/NA
Lead	0.575		0.0500	0.00750	mg/L	1		6010C	TCLP

This Detection Summary does not include radiochemical test results.

Method Summary

Client: Kemron Environmental Services, Inc.
Project/Site: NASA PBS Firing Ranges 3&4

Job ID: 500-174463-1

Method	Method Description	Protocol	Laboratory
6010C	Metals (ICP)	SW846	TAL CHI
Moisture	Percent Moisture	EPA	TAL CHI
1311	TCLP Extraction	SW846	TAL CHI
3010A	Preparation, Total Metals	SW846	TAL CHI
3050B	Preparation, Metals	SW846	TAL CHI

Protocol References:

EPA = US Environmental Protection Agency

SW846 = "Test Methods For Evaluating Solid Waste, Physical/Chemical Methods", Third Edition, November 1986 And Its Updates.

Laboratory References:

TAL CHI = Eurofins TestAmerica, Chicago, 2417 Bond Street, University Park, IL 60484, TEL (708)534-5200

Sample Summary

Client: Kemron Environmental Services, Inc.
Project/Site: NASA PBS Firing Ranges 3&4

Job ID: 500-174463-1

Lab Sample ID	Client Sample ID	Matrix	Collected	Received	Asset ID
500-174463-1	FR34-BT001	Solid	12/03/19 10:30	12/04/19 09:40	

Client Sample Results

Client: Kemron Environmental Services, Inc.
Project/Site: NASA PBS Firing Ranges 3&4

Job ID: 500-174463-1

Client Sample ID: FR34-BT001

Date Collected: 12/03/19 10:30
Date Received: 12/04/19 09:40

Lab Sample ID: 500-174463-1

Matrix: Solid
Percent Solids: 79.1

Method: 6010C - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Lead	217	F2 V	0.581	0.268	mg/Kg	☼	12/10/19 19:24	12/12/19 02:30	1

Method: 6010C - Metals (ICP) - TCLP

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Lead	0.575		0.0500	0.00750	mg/L		12/12/19 15:29	12/13/19 10:58	1

Definitions/Glossary

Client: Kemron Environmental Services, Inc.
Project/Site: NASA PBS Firing Ranges 3&4

Job ID: 500-174463-1

Qualifiers

Metals

Qualifier	Qualifier Description
4	MS, MSD: The analyte present in the original sample is greater than 4 times the matrix spike concentration; therefore, control limits are not applicable.
F2	MS/MSD RPD exceeds control limits
V	Serial Dilution exceeds the control limits

Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
¤	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CFL	Contains Free Liquid
CNF	Contains No Free Liquid
DER	Duplicate Error Ratio (normalized absolute difference)
Dil Fac	Dilution Factor
DL	Detection Limit (DoD/DOE)
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision Level Concentration (Radiochemistry)
EDL	Estimated Detection Limit (Dioxin)
LOD	Limit of Detection (DoD/DOE)
LOQ	Limit of Quantitation (DoD/DOE)
MDA	Minimum Detectable Activity (Radiochemistry)
MDC	Minimum Detectable Concentration (Radiochemistry)
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
NC	Not Calculated
ND	Not Detected at the reporting limit (or MDL or EDL if shown)
PQL	Practical Quantitation Limit
QC	Quality Control
RER	Relative Error Ratio (Radiochemistry)
RL	Reporting Limit or Requested Limit (Radiochemistry)
RPD	Relative Percent Difference, a measure of the relative difference between two points
TEF	Toxicity Equivalent Factor (Dioxin)
TEQ	Toxicity Equivalent Quotient (Dioxin)

QC Association Summary

Client: Kemron Environmental Services, Inc.
Project/Site: NASA PBS Firing Ranges 3&4

Job ID: 500-174463-1

Metals

Prep Batch: 519866

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
500-174463-1	FR34-BT001	Total/NA	Solid	3050B	
MB 500-519866/1-A	Method Blank	Total/NA	Solid	3050B	
LCS 500-519866/2-A	Lab Control Sample	Total/NA	Solid	3050B	
500-174463-1 MS	FR34-BT001	Total/NA	Solid	3050B	
500-174463-1 MSD	FR34-BT001	Total/NA	Solid	3050B	
500-174463-1 DU	FR34-BT001	Total/NA	Solid	3050B	

Leach Batch: 520052

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
500-174463-1	FR34-BT001	TCLP	Solid	1311	
LB 500-520052/1-C	Method Blank	TCLP	Solid	1311	

Analysis Batch: 520144

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
500-174463-1	FR34-BT001	Total/NA	Solid	6010C	519866
MB 500-519866/1-A	Method Blank	Total/NA	Solid	6010C	519866
LCS 500-519866/2-A	Lab Control Sample	Total/NA	Solid	6010C	519866
500-174463-1 MS	FR34-BT001	Total/NA	Solid	6010C	519866
500-174463-1 MSD	FR34-BT001	Total/NA	Solid	6010C	519866
500-174463-1 DU	FR34-BT001	Total/NA	Solid	6010C	519866

Prep Batch: 520320

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
500-174463-1	FR34-BT001	TCLP	Solid	3010A	520052
LB 500-520052/1-C	Method Blank	TCLP	Solid	3010A	520052
LCS 500-520320/2-A	Lab Control Sample	Total/NA	Solid	3010A	

Analysis Batch: 520505

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
500-174463-1	FR34-BT001	TCLP	Solid	6010C	520320
LB 500-520052/1-C	Method Blank	TCLP	Solid	6010C	520320
LCS 500-520320/2-A	Lab Control Sample	Total/NA	Solid	6010C	520320

General Chemistry

Analysis Batch: 518894

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
500-174463-1	FR34-BT001	Total/NA	Solid	Moisture	

QC Sample Results

Client: Kemron Environmental Services, Inc.
Project/Site: NASA PBS Firing Ranges 3&4

Job ID: 500-174463-1

Method: 6010C - Metals (ICP)

Lab Sample ID: MB 500-519866/1-A — **Client Sample ID: Method Blank**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 520144 — **Prep Batch: 519866**

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Lead	ND		0.500	0.231	mg/Kg		12/10/19 19:24	12/12/19 02:21	1

Lab Sample ID: LCS 500-519866/2-A — **Client Sample ID: Lab Control Sample**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 520144 — **Prep Batch: 519866**

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Lead	10.0	9.068		mg/Kg		91	80 - 120

Lab Sample ID: 500-174463-1 MS — **Client Sample ID: FR34-BT001**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 520144 — **Prep Batch: 519866**

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
Lead	217	F2 V	11.5	180.6	4	mg/Kg	☼	-317	75 - 125

Lab Sample ID: 500-174463-1 MSD — **Client Sample ID: FR34-BT001**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 520144 — **Prep Batch: 519866**

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Lead	217	F2 V	12.1	237.8	4 F2	mg/Kg	☼	171	75 - 125	27	20

Lab Sample ID: 500-174463-1 DU — **Client Sample ID: FR34-BT001**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 520144 — **Prep Batch: 519866**

Analyte	Sample Result	Sample Qualifier	DU Result	DU Qualifier	Unit	D	RPD	RPD Limit
Lead	217	F2 V	182.7		mg/Kg	☼	17	20

Lab Sample ID: LCS 500-520320/2-A — **Client Sample ID: Lab Control Sample**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 520505 — **Prep Batch: 520320**

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Lead	0.100	0.09548		mg/L		95	80 - 120

Lab Sample ID: LB 500-520052/1-C — **Client Sample ID: Method Blank**
Matrix: Solid — **Prep Type: TCLP**
Analysis Batch: 520505 — **Prep Batch: 520320**

Analyte	LB Result	LB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Lead	ND		0.0500	0.00750	mg/L		12/12/19 15:29	12/13/19 08:59	1

Lab Chronicle

Client: Kemron Environmental Services, Inc.
Project/Site: NASA PBS Firing Ranges 3&4

Job ID: 500-174463-1

Client Sample ID: FR34-BT001

Lab Sample ID: 500-174463-1
Date Collected: 12/03/19 10:30
Matrix: Solid
Date Received: 12/04/19 09:40

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
TCLP	Leach	1311			520052	12/11/19 13:35	GCA	TAL CHI
TCLP	Prep	3010A			520320	12/12/19 15:29	BDE	TAL CHI
TCLP	Analysis	6010C		1	520505	12/13/19 10:58	EEN	TAL CHI
Total/NA	Analysis	Moisture		1	518894	12/05/19 10:01	LWN	TAL CHI

Client Sample ID: FR34-BT001

Lab Sample ID: 500-174463-1
Date Collected: 12/03/19 10:30
Matrix: Solid
Date Received: 12/04/19 09:40
Percent Solids: 79.1

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3050B			519866	12/10/19 19:24	BDE	TAL CHI
Total/NA	Analysis	6010C		1	520144	12/12/19 02:30	JEF	TAL CHI

Laboratory References:

TAL CHI = Eurofins TestAmerica, Chicago, 2417 Bond Street, University Park, IL 60484, TEL (708)534-5200

Accreditation/Certification Summary

Client: Kemron Environmental Services, Inc.
Project/Site: NASA PBS Firing Ranges 3&4

Job ID: 500-174463-1

Laboratory: Eurofins TestAmerica, Chicago

Unless otherwise noted, all analytes for this laboratory were covered under each accreditation/certification below.

Authority	Program	Identification Number	Expiration Date
Georgia	State Program	N/A	04-30-20

The following analytes are included in this report, but the laboratory is not certified by the governing authority. This list may include analytes for which the agency does not offer certification.

Analysis Method	Prep Method	Matrix	Analyte
Moisture		Solid	Percent Moisture
Moisture		Solid	Percent Solids

Eurofins TestAmerica, Chicago
2417 Bond Street

University Park, IL 60484-3101
phone 708.534.5200 fax 708.534.5211

Chain of Custody Record

eurofins Environment Testing TestAmerica

681-Atlanta

Regulatory Program: ☐ DW ☐ NPDES ☐ RCRA ☐ Other:

TestAmerica Laboratories, Inc. d/b/a Eurofins TestAmerica

Client Contact	Project Manager: Tomecia Bradley	Site Contact:	Date: 12-3-19	COC No:
KEMRON Environmental Services, Inc.	Email: triley119@gmail.com	Lab Contact:	Carrier:	1 of 1 COCs
1359 Ellsworth Industrial Blvd	Tel/Fax: 404-636-0928			TALS Project #:
Atlanta, GA 30318	Analysis Turnaround Time			Sampler:
(404)636-0928 Phone	☐ CALENDAR DAYS ☑ WORKING DAYS			For Lab Use Only:
(xxx) xxx-xxxx FAX	TAT if different from Below _____			Walk-in Client:
Project Name: NASA PBS Firing Ranges 3&4	☑ 2 weeks			Lab Sampling:
Site:	☐ 1 week			
P O # SH0734	☐ 2 days			Job / SDG No.: 500-174463
	☐ 1 day			

500-174463 COC

Sample Identification	Sample Date	Sample Time	Sample Type (C=Comp, G=Grab)	Matrix	# of Cont.	Filtered Sample (Y / N)	Perform MS / MSD (Y / N)	Total Lead 6010	TCLP Lead 1311/6010	Sample Specific Notes:
FR34-BT001	12/3/19	1030	G	S	2			X	X	

Preservation Used: 1= Ice, 2= HCl; 3= H2SO4; 4=HNO3; 5=NaOH; 6= Other _____

Possible Hazard Identification:
Are any samples from a listed EPA Hazardous Waste? Please List any EPA Waste Codes for the sample in the Comments Section if the lab is to dispose of the sample.
☑ Non-Hazard ☐ Flammable ☐ Skin-Irritant ☐ Poison-B ☐ Unknown

Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)
☐ Return-to-Client ☑ Disposal-by Lab ☐ Archive for _____ Months

Special Instructions/QC Requirements & Comments: ***Include pH Logs****

Custody Seals Intact: ☐ Yes ☐ No	Custody Seal No.:		Cooler Temp. (°C): Obs'd: 0.7 Corr'd: 0.7		Therm ID No.:
Relinquished by: Alesh: MCDaid	Company: KEMRON	Date/Time: 12/3/19 1130	Received by:	Company: 12-3-19	Date/Time: 1130
Relinquished by:	Company: 12-3-19	Date/Time: 1212	Received by:	Company:	Date/Time:
Relinquished by:	Company:	Date/Time:	Received in Laboratory by:	Company: TA	Date/Time: 12/4/19 0940

Reviewer: _____ Date: _____

CHI-22-15-003/Q-12/19

Eurofins TestAmerica Chicago

TCLP Extraction Logbook

Page Number: _____

Rotator RPM:30 ± 2 RPMs ID#: C2854 Extr. Start Date: 12/11/19 Time 1335 Temp: Uncorrected 20 Corrected 20.2 °C

Group Number: T177 Extr. End Date: 12/12/19 Time 0735 Temp: Uncorrected 20.5 Corrected 20.7 °C

LIMS Batch No.: 520052 Min.Temp: Uncorrected/Corrected 19.5 / 19.7 °C Max.Temp: Uncorrected/Corrected 20.5 / 21.2 °C

Sample Size Specifications: ____ <9.5 mm Control Limits: 10 ± 5 PSI; 23 ± 2 °C

Sample Type (Circle): TCLV SPLP (TCLP) ASTM

Filtration Start Time: 1236

Filtration End Time: 1346

Filter Paper Lot #: 112167-9780

Thermometer ID: C3024

250 mL Container Lot#: 0303801E

Sample Number	LB	500-174652-1	500-174654-1	500-174656-1	500-174658-1
Sample Description	Extraction Fluid #1	Solid			
Sample Weight (g)	N/A	50.06	50.30	50.42	50.40
Liquid-Solid Separation (Yes/No)	No				
Volume of Mother Liquid (mLs)	N/A				
Solid Extraction Material (g)	N/A	50.06	50.30	50.42	50.40
Extraction Fluid Selection pH of Initial Solution: If <5.0, use Extraction Fluid #1	N/A	6.87	5.84	2.43	7.40
pH of Acid/Heat Treated Solution: If <5.0, use Extraction Fluid #1; If >5.0, use Extraction Fluid #2	4.93	1.59	1.56	N/A	1.68
Extraction Fluid Type (1 or 2)	1				
Extraction Vessel Type / Pressure Check	HDPE/T(3)	HDPE			
Extraction Fluid Volume (mLs)	2000	1000			
Extract Filtered (Yes or No)	Yes				
Mother Liquid Added (mLs)	N/A				
Combined Filtrate Volume (mLs)	250				
Final pH Reading	4.94/4.93	4.89	4.88	4.61	5.10
Filtrate Preserved	Yes m				
ZHE: Initial psi / Final psi	N/A				

Comments: _____

Extraction Vessel Codes: T = Teflon Organics/Metals ZHE = Zero Headspace VOA's HDPE = High Density Polyethylene (Lot # 051090ID) Metals

Analyst: _____ Date: 12/11/19

Reviewer: _____ Date: 12/16/19

CHI-22-15-003/Q-12/19

Eurofins TestAmerica Chicago
TCLP Extraction Logbook

Page Number: _____

Rotator RPM:30 ± 2 RPMs ID#: C2854 Extr. Start Date 12/1/19 Time 1335 Temp: Uncorrected 20 Corrected 20.2 °C Filtration Start Time: 1236
Group Number: T177 Extr. End Date 12/2/19 Time 0735 Temp: Uncorrected 20.5 Corrected 20.7 °C Filtration End Time: 1346
LIMS Batch No.: 520052 Min.Temp: Uncorrected/Corrected 19.5/19.7 °C Max.Temp: Uncorrected/Corrected 20.5/21.2 °C Filter Paper Lot #: 112167-9280
Sample Size Specifications: <9.5 mm Control Limits: 10 ± 5 PSI; 23 ± 2 °C Thermometer ID: C3024
Sample Type (Circle): TCLV SPLP (TCLP) ASTM 250 mL Container Lot#: 0303801E

Sample Number	500-174596-6	500-174463-1	500-174490-2	500-174755-1	500-174531-1
Sample Description	Solid				
Sample Weight (g)	50.40	50.06	50.50	50.06	50.08
Liquid-Solid Separation (Yes/No)	No				
Volume of Mother Liquid (mLs)	N/A				
Solid Extraction Material (g)	50.40	50.06	50.50	50.06	50.08
Extraction Fluid Selection pH of Initial Solution: If <5.0, use Extraction Fluid #1	9.20	5.11	5.13	10.61	8.74
pH of Acid/Heat Treated Solution: If <5.0, use Extraction Fluid #1 If >5.0, use Extraction Fluid #2	1.80	1.60	1.83	1.69	2.36
Extraction Fluid Type (1 or 2)	1				
Extraction Vessel Type / Pressure Check	HDPE		T(25)	HDPE	
Extraction Fluid Volume (mLs)	1000				
Extract Filtered (Yes or No)	Yes				
Mother Liquid Added (mLs)	N/A				
Combined Filtrate Volume (mLs)	250				
Final pH Reading	5.65	4.92	~~6.18~~ 5.06 (pH 12/13/19)	6.18	6.26
Filtrate Preserved	Yes m				
ZHE: Initial psi / Final psi	N/A				

Comments: _____
Extraction Vessel Codes: T = Teflon Organics/Metals ZHE = Zero Headspace VOA's HDPE = High Density Polyethylene (Lot # 0510901D) Metals
Analyst: _____ Date: 12/1/19
Reviewer: _____ Date: 12/16/19

CHI-22-15-003/Q-12/19

Eurofins TestAmerica Chicago
TCLP Extraction Logbook

Page Number: _____

Rotator RPM:30 ± 2 RPMs ID#: C2393 Extr. Start Date 12/2/19 Time 1210 Temp: Uncorrected 20 Corrected 20 °C Filtration Start Time: [illegible]

ORIGIN ID:ATLA (678) 888 0331
GEORGE TAYLOR
EUROFINS TESTAMERICA
6500 MCDONOUGH DRIVE
SUITE C-10
NORCROSS, GA 30093
UNITED STATES US

SHIP DATE: 03DEC19
ACTWGT: 8.95 LB
CAD: 859118/CAFE3211

BILL RECIPIENT

Part # 159469-434 RIT2 EXP 05/20 ••

JP01/1018/C3135

TO SAMPLE RECEIVING
EUROFINSTESTAMERICA CHICAGO
2417 BOND ST.

UNIVERSITY PARK IL 60484
(708) 534-6200
REF: KEMRON

FedEx Express

J181117806050 4

TRK# 0201 1314 8602 6178

WED - 04 DEC 3:00P
STANDARD OVERNIGHT

NA JOTA

60484
IL-US ORD

9pt

500-174463 Waybill

Login Sample Receipt Checklist

Client: Kemron Environmental Services, Inc.

Job Number: 500-174463-1

Login Number: 174463
List Number: 1
Creator: James, Jeff A

List Source: Eurofins TestAmerica, Chicago

Question	Answer	Comment
Radioactivity wasn't checked or is </= background as measured by a survey meter.	True	
The cooler's custody seal, if present, is intact.	True	
Sample custody seals, if present, are intact.	True	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	True	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	0.7
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	True	
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time (excluding tests with immediate HTs)	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	True	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	N/A	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

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Attachment A.2

EnviroBlend® Untreated Characterization Results

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From: Charis Gehret
To: Sprinzl, Rich E. [US-US]
Cc: Lowak, David J. [US-US]
Subject: EXTERNAL: RE: EnviroBlend - Sandusky OH project
Date: Thursday, December 5, 2019 3:07:54 PM

Hi Rich,

Please see the results below. It is not uncommon to get a passing sample from a site that one already knows is hazardous. Sometimes it is just a fluke. Let me know how it turns out once you have Kemron's results. Thanks!

Compositional Results (mg/kg)				
Sample Name	Ursus Lab ID	Lead	Solids	Bulk Density Tons/Yard3
Firing Range Berm Soil	19-11001	6,200	80%	1.76

Leaching Results							
Sample Name		EnviroBlend® Dosage		Screening Leaching Test Results			
	Ursus Lab ID	Chemical	Percentage	Pretest pH	Solution	Final pH	Lead mg/L
Firing Range Berm Soil	19-11001	Untreated	-	1.48	TCLP 1	4.87	1.74

-----Original Message-----
From: Sprinzl, Rich <RICHARD.E.SPRINZL@leidos.com>
Sent: Wednesday, December 4, 2019 10:25 AM
To: Charis Gehret <cgehret@premiermagnesia.com>
Cc: Lowak, David J. <DAVID.J.LOWAK@leidos.com>
Subject: RE: EnviroBlend - Sandusky OH project

Charis-Thanks for update.
Interesting that TCLP was <5. Did you also analyze total lead, pH and/or TCLP pH?
We will need to hold to compare to the primary sample results once received from Kemron before we make further testing request.

Thanks,
Rich Sprinzl, P.E. | Leidos
phone: 330.405.5808
mobile: 330.348.1378

-----Original Message-----
From: Charis Gehret <cgehret@premiermagnesia.com>
Sent: Tuesday, December 3, 2019 11:45 AM
To: Sprinzl, Rich E. [US-US] <RICHARD.E.SPRINZL@leidos.com>
Subject: EXTERNAL: RE: EnviroBlend - Sandusky OH project

Hi Rich,

The sample we tested in the lab was non-hazardous for lead (at 1.74 mg/L in the TCLP). We can treat it anyway to show further reductions of leaching, or else if you had another sample that you knew was hot, we could test that.

Let me know what you prefer.

Thanks,
Charis

-----Original Message-----
From: Sprinzl, Rich <RICHARD.E.SPRINZL@leidos.com>
Sent: Thursday, November 21, 2019 5:23 PM
To: Charis Gehret <cgehret@premiermagnesia.com>
Cc: Bonnie Cassey <bcassey@premiermagnesia.com>
Subject: RE: EnviroBlend - Sandusky OH project

Charis,
We were recently informed by our client that any soil samples from this facility should be flagged if observed red color change.

I forgot to include this on COC/form "Note any red/pink pigment in sample during prep or analysis" This can be reported within the Narrative of the Report.
Please inform the lab.

Thanks,
Rich Sprinzl, P.E. | Leidos
phone: 330.405.5808
mobile: 330.348.1378

-----Original Message-----
From: Charis Gehret <cgehret@premiermagnesia.com>
Sent: Thursday, November 21, 2019 4:47 PM
To: Sprinzl, Rich E. [US-US] <RICHARD.E.SPRINZL@leidos.com>
Cc: Bonnie Cassey <bcassey@premiermagnesia.com>
Subject: EXTERNAL: RE: EnviroBlend - Sandusky OH project

Sample received. We should have final results early next week.

-----Original Message-----
From: Sprinzl, Rich <RICHARD.E.SPRINZL@leidos.com>
Sent: Tuesday, November 19, 2019 3:35 PM
To: Charis Gehret <cgehret@premiermagnesia.com>
Cc: Bonnie Cassey <bcassey@premiermagnesia.com>
Subject: RE: EnviroBlend - Sandusky OH project

Sorry I forgot to send the form sooner. I will be collecting test sample tomorrow.
Thanks,
Rich Sprinzl, P.E. | Leidos
phone: 330.405.5808
mobile: 330.348.1378

-----Original Message-----
From: Charis Gehret <cgehret@premiermagnesia.com>
Sent: Wednesday, November 13, 2019 3:29 PM
To: Sprinzl, Rich E. [US-US] <RICHARD.E.SPRINZL@leidos.com>
Cc: Bonnie Cassey <bcassey@premiermagnesia.com>
Subject: EXTERNAL: RE: EnviroBlend - Sandusky OH project

Hi Rich,

Please use the attached form for your sample. Please fill it out and email back to me. The actual sample should be labeled with your company name, and site (Sandusky).

Any packaging is fine (ziplock, etc.), and there are no special instructions for mailing. You do not need ice, and it can be shipped any way you want.

Thanks!
Charis

-----Original Message-----
From: Sprinzl, Rich <RICHARD.E.SPRINZL@leidos.com>
Sent: Wednesday, November 13, 2019 3:26 PM
To: Charis Gehret <cgehret@premiermagnesia.com>
Cc: Bonnie Cassey <bcassey@premiermagnesia.com>
Subject: RE: EnviroBlend - Sandusky OH project

Charis
Thanks for the pricing.
We are planning to collect a treatability sample from our new firing range site next Tuesday 11/19 and would like to send you a sample too.
I may be able to also grab a sample from 1 of the 3 sample locations at our existing firing range to compare to Kemron's data.
Can it be collected into a Ziploc bag, or maybe i have a widemouth 32oz jar?
Does sample need iced? If not, does it still need shipped next day?
Can it shipped in a box?
What is lab shipping address/information?
Do you have a standard chain of custody with analyses listed that I can print/use? (Kemron tested Enviroblend CS for first site)

Thanks,
Rich Sprinzl, P.E. | Leidos
phone: 330.405.5808
mobile: 330.348.1378

-----Original Message-----
From: Charis Gehret <cgehret@premiermagnesia.com>
Sent: Friday, November 8, 2019 9:18 AM
To: Sprinzl, Rich E. [US-US] <RICHARD.E.SPRINZL@leidos.com>
Cc: Bonnie Cassey <bcassey@premiermagnesia.com>
Subject: EXTERNAL: RE: EnviroBlend - Sandusky OH project

Hi Rich,

Please se the attached price quotes for EnviroBlend delivered to Sandusky, OH. I included both supersacks and bulk pricing. If you decide that you want us to do a complimentary treatability test to confirm the dosage rate, we can do so. I would just need a 1-2 lb. representative sample of soil. Let me know and I can send the lab information.

Also note that there could be volume discounts depending on how much you need.

Thanks, and let me know if there is anything else you need.

Charis

Charis Y. Gehret
VP Business Development and Marketing
Premier Magnesia, LLC
Cell: 610-551-9436

www.enviroblend.com
www.re3conference.com
www.amphomag.com

-----Original Message-----
From: Charis Gehret
Sent: Tuesday, November 5, 2019 10:37 PM
To: Richard.e.sprinzl@leidos.com
Subject: EnviroBlend - Sandusky OH project

Hi Rich,

Thanks for contacting us regarding EnviroBlend. I will send you ballpark pricing as soon as I have the freight rates back (possibly tomorrow).

Thanks,
Charis
610-551-9436

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Attachment A.3

Waste Characterization Results

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eurofins | Environment Testing TestAmerica

ANALYTICAL REPORT

Eurofins TestAmerica, Canton
4101 Shuffel Street NW
North Canton, OH 44720
Tel: (330)497-9396

Laboratory Job ID: 240-125349-1
Client Project/Site: NASA PBS Waste - FR3 + 4
Revision: 1

For:
Leidos, Inc.
8866 Commons Boulevard
Suite 201
Twinsburg, Ohio 44087

Attn: Rich E Sprinzl

Authorized for release by:
4/1/2020 10:30:50 AM

Opal Johnson, Project Manager II
(330)966-9279
opal.johnson@testamericainc.com

LINKS

Review your project results through TotalAccess

Have a Question? Ask The Expert

Visit us at: www.testamericainc.com

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

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

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Qualifiers

GC/MS VOA

Qualifier	Qualifier Description
*	ISTD response or retention time outside acceptable limits
*	LCS or LCSD is outside acceptance limits.
F1	MS and/or MSD recovery exceeds control limits.
F2	MS/MSD RPD exceeds control limits
J	Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value.

GC/MS Semi VOA

Qualifier	Qualifier Description
F1	MS and/or MSD recovery exceeds control limits.
J	Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value.
X	Surrogate recovery exceeds control limits

GC Semi VOA

Qualifier	Qualifier Description
F2	MS/MSD RPD exceeds control limits
p	The %RPD between the primary and confirmation column/detector is >40%. The lower value has been reported.
X	Surrogate recovery exceeds control limits

Metals

Qualifier	Qualifier Description
J	Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value.

General Chemistry

Qualifier	Qualifier Description
F2	MS/MSD RPD exceeds control limits
F4	MS/MSD RPD exceeds control limits due to sample size difference.
HF	Field parameter with a holding time of 15 minutes. Test performed by laboratory at client's request.

Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
¤	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CFL	Contains Free Liquid
CNF	Contains No Free Liquid
DER	Duplicate Error Ratio (normalized absolute difference)
Dil Fac	Dilution Factor
DL	Detection Limit (DoD/DOE)
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision Level Concentration (Radiochemistry)
EDL	Estimated Detection Limit (Dioxin)
LOD	Limit of Detection (DoD/DOE)
LOQ	Limit of Quantitation (DoD/DOE)
MDA	Minimum Detectable Activity (Radiochemistry)
MDC	Minimum Detectable Concentration (Radiochemistry)
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
NC	Not Calculated
ND	Not Detected at the reporting limit (or MDL or EDL if shown)
PQL	Practical Quantitation Limit
QC	Quality Control
RER	Relative Error Ratio (Radiochemistry)
RL	Reporting Limit or Requested Limit (Radiochemistry)
RPD	Relative Percent Difference, a measure of the relative difference between two points
TEF	Toxicity Equivalent Factor (Dioxin)
TEQ	Toxicity Equivalent Quotient (Dioxin)

Job ID: 240-125349-1

Laboratory: Eurofins TestAmerica, Canton

Narrative

CASE NARRATIVE

Client: Leidos, Inc.

Project: NASA PBS Waste - FR3 + 4

Report Number: 240-125349-1

Revision I

Revision I: Added metal compounds to TCLP sample: FR34-WC-008 (240-125349-8).

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

Eurofins TestAmerica, Canton attests to the validity of the laboratory data generated by Eurofins TestAmerica facilities reported herein. All analyses performed by Eurofins TestAmerica facilities were done using established laboratory SOPs that incorporate QA/QC procedures described in the application methods. Eurofins TestAmerica's operations groups have reviewed the data for compliance with the laboratory QA/QC plan, and data have been found to be compliant with laboratory protocols unless otherwise noted below.

The 8015B Organics by Direct Aqueous Injection analysis was performed at the Eurofins TestAmerica, Houston laboratory.

The test results in this report meet all NELAP requirements for parameters for which accreditation is required or available. Any exceptions to NELAP requirements are noted in this report. Pursuant to NELAP, this report may not be reproduced, except in full, without the written approval of the laboratory.

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

All holding times were met and proper preservation noted for the methods performed on these samples, unless otherwise detailed in the individual sections below.

All solid sample results are reported on an "as received" basis unless otherwise indicated by the presence of a % solids value in the method header.

This laboratory report is confidential and is intended for the sole use of Eurofins TestAmerica and its client.

RECEIPT

The samples were received on 1/24/2020 10:40 AM; the samples arrived in good condition, properly preserved and, where required, on ice. The temperatures of the 4 coolers at receipt time were 1.8º C, 1.8º C, 2.5º C and 2.7º C.

TCLP VOLATILE ORGANIC COMPOUNDS (GCMS)

Samples FR34-WC-001 (240-125349-1), FR34-WC-002 (240-125349-2), FR34-WC-003 (240-125349-3), FR34-WC-004 (240-125349-4), FR34-WC-005 (240-125349-5), FR34-WC-006 (240-125349-6), FR34-WC-007 (240-125349-7) and FR34-WC-008 (240-125349-8) were analyzed for TCLP volatile organic compounds (GCMS) in accordance with EPA SW-846 Methods 1311/8260B. The samples were leached on 01/27/2020 and 01/28/2020 and analyzed on 01/28/2020 and 01/29/2020.

Sample FR34-WC-008 (240-125349-8)[2X] required dilution prior to analysis due to matrix and foaming at the time of purging during the original sample analysis. The reporting limits have been adjusted accordingly.

Job ID: 240-125349-1 (Continued)

Laboratory: Eurofins TestAmerica, Canton (Continued)

Internal standard (ISTD) response for the following sample was outside control limits: FR34-WC-005 (240-125349-5). The sample was re-extracted and/or re-analyzed with concurring results, and the second set of data has been reported.

Internal standard (ISTD) response for the following sample was outside control limits: FR34-WC-007 (240-125349-7). The sample was re-extracted and/or re-analyzed with concurring results, and the original set of data has been reported.

The laboratory control sample for preparation batch 240-420314 and 240-420776 and analytical batch 240-420897 recovered outside control limits for the following analyte(s): Acetone. Acetone has been identified as a poor performing analyte when analyzed using this method; therefore, re-extraction/re-analysis was not performed. These resultsFR34-WC-008 (240-125349-8), (LCS 240-420776/2-A), (MB 240-420776/1-A), (240-125349-B-8-Q MS) and (240-125349-B-8-R MSD) have been reported and qualified.

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

VOLATILE ORGANIC COMPOUNDS WITH PARTICLE SIZE REDUCTION

Sample FR34-WC-008 (240-125349-8) was analyzed for Volatile organic compounds with particle size reduction in accordance with EPA SW-846 Method 8260B. The sample was prepared on 01/27/2020 and analyzed on 01/30/2020.

Acetone failed the recovery criteria low for LCS 240-420776/2-A.

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

VOLATILE ORGANIC COMPOUNDS (GCMS)

Samples FR34-WC-001 (240-125349-1), FR34-WC-002 (240-125349-2), FR34-WC-003 (240-125349-3), FR34-WC-004 (240-125349-4), FR34-WC-005 (240-125349-5), FR34-WC-006 (240-125349-6) and FR34-WC-007 (240-125349-7) were analyzed for volatile organic compounds (GCMS) in accordance with EPA SW-846 Method 8260B. The samples were prepared and analyzed on 01/28/2020 and 01/29/2020.

Acetone failed the recovery criteria high for the MS and MSD of sample FR34-WC-005 (240-125349-5) in batch 240-420675.

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

TCLP SEMIVOLATILE ORGANIC COMPOUNDS (GCMS)

Samples FR34-WC-001 (240-125349-1), FR34-WC-002 (240-125349-2), FR34-WC-003 (240-125349-3), FR34-WC-004 (240-125349-4), FR34-WC-005 (240-125349-5), FR34-WC-006 (240-125349-6), FR34-WC-007 (240-125349-7) and FR34-WC-008 (240-125349-8) were analyzed for TCLP semivolatile organic compounds (GCMS) in accordance with EPA SW-846 Methods 1311/8270C. The samples were leached on 01/27/2020 and 01/28/2020, prepared on 01/28/2020 and 01/29/2020 and analyzed on 01/30/2020 and 02/04/2020.

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

SEMIVOLATILE ORGANIC COMPOUNDS (GC-MS) WITH PARTICLE SIZE REDUCTION

Sample FR34-WC-008 (240-125349-8) was analyzed for semivolatile organic compounds (GC-MS) with incremental sample preparation in accordance with SW-846 Method 8270D. The sample was prepared on 01/27/2020, prepared on 01/28/2020 and analyzed on 02/05/2020.

2,4,6-Tribromophenol (Surr), 2-Fluorobiphenyl (Surr), 2-Fluorophenol (Surr), Nitrobenzene-d5 (Surr), Phenol-d5 (Surr) and Terphenyl-d14 (Surr) failed the surrogate recovery criteria low for FR34-WC-008 (240-125349-8). Terphenyl-d14 (Surr) failed the surrogate recovery criteria high.

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

SEMIVOLATILE ORGANIC COMPOUNDS (GCMS)

Samples FR34-WC-001 (240-125349-1), FR34-WC-002 (240-125349-2), FR34-WC-003 (240-125349-3), FR34-WC-004 (240-125349-4), FR34-WC-005 (240-125349-5), FR34-WC-006 (240-125349-6) and FR34-WC-007 (240-125349-7) were analyzed for semivolatile organic compounds (GCMS) in accordance with EPA SW-846 Method 8270D. The samples were prepared on 01/28/2020 and analyzed on

Job ID: 240-125349-1 (Continued)

Laboratory: Eurofins TestAmerica, Canton (Continued)

02/05/2020 and 02/06/2020.

Samples FR34-WC-001 (240-125349-1)[4X], FR34-WC-002 (240-125349-2)[10X], FR34-WC-002 (240-125349-2)[100X], FR34-WC-003 (240-125349-3)[10X], FR34-WC-004 (240-125349-4)[10X], FR34-WC-005 (240-125349-5)[2X], FR34-WC-005 (240-125349-5)[5X] and FR34-WC-007 (240-125349-7)[2.5X] required dilution prior to analysis due to the nature of the sample matrix. The reporting limits have been adjusted accordingly.

Target analytes Benzoic acid and Hexachlorocyclopentadiene had %D's in excess of method recommendations for the CCV associated with analytical batch 240-421566. A LODV was analyzed to demonstrate sensitivity for these compounds at the reporting limit for the following samples: FR34-WC-001 (240-125349-1), FR34-WC-002 (240-125349-2), FR34-WC-003 (240-125349-3), FR34-WC-006 (240-125349-6), FR34-WC-007 (240-125349-7) and FR34-WC-008 (240-125349-8).

The target analyte Hexachlorocyclopentadiene had a %D in excess of method recommendations for the CCV associated with analytical batch 240-421712. A LODV was analyzed to demonstrate sensitivity for this compound at the reporting limit for the following samples: FR34-WC-004 (240-125349-4) and FR34-WC-005 (240-125349-5).

Several analytes failed the recovery criteria low for the MS and MSD of sample FR34-WC-001 (240-125349-1) in batch 240-421566.

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

DI LEACH - ORGANICS BY DIRECT AQUEOUS INJECTION

Samples FR34-WC-001 (240-125349-1), FR34-WC-002 (240-125349-2), FR34-WC-003 (240-125349-3), FR34-WC-004 (240-125349-4), FR34-WC-005 (240-125349-5), FR34-WC-006 (240-125349-6), FR34-WC-007 (240-125349-7) and FR34-WC-008 (240-125349-8) were analyzed for DI Leach - organics by direct aqueous injection in accordance with DI Leach/EPA SW-846 Method 8015B - DAI. The samples were leached on 01/27/2020 and 01/29/2020 and analyzed on 01/27/2020 and 01/29/2020.

No analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

TCLP CHLORINATED PESTICIDES

Samples FR34-WC-001 (240-125349-1), FR34-WC-002 (240-125349-2), FR34-WC-003 (240-125349-3), FR34-WC-004 (240-125349-4), FR34-WC-005 (240-125349-5), FR34-WC-006 (240-125349-6), FR34-WC-007 (240-125349-7) and FR34-WC-008 (240-125349-8) were analyzed for TCLP chlorinated pesticides in accordance with EPA SW-846 Methods 1311/8081A. The samples were leached on 01/27/2020 and 01/28/2020, prepared on 01/28/2020 and 01/29/2020 and analyzed on 01/31/2020 and 02/03/2020.

The following sample was diluted due to the nature of the sample matrix: FR34-WC-008 (240-125349-8). As such, surrogate recoveries may be below the calibration range, and elevated reporting limits (RLs) are provided.

The continuing calibration verification (CCV) associated with batch 240-420998 was outside %D criteria for the individual peak used for the quantitation of Chlordane (technical). The average %D is in control for this analyte; therefore, corrective action was not performed.

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

POLYCHLORINATED BIPHENYLS (PCBS) WITH PARTICLE SIZE REDUCTION

Sample FR34-WC-008 (240-125349-8) was analyzed for polychlorinated biphenyls (PCBs) in accordance with SW-846 Method 8082A. The sample was prepared on 01/27/2020, prepared on 01/28/2020 and analyzed on 01/30/2020.

All of the samples in this data set analyzed for PCBs were subjected to the sulfuric acid cleanup procedure before instrumental analysis, per EPA Method 3665A.

No analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

POLYCHLORINATED BIPHENYLS (PCBS)

Samples FR34-WC-001 (240-125349-1), FR34-WC-002 (240-125349-2), FR34-WC-003 (240-125349-3), FR34-WC-004 (240-125349-4), FR34-WC-005 (240-125349-5), FR34-WC-006 (240-125349-6) and FR34-WC-007 (240-125349-7) were analyzed for polychlorinated biphenyls (PCBs) in accordance with EPA SW-846 Method 8082. The samples were prepared on 01/27/2020 and analyzed on 01/29/2020

Job ID: 240-125349-1 (Continued)

Laboratory: Eurofins TestAmerica, Canton (Continued)

and 01/31/2020.

Samples FR34-WC-002 (240-125349-2)[5X] and FR34-WC-003 (240-125349-3)[5X] required dilution prior to analysis due to the nature of the sample matrix. The reporting limits have been adjusted accordingly.

Surrogate Decachlorobiphenyl recovery for the following samples were outside control limits: FR34-WC-004 (240-125349-4) and FR34-WC-005 (240-125349-5). Evidence of matrix interference is present; therefore, re-extraction and/or re-analysis was not performed.

Surrogates are added during the extraction process prior to dilution. When the sample dilution is 5X or greater, surrogate recoveries are diluted out and no corrective action is required.
DCB Decachlorobiphenyl failed the surrogate recovery criteria high for FR34-WC-004 (240-125349-4) and FR34-WC-005 (240-125349-5).

The following samples required a copper clean-up to reduce matrix interferences caused by sulfur: FR34-WC-001 (240-125349-1), FR34-WC-004 (240-125349-4), FR34-WC-005 (240-125349-5), FR34-WC-006 (240-125349-6), FR34-WC-007 (240-125349-7), (240-125349-F-1-B MS) and (240-125349-F-1-C MSD). Reagent: 4499064.

All of the samples in this data set analyzed for PCBs were subjected to the sulfuric acid cleanup procedure before instrumental analysis, per EPA Method 3665A.

Aroclor-1260 exceeded the RPD limit for the MSD of sample FR34-WC-001MSD (240-125349-1) in batch 240-420600.

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

TCLP CHLORINATED HERBICIDES
Samples FR34-WC-001 (240-125349-1), FR34-WC-002 (240-125349-2), FR34-WC-003 (240-125349-3), FR34-WC-004 (240-125349-4), FR34-WC-005 (240-125349-5), FR34-WC-006 (240-125349-6), FR34-WC-007 (240-125349-7) and FR34-WC-008 (240-125349-8) were analyzed for TCLP chlorinated herbicides in accordance with EPA SW-846 Methods 1311/8151A. The samples were leached on 01/27/2020 and 01/28/2020, prepared on 01/29/2020 and 02/03/2020 and analyzed on 02/04/2020 and 02/05/2020.

The continuing calibration verification (CCV) associated with batch 240-421572 recovered above the upper control limit for 2,4-D and Silvex (2,4,5-TP). The samples associated with this CCV were non-detects for the affected analytes; therefore, the data have been reported.

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

TCLP METALS (ICP)
Samples FR34-WC-001 (240-125349-1), FR34-WC-002 (240-125349-2), FR34-WC-003 (240-125349-3), FR34-WC-004 (240-125349-4), FR34-WC-005 (240-125349-5), FR34-WC-006 (240-125349-6), FR34-WC-007 (240-125349-7) and FR34-WC-008 (240-125349-8) were analyzed for TCLP metals (ICP) in accordance with EPA SW-846 Methods 1311/6010C. The samples were leached on 01/27/2020 and 01/28/2020, prepared on 01/28/2020 and 01/29/2020 and analyzed on 01/29/2020 and 01/30/2020.

Samples FR34-WC-004 (240-125349-4)[5X], FR34-WC-005 (240-125349-5)[100X] and FR34-WC-007 (240-125349-7)[10X] required dilution prior to analysis. The reporting limits have been adjusted accordingly.

No analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

ICP WITH PARTICLE SIZE REDUCTION
Sample FR34-WC-008 (240-125349-8) was analyzed for ICP in accordance with SW-846 Method 6010C. The sample was prepared on 01/27/2020, prepared on 01/29/2020 and analyzed on 01/30/2020 and 01/31/2020.

Sample FR34-WC-008 (240-125349-8)[5X] required dilution prior to analysis. The reporting limits have been adjusted accordingly.

No analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

TOTAL METALS (ICP)
Samples FR34-WC-001 (240-125349-1), FR34-WC-002 (240-125349-2), FR34-WC-003 (240-125349-3), FR34-WC-004 (240-125349-4),

Job ID: 240-125349-1 (Continued)

Laboratory: Eurofins TestAmerica, Canton (Continued)

FR34-WC-005 (240-125349-5), FR34-WC-006 (240-125349-6) and FR34-WC-007 (240-125349-7) were analyzed for total metals (ICP) in accordance with EPA SW-846 Method 6010C. The samples were prepared on 01/27/2020 and analyzed on 01/28/2020 and 01/29/2020.

Sample FR34-WC-005 (240-125349-5)[5X] required dilution prior to analysis. The reporting limits have been adjusted accordingly.

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

TCLP MERCURY
Samples FR34-WC-001 (240-125349-1), FR34-WC-002 (240-125349-2), FR34-WC-003 (240-125349-3), FR34-WC-004 (240-125349-4), FR34-WC-005 (240-125349-5), FR34-WC-006 (240-125349-6), FR34-WC-007 (240-125349-7) and FR34-WC-008 (240-125349-8) were analyzed for TCLP mercury in accordance with EPA SW-846 Methods 1311/7470A. The samples were leached on 01/27/2020 and 01/28/2020, prepared on 01/28/2020 and 01/29/2020 and analyzed on 01/29/2020 and 01/30/2020.

No analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

MERCURY WITH PARTICLE SIZE REDUCTION
Sample FR34-WC-008 (240-125349-8) was analyzed for mercury in accordance with SW-846 Method 7471B. The sample was preapred on 01/27/2020, prepared on 01/29/2020 and analyzed on 01/30/2020.

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

MERCURY
Samples FR34-WC-001 (240-125349-1), FR34-WC-002 (240-125349-2), FR34-WC-003 (240-125349-3), FR34-WC-004 (240-125349-4), FR34-WC-005 (240-125349-5), FR34-WC-006 (240-125349-6) and FR34-WC-007 (240-125349-7) were analyzed for mercury in accordance with EPA SW-846 Method 7471B. The samples were prepared on 01/27/2020 and analyzed on 01/28/2020.

There was a red precipitate, post mercury digestion, in the following sample: FR34-WC-005 (240-125349-5).

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

FLASHPOINT WITH PARTICLE SIZE REDUCTION
Sample FR34-WC-008 (240-125349-8) was analyzed for flashpoint in accordance with EPA SW-846 Method 1010. The sample was prepared on 01/27/2020 and analyzed on 01/29/2020.

No analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

FLASHPOINT
Samples FR34-WC-001 (240-125349-1), FR34-WC-002 (240-125349-2), FR34-WC-003 (240-125349-3), FR34-WC-004 (240-125349-4), FR34-WC-005 (240-125349-5), FR34-WC-006 (240-125349-6) and FR34-WC-007 (240-125349-7) were analyzed for flashpoint in accordance with EPA SW-846 Method 1010. The samples were analyzed on 01/28/2020.

No analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

CYANIDE WITH PARTICLE SIZE REDUCTION
Sample FR34-WC-008 (240-125349-8) was analyzed for Cyanide with incremental sample preparation in accordance with EPA SW-846 Method 9012A. The sample was prepared on 01/27/2020, and prepared and analyzed on 01/29/2020.

No analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

TOTAL CYANIDE
Samples FR34-WC-001 (240-125349-1), FR34-WC-002 (240-125349-2), FR34-WC-003 (240-125349-3), FR34-WC-004 (240-125349-4), FR34-WC-005 (240-125349-5), FR34-WC-006 (240-125349-6) and FR34-WC-007 (240-125349-7) were analyzed for total cyanide in accordance with EPA SW-846 Method 9012A. The samples were prepared and analyzed on 01/29/2020.

The matrix spike / matrix spike duplicate (MS/MSD) recoveries for preparation batch 240-420678 and analytical batch 240-420764 were

Job ID: 240-125349-1 (Continued)

Laboratory: Eurofins TestAmerica, Canton (Continued)

outside control limits. Sample matrix interference is suspected because the associated laboratory control sample (LCS) recovery was within acceptance limits.

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

SULFIDE WITH PARTICLE SIZE REDUCTION
Sample FR34-WC-008 (240-125349-8) was analyzed for sulfide in accordance with EPA SW-846 Method 9034. The sample was prepared on 01/27/2020, and prepared and analyzed on 01/30/2020.

No analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

SULFIDE
Samples FR34-WC-001 (240-125349-1), FR34-WC-002 (240-125349-2), FR34-WC-003 (240-125349-3), FR34-WC-004 (240-125349-4), FR34-WC-005 (240-125349-5), FR34-WC-006 (240-125349-6) and FR34-WC-007 (240-125349-7) were analyzed for sulfide in accordance with EPA SW-846 Method 9034. The samples were prepared and analyzed on 01/27/2020.

No analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

CORROSIVITY WITH PARTICLE SIZE REDUCTION
Sample FR34-WC-008 (240-125349-8) was analyzed for Corrosivity in accordance with SW-846 Method 9045C. The sample was prepared on 01/27/2020 and analyzed on 01/28/2020.

No analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

pH
Samples FR34-WC-001 (240-125349-1), FR34-WC-002 (240-125349-2), FR34-WC-003 (240-125349-3), FR34-WC-004 (240-125349-4), FR34-WC-005 (240-125349-5), FR34-WC-006 (240-125349-6) and FR34-WC-007 (240-125349-7) were analyzed for pH in accordance with EPA SW-846 Method 9045C. The samples were analyzed on 01/27/2020.

No analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

PAINT FILTER WITH PARTICLE SIZE REDUCTION
Sample FR34-WC-008 (240-125349-8) was analyzed for paint filter in accordance with SW-846 Method 9095A. The sample was prepared on 01/27/2020 and analyzed on 02/05/2020.

No analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

PAINT FILTER
Samples FR34-WC-001 (240-125349-1), FR34-WC-002 (240-125349-2), FR34-WC-003 (240-125349-3), FR34-WC-004 (240-125349-4), FR34-WC-005 (240-125349-5), FR34-WC-006 (240-125349-6) and FR34-WC-007 (240-125349-7) were analyzed for paint filter in accordance with EPA SW-846 Method 9095A. The samples were analyzed on 02/05/2020.

No analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

MOISTURE WITH PARTICLE SIZE REDUCTION
Sample FR34-WC-008 (240-125349-8) was analyzed for Moisture in accordance with Moisture. The sample was prepared on 01/27/2020 and analyzed on 01/27/2020.

No analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

PERCENT SOLIDS
Samples FR34-WC-001 (240-125349-1), FR34-WC-002 (240-125349-2), FR34-WC-003 (240-125349-3), FR34-WC-004 (240-125349-4), FR34-WC-005 (240-125349-5), FR34-WC-006 (240-125349-6) and FR34-WC-007 (240-125349-7) were analyzed for percent solids in accordance with ASTM Method D2216-80. The samples were analyzed on 01/27/2020.

No analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

Method Summary

Client: Leidos, Inc.
Project/Site: NASA PBS Waste - FR3 + 4

Job ID: 240-125349-1

Method	Method Description	Protocol	Laboratory
8260B	Volatile Organic Compounds (GC/MS)	SW846	TAL CAN
8270C	Semivolatile Organic Compounds (GC/MS)	SW846	TAL CAN
8270D	Semivolatile Organic Compounds (GC/MS)	SW846	TAL CAN
8015B	Nonhalogenated Organic Compounds - Direct Injection (GC)	SW846	TAL HOU
8081A	Organochlorine Pesticides (GC)	SW846	TAL CAN
8082	Polychlorinated Biphenyls (PCBs) by Gas Chromatography	SW846	TAL CAN
8151A	Herbicides (GC)	SW846	TAL CAN
6010C	Metals (ICP)	SW846	TAL CAN
7470A	Mercury (CVAA)	SW846	TAL CAN
7471B	Mercury (CVAA)	SW846	TAL CAN
1010	Ignitability, Pensky-Martens Closed-Cup Method	SW846	TAL CAN
9012A	Cyanide, Total and/or Amenable	SW846	TAL CAN
9034	Sulfide, Acid soluble and Insoluble (Titrimetric)	SW846	TAL CAN
9045C	pH	SW846	TAL CAN
9095A	Paint Filter	SW846	TAL CAN
Moisture	Percent Moisture	EPA	TAL CAN
1311	TCLP Extraction	SW846	TAL CAN
3010A	Preparation, Total Metals	SW846	TAL CAN
3050B	Preparation, Metals	SW846	TAL CAN
3510C	Liquid-Liquid Extraction (Separatory Funnel)	SW846	TAL CAN
3540C	Soxhlet Extraction	SW846	TAL CAN
5030A	Purge and Trap	SW846	TAL CAN
5030B	Purge and Trap	SW846	TAL CAN
7470A	Preparation, Mercury	SW846	TAL CAN
7471B	Preparation, Mercury	SW846	TAL CAN
8151A	Extraction (Herbicides)	SW846	TAL CAN
9012A	Cyanide, Total and/or Amenable, Distillation	SW846	TAL CAN
9030B	Sulfide, Distillation (Acid Soluble and Insoluble)	SW846	TAL CAN
DI Leach	Deionized Water Leaching Procedure (Routine)	ASTM	TAL HOU
Part Size Red	Particle Size Reduction Preparation	None	TAL CAN
Part Size Red	Particle Size Reduction Preparation	None	TAL CAN

Protocol References:

ASTM = ASTM International
EPA = US Environmental Protection Agency
None = None
SW846 = "Test Methods For Evaluating Solid Waste, Physical/Chemical Methods", Third Edition, November 1986 And Its Updates.

Laboratory References:

TAL CAN = Eurofins TestAmerica, Canton, 4101 Shuffel Street NW, North Canton, OH 44720, TEL (330)497-9396
TAL HOU = Eurofins TestAmerica, Houston, 6310 Rothway Street, Houston, TX 77040, TEL (713)690-4444

Sample Summary

Client: Leidos, Inc.
Project/Site: NASA PBS Waste - FR3 + 4

Job ID: 240-125349-1

Lab Sample ID	Client Sample ID	Matrix	Collected	Received	Asset ID
240-125349-1	FR34-WC-001	Solid	01/23/20 10:30	01/24/20 10:40	
240-125349-2	FR34-WC-002	Solid	01/23/20 12:00	01/24/20 10:40	
240-125349-3	FR34-WC-003	Solid	01/23/20 13:00	01/24/20 10:40	
240-125349-4	FR34-WC-004	Solid	01/23/20 13:55	01/24/20 10:40	
240-125349-5	FR34-WC-005	Solid	01/23/20 14:50	01/24/20 10:40	
240-125349-6	FR34-WC-006	Solid	01/23/20 16:15	01/24/20 10:40	
240-125349-7	FR34-WC-007	Solid	01/23/20 15:45	01/24/20 10:40	
240-125349-8	FR34-WC-008	Solid	01/23/20 16:00	01/24/20 10:40	

Detection Summary

Client: Leidos, Inc.
Project/Site: NASA PBS Waste - FR3 + 4

Job ID: 240-125349-1

Client Sample ID: FR34-WC-001 — Lab Sample ID: 240-125349-1

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Benzo[a]anthracene	110		75		ug/Kg	4	☼	8270D	Total/NA
Benzo[a]pyrene	100		75		ug/Kg	4	☼	8270D	Total/NA
Benzo[b]fluoranthene	190		75		ug/Kg	4	☼	8270D	Total/NA
Chrysene	170		75		ug/Kg	4	☼	8270D	Total/NA
Fluoranthene	220		75		ug/Kg	4	☼	8270D	Total/NA
2-Methylnaphthalene	300		75		ug/Kg	4	☼	8270D	Total/NA
Naphthalene	97		75		ug/Kg	4	☼	8270D	Total/NA
Phenanthrene	240		75		ug/Kg	4	☼	8270D	Total/NA
Pyrene	180		75		ug/Kg	4	☼	8270D	Total/NA
Arsenic	16		1.7		mg/Kg	1	☼	6010C	Total/NA
Barium	33		23		mg/Kg	1	☼	6010C	Total/NA
Chromium	9.0		1.2		mg/Kg	1	☼	6010C	Total/NA
Lead	28		1.2		mg/Kg	1	☼	6010C	Total/NA
Nickel	32		4.6		mg/Kg	1	☼	6010C	Total/NA
Flashpoint	>200		1.00		Degrees F	1		1010	Total/NA
pH	7.5	HF	0.1		SU	1		9045C	Total/NA
Free Liquid	CNF		0.10		NONE	1		9095A	Total/NA

Client Sample ID: FR34-WC-002 — Lab Sample ID: 240-125349-2

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Acenaphthene	5900		190		ug/Kg	10	☼	8270D	Total/NA
Acenaphthylene	5600		190		ug/Kg	10	☼	8270D	Total/NA
Carbazole	3700		640		ug/Kg	10	☼	8270D	Total/NA
Dibenz(a,h)anthracene	6800		190		ug/Kg	10	☼	8270D	Total/NA
Dibenzofuran	10000		640		ug/Kg	10	☼	8270D	Total/NA
Fluorene	18000		190		ug/Kg	10	☼	8270D	Total/NA
2-Methylnaphthalene	2600		190		ug/Kg	10	☼	8270D	Total/NA
Naphthalene	2000		190		ug/Kg	10	☼	8270D	Total/NA
Anthracene - RA	26000		1900		ug/Kg	100	☼	8270D	Total/NA
Benzo[a]anthracene - RA	46000		1900		ug/Kg	100	☼	8270D	Total/NA
Benzo[a]pyrene - RA	42000		1900		ug/Kg	100	☼	8270D	Total/NA
Benzo[b]fluoranthene - RA	53000		1900		ug/Kg	100	☼	8270D	Total/NA
Benzo[g,h,i]perylene - RA	22000		1900		ug/Kg	100	☼	8270D	Total/NA
Benzo[k]fluoranthene - RA	22000		1900		ug/Kg	100	☼	8270D	Total/NA
Chrysene - RA	42000		1900		ug/Kg	100	☼	8270D	Total/NA
Fluoranthene - RA	120000		1900		ug/Kg	100	☼	8270D	Total/NA
Indeno[1,2,3-cd]pyrene - RA	23000		1900		ug/Kg	100	☼	8270D	Total/NA
Phenanthrene - RA	84000		1900		ug/Kg	100	☼	8270D	Total/NA
Pyrene - RA	91000		1900		ug/Kg	100	☼	8270D	Total/NA
Arsenic	8.6		1.9		mg/Kg	1	☼	6010C	Total/NA
Barium	51		25		mg/Kg	1	☼	6010C	Total/NA
Chromium	9.3		1.3		mg/Kg	1	☼	6010C	Total/NA
Lead	350		1.3		mg/Kg	1	☼	6010C	Total/NA
Nickel	23		5.1		mg/Kg	1	☼	6010C	Total/NA
Barium	0.65		0.50		mg/L	1		6010C	TCLP
Lead	0.093		0.050		mg/L	1		6010C	TCLP
Flashpoint	>200		1.00		Degrees F	1		1010	Total/NA
pH	8.0	HF	0.1		SU	1		9045C	Total/NA
Free Liquid	CNF		0.10		NONE	1		9095A	Total/NA

This Detection Summary does not include radiochemical test results.

Detection Summary

Client: Leidos, Inc.
Project/Site: NASA PBS Waste - FR3 + 4

Job ID: 240-125349-1

Client Sample ID: FR34-WC-003 — Lab Sample ID: 240-125349-3

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Acenaphthene	260		18		ug/Kg	1	☼	8270D	Total/NA
Acenaphthylene	640		18		ug/Kg	1	☼	8270D	Total/NA
Anthracene	720		18		ug/Kg	1	☼	8270D	Total/NA
Benzo[g,h,i]perylene	1700		18		ug/Kg	1	☼	8270D	Total/NA
Carbazole	320		59		ug/Kg	1	☼	8270D	Total/NA
Dibenz(a,h)anthracene	630		18		ug/Kg	1	☼	8270D	Total/NA
Dibenzofuran	79		59		ug/Kg	1	☼	8270D	Total/NA
Di-n-butyl phthalate	150		83		ug/Kg	1	☼	8270D	Total/NA
Fluorene	150		18		ug/Kg	1	☼	8270D	Total/NA
Indeno[1,2,3-cd]pyrene	1900		18		ug/Kg	1	☼	8270D	Total/NA
2-Methylnaphthalene	58		18		ug/Kg	1	☼	8270D	Total/NA
Naphthalene	60		18		ug/Kg	1	☼	8270D	Total/NA
N-Nitrosodiphenylamine	170		59		ug/Kg	1	☼	8270D	Total/NA
Benzo[a]anthracene - RA	4200		180		ug/Kg	10	☼	8270D	Total/NA
Benzo[a]pyrene - RA	6300		180		ug/Kg	10	☼	8270D	Total/NA
Benzo[b]fluoranthene - RA	8100		180		ug/Kg	10	☼	8270D	Total/NA
Benzo[k]fluoranthene - RA	3300		180		ug/Kg	10	☼	8270D	Total/NA
Chrysene - RA	4700		180		ug/Kg	10	☼	8270D	Total/NA
Fluoranthene - RA	9000		180		ug/Kg	10	☼	8270D	Total/NA
Phenanthrene - RA	2200		180		ug/Kg	10	☼	8270D	Total/NA
Pyrene - RA	7800		180		ug/Kg	10	☼	8270D	Total/NA
Arsenic	4.7		1.4		mg/Kg	1	☼	6010C	Total/NA
Barium	120		18		mg/Kg	1	☼	6010C	Total/NA
Cadmium	0.50		0.46		mg/Kg	1	☼	6010C	Total/NA
Chromium	7.4		0.91		mg/Kg	1	☼	6010C	Total/NA
Lead	160		0.91		mg/Kg	1	☼	6010C	Total/NA
Nickel	14		3.7		mg/Kg	1	☼	6010C	Total/NA
Barium	1.4		0.50		mg/L	1		6010C	TCLP
Lead	0.21		0.050		mg/L	1		6010C	TCLP
Flashpoint	>200		1.00		Degrees F	1		1010	Total/NA
pH	8.4	HF	0.1		SU	1		9045C	Total/NA
Free Liquid	CNF		0.10		NONE	1		9095A	Total/NA

Client Sample ID: FR34-WC-004 — Lab Sample ID: 240-125349-4

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Acenaphthene	37		18		ug/Kg	1	☼	8270D	Total/NA
Acenaphthylene	240		18		ug/Kg	1	☼	8270D	Total/NA
Anthracene	1400		18		ug/Kg	1	☼	8270D	Total/NA
Benzo[g,h,i]perylene	900		18		ug/Kg	1	☼	8270D	Total/NA
Benzoic acid	1000		860		ug/Kg	1	☼	8270D	Total/NA
Benzo[k]fluoranthene	2000		18		ug/Kg	1	☼	8270D	Total/NA
Carbazole	300		61		ug/Kg	1	☼	8270D	Total/NA
Dibenz(a,h)anthracene	380		18		ug/Kg	1	☼	8270D	Total/NA
Fluorene	47		18		ug/Kg	1	☼	8270D	Total/NA
Indeno[1,2,3-cd]pyrene	1000		18		ug/Kg	1	☼	8270D	Total/NA
2-Methylnaphthalene	130		18		ug/Kg	1	☼	8270D	Total/NA
Naphthalene	54		18		ug/Kg	1	☼	8270D	Total/NA
Phenanthrene	370		18		ug/Kg	1	☼	8270D	Total/NA
Benzo[a]anthracene - RA	5600		180		ug/Kg	10	☼	8270D	Total/NA
Benzo[a]pyrene - RA	2600		180		ug/Kg	10	☼	8270D	Total/NA

This Detection Summary does not include radiochemical test results.

Client Sample ID: FR34-WC-004 (Continued) — Lab Sample ID: 240-125349-4

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Benzo[b]fluoranthene - RA	6000		180		ug/Kg	10	☼	8270D	Total/NA
Chrysene - RA	5400		180		ug/Kg	10	☼	8270D	Total/NA
Fluoranthene - RA	12000		180		ug/Kg	10	☼	8270D	Total/NA
Pyrene - RA	10000		180		ug/Kg	10	☼	8270D	Total/NA
Arsenic	19		1.4		mg/Kg	1	☼	6010C	Total/NA
Barium	110		19		mg/Kg	1	☼	6010C	Total/NA
Chromium	14		0.95		mg/Kg	1	☼	6010C	Total/NA
Lead	750		0.95		mg/Kg	1	☼	6010C	Total/NA
Nickel	46		3.8		mg/Kg	1	☼	6010C	Total/NA
Nickel	0.12		0.040		mg/L	1		6010C	TCLP
Lead	34		0.25		mg/L	5		6010C	TCLP
Flashpoint	>200		1.00		Degrees F	1		1010	Total/NA
pH	5.0	HF	0.1		SU	1		9045C	Total/NA
Free Liquid	CNF		0.10		NONE	1		9095A	Total/NA

Client Sample ID: FR34-WC-005 — Lab Sample ID: 240-125349-5

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Acenaphthene	78		36		ug/Kg	2	☼	8270D	Total/NA
Acenaphthylene	180		36		ug/Kg	2	☼	8270D	Total/NA
Anthracene	980		36		ug/Kg	2	☼	8270D	Total/NA
Benzo[a]anthracene	3200		36		ug/Kg	2	☼	8270D	Total/NA
Benzo[a]pyrene	1600		36		ug/Kg	2	☼	8270D	Total/NA
Benzo[g,h,i]perylene	730		36		ug/Kg	2	☼	8270D	Total/NA
Benzo[k]fluoranthene	1900		36		ug/Kg	2	☼	8270D	Total/NA
Carbazole	370		120		ug/Kg	2	☼	8270D	Total/NA
Chrysene	3800		36		ug/Kg	2	☼	8270D	Total/NA
Dibenz(a,h)anthracene	330		36		ug/Kg	2	☼	8270D	Total/NA
Dibenzofuran	240		120		ug/Kg	2	☼	8270D	Total/NA
Indeno[1,2,3-cd]pyrene	840		36		ug/Kg	2	☼	8270D	Total/NA
2-Methylnaphthalene	450		36		ug/Kg	2	☼	8270D	Total/NA
Naphthalene	200		36		ug/Kg	2	☼	8270D	Total/NA
Phenanthrene	1200		36		ug/Kg	2	☼	8270D	Total/NA
Pyrene	3800		36		ug/Kg	2	☼	8270D	Total/NA
Benzo[b]fluoranthene - RA	4700		89		ug/Kg	5	☼	8270D	Total/NA
Fluoranthene - RA	4400		89		ug/Kg	5	☼	8270D	Total/NA
Arsenic	29		1.3		mg/Kg	1	☼	6010C	Total/NA
Barium	55		17		mg/Kg	1	☼	6010C	Total/NA
Chromium	8.3		0.84		mg/Kg	1	☼	6010C	Total/NA
Lead	4500		4.2		mg/Kg	5	☼	6010C	Total/NA
Nickel	25		3.4		mg/Kg	1	☼	6010C	Total/NA
Arsenic	0.46		0.050		mg/L	1		6010C	TCLP
Nickel	0.12		0.040		mg/L	1		6010C	TCLP
Lead	590		5.0		mg/L	100		6010C	TCLP
Flashpoint	>200		1.00		Degrees F	1		1010	Total/NA
pH	3.7	HF	0.1		SU	1		9045C	Total/NA
Free Liquid	CNF		0.10		NONE	1		9095A	Total/NA

Client Sample ID: FR34-WC-006 — Lab Sample ID: 240-125349-6

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Methylene Chloride	28		25		ug/Kg	1	☼	8260B	Total/NA

This Detection Summary does not include radiochemical test results.

Detection Summary

Client: Leidos, Inc.
Project/Site: NASA PBS Waste - FR3 + 4

Job ID: 240-125349-1

Client Sample ID: FR34-WC-006 (Continued) — Lab Sample ID: 240-125349-6

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Acenaphthylene	19		18		ug/Kg	1	☼	8270D	Total/NA
Anthracene	47		18		ug/Kg	1	☼	8270D	Total/NA
Benzo[a]anthracene	200		18		ug/Kg	1	☼	8270D	Total/NA
Benzo[a]pyrene	140		18		ug/Kg	1	☼	8270D	Total/NA
Benzo[b]fluoranthene	380		18		ug/Kg	1	☼	8270D	Total/NA
Benzo[g,h,i]perylene	50		18		ug/Kg	1	☼	8270D	Total/NA
Benzo[k]fluoranthene	150		18		ug/Kg	1	☼	8270D	Total/NA
Chrysene	270		18		ug/Kg	1	☼	8270D	Total/NA
Dibenz(a,h)anthracene	22		18		ug/Kg	1	☼	8270D	Total/NA
Fluoranthene	210		18		ug/Kg	1	☼	8270D	Total/NA
Indeno[1,2,3-cd]pyrene	66		18		ug/Kg	1	☼	8270D	Total/NA
2-Methylnaphthalene	49		18		ug/Kg	1	☼	8270D	Total/NA
Phenanthrene	39		18		ug/Kg	1	☼	8270D	Total/NA
Pyrene	250		18		ug/Kg	1	☼	8270D	Total/NA
Arsenic	15		1.3		mg/Kg	1	☼	6010C	Total/NA
Barium	83		17		mg/Kg	1	☼	6010C	Total/NA
Chromium	9.8		0.85		mg/Kg	1	☼	6010C	Total/NA
Lead	86		0.85		mg/Kg	1	☼	6010C	Total/NA
Nickel	35		3.4		mg/Kg	1	☼	6010C	Total/NA
Nickel	0.094		0.040		mg/L	1		6010C	TCLP
Lead	3.6		0.050		mg/L	1		6010C	TCLP
Flashpoint	>200		1.00		Degrees F	1		1010	Total/NA
pH	4.4	HF	0.1		SU	1		9045C	Total/NA
Free Liquid	CNF		0.10		NONE	1		9095A	Total/NA

Client Sample ID: FR34-WC-007 — Lab Sample ID: 240-125349-7

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
1,2,4-Trimethylbenzene	6.9	*	5.4		ug/Kg	1	☼	8260B	Total/NA
Toluene	9.5		5.4		ug/Kg	1	☼	8260B	Total/NA
Acenaphthylene	49		44		ug/Kg	2.5	☼	8270D	Total/NA
Anthracene	210		44		ug/Kg	2.5	☼	8270D	Total/NA
Benzo[a]anthracene	1000		44		ug/Kg	2.5	☼	8270D	Total/NA
Benzo[a]pyrene	490		44		ug/Kg	2.5	☼	8270D	Total/NA
Benzo[b]fluoranthene	1300		44		ug/Kg	2.5	☼	8270D	Total/NA
Benzo[g,h,i]perylene	130		44		ug/Kg	2.5	☼	8270D	Total/NA
Benzo[k]fluoranthene	510		44		ug/Kg	2.5	☼	8270D	Total/NA
Chrysene	1400		44		ug/Kg	2.5	☼	8270D	Total/NA
Dibenz(a,h)anthracene	73		44		ug/Kg	2.5	☼	8270D	Total/NA
Fluoranthene	1400		44		ug/Kg	2.5	☼	8270D	Total/NA
Indeno[1,2,3-cd]pyrene	160		44		ug/Kg	2.5	☼	8270D	Total/NA
2-Methylnaphthalene	290		44		ug/Kg	2.5	☼	8270D	Total/NA
Naphthalene	100		44		ug/Kg	2.5	☼	8270D	Total/NA
Phenanthrene	350		44		ug/Kg	2.5	☼	8270D	Total/NA
Pyrene	1100		44		ug/Kg	2.5	☼	8270D	Total/NA
Arsenic	25		1.6		mg/Kg	1	☼	6010C	Total/NA
Barium	57		21		mg/Kg	1	☼	6010C	Total/NA
Chromium	9.4		1.0		mg/Kg	1	☼	6010C	Total/NA
Lead	1900		1.0		mg/Kg	1	☼	6010C	Total/NA
Nickel	34		4.2		mg/Kg	1	☼	6010C	Total/NA
Arsenic	0.086		0.050		mg/L	1		6010C	TCLP

This Detection Summary does not include radiochemical test results.

Detection Summary

Client: Leidos, Inc.
Project/Site: NASA PBS Waste - FR3 + 4

Job ID: 240-125349-1

Client Sample ID: FR34-WC-007 (Continued) — Lab Sample ID: 240-125349-7

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Nickel	0.28		0.040		mg/L	1		6010C	TCLP
Lead	100		0.50		mg/L	10		6010C	TCLP
Flashpoint	>200		1.00		Degrees F	1		1010	Total/NA
pH	3.8	HF	0.1		SU	1		9045C	Total/NA
Free Liquid	CNF		0.10		NONE	1		9095A	Total/NA

Client Sample ID: FR34-WC-008 — Lab Sample ID: 240-125349-8

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Acenaphthene	240000		5400		ug/Kg	50	☼	8270D	Total/NA
Acenaphthylene	23000		5400		ug/Kg	50	☼	8270D	Total/NA
Anthracene	190000		5400		ug/Kg	50	☼	8270D	Total/NA
Benzo[a]pyrene	290000		5400		ug/Kg	50	☼	8270D	Total/NA
Benzo[g,h,i]perylene	140000		5400		ug/Kg	50	☼	8270D	Total/NA
Benzo[k]fluoranthene	290000		5400		ug/Kg	50	☼	8270D	Total/NA
Carbazole	140000		18000		ug/Kg	50	☼	8270D	Total/NA
Dibenz(a,h)anthracene	48000		5400		ug/Kg	50	☼	8270D	Total/NA
Dibenzofuran	96000		18000		ug/Kg	50	☼	8270D	Total/NA
Fluorene	260000		5400		ug/Kg	50	☼	8270D	Total/NA
Indeno[1,2,3-cd]pyrene	150000		5400		ug/Kg	50	☼	8270D	Total/NA
Benzo[a]anthracene - RA	690000		54000		ug/Kg	500	☼	8270D	Total/NA
Benzo[b]fluoranthene - RA	900000		54000		ug/Kg	500	☼	8270D	Total/NA
Chrysene - RA	1300000		54000		ug/Kg	500	☼	8270D	Total/NA
Fluoranthene - RA	4100000		54000		ug/Kg	500	☼	8270D	Total/NA
Phenanthrene - RA	2700000		54000		ug/Kg	500	☼	8270D	Total/NA
Pyrene - RA	3200000		54000		ug/Kg	500	☼	8270D	Total/NA
Arsenic	6.2		1.8		mg/Kg	1	☼	6010C	Total/NA
Nickel	4.8		4.8		mg/Kg	1	☼	6010C	Total/NA
Lead	5300		6.0		mg/Kg	5	☼	6010C	Total/NA
Arsenic	0.32		0.050		mg/L	1		6010C	TCLP
Nickel	0.041		0.040		mg/L	1		6010C	TCLP
Lead	28		0.050		mg/L	1		6010C	TCLP
Antimony	0.47		0.30		mg/L	1		6010C	TCLP
Flashpoint	>200		1.00		Degrees F	1		1010	Total/NA
Sulfide	150		38		mg/Kg	1	☼	9034	Total/NA
pH	6.4	HF	0.1		SU	1		9045C	Total/NA
Free Liquid	CNF		0.10		NONE	1		9095A	Total/NA

This Detection Summary does not include radiochemical test results.

Client Sample Results

Client: Leidos, Inc.
Project/Site: NASA PBS Waste - FR3 + 4

Job ID: 240-125349-1

Client Sample ID: FR34-WC-001

Date Collected: 01/23/20 10:30
Date Received: 01/24/20 10:40

Lab Sample ID: 240-125349-1

Matrix: Solid
Percent Solids: 81.0

Method: 8260B - Volatile Organic Compounds (GC/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
1,1,1,2-Tetrachloroethane	<5.8		5.8		ug/Kg	☼	01/28/20 12:56	01/28/20 18:24	1
1,1,1-Trichloroethane	<5.8		5.8		ug/Kg	☼	01/28/20 12:56	01/28/20 18:24	1
1,1,2,2-Tetrachloroethane	<5.8		5.8		ug/Kg	☼	01/28/20 12:56	01/28/20 18:24	1
1,1,2-Trichloro-1,2,2-trichfluoroethane	<5.8		5.8		ug/Kg	☼	01/28/20 12:56	01/28/20 18:24	1
1,1,2-Trichloroethane	<5.8		5.8		ug/Kg	☼	01/28/20 12:56	01/28/20 18:24	1
1,1-Dichloroethane	<5.8		5.8		ug/Kg	☼	01/28/20 12:56	01/28/20 18:24	1
1,1-Dichloroethene	<5.8		5.8		ug/Kg	☼	01/28/20 12:56	01/28/20 18:24	1
1,1-Dichloropropene	<5.8		5.8		ug/Kg	☼	01/28/20 12:56	01/28/20 18:24	1
1,2,3-Trichlorobenzene	<5.8		5.8		ug/Kg	☼	01/28/20 12:56	01/28/20 18:24	1
1,2,3-Trichloropropane	<5.8		5.8		ug/Kg	☼	01/28/20 12:56	01/28/20 18:24	1
1,2,4-Trimethylbenzene	<5.8		5.8		ug/Kg	☼	01/28/20 12:56	01/28/20 18:24	1
1,2-Dibromo-3-Chloropropane	<12		12		ug/Kg	☼	01/28/20 12:56	01/28/20 18:24	1
1,2-Dichlorobenzene	<5.8		5.8		ug/Kg	☼	01/28/20 12:56	01/28/20 18:24	1
1,2-Dichloroethane	<5.8		5.8		ug/Kg	☼	01/28/20 12:56	01/28/20 18:24	1
1,2-Dichloropropane	<5.8		5.8		ug/Kg	☼	01/28/20 12:56	01/28/20 18:24	1
2-Nitropropane	<12		12		ug/Kg	☼	01/28/20 12:56	01/28/20 18:24	1
2,2-Dichloropropane	<5.8		5.8		ug/Kg	☼	01/28/20 12:56	01/28/20 18:24	1
2-Chlorotoluene	<5.8		5.8		ug/Kg	☼	01/28/20 12:56	01/28/20 18:24	1
2-Hexanone	<23		23		ug/Kg	☼	01/28/20 12:56	01/28/20 18:24	1
Bromobenzene	<5.8		5.8		ug/Kg	☼	01/28/20 12:56	01/28/20 18:24	1
Chlorobromomethane	<5.8		5.8		ug/Kg	☼	01/28/20 12:56	01/28/20 18:24	1
4-Chlorotoluene	<5.8		5.8		ug/Kg	☼	01/28/20 12:56	01/28/20 18:24	1
4-Isopropyltoluene	<5.8		5.8		ug/Kg	☼	01/28/20 12:56	01/28/20 18:24	1
Acetone	<29		29		ug/Kg	☼	01/28/20 12:56	01/28/20 18:24	1
Benzene	<5.8		5.8		ug/Kg	☼	01/28/20 12:56	01/28/20 18:24	1
Bromoform	<5.8		5.8		ug/Kg	☼	01/28/20 12:56	01/28/20 18:24	1
Bromomethane	<5.8		5.8		ug/Kg	☼	01/28/20 12:56	01/28/20 18:24	1
Carbon disulfide	<5.8		5.8		ug/Kg	☼	01/28/20 12:56	01/28/20 18:24	1
Carbon tetrachloride	<5.8		5.8		ug/Kg	☼	01/28/20 12:56	01/28/20 18:24	1
Chlorobenzene	<5.8		5.8		ug/Kg	☼	01/28/20 12:56	01/28/20 18:24	1
Chloroethane	<5.8		5.8		ug/Kg	☼	01/28/20 12:56	01/28/20 18:24	1
Chloroform	<5.8		5.8		ug/Kg	☼	01/28/20 12:56	01/28/20 18:24	1
Chloromethane	<5.8		5.8		ug/Kg	☼	01/28/20 12:56	01/28/20 18:24	1
cis-1,2-Dichloroethene	<5.8		5.8		ug/Kg	☼	01/28/20 12:56	01/28/20 18:24	1
Ethyl acetate	<23		23		ug/Kg	☼	01/28/20 12:56	01/28/20 18:24	1
cis-1,3-Dichloropropene	<5.8		5.8		ug/Kg	☼	01/28/20 12:56	01/28/20 18:24	1
Cyclohexanone	<120		120		ug/Kg	☼	01/28/20 12:56	01/28/20 18:24	1
Dibromomethane	<5.8		5.8		ug/Kg	☼	01/28/20 12:56	01/28/20 18:24	1
Dichlorobromomethane	<5.8		5.8		ug/Kg	☼	01/28/20 12:56	01/28/20 18:24	1
Dichlorodifluoromethane	<5.8		5.8		ug/Kg	☼	01/28/20 12:56	01/28/20 18:24	1
Ethyl ether	<5.8		5.8		ug/Kg	☼	01/28/20 12:56	01/28/20 18:24	1
Ethylbenzene	<5.8		5.8		ug/Kg	☼	01/28/20 12:56	01/28/20 18:24	1
Ethylene Dibromide	<5.8		5.8		ug/Kg	☼	01/28/20 12:56	01/28/20 18:24	1
Isobutyl alcohol	<230		230		ug/Kg	☼	01/28/20 12:56	01/28/20 18:24	1
m-Xylene & p-Xylene	<12		12		ug/Kg	☼	01/28/20 12:56	01/28/20 18:24	1
n-Butylbenzene	<5.8		5.8		ug/Kg	☼	01/28/20 12:56	01/28/20 18:24	1
Isopropylbenzene	<5.8		5.8		ug/Kg	☼	01/28/20 12:56	01/28/20 18:24	1
N-Propylbenzene	<5.8		5.8		ug/Kg	☼	01/28/20 12:56	01/28/20 18:24	1
2-Butanone (MEK)	<23		23		ug/Kg	☼	01/28/20 12:56	01/28/20 18:24	1

Client Sample Results

Client: Leidos, Inc.
Project/Site: NASA PBS Waste - FR3 + 4

Job ID: 240-125349-1

Client Sample ID: FR34-WC-001

Date Collected: 01/23/20 10:30
Date Received: 01/24/20 10:40

Lab Sample ID: 240-125349-1

Matrix: Solid
Percent Solids: 81.0

Method: 8260B - Volatile Organic Compounds (GC/MS) (Continued)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
4-Methyl-2-pentanone (MIBK)	<23		23		ug/Kg	☼	01/28/20 12:56	01/28/20 18:24	1
sec-Butylbenzene	<5.8		5.8		ug/Kg	☼	01/28/20 12:56	01/28/20 18:24	1
Methyl tert-butyl ether	<5.8		5.8		ug/Kg	☼	01/28/20 12:56	01/28/20 18:24	1
Methylene Chloride	<29		29		ug/Kg	☼	01/28/20 12:56	01/28/20 18:24	1
n-Butanol	<1200		1200		ug/Kg	☼	01/28/20 12:56	01/28/20 18:24	1
o-Xylene	<5.8		5.8		ug/Kg	☼	01/28/20 12:56	01/28/20 18:24	1
Styrene	<5.8		5.8		ug/Kg	☼	01/28/20 12:56	01/28/20 18:24	1
tert-Butylbenzene	<5.8		5.8		ug/Kg	☼	01/28/20 12:56	01/28/20 18:24	1
Tetrachloroethene	<5.8		5.8		ug/Kg	☼	01/28/20 12:56	01/28/20 18:24	1
Toluene	<5.8		5.8		ug/Kg	☼	01/28/20 12:56	01/28/20 18:24	1
trans-1,2-Dichloroethene	<5.8		5.8		ug/Kg	☼	01/28/20 12:56	01/28/20 18:24	1
trans-1,3-Dichloropropene	<5.8		5.8		ug/Kg	☼	01/28/20 12:56	01/28/20 18:24	1
Trichloroethene	<5.8		5.8		ug/Kg	☼	01/28/20 12:56	01/28/20 18:24	1
Trichlorofluoromethane	<5.8		5.8		ug/Kg	☼	01/28/20 12:56	01/28/20 18:24	1
Vinyl chloride	<5.8		5.8		ug/Kg	☼	01/28/20 12:56	01/28/20 18:24	1
Xylenes, Total	<12		12		ug/Kg	☼	01/28/20 12:56	01/28/20 18:24	1
Chlorodibromomethane	<5.8		5.8		ug/Kg	☼	01/28/20 12:56	01/28/20 18:24	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
1,2-Dichloroethane-d4 (Surr)	*102*		*59 - 120*	*01/28/20 12:56*	*01/28/20 18:24*	*1*
4-Bromofluorobenzene (Surr)	*105*		*51 - 127*	*01/28/20 12:56*	*01/28/20 18:24*	*1*
Toluene-d8 (Surr)	*110*		*64 - 124*	*01/28/20 12:56*	*01/28/20 18:24*	*1*
Dibromofluoromethane (Surr)	*91*		*56 - 122*	*01/28/20 12:56*	*01/28/20 18:24*	*1*

Method: 8260B - Volatile Organic Compounds (GC/MS) - TCLP

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
1,1-Dichloroethene	<0.025		0.025		mg/L			01/28/20 20:32	1
1,2-Dichloroethane	<0.025		0.025		mg/L			01/28/20 20:32	1
2-Butanone (MEK)	<0.25		0.25		mg/L			01/28/20 20:32	1
Benzene	<0.025		0.025		mg/L			01/28/20 20:32	1
Carbon tetrachloride	<0.025		0.025		mg/L			01/28/20 20:32	1
Chlorobenzene	<0.025		0.025		mg/L			01/28/20 20:32	1
Chloroform	<0.025		0.025		mg/L			01/28/20 20:32	1
Tetrachloroethene	<0.025		0.025		mg/L			01/28/20 20:32	1
Trichloroethene	<0.025		0.025		mg/L			01/28/20 20:32	1
Vinyl chloride	<0.025		0.025		mg/L			01/28/20 20:32	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
1,2-Dichloroethane-d4 (Surr)	*87*		*74 - 124*		*01/28/20 20:32*	*1*
4-Bromofluorobenzene (Surr)	*92*		*77 - 120*		*01/28/20 20:32*	*1*
Toluene-d8 (Surr)	*94*		*80 - 120*		*01/28/20 20:32*	*1*
Dibromofluoromethane (Surr)	*97*		*80 - 120*		*01/28/20 20:32*	*1*

Method: 8270C - Semivolatile Organic Compounds (GC/MS) - TCLP

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
1,4-Dichlorobenzene	<0.0040		0.0040		mg/L		01/28/20 10:40	01/30/20 10:08	1
2,4,5-Trichlorophenol	<0.0040		0.0040		mg/L		01/28/20 10:40	01/30/20 10:08	1
2,4,6-Trichlorophenol	<0.0040		0.0040		mg/L		01/28/20 10:40	01/30/20 10:08	1
2,4-Dinitrotoluene	<0.0040		0.0040		mg/L		01/28/20 10:40	01/30/20 10:08	1
Hexachlorobenzene	<0.00080		0.00080		mg/L		01/28/20 10:40	01/30/20 10:08	1

Client Sample Results

Client: Leidos, Inc.
Project/Site: NASA PBS Waste - FR3 + 4

Job ID: 240-125349-1

Client Sample ID: FR34-WC-001

Date Collected: 01/23/20 10:30
Date Received: 01/24/20 10:40

Lab Sample ID: 240-125349-1

Matrix: Solid
Percent Solids: 81.0

Method: 8270C - Semivolatile Organic Compounds (GC/MS) - TCLP (Continued)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Hexachlorobutadiene	<0.0040		0.0040		mg/L		01/28/20 10:40	01/30/20 10:08	1
Hexachloroethane	<0.0040		0.0040		mg/L		01/28/20 10:40	01/30/20 10:08	1
3 & 4 Methylphenol	<0.0040		0.0040		mg/L		01/28/20 10:40	01/30/20 10:08	1
2-Methylphenol	<0.0040		0.0040		mg/L		01/28/20 10:40	01/30/20 10:08	1
Nitrobenzene	<0.0040		0.0040		mg/L		01/28/20 10:40	01/30/20 10:08	1
Pentachlorophenol	<0.016		0.016		mg/L		01/28/20 10:40	01/30/20 10:08	1
Pyridine	<0.0040		0.0040		mg/L		01/28/20 10:40	01/30/20 10:08	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
2-Fluorobiphenyl (Surr)	*84*		*39 - 120*	*01/28/20 10:40*	*01/30/20 10:08*	*1*
2-Fluorophenol (Surr)	*75*		*10 - 120*	*01/28/20 10:40*	*01/30/20 10:08*	*1*
2,4,6-Tribromophenol (Surr)	*100*		*33 - 120*	*01/28/20 10:40*	*01/30/20 10:08*	*1*
Nitrobenzene-d5 (Surr)	*84*		*33 - 120*	*01/28/20 10:40*	*01/30/20 10:08*	*1*
Phenol-d5 (Surr)	*60*		*10 - 120*	*01/28/20 10:40*	*01/30/20 10:08*	*1*
Terphenyl-d14 (Surr)	*96*		*36 - 122*	*01/28/20 10:40*	*01/30/20 10:08*	*1*

Method: 8270D - Semivolatile Organic Compounds (GC/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Acenaphthene	<75		75		ug/Kg	☼	01/28/20 09:56	02/05/20 18:55	4
Acenaphthylene	<75		75		ug/Kg	☼	01/28/20 09:56	02/05/20 18:55	4
Anthracene	<75		75		ug/Kg	☼	01/28/20 09:56	02/05/20 18:55	4
Benzo[a]anthracene	**110**		75		ug/Kg	☼	01/28/20 09:56	02/05/20 18:55	4
Benzo[a]pyrene	**100**		75		ug/Kg	☼	01/28/20 09:56	02/05/20 18:55	4
Benzo[b]fluoranthene	**190**		75		ug/Kg	☼	01/28/20 09:56	02/05/20 18:55	4
Benzo[g,h,i]perylene	<75		75		ug/Kg	☼	01/28/20 09:56	02/05/20 18:55	4
Benzoic acid	<3500		3500		ug/Kg	☼	01/28/20 09:56	02/05/20 18:55	4
Benzo[k]fluoranthene	<75		75		ug/Kg	☼	01/28/20 09:56	02/05/20 18:55	4
Benzyl alcohol	<1700		1700		ug/Kg	☼	01/28/20 09:56	02/05/20 18:55	4
Bis(2-chloroethoxy)methane	<500		500		ug/Kg	☼	01/28/20 09:56	02/05/20 18:55	4
Bis(2-chloroethyl)ether	<500		500		ug/Kg	☼	01/28/20 09:56	02/05/20 18:55	4
bis (2-chloroisopropyl) ether	<500		500		ug/Kg	☼	01/28/20 09:56	02/05/20 18:55	4
Bis(2-ethylhexyl) phthalate	<350		350		ug/Kg	☼	01/28/20 09:56	02/05/20 18:55	4
4-Bromophenyl phenyl ether	<250		250		ug/Kg	☼	01/28/20 09:56	02/05/20 18:55	4
Butyl benzyl phthalate	<350		350		ug/Kg	☼	01/28/20 09:56	02/05/20 18:55	4
Carbazole	<250		250		ug/Kg	☼	01/28/20 09:56	02/05/20 18:55	4
4-Chloroaniline	<750		750		ug/Kg	☼	01/28/20 09:56	02/05/20 18:55	4
4-Chloro-3-methylphenol	<750		750		ug/Kg	☼	01/28/20 09:56	02/05/20 18:55	4
2-Chloronaphthalene	<250		250		ug/Kg	☼	01/28/20 09:56	02/05/20 18:55	4
2-Chlorophenol	<250		250		ug/Kg	☼	01/28/20 09:56	02/05/20 18:55	4
4-Chlorophenyl phenyl ether	<250		250		ug/Kg	☼	01/28/20 09:56	02/05/20 18:55	4
Chrysene	**170**		75		ug/Kg	☼	01/28/20 09:56	02/05/20 18:55	4
Dibenz(a,h)anthracene	<75		75		ug/Kg	☼	01/28/20 09:56	02/05/20 18:55	4
Dibenzofuran	<250		250		ug/Kg	☼	01/28/20 09:56	02/05/20 18:55	4
1,3-Dichlorobenzene	<250		250		ug/Kg	☼	01/28/20 09:56	02/05/20 18:55	4
1,4-Dichlorobenzene	<250		250		ug/Kg	☼	01/28/20 09:56	02/05/20 18:55	4
3,3'-Dichlorobenzidine	<500	F1	500		ug/Kg	☼	01/28/20 09:56	02/05/20 18:55	4
2,4-Dichlorophenol	<750		750		ug/Kg	☼	01/28/20 09:56	02/05/20 18:55	4
Diethyl phthalate	<350		350		ug/Kg	☼	01/28/20 09:56	02/05/20 18:55	4
2,4-Dimethylphenol	<750		750		ug/Kg	☼	01/28/20 09:56	02/05/20 18:55	4
Dimethyl phthalate	<350		350		ug/Kg	☼	01/28/20 09:56	02/05/20 18:55	4

Client Sample ID: FR34-WC-001

Date Collected: 01/23/20 10:30
Date Received: 01/24/20 10:40

Lab Sample ID: 240-125349-1

Matrix: Solid
Percent Solids: 81.0

Method: 8270D - Semivolatile Organic Compounds (GC/MS) (Continued)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Di-n-butyl phthalate	<350		350		ug/Kg	☼	01/28/20 09:56	02/05/20 18:55	4
4,6-Dinitro-2-methylphenol	<1700	F1	1700		ug/Kg	☼	01/28/20 09:56	02/05/20 18:55	4
2,4-Dinitrophenol	<1700	F1	1700		ug/Kg	☼	01/28/20 09:56	02/05/20 18:55	4
2,4-Dinitrotoluene	<1000		1000		ug/Kg	☼	01/28/20 09:56	02/05/20 18:55	4
2,6-Dinitrotoluene	<1000		1000		ug/Kg	☼	01/28/20 09:56	02/05/20 18:55	4
Di-n-octyl phthalate	<350		350		ug/Kg	☼	01/28/20 09:56	02/05/20 18:55	4
Fluoranthene	**220**		75		ug/Kg	☼	01/28/20 09:56	02/05/20 18:55	4
Fluorene	<75		75		ug/Kg	☼	01/28/20 09:56	02/05/20 18:55	4
Hexachlorobenzene	<75		75		ug/Kg	☼	01/28/20 09:56	02/05/20 18:55	4
Hexachlorobutadiene	<250		250		ug/Kg	☼	01/28/20 09:56	02/05/20 18:55	4
Hexachlorocyclopentadiene	<1700	F1	1700		ug/Kg	☼	01/28/20 09:56	02/05/20 18:55	4
Hexachloroethane	<250		250		ug/Kg	☼	01/28/20 09:56	02/05/20 18:55	4
Indeno[1,2,3-cd]pyrene	<75		75		ug/Kg	☼	01/28/20 09:56	02/05/20 18:55	4
Isophorone	<250		250		ug/Kg	☼	01/28/20 09:56	02/05/20 18:55	4
2-Methylnaphthalene	**300**		75		ug/Kg	☼	01/28/20 09:56	02/05/20 18:55	4
2-Methylphenol	<1000		1000		ug/Kg	☼	01/28/20 09:56	02/05/20 18:55	4
3 & 4 Methylphenol	<2000		2000		ug/Kg	☼	01/28/20 09:56	02/05/20 18:55	4
Naphthalene	**97**		75		ug/Kg	☼	01/28/20 09:56	02/05/20 18:55	4
2-Nitroaniline	<1000		1000		ug/Kg	☼	01/28/20 09:56	02/05/20 18:55	4
3-Nitroaniline	<1000		1000		ug/Kg	☼	01/28/20 09:56	02/05/20 18:55	4
4-Nitroaniline	<1000	F1	1000		ug/Kg	☼	01/28/20 09:56	02/05/20 18:55	4
Nitrobenzene	<500		500		ug/Kg	☼	01/28/20 09:56	02/05/20 18:55	4
2-Nitrophenol	<250		250		ug/Kg	☼	01/28/20 09:56	02/05/20 18:55	4
4-Nitrophenol	<1700		1700		ug/Kg	☼	01/28/20 09:56	02/05/20 18:55	4
N-Nitrosodi-n-propylamine	<250		250		ug/Kg	☼	01/28/20 09:56	02/05/20 18:55	4
N-Nitrosodiphenylamine	<250		250		ug/Kg	☼	01/28/20 09:56	02/05/20 18:55	4
Pentachlorophenol	<750		750		ug/Kg	☼	01/28/20 09:56	02/05/20 18:55	4
Phenanthrene	**240**		75		ug/Kg	☼	01/28/20 09:56	02/05/20 18:55	4
Phenol	<250		250		ug/Kg	☼	01/28/20 09:56	02/05/20 18:55	4
Pyrene	**180**		75		ug/Kg	☼	01/28/20 09:56	02/05/20 18:55	4
Pyridine	<750		750		ug/Kg	☼	01/28/20 09:56	02/05/20 18:55	4
1,2,4-Trichlorobenzene	<250		250		ug/Kg	☼	01/28/20 09:56	02/05/20 18:55	4
2,4,5-Trichlorophenol	<750		750		ug/Kg	☼	01/28/20 09:56	02/05/20 18:55	4
2,4,6-Trichlorophenol	<750		750		ug/Kg	☼	01/28/20 09:56	02/05/20 18:55	4

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
2-Fluorobiphenyl (Surr)	*66*		*35 - 120*	*01/28/20 09:56*	*02/05/20 18:55*	*4*
2-Fluorophenol (Surr)	*58*		*26 - 120*	*01/28/20 09:56*	*02/05/20 18:55*	*4*
Nitrobenzene-d5 (Surr)	*60*		*28 - 120*	*01/28/20 09:56*	*02/05/20 18:55*	*4*
Phenol-d5 (Surr)	*71*		*28 - 120*	*01/28/20 09:56*	*02/05/20 18:55*	*4*
Terphenyl-d14 (Surr)	*71*		*39 - 120*	*01/28/20 09:56*	*02/05/20 18:55*	*4*
2,4,6-Tribromophenol (Surr)	*67*		*10 - 120*	*01/28/20 09:56*	*02/05/20 18:55*	*4*

Method: 8015B - Nonhalogenated Organic Compounds - Direct Injection (GC) - Soluble

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
2-Ethoxyethanol	<6.2		6.2		mg/Kg	☼		01/27/20 11:51	1
Methanol	<6.2		6.2		mg/Kg	☼		01/27/20 12:29	1

Client Sample Results

Client: Leidos, Inc.
Project/Site: NASA PBS Waste - FR3 + 4

Job ID: 240-125349-1

Client Sample ID: FR34-WC-001

Date Collected: 01/23/20 10:30
Date Received: 01/24/20 10:40

Lab Sample ID: 240-125349-1

Matrix: Solid
Percent Solids: 81.0

Method: 8081A - Organochlorine Pesticides (GC) - TCLP

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chlordane (technical)	<0.0050		0.0050		mg/L		01/28/20 10:42	02/03/20 12:36	1
Endrin	<0.00050		0.00050		mg/L		01/28/20 10:42	02/03/20 12:36	1
Heptachlor	<0.00050		0.00050		mg/L		01/28/20 10:42	02/03/20 12:36	1
Heptachlor epoxide	<0.00050		0.00050		mg/L		01/28/20 10:42	02/03/20 12:36	1
gamma-BHC (Lindane)	<0.00050		0.00050		mg/L		01/28/20 10:42	02/03/20 12:36	1
Methoxychlor	<0.0010		0.0010		mg/L		01/28/20 10:42	02/03/20 12:36	1
Toxaphene	<0.020		0.020		mg/L		01/28/20 10:42	02/03/20 12:36	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Tetrachloro-m-xylene	*65*		*33 - 123*	*01/28/20 10:42*	*02/03/20 12:36*	*1*
Tetrachloro-m-xylene	*62*		*33 - 123*	*01/28/20 10:42*	*02/03/20 12:36*	*1*
DCB Decachlorobiphenyl	*72*		*21 - 135*	*01/28/20 10:42*	*02/03/20 12:36*	*1*
DCB Decachlorobiphenyl	*64*		*21 - 135*	*01/28/20 10:42*	*02/03/20 12:36*	*1*

Method: 8082 - Polychlorinated Biphenyls (PCBs) by Gas Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Aroclor-1016	<20		20		ug/Kg	☼	01/27/20 09:29	01/29/20 09:11	1
Aroclor-1221	<20		20		ug/Kg	☼	01/27/20 09:29	01/29/20 09:11	1
Aroclor-1232	<20		20		ug/Kg	☼	01/27/20 09:29	01/29/20 09:11	1
Aroclor-1242	<20		20		ug/Kg	☼	01/27/20 09:29	01/29/20 09:11	1
Aroclor-1248	<20		20		ug/Kg	☼	01/27/20 09:29	01/29/20 09:11	1
Aroclor-1254	<20		20		ug/Kg	☼	01/27/20 09:29	01/29/20 09:11	1
Aroclor-1260	<20	F2	20		ug/Kg	☼	01/27/20 09:29	01/29/20 09:11	1
Aroclor-1262	<20		20		ug/Kg	☼	01/27/20 09:29	01/29/20 09:11	1
Aroclor-1268	<20		20		ug/Kg	☼	01/27/20 09:29	01/29/20 09:11	1
Polychlorinated biphenyls, Total	<20		20		ug/Kg	☼	01/27/20 09:29	01/29/20 09:11	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Tetrachloro-m-xylene	*80*		*14 - 128*	*01/27/20 09:29*	*01/29/20 09:11*	*1*
DCB Decachlorobiphenyl	*116*		*10 - 132*	*01/27/20 09:29*	*01/29/20 09:11*	*1*

Method: 8151A - Herbicides (GC) - TCLP

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
2,4-D	<0.040		0.040		mg/L		02/03/20 10:51	02/05/20 11:06	1
Silvex (2,4,5-TP)	<0.010		0.010		mg/L		02/03/20 10:51	02/05/20 11:06	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
2,4-Dichlorophenylacetic acid	*73*		*41 - 130*	*02/03/20 10:51*	*02/05/20 11:06*	*1*
2,4-Dichlorophenylacetic acid	*75*		*41 - 130*	*02/03/20 10:51*	*02/05/20 11:06*	*1*

Method: 6010C - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	**16**		1.7		mg/Kg	☼	01/27/20 14:00	01/28/20 18:50	1
Barium	**33**		23		mg/Kg	☼	01/27/20 14:00	01/28/20 18:50	1
Cadmium	<0.58		0.58		mg/Kg	☼	01/27/20 14:00	01/28/20 18:50	1
Chromium	**9.0**		1.2		mg/Kg	☼	01/27/20 14:00	01/28/20 18:50	1
Lead	**28**		1.2		mg/Kg	☼	01/27/20 14:00	01/28/20 18:50	1
Nickel	**32**		4.6		mg/Kg	☼	01/27/20 14:00	01/28/20 18:50	1
Selenium	<2.3		2.3		mg/Kg	☼	01/27/20 14:00	01/28/20 18:50	1
Silver	<1.2		1.2		mg/Kg	☼	01/27/20 14:00	01/28/20 18:50	1

Client Sample Results

Client: Leidos, Inc.
Project/Site: NASA PBS Waste - FR3 + 4

Job ID: 240-125349-1

Client Sample ID: FR34-WC-001

Date Collected: 01/23/20 10:30
Date Received: 01/24/20 10:40

Lab Sample ID: 240-125349-1

Matrix: Solid
Percent Solids: 81.0

Method: 6010C - Metals (ICP) - TCLP

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Silver	<0.050		0.050		mg/L		01/28/20 14:00	01/29/20 15:44	1
Arsenic	<0.050		0.050		mg/L		01/28/20 14:00	01/29/20 15:44	1
Barium	<0.50		0.50		mg/L		01/28/20 14:00	01/29/20 15:44	1
Cadmium	<0.050		0.050		mg/L		01/28/20 14:00	01/29/20 15:44	1
Chromium	<0.050		0.050		mg/L		01/28/20 14:00	01/29/20 15:44	1
Nickel	<0.040		0.040		mg/L		01/28/20 14:00	01/29/20 15:44	1
Lead	<0.050		0.050		mg/L		01/28/20 14:00	01/29/20 15:44	1
Selenium	<0.050		0.050		mg/L		01/28/20 14:00	01/29/20 15:44	1

Method: 7470A - Mercury (CVAA) - TCLP

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	<0.0020		0.0020		mg/L		01/28/20 12:00	01/29/20 13:25	1

Method: 7471B - Mercury (CVAA)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	<0.12		0.12		mg/Kg	☼	01/27/20 16:00	01/28/20 14:29	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Flashpoint	**>200**		1.00		Degrees F			01/28/20 07:42	1
Cyanide, Total	<0.59		0.59		mg/Kg	☼	01/29/20 09:55	01/29/20 13:29	1
Sulfide	<37		37		mg/Kg	☼	01/27/20 07:57	01/27/20 12:37	1
pH	**7.5**	**HF**	0.1		SU			01/27/20 15:37	1
Free Liquid	**CNF**		0.10		NONE			02/05/20 16:59	1
Percent Moisture	**19.0**		0.1		%			01/27/20 17:38	1

Client Sample Results

Client: Leidos, Inc.
Project/Site: NASA PBS Waste - FR3 + 4

Job ID: 240-125349-1

Client Sample ID: FR34-WC-002

Date Collected: 01/23/20 12:00
Date Received: 01/24/20 10:40

Lab Sample ID: 240-125349-2

Matrix: Solid
Percent Solids: 78.8

Method: 8260B - Volatile Organic Compounds (GC/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
1,1,1,2-Tetrachloroethane	<5.4		5.4		ug/Kg	☼	01/28/20 12:56	01/28/20 18:50	1
1,1,1-Trichloroethane	<5.4		5.4		ug/Kg	☼	01/28/20 12:56	01/28/20 18:50	1
1,1,2,2-Tetrachloroethane	<5.4		5.4		ug/Kg	☼	01/28/20 12:56	01/28/20 18:50	1
1,1,2-Trichloro-1,2,2-trichfluoroethane	<5.4		5.4		ug/Kg	☼	01/28/20 12:56	01/28/20 18:50	1
1,1,2-Trichloroethane	<5.4		5.4		ug/Kg	☼	01/28/20 12:56	01/28/20 18:50	1
1,1-Dichloroethane	<5.4		5.4		ug/Kg	☼	01/28/20 12:56	01/28/20 18:50	1
1,1-Dichloroethene	<5.4		5.4		ug/Kg	☼	01/28/20 12:56	01/28/20 18:50	1
1,1-Dichloropropene	<5.4		5.4		ug/Kg	☼	01/28/20 12:56	01/28/20 18:50	1
1,2,3-Trichlorobenzene	<5.4		5.4		ug/Kg	☼	01/28/20 12:56	01/28/20 18:50	1
1,2,3-Trichloropropane	<5.4		5.4		ug/Kg	☼	01/28/20 12:56	01/28/20 18:50	1
1,2,4-Trimethylbenzene	<5.4		5.4		ug/Kg	☼	01/28/20 12:56	01/28/20 18:50	1
1,2-Dibromo-3-Chloropropane	<11		11		ug/Kg	☼	01/28/20 12:56	01/28/20 18:50	1
1,2-Dichlorobenzene	<5.4		5.4		ug/Kg	☼	01/28/20 12:56	01/28/20 18:50	1
1,2-Dichloroethane	<5.4		5.4		ug/Kg	☼	01/28/20 12:56	01/28/20 18:50	1
1,2-Dichloropropane	<5.4		5.4		ug/Kg	☼	01/28/20 12:56	01/28/20 18:50	1
2-Nitropropane	<11		11		ug/Kg	☼	01/28/20 12:56	01/28/20 18:50	1
2,2-Dichloropropane	<5.4		5.4		ug/Kg	☼	01/28/20 12:56	01/28/20 18:50	1
2-Chlorotoluene	<5.4		5.4		ug/Kg	☼	01/28/20 12:56	01/28/20 18:50	1
2-Hexanone	<22		22		ug/Kg	☼	01/28/20 12:56	01/28/20 18:50	1
Bromobenzene	<5.4		5.4		ug/Kg	☼	01/28/20 12:56	01/28/20 18:50	1
Chlorobromomethane	<5.4		5.4		ug/Kg	☼	01/28/20 12:56	01/28/20 18:50	1
4-Chlorotoluene	<5.4		5.4		ug/Kg	☼	01/28/20 12:56	01/28/20 18:50	1
4-Isopropyltoluene	<5.4		5.4		ug/Kg	☼	01/28/20 12:56	01/28/20 18:50	1
Acetone	<27		27		ug/Kg	☼	01/28/20 12:56	01/28/20 18:50	1
Benzene	<5.4		5.4		ug/Kg	☼	01/28/20 12:56	01/28/20 18:50	1
Bromoform	<5.4		5.4		ug/Kg	☼	01/28/20 12:56	01/28/20 18:50	1
Bromomethane	<5.4		5.4		ug/Kg	☼	01/28/20 12:56	01/28/20 18:50	1
Carbon disulfide	<5.4		5.4		ug/Kg	☼	01/28/20 12:56	01/28/20 18:50	1
Carbon tetrachloride	<5.4		5.4		ug/Kg	☼	01/28/20 12:56	01/28/20 18:50	1
Chlorobenzene	<5.4		5.4		ug/Kg	☼	01/28/20 12:56	01/28/20 18:50	1
Chloroethane	<5.4		5.4		ug/Kg	☼	01/28/20 12:56	01/28/20 18:50	1
Chloroform	<5.4		5.4		ug/Kg	☼	01/28/20 12:56	01/28/20 18:50	1
Chloromethane	<5.4		5.4		ug/Kg	☼	01/28/20 12:56	01/28/20 18:50	1
cis-1,2-Dichloroethene	<5.4		5.4		ug/Kg	☼	01/28/20 12:56	01/28/20 18:50	1
Ethyl acetate	<22		22		ug/Kg	☼	01/28/20 12:56	01/28/20 18:50	1
cis-1,3-Dichloropropene	<5.4		5.4		ug/Kg	☼	01/28/20 12:56	01/28/20 18:50	1
Cyclohexanone	<110		110		ug/Kg	☼	01/28/20 12:56	01/28/20 18:50	1
Dibromomethane	<5.4		5.4		ug/Kg	☼	01/28/20 12:56	01/28/20 18:50	1
Dichlorobromomethane	<5.4		5.4		ug/Kg	☼	01/28/20 12:56	01/28/20 18:50	1
Dichlorodifluoromethane	<5.4		5.4		ug/Kg	☼	01/28/20 12:56	01/28/20 18:50	1
Ethyl ether	<5.4		5.4		ug/Kg	☼	01/28/20 12:56	01/28/20 18:50	1
Ethylbenzene	<5.4		5.4		ug/Kg	☼	01/28/20 12:56	01/28/20 18:50	1
Ethylene Dibromide	<5.4		5.4		ug/Kg	☼	01/28/20 12:56	01/28/20 18:50	1
Isobutyl alcohol	<220		220		ug/Kg	☼	01/28/20 12:56	01/28/20 18:50	1
m-Xylene & p-Xylene	<11		11		ug/Kg	☼	01/28/20 12:56	01/28/20 18:50	1
n-Butylbenzene	<5.4		5.4		ug/Kg	☼	01/28/20 12:56	01/28/20 18:50	1
Isopropylbenzene	<5.4		5.4		ug/Kg	☼	01/28/20 12:56	01/28/20 18:50	1
N-Propylbenzene	<5.4		5.4		ug/Kg	☼	01/28/20 12:56	01/28/20 18:50	1
2-Butanone (MEK)	<22		22		ug/Kg	☼	01/28/20 12:56	01/28/20 18:50	1

Client Sample ID: FR34-WC-002

Date Collected: 01/23/20 12:00
Date Received: 01/24/20 10:40

Lab Sample ID: 240-125349-2

Matrix: Solid
Percent Solids: 78.8

Method: 8260B - Volatile Organic Compounds (GC/MS) (Continued)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
4-Methyl-2-pentanone (MIBK)	<22		22		ug/Kg	☼	01/28/20 12:56	01/28/20 18:50	1
sec-Butylbenzene	<5.4		5.4		ug/Kg	☼	01/28/20 12:56	01/28/20 18:50	1
Methyl tert-butyl ether	<5.4		5.4		ug/Kg	☼	01/28/20 12:56	01/28/20 18:50	1
Methylene Chloride	<27		27		ug/Kg	☼	01/28/20 12:56	01/28/20 18:50	1
n-Butanol	<1100		1100		ug/Kg	☼	01/28/20 12:56	01/28/20 18:50	1
o-Xylene	<5.4		5.4		ug/Kg	☼	01/28/20 12:56	01/28/20 18:50	1
Styrene	<5.4		5.4		ug/Kg	☼	01/28/20 12:56	01/28/20 18:50	1
tert-Butylbenzene	<5.4		5.4		ug/Kg	☼	01/28/20 12:56	01/28/20 18:50	1
Tetrachloroethene	<5.4		5.4		ug/Kg	☼	01/28/20 12:56	01/28/20 18:50	1
Toluene	<5.4		5.4		ug/Kg	☼	01/28/20 12:56	01/28/20 18:50	1
trans-1,2-Dichloroethene	<5.4		5.4		ug/Kg	☼	01/28/20 12:56	01/28/20 18:50	1
trans-1,3-Dichloropropene	<5.4		5.4		ug/Kg	☼	01/28/20 12:56	01/28/20 18:50	1
Trichloroethene	<5.4		5.4		ug/Kg	☼	01/28/20 12:56	01/28/20 18:50	1
Trichlorofluoromethane	<5.4		5.4		ug/Kg	☼	01/28/20 12:56	01/28/20 18:50	1
Vinyl chloride	<5.4		5.4		ug/Kg	☼	01/28/20 12:56	01/28/20 18:50	1
Xylenes, Total	<11		11		ug/Kg	☼	01/28/20 12:56	01/28/20 18:50	1
Chlorodibromomethane	<5.4		5.4		ug/Kg	☼	01/28/20 12:56	01/28/20 18:50	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
1,2-Dichloroethane-d4 (Surr)	*110*		*59 - 120*	*01/28/20 12:56*	*01/28/20 18:50*	*1*
4-Bromofluorobenzene (Surr)	*95*		*51 - 127*	*01/28/20 12:56*	*01/28/20 18:50*	*1*
Toluene-d8 (Surr)	*100*		*64 - 124*	*01/28/20 12:56*	*01/28/20 18:50*	*1*
Dibromofluoromethane (Surr)	*96*		*56 - 122*	*01/28/20 12:56*	*01/28/20 18:50*	*1*

Method: 8260B - Volatile Organic Compounds (GC/MS) - TCLP

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
1,1-Dichloroethene	<0.025		0.025		mg/L			01/28/20 20:54	1
1,2-Dichloroethane	<0.025		0.025		mg/L			01/28/20 20:54	1
2-Butanone (MEK)	<0.25		0.25		mg/L			01/28/20 20:54	1
Benzene	<0.025		0.025		mg/L			01/28/20 20:54	1
Carbon tetrachloride	<0.025		0.025		mg/L			01/28/20 20:54	1
Chlorobenzene	<0.025		0.025		mg/L			01/28/20 20:54	1
Chloroform	<0.025		0.025		mg/L			01/28/20 20:54	1
Tetrachloroethene	<0.025		0.025		mg/L			01/28/20 20:54	1
Trichloroethene	<0.025		0.025		mg/L			01/28/20 20:54	1
Vinyl chloride	<0.025		0.025		mg/L			01/28/20 20:54	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
1,2-Dichloroethane-d4 (Surr)	*87*		*74 - 124*		*01/28/20 20:54*	*1*
4-Bromofluorobenzene (Surr)	*95*		*77 - 120*		*01/28/20 20:54*	*1*
Toluene-d8 (Surr)	*95*		*80 - 120*		*01/28/20 20:54*	*1*
Dibromofluoromethane (Surr)	*98*		*80 - 120*		*01/28/20 20:54*	*1*

Method: 8270C - Semivolatile Organic Compounds (GC/MS) - TCLP

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
1,4-Dichlorobenzene	<0.0040		0.0040		mg/L		01/28/20 10:40	01/30/20 10:32	1
2,4,5-Trichlorophenol	<0.0040		0.0040		mg/L		01/28/20 10:40	01/30/20 10:32	1
2,4,6-Trichlorophenol	<0.0040		0.0040		mg/L		01/28/20 10:40	01/30/20 10:32	1
2,4-Dinitrotoluene	<0.0040		0.0040		mg/L		01/28/20 10:40	01/30/20 10:32	1
Hexachlorobenzene	<0.00080		0.00080		mg/L		01/28/20 10:40	01/30/20 10:32	1

Client Sample Results

Client: Leidos, Inc.
Project/Site: NASA PBS Waste - FR3 + 4

Job ID: 240-125349-1

Client Sample ID: FR34-WC-002

Date Collected: 01/23/20 12:00
Date Received: 01/24/20 10:40

Lab Sample ID: 240-125349-2

Matrix: Solid
Percent Solids: 78.8

Method: 8270C - Semivolatile Organic Compounds (GC/MS) - TCLP (Continued)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Hexachlorobutadiene	<0.0040		0.0040		mg/L		01/28/20 10:40	01/30/20 10:32	1
Hexachloroethane	<0.0040		0.0040		mg/L		01/28/20 10:40	01/30/20 10:32	1
3 & 4 Methylphenol	<0.0040		0.0040		mg/L		01/28/20 10:40	01/30/20 10:32	1
2-Methylphenol	<0.0040		0.0040		mg/L		01/28/20 10:40	01/30/20 10:32	1
Nitrobenzene	<0.0040		0.0040		mg/L		01/28/20 10:40	01/30/20 10:32	1
Pentachlorophenol	<0.016		0.016		mg/L		01/28/20 10:40	01/30/20 10:32	1
Pyridine	<0.0040		0.0040		mg/L		01/28/20 10:40	01/30/20 10:32	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
2-Fluorobiphenyl (Surr)	*79*		*39 - 120*	*01/28/20 10:40*	*01/30/20 10:32*	*1*
2-Fluorophenol (Surr)	*71*		*10 - 120*	*01/28/20 10:40*	*01/30/20 10:32*	*1*
2,4,6-Tribromophenol (Surr)	*90*		*33 - 120*	*01/28/20 10:40*	*01/30/20 10:32*	*1*
Nitrobenzene-d5 (Surr)	*77*		*33 - 120*	*01/28/20 10:40*	*01/30/20 10:32*	*1*
Phenol-d5 (Surr)	*59*		*10 - 120*	*01/28/20 10:40*	*01/30/20 10:32*	*1*
Terphenyl-d14 (Surr)	*89*		*36 - 122*	*01/28/20 10:40*	*01/30/20 10:32*	*1*

Method: 8270D - Semivolatile Organic Compounds (GC/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Acenaphthene	**5900**		190		ug/Kg	☼	01/28/20 09:56	02/05/20 15:19	10
Acenaphthylene	**5600**		190		ug/Kg	☼	01/28/20 09:56	02/05/20 15:19	10
Benzoic acid	<8900		8900		ug/Kg	☼	01/28/20 09:56	02/05/20 15:19	10
Benzyl alcohol	<4200		4200		ug/Kg	☼	01/28/20 09:56	02/05/20 15:19	10
Bis(2-chloroethoxy)methane	<1300		1300		ug/Kg	☼	01/28/20 09:56	02/05/20 15:19	10
Bis(2-chloroethyl)ether	<1300		1300		ug/Kg	☼	01/28/20 09:56	02/05/20 15:19	10
bis (2-chloroisopropyl) ether	<1300		1300		ug/Kg	☼	01/28/20 09:56	02/05/20 15:19	10
Bis(2-ethylhexyl) phthalate	<890		890		ug/Kg	☼	01/28/20 09:56	02/05/20 15:19	10
4-Bromophenyl phenyl ether	<640		640		ug/Kg	☼	01/28/20 09:56	02/05/20 15:19	10
Butyl benzyl phthalate	<890		890		ug/Kg	☼	01/28/20 09:56	02/05/20 15:19	10
Carbazole	**3700**		640		ug/Kg	☼	01/28/20 09:56	02/05/20 15:19	10
4-Chloroaniline	<1900		1900		ug/Kg	☼	01/28/20 09:56	02/05/20 15:19	10
4-Chloro-3-methylphenol	<1900		1900		ug/Kg	☼	01/28/20 09:56	02/05/20 15:19	10
2-Chloronaphthalene	<640		640		ug/Kg	☼	01/28/20 09:56	02/05/20 15:19	10
2-Chlorophenol	<640		640		ug/Kg	☼	01/28/20 09:56	02/05/20 15:19	10
4-Chlorophenyl phenyl ether	<640		640		ug/Kg	☼	01/28/20 09:56	02/05/20 15:19	10
Dibenz(a,h)anthracene	**6800**		190		ug/Kg	☼	01/28/20 09:56	02/05/20 15:19	10
Dibenzofuran	**10000**		640		ug/Kg	☼	01/28/20 09:56	02/05/20 15:19	10
1,3-Dichlorobenzene	<640		640		ug/Kg	☼	01/28/20 09:56	02/05/20 15:19	10
1,4-Dichlorobenzene	<640		640		ug/Kg	☼	01/28/20 09:56	02/05/20 15:19	10
3,3'-Dichlorobenzidine	<1300		1300		ug/Kg	☼	01/28/20 09:56	02/05/20 15:19	10
2,4-Dichlorophenol	<1900		1900		ug/Kg	☼	01/28/20 09:56	02/05/20 15:19	10
Diethyl phthalate	<890		890		ug/Kg	☼	01/28/20 09:56	02/05/20 15:19	10
2,4-Dimethylphenol	<1900		1900		ug/Kg	☼	01/28/20 09:56	02/05/20 15:19	10
Dimethyl phthalate	<890		890		ug/Kg	☼	01/28/20 09:56	02/05/20 15:19	10
Di-n-butyl phthalate	<890		890		ug/Kg	☼	01/28/20 09:56	02/05/20 15:19	10
4,6-Dinitro-2-methylphenol	<4200		4200		ug/Kg	☼	01/28/20 09:56	02/05/20 15:19	10
2,4-Dinitrophenol	<4200		4200		ug/Kg	☼	01/28/20 09:56	02/05/20 15:19	10
2,4-Dinitrotoluene	<2500		2500		ug/Kg	☼	01/28/20 09:56	02/05/20 15:19	10
2,6-Dinitrotoluene	<2500		2500		ug/Kg	☼	01/28/20 09:56	02/05/20 15:19	10
Di-n-octyl phthalate	<890		890		ug/Kg	☼	01/28/20 09:56	02/05/20 15:19	10
Fluorene	**18000**		190		ug/Kg	☼	01/28/20 09:56	02/05/20 15:19	10

Client Sample ID: FR34-WC-002

Date Collected: 01/23/20 12:00
Date Received: 01/24/20 10:40

Lab Sample ID: 240-125349-2

Matrix: Solid
Percent Solids: 78.8

Method: 8270D - Semivolatile Organic Compounds (GC/MS) (Continued)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Hexachlorobenzene	<190		190		ug/Kg	☼	01/28/20 09:56	02/05/20 15:19	10
Hexachlorobutadiene	<640		640		ug/Kg	☼	01/28/20 09:56	02/05/20 15:19	10
Hexachlorocyclopentadiene	<4200		4200		ug/Kg	☼	01/28/20 09:56	02/05/20 15:19	10
Hexachloroethane	<640		640		ug/Kg	☼	01/28/20 09:56	02/05/20 15:19	10
Isophorone	<640		640		ug/Kg	☼	01/28/20 09:56	02/05/20 15:19	10
2-Methylnaphthalene	**2600**		190		ug/Kg	☼	01/28/20 09:56	02/05/20 15:19	10
2-Methylphenol	<2500		2500		ug/Kg	☼	01/28/20 09:56	02/05/20 15:19	10
3 & 4 Methylphenol	<5100		5100		ug/Kg	☼	01/28/20 09:56	02/05/20 15:19	10
Naphthalene	**2000**		190		ug/Kg	☼	01/28/20 09:56	02/05/20 15:19	10
2-Nitroaniline	<2500		2500		ug/Kg	☼	01/28/20 09:56	02/05/20 15:19	10
3-Nitroaniline	<2500		2500		ug/Kg	☼	01/28/20 09:56	02/05/20 15:19	10
4-Nitroaniline	<2500		2500		ug/Kg	☼	01/28/20 09:56	02/05/20 15:19	10
Nitrobenzene	<1300		1300		ug/Kg	☼	01/28/20 09:56	02/05/20 15:19	10
2-Nitrophenol	<640		640		ug/Kg	☼	01/28/20 09:56	02/05/20 15:19	10
4-Nitrophenol	<4200		4200		ug/Kg	☼	01/28/20 09:56	02/05/20 15:19	10
N-Nitrosodi-n-propylamine	<640		640		ug/Kg	☼	01/28/20 09:56	02/05/20 15:19	10
N-Nitrosodiphenylamine	<640		640		ug/Kg	☼	01/28/20 09:56	02/05/20 15:19	10
Pentachlorophenol	<1900		1900		ug/Kg	☼	01/28/20 09:56	02/05/20 15:19	10
Phenol	<640		640		ug/Kg	☼	01/28/20 09:56	02/05/20 15:19	10
Pyridine	<1900		1900		ug/Kg	☼	01/28/20 09:56	02/05/20 15:19	10
1,2,4-Trichlorobenzene	<640		640		ug/Kg	☼	01/28/20 09:56	02/05/20 15:19	10
2,4,5-Trichlorophenol	<1900		1900		ug/Kg	☼	01/28/20 09:56	02/05/20 15:19	10
2,4,6-Trichlorophenol	<1900		1900		ug/Kg	☼	01/28/20 09:56	02/05/20 15:19	10

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
2-Fluorobiphenyl (Surr)	*83*		*35 - 120*	*01/28/20 09:56*	*02/05/20 15:19*	*10*
2-Fluorophenol (Surr)	*82*		*26 - 120*	*01/28/20 09:56*	*02/05/20 15:19*	*10*
Nitrobenzene-d5 (Surr)	*82*		*28 - 120*	*01/28/20 09:56*	*02/05/20 15:19*	*10*
Phenol-d5 (Surr)	*76*		*28 - 120*	*01/28/20 09:56*	*02/05/20 15:19*	*10*
Terphenyl-d14 (Surr)	*89*		*39 - 120*	*01/28/20 09:56*	*02/05/20 15:19*	*10*
2,4,6-Tribromophenol (Surr)	*72*		*10 - 120*	*01/28/20 09:56*	*02/05/20 15:19*	*10*

Method: 8270D - Semivolatile Organic Compounds (GC/MS) - RA

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Anthracene	**26000**		1900		ug/Kg	☼	01/28/20 09:56	02/05/20 15:43	100
Benzo[a]anthracene	**46000**		1900		ug/Kg	☼	01/28/20 09:56	02/05/20 15:43	100
Benzo[a]pyrene	**42000**		1900		ug/Kg	☼	01/28/20 09:56	02/05/20 15:43	100
Benzo[b]fluoranthene	**53000**		1900		ug/Kg	☼	01/28/20 09:56	02/05/20 15:43	100
Benzo[g,h,i]perylene	**22000**		1900		ug/Kg	☼	01/28/20 09:56	02/05/20 15:43	100
Benzo[k]fluoranthene	**22000**		1900		ug/Kg	☼	01/28/20 09:56	02/05/20 15:43	100
Chrysene	**42000**		1900		ug/Kg	☼	01/28/20 09:56	02/05/20 15:43	100
Fluoranthene	**120000**		1900		ug/Kg	☼	01/28/20 09:56	02/05/20 15:43	100
Indeno[1,2,3-cd]pyrene	**23000**		1900		ug/Kg	☼	01/28/20 09:56	02/05/20 15:43	100
Phenanthrene	**84000**		1900		ug/Kg	☼	01/28/20 09:56	02/05/20 15:43	100
Pyrene	**91000**		1900		ug/Kg	☼	01/28/20 09:56	02/05/20 15:43	100

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
2-Fluorobiphenyl (Surr)	*81*		*35 - 120*	*01/28/20 09:56*	*02/05/20 15:43*	*100*
2-Fluorophenol (Surr)	*58*		*26 - 120*	*01/28/20 09:56*	*02/05/20 15:43*	*100*
Nitrobenzene-d5 (Surr)	*80*		*28 - 120*	*01/28/20 09:56*	*02/05/20 15:43*	*100*

Client Sample ID: FR34-WC-002

Date Collected: 01/23/20 12:00
Date Received: 01/24/20 10:40

Lab Sample ID: 240-125349-2

Matrix: Solid
Percent Solids: 78.8

Method: 8270D - Semivolatile Organic Compounds (GC/MS) - RA (Continued)

Surrogate	%Recovery	Qualifier	Limits	Prepared	Analyzed	Dil Fac
Phenol-d5 (Surr)	81		28 - 120	01/28/20 09:56	02/05/20 15:43	100
Terphenyl-d14 (Surr)	96		39 - 120	01/28/20 09:56	02/05/20 15:43	100
2,4,6-Tribromophenol (Surr)	68		10 - 120	01/28/20 09:56	02/05/20 15:43	100

Method: 8015B - Nonhalogenated Organic Compounds - Direct Injection (GC) - Soluble

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
2-Ethoxyethanol	<6.3		6.3		mg/Kg	☼		01/27/20 12:04	1
Methanol	<6.3		6.3		mg/Kg	☼		01/27/20 12:45	1

Method: 8081A - Organochlorine Pesticides (GC) - TCLP

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chlordane (technical)	<0.0050		0.0050		mg/L		01/28/20 10:42	02/03/20 12:49	1
Endrin	<0.00050		0.00050		mg/L		01/28/20 10:42	02/03/20 12:49	1
Heptachlor	<0.00050		0.00050		mg/L		01/28/20 10:42	02/03/20 12:49	1
Heptachlor epoxide	<0.00050		0.00050		mg/L		01/28/20 10:42	02/03/20 12:49	1
gamma-BHC (Lindane)	<0.00050		0.00050		mg/L		01/28/20 10:42	02/03/20 12:49	1
Methoxychlor	<0.0010		0.0010		mg/L		01/28/20 10:42	02/03/20 12:49	1
Toxaphene	<0.020		0.020		mg/L		01/28/20 10:42	02/03/20 12:49	1

Surrogate	%Recovery	Qualifier	Limits	Prepared	Analyzed	Dil Fac
Tetrachloro-m-xylene	67		33 - 123	01/28/20 10:42	02/03/20 12:49	1
Tetrachloro-m-xylene	59		33 - 123	01/28/20 10:42	02/03/20 12:49	1
DCB Decachlorobiphenyl	77		21 - 135	01/28/20 10:42	02/03/20 12:49	1
DCB Decachlorobiphenyl	66		21 - 135	01/28/20 10:42	02/03/20 12:49	1

Method: 8082 - Polychlorinated Biphenyls (PCBs) by Gas Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Aroclor-1016	<110		110		ug/Kg	☼	01/27/20 09:29	01/31/20 12:22	5
Aroclor-1221	<110		110		ug/Kg	☼	01/27/20 09:29	01/31/20 12:22	5
Aroclor-1232	<110		110		ug/Kg	☼	01/27/20 09:29	01/31/20 12:22	5
Aroclor-1242	<110		110		ug/Kg	☼	01/27/20 09:29	01/31/20 12:22	5
Aroclor-1248	<110		110		ug/Kg	☼	01/27/20 09:29	01/31/20 12:22	5
Aroclor-1254	<110		110		ug/Kg	☼	01/27/20 09:29	01/31/20 12:22	5
Aroclor-1260	<110		110		ug/Kg	☼	01/27/20 09:29	01/31/20 12:22	5
Aroclor-1262	<110		110		ug/Kg	☼	01/27/20 09:29	01/31/20 12:22	5
Aroclor-1268	<110		110		ug/Kg	☼	01/27/20 09:29	01/31/20 12:22	5
Polychlorinated biphenyls, Total	<110		110		ug/Kg	☼	01/27/20 09:29	01/31/20 12:22	5

Surrogate	%Recovery	Qualifier	Limits	Prepared	Analyzed	Dil Fac
Tetrachloro-m-xylene	102		14 - 128	01/27/20 09:29	01/31/20 12:22	5
DCB Decachlorobiphenyl	86	p	10 - 132	01/27/20 09:29	01/31/20 12:22	5

Method: 8151A - Herbicides (GC) - TCLP

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
2,4-D	<0.040		0.040		mg/L		02/03/20 10:51	02/05/20 12:57	1
Silvex (2,4,5-TP)	<0.010		0.010		mg/L		02/03/20 10:51	02/05/20 12:57	1

Surrogate	%Recovery	Qualifier	Limits	Prepared	Analyzed	Dil Fac
2,4-Dichlorophenylacetic acid	80		41 - 130	02/03/20 10:51	02/05/20 12:57	1
2,4-Dichlorophenylacetic acid	85		41 - 130	02/03/20 10:51	02/05/20 12:57	1

Client Sample Results

Client: Leidos, Inc.
Project/Site: NASA PBS Waste - FR3 + 4

Job ID: 240-125349-1

Client Sample ID: FR34-WC-002

Date Collected: 01/23/20 12:00
Date Received: 01/24/20 10:40

Lab Sample ID: 240-125349-2

Matrix: Solid
Percent Solids: 78.8

Method: 6010C - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	**8.6**		1.9		mg/Kg	☼	01/27/20 14:00	01/28/20 18:54	1
Barium	**51**		25		mg/Kg	☼	01/27/20 14:00	01/28/20 18:54	1
Cadmium	<0.63		0.63		mg/Kg	☼	01/27/20 14:00	01/28/20 18:54	1
Chromium	**9.3**		1.3		mg/Kg	☼	01/27/20 14:00	01/28/20 18:54	1
Lead	**350**		1.3		mg/Kg	☼	01/27/20 14:00	01/28/20 18:54	1
Nickel	**23**		5.1		mg/Kg	☼	01/27/20 14:00	01/28/20 18:54	1
Selenium	<2.5		2.5		mg/Kg	☼	01/27/20 14:00	01/28/20 18:54	1
Silver	<1.3		1.3		mg/Kg	☼	01/27/20 14:00	01/28/20 18:54	1

Method: 6010C - Metals (ICP) - TCLP

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Silver	<0.050		0.050		mg/L		01/28/20 14:00	01/29/20 15:57	1
Arsenic	<0.050		0.050		mg/L		01/28/20 14:00	01/29/20 15:57	1
Barium	**0.65**		0.50		mg/L		01/28/20 14:00	01/29/20 15:57	1
Cadmium	<0.050		0.050		mg/L		01/28/20 14:00	01/29/20 15:57	1
Chromium	<0.050		0.050		mg/L		01/28/20 14:00	01/29/20 15:57	1
Nickel	<0.040		0.040		mg/L		01/28/20 14:00	01/29/20 15:57	1
Lead	**0.093**		0.050		mg/L		01/28/20 14:00	01/29/20 15:57	1
Selenium	<0.050		0.050		mg/L		01/28/20 14:00	01/29/20 15:57	1

Method: 7470A - Mercury (CVAA) - TCLP

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	<0.0020		0.0020		mg/L		01/28/20 12:00	01/29/20 13:27	1

Method: 7471B - Mercury (CVAA)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	<0.12		0.12		mg/Kg	☼	01/27/20 16:00	01/28/20 14:31	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Flashpoint	**>200**		1.00		Degrees F			01/28/20 08:15	1
Cyanide, Total	<0.57	F2	0.57		mg/Kg	☼	01/29/20 09:55	01/29/20 13:24	1
Sulfide	<38		38		mg/Kg	☼	01/27/20 07:57	01/27/20 12:43	1
pH	**8.0**	**HF**	0.1		SU			01/27/20 15:48	1
Free Liquid	**CNF**		0.10		NONE			02/05/20 16:59	1
Percent Moisture	**21.2**		0.1		%			01/27/20 17:38	1

Client Sample Results

Client: Leidos, Inc.
Project/Site: NASA PBS Waste - FR3 + 4

Job ID: 240-125349-1

Client Sample ID: FR34-WC-003

Date Collected: 01/23/20 13:00
Date Received: 01/24/20 10:40

Lab Sample ID: 240-125349-3

Matrix: Solid
Percent Solids: 84.8

Method: 8260B - Volatile Organic Compounds (GC/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
1,1,1,2-Tetrachloroethane	<5.0		5.0		ug/Kg	☼	01/28/20 12:56	01/28/20 19:16	1
1,1,1-Trichloroethane	<5.0		5.0		ug/Kg	☼	01/28/20 12:56	01/28/20 19:16	1
1,1,2,2-Tetrachloroethane	<5.0		5.0		ug/Kg	☼	01/28/20 12:56	01/28/20 19:16	1
1,1,2-Trichloro-1,2,2-trichfluoroethane	<5.0		5.0		ug/Kg	☼	01/28/20 12:56	01/28/20 19:16	1
1,1,2-Trichloroethane	<5.0		5.0		ug/Kg	☼	01/28/20 12:56	01/28/20 19:16	1
1,1-Dichloroethane	<5.0		5.0		ug/Kg	☼	01/28/20 12:56	01/28/20 19:16	1
1,1-Dichloroethene	<5.0		5.0		ug/Kg	☼	01/28/20 12:56	01/28/20 19:16	1
1,1-Dichloropropene	<5.0		5.0		ug/Kg	☼	01/28/20 12:56	01/28/20 19:16	1
1,2,3-Trichlorobenzene	<5.0		5.0		ug/Kg	☼	01/28/20 12:56	01/28/20 19:16	1
1,2,3-Trichloropropane	<5.0		5.0		ug/Kg	☼	01/28/20 12:56	01/28/20 19:16	1
1,2,4-Trimethylbenzene	<5.0		5.0		ug/Kg	☼	01/28/20 12:56	01/28/20 19:16	1
1,2-Dibromo-3-Chloropropane	<10		10		ug/Kg	☼	01/28/20 12:56	01/28/20 19:16	1
1,2-Dichlorobenzene	<5.0		5.0		ug/Kg	☼	01/28/20 12:56	01/28/20 19:16	1
1,2-Dichloroethane	<5.0		5.0		ug/Kg	☼	01/28/20 12:56	01/28/20 19:16	1
1,2-Dichloropropane	<5.0		5.0		ug/Kg	☼	01/28/20 12:56	01/28/20 19:16	1
2-Nitropropane	<10		10		ug/Kg	☼	01/28/20 12:56	01/28/20 19:16	1
2,2-Dichloropropane	<5.0		5.0		ug/Kg	☼	01/28/20 12:56	01/28/20 19:16	1
2-Chlorotoluene	<5.0		5.0		ug/Kg	☼	01/28/20 12:56	01/28/20 19:16	1
2-Hexanone	<20		20		ug/Kg	☼	01/28/20 12:56	01/28/20 19:16	1
Bromobenzene	<5.0		5.0		ug/Kg	☼	01/28/20 12:56	01/28/20 19:16	1
Chlorobromomethane	<5.0		5.0		ug/Kg	☼	01/28/20 12:56	01/28/20 19:16	1
4-Chlorotoluene	<5.0		5.0		ug/Kg	☼	01/28/20 12:56	01/28/20 19:16	1
4-Isopropyltoluene	<5.0		5.0		ug/Kg	☼	01/28/20 12:56	01/28/20 19:16	1
Acetone	<25		25		ug/Kg	☼	01/28/20 12:56	01/28/20 19:16	1
Benzene	<5.0		5.0		ug/Kg	☼	01/28/20 12:56	01/28/20 19:16	1
Bromoform	<5.0		5.0		ug/Kg	☼	01/28/20 12:56	01/28/20 19:16	1
Bromomethane	<5.0		5.0		ug/Kg	☼	01/28/20 12:56	01/28/20 19:16	1
Carbon disulfide	<5.0		5.0		ug/Kg	☼	01/28/20 12:56	01/28/20 19:16	1
Carbon tetrachloride	<5.0		5.0		ug/Kg	☼	01/28/20 12:56	01/28/20 19:16	1
Chlorobenzene	<5.0		5.0		ug/Kg	☼	01/28/20 12:56	01/28/20 19:16	1
Chloroethane	<5.0		5.0		ug/Kg	☼	01/28/20 12:56	01/28/20 19:16	1
Chloroform	<5.0		5.0		ug/Kg	☼	01/28/20 12:56	01/28/20 19:16	1
Chloromethane	<5.0		5.0		ug/Kg	☼	01/28/20 12:56	01/28/20 19:16	1
cis-1,2-Dichloroethene	<5.0		5.0		ug/Kg	☼	01/28/20 12:56	01/28/20 19:16	1
Ethyl acetate	<20		20		ug/Kg	☼	01/28/20 12:56	01/28/20 19:16	1
cis-1,3-Dichloropropene	<5.0		5.0		ug/Kg	☼	01/28/20 12:56	01/28/20 19:16	1
Cyclohexanone	<100		100		ug/Kg	☼	01/28/20 12:56	01/28/20 19:16	1
Dibromomethane	<5.0		5.0		ug/Kg	☼	01/28/20 12:56	01/28/20 19:16	1
Dichlorobromomethane	<5.0		5.0		ug/Kg	☼	01/28/20 12:56	01/28/20 19:16	1
Dichlorodifluoromethane	<5.0		5.0		ug/Kg	☼	01/28/20 12:56	01/28/20 19:16	1
Ethyl ether	<5.0		5.0		ug/Kg	☼	01/28/20 12:56	01/28/20 19:16	1
Ethylbenzene	<5.0		5.0		ug/Kg	☼	01/28/20 12:56	01/28/20 19:16	1
Ethylene Dibromide	<5.0		5.0		ug/Kg	☼	01/28/20 12:56	01/28/20 19:16	1
Isobutyl alcohol	<200		200		ug/Kg	☼	01/28/20 12:56	01/28/20 19:16	1
m-Xylene & p-Xylene	<10		10		ug/Kg	☼	01/28/20 12:56	01/28/20 19:16	1
n-Butylbenzene	<5.0		5.0		ug/Kg	☼	01/28/20 12:56	01/28/20 19:16	1
Isopropylbenzene	<5.0		5.0		ug/Kg	☼	01/28/20 12:56	01/28/20 19:16	1
N-Propylbenzene	<5.0		5.0		ug/Kg	☼	01/28/20 12:56	01/28/20 19:16	1
2-Butanone (MEK)	<20		20		ug/Kg	☼	01/28/20 12:56	01/28/20 19:16	1

Client Sample ID: FR34-WC-003

Date Collected: 01/23/20 13:00
Date Received: 01/24/20 10:40

Lab Sample ID: 240-125349-3

Matrix: Solid
Percent Solids: 84.8

Method: 8260B - Volatile Organic Compounds (GC/MS) (Continued)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
4-Methyl-2-pentanone (MIBK)	<20		20		ug/Kg	☼	01/28/20 12:56	01/28/20 19:16	1
sec-Butylbenzene	<5.0		5.0		ug/Kg	☼	01/28/20 12:56	01/28/20 19:16	1
Methyl tert-butyl ether	<5.0		5.0		ug/Kg	☼	01/28/20 12:56	01/28/20 19:16	1
Methylene Chloride	<25		25		ug/Kg	☼	01/28/20 12:56	01/28/20 19:16	1
n-Butanol	<1000		1000		ug/Kg	☼	01/28/20 12:56	01/28/20 19:16	1
o-Xylene	<5.0		5.0		ug/Kg	☼	01/28/20 12:56	01/28/20 19:16	1
Styrene	<5.0		5.0		ug/Kg	☼	01/28/20 12:56	01/28/20 19:16	1
tert-Butylbenzene	<5.0		5.0		ug/Kg	☼	01/28/20 12:56	01/28/20 19:16	1
Tetrachloroethene	<5.0		5.0		ug/Kg	☼	01/28/20 12:56	01/28/20 19:16	1
Toluene	<5.0		5.0		ug/Kg	☼	01/28/20 12:56	01/28/20 19:16	1
trans-1,2-Dichloroethene	<5.0		5.0		ug/Kg	☼	01/28/20 12:56	01/28/20 19:16	1
trans-1,3-Dichloropropene	<5.0		5.0		ug/Kg	☼	01/28/20 12:56	01/28/20 19:16	1
Trichloroethene	<5.0		5.0		ug/Kg	☼	01/28/20 12:56	01/28/20 19:16	1
Trichlorofluoromethane	<5.0		5.0		ug/Kg	☼	01/28/20 12:56	01/28/20 19:16	1
Vinyl chloride	<5.0		5.0		ug/Kg	☼	01/28/20 12:56	01/28/20 19:16	1
Xylenes, Total	<10		10		ug/Kg	☼	01/28/20 12:56	01/28/20 19:16	1
Chlorodibromomethane	<5.0		5.0		ug/Kg	☼	01/28/20 12:56	01/28/20 19:16	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
1,2-Dichloroethane-d4 (Surr)	*99*		*59 - 120*	*01/28/20 12:56*	*01/28/20 19:16*	*1*
4-Bromofluorobenzene (Surr)	*113*		*51 - 127*	*01/28/20 12:56*	*01/28/20 19:16*	*1*
Toluene-d8 (Surr)	*105*		*64 - 124*	*01/28/20 12:56*	*01/28/20 19:16*	*1*
Dibromofluoromethane (Surr)	*90*		*56 - 122*	*01/28/20 12:56*	*01/28/20 19:16*	*1*

Method: 8260B - Volatile Organic Compounds (GC/MS) - TCLP

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
1,1-Dichloroethene	<0.025		0.025		mg/L			01/28/20 21:17	1
1,2-Dichloroethane	<0.025		0.025		mg/L			01/28/20 21:17	1
2-Butanone (MEK)	<0.25		0.25		mg/L			01/28/20 21:17	1
Benzene	<0.025		0.025		mg/L			01/28/20 21:17	1
Carbon tetrachloride	<0.025		0.025		mg/L			01/28/20 21:17	1
Chlorobenzene	<0.025		0.025		mg/L			01/28/20 21:17	1
Chloroform	<0.025		0.025		mg/L			01/28/20 21:17	1
Tetrachloroethene	<0.025		0.025		mg/L			01/28/20 21:17	1
Trichloroethene	<0.025		0.025		mg/L			01/28/20 21:17	1
Vinyl chloride	<0.025		0.025		mg/L			01/28/20 21:17	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
1,2-Dichloroethane-d4 (Surr)	*91*		*74 - 124*		*01/28/20 21:17*	*1*
4-Bromofluorobenzene (Surr)	*94*		*77 - 120*		*01/28/20 21:17*	*1*
Toluene-d8 (Surr)	*95*		*80 - 120*		*01/28/20 21:17*	*1*
Dibromofluoromethane (Surr)	*98*		*80 - 120*		*01/28/20 21:17*	*1*

Method: 8270C - Semivolatile Organic Compounds (GC/MS) - TCLP

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
1,4-Dichlorobenzene	<0.0040		0.0040		mg/L		01/28/20 10:40	01/30/20 10:55	1
2,4,5-Trichlorophenol	<0.0040		0.0040		mg/L		01/28/20 10:40	01/30/20 10:55	1
2,4,6-Trichlorophenol	<0.0040		0.0040		mg/L		01/28/20 10:40	01/30/20 10:55	1
2,4-Dinitrotoluene	<0.0040		0.0040		mg/L		01/28/20 10:40	01/30/20 10:55	1
Hexachlorobenzene	<0.00080		0.00080		mg/L		01/28/20 10:40	01/30/20 10:55	1

Client Sample Results

Client: Leidos, Inc.
Project/Site: NASA PBS Waste - FR3 + 4

Job ID: 240-125349-1

Client Sample ID: FR34-WC-003

Date Collected: 01/23/20 13:00
Date Received: 01/24/20 10:40

Lab Sample ID: 240-125349-3

Matrix: Solid
Percent Solids: 84.8

Method: 8270C - Semivolatile Organic Compounds (GC/MS) - TCLP (Continued)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Hexachlorobutadiene	<0.0040		0.0040		mg/L		01/28/20 10:40	01/30/20 10:55	1
Hexachloroethane	<0.0040		0.0040		mg/L		01/28/20 10:40	01/30/20 10:55	1
3 & 4 Methylphenol	<0.0040		0.0040		mg/L		01/28/20 10:40	01/30/20 10:55	1
2-Methylphenol	<0.0040		0.0040		mg/L		01/28/20 10:40	01/30/20 10:55	1
Nitrobenzene	<0.0040		0.0040		mg/L		01/28/20 10:40	01/30/20 10:55	1
Pentachlorophenol	<0.016		0.016		mg/L		01/28/20 10:40	01/30/20 10:55	1
Pyridine	<0.0040		0.0040		mg/L		01/28/20 10:40	01/30/20 10:55	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
2-Fluorobiphenyl (Surr)	*85*		*39 - 120*	*01/28/20 10:40*	*01/30/20 10:55*	*1*
2-Fluorophenol (Surr)	*77*		*10 - 120*	*01/28/20 10:40*	*01/30/20 10:55*	*1*
2,4,6-Tribromophenol (Surr)	*100*		*33 - 120*	*01/28/20 10:40*	*01/30/20 10:55*	*1*
Nitrobenzene-d5 (Surr)	*84*		*33 - 120*	*01/28/20 10:40*	*01/30/20 10:55*	*1*
Phenol-d5 (Surr)	*64*		*10 - 120*	*01/28/20 10:40*	*01/30/20 10:55*	*1*
Terphenyl-d14 (Surr)	*98*		*36 - 122*	*01/28/20 10:40*	*01/30/20 10:55*	*1*

Method: 8270D - Semivolatile Organic Compounds (GC/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Acenaphthene	**260**		18		ug/Kg	☼	01/28/20 09:56	02/05/20 16:55	1
Acenaphthylene	**640**		18		ug/Kg	☼	01/28/20 09:56	02/05/20 16:55	1
Anthracene	**720**		18		ug/Kg	☼	01/28/20 09:56	02/05/20 16:55	1
Benzo[g,h,i]perylene	**1700**		18		ug/Kg	☼	01/28/20 09:56	02/05/20 16:55	1
Benzoic acid	<830		830		ug/Kg	☼	01/28/20 09:56	02/05/20 16:55	1
Benzyl alcohol	<390		390		ug/Kg	☼	01/28/20 09:56	02/05/20 16:55	1
Bis(2-chloroethoxy)methane	<120		120		ug/Kg	☼	01/28/20 09:56	02/05/20 16:55	1
Bis(2-chloroethyl)ether	<120		120		ug/Kg	☼	01/28/20 09:56	02/05/20 16:55	1
bis (2-chloroisopropyl) ether	<120		120		ug/Kg	☼	01/28/20 09:56	02/05/20 16:55	1
Bis(2-ethylhexyl) phthalate	<83		83		ug/Kg	☼	01/28/20 09:56	02/05/20 16:55	1
4-Bromophenyl phenyl ether	<59		59		ug/Kg	☼	01/28/20 09:56	02/05/20 16:55	1
Butyl benzyl phthalate	<83		83		ug/Kg	☼	01/28/20 09:56	02/05/20 16:55	1
Carbazole	**320**		59		ug/Kg	☼	01/28/20 09:56	02/05/20 16:55	1
4-Chloroaniline	<180		180		ug/Kg	☼	01/28/20 09:56	02/05/20 16:55	1
4-Chloro-3-methylphenol	<180		180		ug/Kg	☼	01/28/20 09:56	02/05/20 16:55	1
2-Chloronaphthalene	<59		59		ug/Kg	☼	01/28/20 09:56	02/05/20 16:55	1
2-Chlorophenol	<59		59		ug/Kg	☼	01/28/20 09:56	02/05/20 16:55	1
4-Chlorophenyl phenyl ether	<59		59		ug/Kg	☼	01/28/20 09:56	02/05/20 16:55	1
Dibenz(a,h)anthracene	**630**		18		ug/Kg	☼	01/28/20 09:56	02/05/20 16:55	1
Dibenzofuran	**79**		59		ug/Kg	☼	01/28/20 09:56	02/05/20 16:55	1
1,3-Dichlorobenzene	<59		59		ug/Kg	☼	01/28/20 09:56	02/05/20 16:55	1
1,4-Dichlorobenzene	<59		59		ug/Kg	☼	01/28/20 09:56	02/05/20 16:55	1
3,3'-Dichlorobenzidine	<120		120		ug/Kg	☼	01/28/20 09:56	02/05/20 16:55	1
2,4-Dichlorophenol	<180		180		ug/Kg	☼	01/28/20 09:56	02/05/20 16:55	1
Diethyl phthalate	<83		83		ug/Kg	☼	01/28/20 09:56	02/05/20 16:55	1
2,4-Dimethylphenol	<180		180		ug/Kg	☼	01/28/20 09:56	02/05/20 16:55	1
Dimethyl phthalate	<83		83		ug/Kg	☼	01/28/20 09:56	02/05/20 16:55	1
Di-n-butyl phthalate	**150**		83		ug/Kg	☼	01/28/20 09:56	02/05/20 16:55	1
4,6-Dinitro-2-methylphenol	<390		390		ug/Kg	☼	01/28/20 09:56	02/05/20 16:55	1
2,4-Dinitrophenol	<390		390		ug/Kg	☼	01/28/20 09:56	02/05/20 16:55	1
2,4-Dinitrotoluene	<240		240		ug/Kg	☼	01/28/20 09:56	02/05/20 16:55	1
2,6-Dinitrotoluene	<240		240		ug/Kg	☼	01/28/20 09:56	02/05/20 16:55	1

Client Sample Results

Client: Leidos, Inc.
Project/Site: NASA PBS Waste - FR3 + 4

Job ID: 240-125349-1

Client Sample ID: FR34-WC-003

Date Collected: 01/23/20 13:00
Date Received: 01/24/20 10:40

Lab Sample ID: 240-125349-3

Matrix: Solid
Percent Solids: 84.8

Method: 8270D - Semivolatile Organic Compounds (GC/MS) (Continued)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Di-n-octyl phthalate	<83		83		ug/Kg	☼	01/28/20 09:56	02/05/20 16:55	1
Fluorene	**150**		18		ug/Kg	☼	01/28/20 09:56	02/05/20 16:55	1
Hexachlorobenzene	<18		18		ug/Kg	☼	01/28/20 09:56	02/05/20 16:55	1
Hexachlorobutadiene	<59		59		ug/Kg	☼	01/28/20 09:56	02/05/20 16:55	1
Hexachlorocyclopentadiene	<390		390		ug/Kg	☼	01/28/20 09:56	02/05/20 16:55	1
Hexachloroethane	<59		59		ug/Kg	☼	01/28/20 09:56	02/05/20 16:55	1
Indeno[1,2,3-cd]pyrene	**1900**		18		ug/Kg	☼	01/28/20 09:56	02/05/20 16:55	1
Isophorone	<59		59		ug/Kg	☼	01/28/20 09:56	02/05/20 16:55	1
2-Methylnaphthalene	**58**		18		ug/Kg	☼	01/28/20 09:56	02/05/20 16:55	1
2-Methylphenol	<240		240		ug/Kg	☼	01/28/20 09:56	02/05/20 16:55	1
3 & 4 Methylphenol	<470		470		ug/Kg	☼	01/28/20 09:56	02/05/20 16:55	1
Naphthalene	**60**		18		ug/Kg	☼	01/28/20 09:56	02/05/20 16:55	1
2-Nitroaniline	<240		240		ug/Kg	☼	01/28/20 09:56	02/05/20 16:55	1
3-Nitroaniline	<240		240		ug/Kg	☼	01/28/20 09:56	02/05/20 16:55	1
4-Nitroaniline	<240		240		ug/Kg	☼	01/28/20 09:56	02/05/20 16:55	1
Nitrobenzene	<120		120		ug/Kg	☼	01/28/20 09:56	02/05/20 16:55	1
2-Nitrophenol	<59		59		ug/Kg	☼	01/28/20 09:56	02/05/20 16:55	1
4-Nitrophenol	<390		390		ug/Kg	☼	01/28/20 09:56	02/05/20 16:55	1
N-Nitrosodi-n-propylamine	<59		59		ug/Kg	☼	01/28/20 09:56	02/05/20 16:55	1
N-Nitrosodiphenylamine	**170**		59		ug/Kg	☼	01/28/20 09:56	02/05/20 16:55	1
Pentachlorophenol	<180		180		ug/Kg	☼	01/28/20 09:56	02/05/20 16:55	1
Phenol	<59		59		ug/Kg	☼	01/28/20 09:56	02/05/20 16:55	1
Pyridine	<180		180		ug/Kg	☼	01/28/20 09:56	02/05/20 16:55	1
1,2,4-Trichlorobenzene	<59		59		ug/Kg	☼	01/28/20 09:56	02/05/20 16:55	1
2,4,5-Trichlorophenol	<180		180		ug/Kg	☼	01/28/20 09:56	02/05/20 16:55	1
2,4,6-Trichlorophenol	<180		180		ug/Kg	☼	01/28/20 09:56	02/05/20 16:55	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
2-Fluorobiphenyl (Surr)	*62*		*35 - 120*	*01/28/20 09:56*	*02/05/20 16:55*	*1*
2-Fluorophenol (Surr)	*67*		*26 - 120*	*01/28/20 09:56*	*02/05/20 16:55*	*1*
Nitrobenzene-d5 (Surr)	*61*		*28 - 120*	*01/28/20 09:56*	*02/05/20 16:55*	*1*
Phenol-d5 (Surr)	*69*		*28 - 120*	*01/28/20 09:56*	*02/05/20 16:55*	*1*
Terphenyl-d14 (Surr)	*63*		*39 - 120*	*01/28/20 09:56*	*02/05/20 16:55*	*1*
2,4,6-Tribromophenol (Surr)	*55*		*10 - 120*	*01/28/20 09:56*	*02/05/20 16:55*	*1*

Method: 8270D - Semivolatile Organic Compounds (GC/MS) - RA

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Benzo[a]anthracene	**4200**		180		ug/Kg	☼	01/28/20 09:56	02/05/20 17:19	10
Benzo[a]pyrene	**6300**		180		ug/Kg	☼	01/28/20 09:56	02/05/20 17:19	10
Benzo[b]fluoranthene	**8100**		180		ug/Kg	☼	01/28/20 09:56	02/05/20 17:19	10
Benzo[k]fluoranthene	**3300**		180		ug/Kg	☼	01/28/20 09:56	02/05/20 17:19	10
Chrysene	**4700**		180		ug/Kg	☼	01/28/20 09:56	02/05/20 17:19	10
Fluoranthene	**9000**		180		ug/Kg	☼	01/28/20 09:56	02/05/20 17:19	10
Phenanthrene	**2200**		180		ug/Kg	☼	01/28/20 09:56	02/05/20 17:19	10
Pyrene	**7800**		180		ug/Kg	☼	01/28/20 09:56	02/05/20 17:19	10

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
2-Fluorobiphenyl (Surr)	*72*		*35 - 120*	*01/28/20 09:56*	*02/05/20 17:19*	*10*
2-Fluorophenol (Surr)	*76*		*26 - 120*	*01/28/20 09:56*	*02/05/20 17:19*	*10*
Nitrobenzene-d5 (Surr)	*62*		*28 - 120*	*01/28/20 09:56*	*02/05/20 17:19*	*10*

Client Sample ID: FR34-WC-003

Date Collected: 01/23/20 13:00
Date Received: 01/24/20 10:40

Lab Sample ID: 240-125349-3

Matrix: Solid
Percent Solids: 84.8

Method: 8270D - Semivolatile Organic Compounds (GC/MS) - RA (Continued)

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Phenol-d5 (Surr)	*78*		*28 - 120*	*01/28/20 09:56*	*02/05/20 17:19*	*10*
Terphenyl-d14 (Surr)	*66*		*39 - 120*	*01/28/20 09:56*	*02/05/20 17:19*	*10*
2,4,6-Tribromophenol (Surr)	*54*		*10 - 120*	*01/28/20 09:56*	*02/05/20 17:19*	*10*

Method: 8015B - Nonhalogenated Organic Compounds - Direct Injection (GC) - Soluble

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
2-Ethoxyethanol	<5.9		5.9		mg/Kg	☼		01/27/20 12:16	1
Methanol	<5.9		5.9		mg/Kg	☼		01/27/20 13:00	1

Method: 8081A - Organochlorine Pesticides (GC) - TCLP

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chlordane (technical)	<0.0050		0.0050		mg/L		01/28/20 10:42	02/03/20 13:02	1
Endrin	<0.00050		0.00050		mg/L		01/28/20 10:42	02/03/20 13:02	1
Heptachlor	<0.00050		0.00050		mg/L		01/28/20 10:42	02/03/20 13:02	1
Heptachlor epoxide	<0.00050		0.00050		mg/L		01/28/20 10:42	02/03/20 13:02	1
gamma-BHC (Lindane)	<0.00050		0.00050		mg/L		01/28/20 10:42	02/03/20 13:02	1
Methoxychlor	<0.0010		0.0010		mg/L		01/28/20 10:42	02/03/20 13:02	1
Toxaphene	<0.020		0.020		mg/L		01/28/20 10:42	02/03/20 13:02	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Tetrachloro-m-xylene	*62*		*33 - 123*	*01/28/20 10:42*	*02/03/20 13:02*	*1*
Tetrachloro-m-xylene	*61*		*33 - 123*	*01/28/20 10:42*	*02/03/20 13:02*	*1*
DCB Decachlorobiphenyl	*68*		*21 - 135*	*01/28/20 10:42*	*02/03/20 13:02*	*1*
DCB Decachlorobiphenyl	*62*		*21 - 135*	*01/28/20 10:42*	*02/03/20 13:02*	*1*

Method: 8082 - Polychlorinated Biphenyls (PCBs) by Gas Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Aroclor-1016	<98		98		ug/Kg	☼	01/27/20 09:29	01/31/20 12:37	5
Aroclor-1221	<98		98		ug/Kg	☼	01/27/20 09:29	01/31/20 12:37	5
Aroclor-1232	<98		98		ug/Kg	☼	01/27/20 09:29	01/31/20 12:37	5
Aroclor-1242	<98		98		ug/Kg	☼	01/27/20 09:29	01/31/20 12:37	5
Aroclor-1248	<98		98		ug/Kg	☼	01/27/20 09:29	01/31/20 12:37	5
Aroclor-1254	<98		98		ug/Kg	☼	01/27/20 09:29	01/31/20 12:37	5
Aroclor-1260	<98		98		ug/Kg	☼	01/27/20 09:29	01/31/20 12:37	5
Aroclor-1262	<98		98		ug/Kg	☼	01/27/20 09:29	01/31/20 12:37	5
Aroclor-1268	<98		98		ug/Kg	☼	01/27/20 09:29	01/31/20 12:37	5
Polychlorinated biphenyls, Total	<98		98		ug/Kg	☼	01/27/20 09:29	01/31/20 12:37	5

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Tetrachloro-m-xylene	*53*		*14 - 128*	*01/27/20 09:29*	*01/31/20 12:37*	*5*
DCB Decachlorobiphenyl	*22*	*p*	*10 - 132*	*01/27/20 09:29*	*01/31/20 12:37*	*5*

Method: 8151A - Herbicides (GC) - TCLP

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
2,4-D	<0.040		0.040		mg/L		02/03/20 10:51	02/05/20 13:19	1
Silvex (2,4,5-TP)	<0.010		0.010		mg/L		02/03/20 10:51	02/05/20 13:19	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
2,4-Dichlorophenylacetic acid	*78*		*41 - 130*	*02/03/20 10:51*	*02/05/20 13:19*	*1*
2,4-Dichlorophenylacetic acid	*80*		*41 - 130*	*02/03/20 10:51*	*02/05/20 13:19*	*1*

Client Sample Results

Client: Leidos, Inc.
Project/Site: NASA PBS Waste - FR3 + 4

Job ID: 240-125349-1

Client Sample ID: FR34-WC-003

Date Collected: 01/23/20 13:00
Date Received: 01/24/20 10:40

Lab Sample ID: 240-125349-3

Matrix: Solid
Percent Solids: 84.8

Method: 6010C - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	**4.7**		1.4		mg/Kg	☼	01/27/20 14:00	01/28/20 18:59	1
Barium	**120**		18		mg/Kg	☼	01/27/20 14:00	01/28/20 18:59	1
Cadmium	**0.50**		0.46		mg/Kg	☼	01/27/20 14:00	01/28/20 18:59	1
Chromium	**7.4**		0.91		mg/Kg	☼	01/27/20 14:00	01/28/20 18:59	1
Lead	**160**		0.91		mg/Kg	☼	01/27/20 14:00	01/28/20 18:59	1
Nickel	**14**		3.7		mg/Kg	☼	01/27/20 14:00	01/28/20 18:59	1
Selenium	<1.8		1.8		mg/Kg	☼	01/27/20 14:00	01/28/20 18:59	1
Silver	<0.91		0.91		mg/Kg	☼	01/27/20 14:00	01/28/20 18:59	1

Method: 6010C - Metals (ICP) - TCLP

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Silver	<0.050		0.050		mg/L		01/28/20 14:00	01/29/20 16:02	1
Arsenic	<0.050		0.050		mg/L		01/28/20 14:00	01/29/20 16:02	1
Barium	**1.4**		0.50		mg/L		01/28/20 14:00	01/29/20 16:02	1
Cadmium	<0.050		0.050		mg/L		01/28/20 14:00	01/29/20 16:02	1
Chromium	<0.050		0.050		mg/L		01/28/20 14:00	01/29/20 16:02	1
Nickel	<0.040		0.040		mg/L		01/28/20 14:00	01/29/20 16:02	1
Lead	**0.21**		0.050		mg/L		01/28/20 14:00	01/29/20 16:02	1
Selenium	<0.050		0.050		mg/L		01/28/20 14:00	01/29/20 16:02	1

Method: 7470A - Mercury (CVAA) - TCLP

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	<0.0020		0.0020		mg/L		01/28/20 12:00	01/29/20 13:29	1

Method: 7471B - Mercury (CVAA)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	<0.11		0.11		mg/Kg	☼	01/27/20 16:00	01/28/20 14:33	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Flashpoint	**>200**		1.00		Degrees F			01/28/20 08:47	1
Cyanide, Total	<0.59		0.59		mg/Kg	☼	01/29/20 09:55	01/29/20 13:20	1
Sulfide	<35		35		mg/Kg	☼	01/27/20 07:57	01/27/20 12:50	1
pH	**8.4**	**HF**	0.1		SU			01/27/20 16:00	1
Free Liquid	**CNF**		0.10		NONE			02/05/20 16:59	1
Percent Moisture	**15.2**		0.1		%			01/27/20 17:38	1

Client Sample Results

Client: Leidos, Inc.
Project/Site: NASA PBS Waste - FR3 + 4

Job ID: 240-125349-1

Client Sample ID: FR34-WC-004

Date Collected: 01/23/20 13:55
Date Received: 01/24/20 10:40

Lab Sample ID: 240-125349-4

Matrix: Solid
Percent Solids: 81.8

Method: 8260B - Volatile Organic Compounds (GC/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
1,1,1,2-Tetrachloroethane	<5.9		5.9		ug/Kg	☼	01/28/20 12:56	01/28/20 19:42	1
1,1,1-Trichloroethane	<5.9		5.9		ug/Kg	☼	01/28/20 12:56	01/28/20 19:42	1
1,1,2,2-Tetrachloroethane	<5.9		5.9		ug/Kg	☼	01/28/20 12:56	01/28/20 19:42	1
1,1,2-Trichloro-1,2,2-trichfluoroethane	<5.9		5.9		ug/Kg	☼	01/28/20 12:56	01/28/20 19:42	1
1,1,2-Trichloroethane	<5.9		5.9		ug/Kg	☼	01/28/20 12:56	01/28/20 19:42	1
1,1-Dichloroethane	<5.9		5.9		ug/Kg	☼	01/28/20 12:56	01/28/20 19:42	1
1,1-Dichloroethene	<5.9		5.9		ug/Kg	☼	01/28/20 12:56	01/28/20 19:42	1
1,1-Dichloropropene	<5.9		5.9		ug/Kg	☼	01/28/20 12:56	01/28/20 19:42	1
1,2,3-Trichlorobenzene	<5.9		5.9		ug/Kg	☼	01/28/20 12:56	01/28/20 19:42	1
1,2,3-Trichloropropane	<5.9		5.9		ug/Kg	☼	01/28/20 12:56	01/28/20 19:42	1
1,2,4-Trimethylbenzene	<5.9		5.9		ug/Kg	☼	01/28/20 12:56	01/28/20 19:42	1
1,2-Dibromo-3-Chloropropane	<12		12		ug/Kg	☼	01/28/20 12:56	01/28/20 19:42	1
1,2-Dichlorobenzene	<5.9		5.9		ug/Kg	☼	01/28/20 12:56	01/28/20 19:42	1
1,2-Dichloroethane	<5.9		5.9		ug/Kg	☼	01/28/20 12:56	01/28/20 19:42	1
1,2-Dichloropropane	<5.9		5.9		ug/Kg	☼	01/28/20 12:56	01/28/20 19:42	1
2-Nitropropane	<12		12		ug/Kg	☼	01/28/20 12:56	01/28/20 19:42	1
2,2-Dichloropropane	<5.9		5.9		ug/Kg	☼	01/28/20 12:56	01/28/20 19:42	1
2-Chlorotoluene	<5.9		5.9		ug/Kg	☼	01/28/20 12:56	01/28/20 19:42	1
2-Hexanone	<24		24		ug/Kg	☼	01/28/20 12:56	01/28/20 19:42	1
Bromobenzene	<5.9		5.9		ug/Kg	☼	01/28/20 12:56	01/28/20 19:42	1
Chlorobromomethane	<5.9		5.9		ug/Kg	☼	01/28/20 12:56	01/28/20 19:42	1
4-Chlorotoluene	<5.9		5.9		ug/Kg	☼	01/28/20 12:56	01/28/20 19:42	1
4-Isopropyltoluene	<5.9		5.9		ug/Kg	☼	01/28/20 12:56	01/28/20 19:42	1
Acetone	<30		30		ug/Kg	☼	01/28/20 12:56	01/28/20 19:42	1
Benzene	<5.9		5.9		ug/Kg	☼	01/28/20 12:56	01/28/20 19:42	1
Bromoform	<5.9		5.9		ug/Kg	☼	01/28/20 12:56	01/28/20 19:42	1
Bromomethane	<5.9		5.9		ug/Kg	☼	01/28/20 12:56	01/28/20 19:42	1
Carbon disulfide	<5.9		5.9		ug/Kg	☼	01/28/20 12:56	01/28/20 19:42	1
Carbon tetrachloride	<5.9		5.9		ug/Kg	☼	01/28/20 12:56	01/28/20 19:42	1
Chlorobenzene	<5.9		5.9		ug/Kg	☼	01/28/20 12:56	01/28/20 19:42	1
Chloroethane	<5.9		5.9		ug/Kg	☼	01/28/20 12:56	01/28/20 19:42	1
Chloroform	<5.9		5.9		ug/Kg	☼	01/28/20 12:56	01/28/20 19:42	1
Chloromethane	<5.9		5.9		ug/Kg	☼	01/28/20 12:56	01/28/20 19:42	1
cis-1,2-Dichloroethene	<5.9		5.9		ug/Kg	☼	01/28/20 12:56	01/28/20 19:42	1
Ethyl acetate	<24		24		ug/Kg	☼	01/28/20 12:56	01/28/20 19:42	1
cis-1,3-Dichloropropene	<5.9		5.9		ug/Kg	☼	01/28/20 12:56	01/28/20 19:42	1
Cyclohexanone	<120		120		ug/Kg	☼	01/28/20 12:56	01/28/20 19:42	1
Dibromomethane	<5.9		5.9		ug/Kg	☼	01/28/20 12:56	01/28/20 19:42	1
Dichlorobromomethane	<5.9		5.9		ug/Kg	☼	01/28/20 12:56	01/28/20 19:42	1
Dichlorodifluoromethane	<5.9		5.9		ug/Kg	☼	01/28/20 12:56	01/28/20 19:42	1
Ethyl ether	<5.9		5.9		ug/Kg	☼	01/28/20 12:56	01/28/20 19:42	1
Ethylbenzene	<5.9		5.9		ug/Kg	☼	01/28/20 12:56	01/28/20 19:42	1
Ethylene Dibromide	<5.9		5.9		ug/Kg	☼	01/28/20 12:56	01/28/20 19:42	1
Isobutyl alcohol	<240		240		ug/Kg	☼	01/28/20 12:56	01/28/20 19:42	1
m-Xylene & p-Xylene	<12		12		ug/Kg	☼	01/28/20 12:56	01/28/20 19:42	1
n-Butylbenzene	<5.9		5.9		ug/Kg	☼	01/28/20 12:56	01/28/20 19:42	1
Isopropylbenzene	<5.9		5.9		ug/Kg	☼	01/28/20 12:56	01/28/20 19:42	1
N-Propylbenzene	<5.9		5.9		ug/Kg	☼	01/28/20 12:56	01/28/20 19:42	1
2-Butanone (MEK)	<24		24		ug/Kg	☼	01/28/20 12:56	01/28/20 19:42	1

Client Sample ID: FR34-WC-004

Date Collected: 01/23/20 13:55
Date Received: 01/24/20 10:40

Lab Sample ID: 240-125349-4

Matrix: Solid
Percent Solids: 81.8

Method: 8260B - Volatile Organic Compounds (GC/MS) (Continued)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
4-Methyl-2-pentanone (MIBK)	<24		24		ug/Kg	☼	01/28/20 12:56	01/28/20 19:42	1
sec-Butylbenzene	<5.9		5.9		ug/Kg	☼	01/28/20 12:56	01/28/20 19:42	1
Methyl tert-butyl ether	<5.9		5.9		ug/Kg	☼	01/28/20 12:56	01/28/20 19:42	1
Methylene Chloride	<30		30		ug/Kg	☼	01/28/20 12:56	01/28/20 19:42	1
n-Butanol	<1200		1200		ug/Kg	☼	01/28/20 12:56	01/28/20 19:42	1
o-Xylene	<5.9		5.9		ug/Kg	☼	01/28/20 12:56	01/28/20 19:42	1
Styrene	<5.9		5.9		ug/Kg	☼	01/28/20 12:56	01/28/20 19:42	1
tert-Butylbenzene	<5.9		5.9		ug/Kg	☼	01/28/20 12:56	01/28/20 19:42	1
Tetrachloroethene	<5.9		5.9		ug/Kg	☼	01/28/20 12:56	01/28/20 19:42	1
Toluene	<5.9		5.9		ug/Kg	☼	01/28/20 12:56	01/28/20 19:42	1
trans-1,2-Dichloroethene	<5.9		5.9		ug/Kg	☼	01/28/20 12:56	01/28/20 19:42	1
trans-1,3-Dichloropropene	<5.9		5.9		ug/Kg	☼	01/28/20 12:56	01/28/20 19:42	1
Trichloroethene	<5.9		5.9		ug/Kg	☼	01/28/20 12:56	01/28/20 19:42	1
Trichlorofluoromethane	<5.9		5.9		ug/Kg	☼	01/28/20 12:56	01/28/20 19:42	1
Vinyl chloride	<5.9		5.9		ug/Kg	☼	01/28/20 12:56	01/28/20 19:42	1
Xylenes, Total	<12		12		ug/Kg	☼	01/28/20 12:56	01/28/20 19:42	1
Chlorodibromomethane	<5.9		5.9		ug/Kg	☼	01/28/20 12:56	01/28/20 19:42	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
1,2-Dichloroethane-d4 (Surr)	*102*		*59 - 120*	*01/28/20 12:56*	*01/28/20 19:42*	*1*
4-Bromofluorobenzene (Surr)	*110*		*51 - 127*	*01/28/20 12:56*	*01/28/20 19:42*	*1*
Toluene-d8 (Surr)	*107*		*64 - 124*	*01/28/20 12:56*	*01/28/20 19:42*	*1*
Dibromofluoromethane (Surr)	*93*		*56 - 122*	*01/28/20 12:56*	*01/28/20 19:42*	*1*

Method: 8260B - Volatile Organic Compounds (GC/MS) - TCLP

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
1,1-Dichloroethene	<0.025		0.025		mg/L			01/28/20 21:39	1
1,2-Dichloroethane	<0.025		0.025		mg/L			01/28/20 21:39	1
2-Butanone (MEK)	<0.25		0.25		mg/L			01/28/20 21:39	1
Benzene	<0.025		0.025		mg/L			01/28/20 21:39	1
Carbon tetrachloride	<0.025		0.025		mg/L			01/28/20 21:39	1
Chlorobenzene	<0.025		0.025		mg/L			01/28/20 21:39	1
Chloroform	<0.025		0.025		mg/L			01/28/20 21:39	1
Tetrachloroethene	<0.025		0.025		mg/L			01/28/20 21:39	1
Trichloroethene	<0.025		0.025		mg/L			01/28/20 21:39	1
Vinyl chloride	<0.025		0.025		mg/L			01/28/20 21:39	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
1,2-Dichloroethane-d4 (Surr)	*90*		*74 - 124*		*01/28/20 21:39*	*1*
4-Bromofluorobenzene (Surr)	*95*		*77 - 120*		*01/28/20 21:39*	*1*
Toluene-d8 (Surr)	*99*		*80 - 120*		*01/28/20 21:39*	*1*
Dibromofluoromethane (Surr)	*99*		*80 - 120*		*01/28/20 21:39*	*1*

Method: 8270C - Semivolatile Organic Compounds (GC/MS) - TCLP

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
1,4-Dichlorobenzene	<0.0040		0.0040		mg/L		01/28/20 10:40	01/30/20 11:19	1
2,4,5-Trichlorophenol	<0.0040		0.0040		mg/L		01/28/20 10:40	01/30/20 11:19	1
2,4,6-Trichlorophenol	<0.0040		0.0040		mg/L		01/28/20 10:40	01/30/20 11:19	1
2,4-Dinitrotoluene	<0.0040		0.0040		mg/L		01/28/20 10:40	01/30/20 11:19	1
Hexachlorobenzene	<0.00080		0.00080		mg/L		01/28/20 10:40	01/30/20 11:19	1

Client Sample Results

Client: Leidos, Inc.
Project/Site: NASA PBS Waste - FR3 + 4

Job ID: 240-125349-1

Client Sample ID: FR34-WC-004

Date Collected: 01/23/20 13:55
Date Received: 01/24/20 10:40

Lab Sample ID: 240-125349-4

Matrix: Solid
Percent Solids: 81.8

Method: 8270C - Semivolatile Organic Compounds (GC/MS) - TCLP (Continued)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Hexachlorobutadiene	<0.0040		0.0040		mg/L		01/28/20 10:40	01/30/20 11:19	1
Hexachloroethane	<0.0040		0.0040		mg/L		01/28/20 10:40	01/30/20 11:19	1
3 & 4 Methylphenol	<0.0040		0.0040		mg/L		01/28/20 10:40	01/30/20 11:19	1
2-Methylphenol	<0.0040		0.0040		mg/L		01/28/20 10:40	01/30/20 11:19	1
Nitrobenzene	<0.0040		0.0040		mg/L		01/28/20 10:40	01/30/20 11:19	1
Pentachlorophenol	<0.016		0.016		mg/L		01/28/20 10:40	01/30/20 11:19	1
Pyridine	<0.0040		0.0040		mg/L		01/28/20 10:40	01/30/20 11:19	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
2-Fluorobiphenyl (Surr)	*82*		*39 - 120*	*01/28/20 10:40*	*01/30/20 11:19*	*1*
2-Fluorophenol (Surr)	*64*		*10 - 120*	*01/28/20 10:40*	*01/30/20 11:19*	*1*
2,4,6-Tribromophenol (Surr)	*94*		*33 - 120*	*01/28/20 10:40*	*01/30/20 11:19*	*1*
Nitrobenzene-d5 (Surr)	*79*		*33 - 120*	*01/28/20 10:40*	*01/30/20 11:19*	*1*
Phenol-d5 (Surr)	*51*		*10 - 120*	*01/28/20 10:40*	*01/30/20 11:19*	*1*
Terphenyl-d14 (Surr)	*91*		*36 - 122*	*01/28/20 10:40*	*01/30/20 11:19*	*1*

Method: 8270D - Semivolatile Organic Compounds (GC/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Acenaphthene	**37**		18		ug/Kg	☼	01/28/20 09:56	02/06/20 11:11	1
Acenaphthylene	**240**		18		ug/Kg	☼	01/28/20 09:56	02/06/20 11:11	1
Anthracene	**1400**		18		ug/Kg	☼	01/28/20 09:56	02/06/20 11:11	1
Benzo[g,h,i]perylene	**900**		18		ug/Kg	☼	01/28/20 09:56	02/06/20 11:11	1
Benzoic acid	**1000**		860		ug/Kg	☼	01/28/20 09:56	02/06/20 11:11	1
Benzo[k]fluoranthene	**2000**		18		ug/Kg	☼	01/28/20 09:56	02/06/20 11:11	1
Benzyl alcohol	<410		410		ug/Kg	☼	01/28/20 09:56	02/06/20 11:11	1
Bis(2-chloroethoxy)methane	<120		120		ug/Kg	☼	01/28/20 09:56	02/06/20 11:11	1
Bis(2-chloroethyl)ether	<120		120		ug/Kg	☼	01/28/20 09:56	02/06/20 11:11	1
bis (2-chloroisopropyl) ether	<120		120		ug/Kg	☼	01/28/20 09:56	02/06/20 11:11	1
Bis(2-ethylhexyl) phthalate	<86		86		ug/Kg	☼	01/28/20 09:56	02/06/20 11:11	1
4-Bromophenyl phenyl ether	<61		61		ug/Kg	☼	01/28/20 09:56	02/06/20 11:11	1
Butyl benzyl phthalate	<86		86		ug/Kg	☼	01/28/20 09:56	02/06/20 11:11	1
Carbazole	**300**		61		ug/Kg	☼	01/28/20 09:56	02/06/20 11:11	1
4-Chloroaniline	<180		180		ug/Kg	☼	01/28/20 09:56	02/06/20 11:11	1
4-Chloro-3-methylphenol	<180		180		ug/Kg	☼	01/28/20 09:56	02/06/20 11:11	1
2-Chloronaphthalene	<61		61		ug/Kg	☼	01/28/20 09:56	02/06/20 11:11	1
2-Chlorophenol	<61		61		ug/Kg	☼	01/28/20 09:56	02/06/20 11:11	1
4-Chlorophenyl phenyl ether	<61		61		ug/Kg	☼	01/28/20 09:56	02/06/20 11:11	1
Dibenz(a,h)anthracene	**380**		18		ug/Kg	☼	01/28/20 09:56	02/06/20 11:11	1
Dibenzofuran	<61		61		ug/Kg	☼	01/28/20 09:56	02/06/20 11:11	1
1,3-Dichlorobenzene	<61		61		ug/Kg	☼	01/28/20 09:56	02/06/20 11:11	1
1,4-Dichlorobenzene	<61		61		ug/Kg	☼	01/28/20 09:56	02/06/20 11:11	1
3,3'-Dichlorobenzidine	<120		120		ug/Kg	☼	01/28/20 09:56	02/06/20 11:11	1
2,4-Dichlorophenol	<180		180		ug/Kg	☼	01/28/20 09:56	02/06/20 11:11	1
Diethyl phthalate	<86		86		ug/Kg	☼	01/28/20 09:56	02/06/20 11:11	1
2,4-Dimethylphenol	<180		180		ug/Kg	☼	01/28/20 09:56	02/06/20 11:11	1
Dimethyl phthalate	<86		86		ug/Kg	☼	01/28/20 09:56	02/06/20 11:11	1
Di-n-butyl phthalate	<86		86		ug/Kg	☼	01/28/20 09:56	02/06/20 11:11	1
4,6-Dinitro-2-methylphenol	<410		410		ug/Kg	☼	01/28/20 09:56	02/06/20 11:11	1
2,4-Dinitrophenol	<410		410		ug/Kg	☼	01/28/20 09:56	02/06/20 11:11	1
2,4-Dinitrotoluene	<250		250		ug/Kg	☼	01/28/20 09:56	02/06/20 11:11	1

Client Sample Results

Client: Leidos, Inc.
Project/Site: NASA PBS Waste - FR3 + 4

Job ID: 240-125349-1

Client Sample ID: FR34-WC-004

Date Collected: 01/23/20 13:55
Date Received: 01/24/20 10:40

Lab Sample ID: 240-125349-4

Matrix: Solid
Percent Solids: 81.8

Method: 8270D - Semivolatile Organic Compounds (GC/MS) (Continued)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
2,6-Dinitrotoluene	<250		250		ug/Kg	☼	01/28/20 09:56	02/06/20 11:11	1
Di-n-octyl phthalate	<86		86		ug/Kg	☼	01/28/20 09:56	02/06/20 11:11	1
Fluorene	**47**		18		ug/Kg	☼	01/28/20 09:56	02/06/20 11:11	1
Hexachlorobenzene	<18		18		ug/Kg	☼	01/28/20 09:56	02/06/20 11:11	1
Hexachlorobutadiene	<61		61		ug/Kg	☼	01/28/20 09:56	02/06/20 11:11	1
Hexachlorocyclopentadiene	<410		410		ug/Kg	☼	01/28/20 09:56	02/06/20 11:11	1
Hexachloroethane	<61		61		ug/Kg	☼	01/28/20 09:56	02/06/20 11:11	1
Indeno[1,2,3-cd]pyrene	**1000**		18		ug/Kg	☼	01/28/20 09:56	02/06/20 11:11	1
Isophorone	<61		61		ug/Kg	☼	01/28/20 09:56	02/06/20 11:11	1
2-Methylnaphthalene	**130**		18		ug/Kg	☼	01/28/20 09:56	02/06/20 11:11	1
2-Methylphenol	<250		250		ug/Kg	☼	01/28/20 09:56	02/06/20 11:11	1
3 & 4 Methylphenol	<490		490		ug/Kg	☼	01/28/20 09:56	02/06/20 11:11	1
Naphthalene	**54**		18		ug/Kg	☼	01/28/20 09:56	02/06/20 11:11	1
2-Nitroaniline	<250		250		ug/Kg	☼	01/28/20 09:56	02/06/20 11:11	1
3-Nitroaniline	<250		250		ug/Kg	☼	01/28/20 09:56	02/06/20 11:11	1
4-Nitroaniline	<250		250		ug/Kg	☼	01/28/20 09:56	02/06/20 11:11	1
Nitrobenzene	<120		120		ug/Kg	☼	01/28/20 09:56	02/06/20 11:11	1
2-Nitrophenol	<61		61		ug/Kg	☼	01/28/20 09:56	02/06/20 11:11	1
4-Nitrophenol	<410		410		ug/Kg	☼	01/28/20 09:56	02/06/20 11:11	1
N-Nitrosodi-n-propylamine	<61		61		ug/Kg	☼	01/28/20 09:56	02/06/20 11:11	1
N-Nitrosodiphenylamine	<61		61		ug/Kg	☼	01/28/20 09:56	02/06/20 11:11	1
Pentachlorophenol	<180		180		ug/Kg	☼	01/28/20 09:56	02/06/20 11:11	1
Phenanthrene	**370**		18		ug/Kg	☼	01/28/20 09:56	02/06/20 11:11	1
Phenol	<61		61		ug/Kg	☼	01/28/20 09:56	02/06/20 11:11	1
Pyridine	<180		180		ug/Kg	☼	01/28/20 09:56	02/06/20 11:11	1
1,2,4-Trichlorobenzene	<61		61		ug/Kg	☼	01/28/20 09:56	02/06/20 11:11	1
2,4,5-Trichlorophenol	<180		180		ug/Kg	☼	01/28/20 09:56	02/06/20 11:11	1
2,4,6-Trichlorophenol	<180		180		ug/Kg	☼	01/28/20 09:56	02/06/20 11:11	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
2-Fluorobiphenyl (Surr)	*82*		*35 - 120*	*01/28/20 09:56*	*02/06/20 11:11*	*1*
2-Fluorophenol (Surr)	*81*		*26 - 120*	*01/28/20 09:56*	*02/06/20 11:11*	*1*
Nitrobenzene-d5 (Surr)	*75*		*28 - 120*	*01/28/20 09:56*	*02/06/20 11:11*	*1*
Phenol-d5 (Surr)	*84*		*28 - 120*	*01/28/20 09:56*	*02/06/20 11:11*	*1*
Terphenyl-d14 (Surr)	*90*		*39 - 120*	*01/28/20 09:56*	*02/06/20 11:11*	*1*
2,4,6-Tribromophenol (Surr)	*87*		*10 - 120*	*01/28/20 09:56*	*02/06/20 11:11*	*1*

Method: 8270D - Semivolatile Organic Compounds (GC/MS) - RA

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Benzo[a]anthracene	**5600**		180		ug/Kg	☼	01/28/20 09:56	02/05/20 18:31	10
Benzo[a]pyrene	**2600**		180		ug/Kg	☼	01/28/20 09:56	02/05/20 18:31	10
Benzo[b]fluoranthene	**6000**		180		ug/Kg	☼	01/28/20 09:56	02/05/20 18:31	10
Chrysene	**5400**		180		ug/Kg	☼	01/28/20 09:56	02/05/20 18:31	10
Fluoranthene	**12000**		180		ug/Kg	☼	01/28/20 09:56	02/05/20 18:31	10
Pyrene	**10000**		180		ug/Kg	☼	01/28/20 09:56	02/05/20 18:31	10

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
2-Fluorobiphenyl (Surr)	*71*		*35 - 120*	*01/28/20 09:56*	*02/05/20 18:31*	*10*
2-Fluorophenol (Surr)	*66*		*26 - 120*	*01/28/20 09:56*	*02/05/20 18:31*	*10*
Nitrobenzene-d5 (Surr)	*72*		*28 - 120*	*01/28/20 09:56*	*02/05/20 18:31*	*10*

Client Sample ID: FR34-WC-004

Date Collected: 01/23/20 13:55
Date Received: 01/24/20 10:40

Lab Sample ID: 240-125349-4

Matrix: Solid
Percent Solids: 81.8

Method: 8270D - Semivolatile Organic Compounds (GC/MS) - RA (Continued)

Surrogate	%Recovery	Qualifier	Limits	Prepared	Analyzed	Dil Fac
Phenol-d5 (Surr)	81		28 - 120	01/28/20 09:56	02/05/20 18:31	10
Terphenyl-d14 (Surr)	82		39 - 120	01/28/20 09:56	02/05/20 18:31	10
2,4,6-Tribromophenol (Surr)	82		10 - 120	01/28/20 09:56	02/05/20 18:31	10

Method: 8015B - Nonhalogenated Organic Compounds - Direct Injection (GC) - Soluble

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
2-Ethoxyethanol	<6.1		6.1		mg/Kg	☼		01/27/20 12:28	1
Methanol	<6.1		6.1		mg/Kg	☼		01/27/20 13:37	1

Method: 8081A - Organochlorine Pesticides (GC) - TCLP

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chlordane (technical)	<0.0050		0.0050		mg/L		01/28/20 10:42	02/03/20 13:15	1
Endrin	<0.00050		0.00050		mg/L		01/28/20 10:42	02/03/20 13:15	1
Heptachlor	<0.00050		0.00050		mg/L		01/28/20 10:42	02/03/20 13:15	1
Heptachlor epoxide	<0.00050		0.00050		mg/L		01/28/20 10:42	02/03/20 13:15	1
gamma-BHC (Lindane)	<0.00050		0.00050		mg/L		01/28/20 10:42	02/03/20 13:15	1
Methoxychlor	<0.0010		0.0010		mg/L		01/28/20 10:42	02/03/20 13:15	1
Toxaphene	<0.020		0.020		mg/L		01/28/20 10:42	02/03/20 13:15	1

Surrogate	%Recovery	Qualifier	Limits	Prepared	Analyzed	Dil Fac
Tetrachloro-m-xylene	78		33 - 123	01/28/20 10:42	02/03/20 13:15	1
Tetrachloro-m-xylene	68		33 - 123	01/28/20 10:42	02/03/20 13:15	1
DCB Decachlorobiphenyl	80		21 - 135	01/28/20 10:42	02/03/20 13:15	1
DCB Decachlorobiphenyl	64		21 - 135	01/28/20 10:42	02/03/20 13:15	1

Method: 8082 - Polychlorinated Biphenyls (PCBs) by Gas Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Aroclor-1016	<20		20		ug/Kg	☼	01/27/20 09:29	01/29/20 10:21	1
Aroclor-1221	<20		20		ug/Kg	☼	01/27/20 09:29	01/29/20 10:21	1
Aroclor-1232	<20		20		ug/Kg	☼	01/27/20 09:29	01/29/20 10:21	1
Aroclor-1242	<20		20		ug/Kg	☼	01/27/20 09:29	01/29/20 10:21	1
Aroclor-1248	<20		20		ug/Kg	☼	01/27/20 09:29	01/29/20 10:21	1
Aroclor-1254	<20		20		ug/Kg	☼	01/27/20 09:29	01/29/20 10:21	1
Aroclor-1260	<20		20		ug/Kg	☼	01/27/20 09:29	01/29/20 10:21	1
Aroclor-1262	<20		20		ug/Kg	☼	01/27/20 09:29	01/29/20 10:21	1
Aroclor-1268	<20		20		ug/Kg	☼	01/27/20 09:29	01/29/20 10:21	1
Polychlorinated biphenyls, Total	<20		20		ug/Kg	☼	01/27/20 09:29	01/29/20 10:21	1

Surrogate	%Recovery	Qualifier	Limits	Prepared	Analyzed	Dil Fac
Tetrachloro-m-xylene	48		14 - 128	01/27/20 09:29	01/29/20 10:21	1
DCB Decachlorobiphenyl	157	X	10 - 132	01/27/20 09:29	01/29/20 10:21	1

Method: 8151A - Herbicides (GC) - TCLP

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
2,4-D	<0.040		0.040		mg/L		02/03/20 10:51	02/05/20 13:41	1
Silvex (2,4,5-TP)	<0.010		0.010		mg/L		02/03/20 10:51	02/05/20 13:41	1

Surrogate	%Recovery	Qualifier	Limits	Prepared	Analyzed	Dil Fac
2,4-Dichlorophenylacetic acid	87		41 - 130	02/03/20 10:51	02/05/20 13:41	1
2,4-Dichlorophenylacetic acid	90		41 - 130	02/03/20 10:51	02/05/20 13:41	1

Client Sample Results

Client: Leidos, Inc.
Project/Site: NASA PBS Waste - FR3 + 4

Job ID: 240-125349-1

Client Sample ID: FR34-WC-004

Date Collected: 01/23/20 13:55
Date Received: 01/24/20 10:40

Lab Sample ID: 240-125349-4

Matrix: Solid
Percent Solids: 81.8

Method: 6010C - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	**19**		1.4		mg/Kg	☼	01/27/20 14:00	01/28/20 19:03	1
Barium	**110**		19		mg/Kg	☼	01/27/20 14:00	01/28/20 19:03	1
Cadmium	<0.48		0.48		mg/Kg	☼	01/27/20 14:00	01/28/20 19:03	1
Chromium	**14**		0.95		mg/Kg	☼	01/27/20 14:00	01/28/20 19:03	1
Lead	**750**		0.95		mg/Kg	☼	01/27/20 14:00	01/28/20 19:03	1
Nickel	**46**		3.8		mg/Kg	☼	01/27/20 14:00	01/28/20 19:03	1
Selenium	<1.9		1.9		mg/Kg	☼	01/27/20 14:00	01/28/20 19:03	1
Silver	<0.95		0.95		mg/Kg	☼	01/27/20 14:00	01/28/20 19:03	1

Method: 6010C - Metals (ICP) - TCLP

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Silver	<0.050		0.050		mg/L		01/28/20 14:00	01/29/20 16:06	1
Arsenic	<0.050		0.050		mg/L		01/28/20 14:00	01/29/20 16:06	1
Barium	<0.50		0.50		mg/L		01/28/20 14:00	01/29/20 16:06	1
Cadmium	<0.050		0.050		mg/L		01/28/20 14:00	01/29/20 16:06	1
Chromium	<0.050		0.050		mg/L		01/28/20 14:00	01/29/20 16:06	1
Nickel	**0.12**		0.040		mg/L		01/28/20 14:00	01/29/20 16:06	1
Lead	**34**		0.25		mg/L		01/28/20 14:00	01/30/20 19:00	5
Selenium	<0.050		0.050		mg/L		01/28/20 14:00	01/29/20 16:06	1

Method: 7470A - Mercury (CVAA) - TCLP

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	<0.0020		0.0020		mg/L		01/28/20 12:00	01/29/20 13:35	1

Method: 7471B - Mercury (CVAA)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	<0.11		0.11		mg/Kg	☼	01/27/20 16:00	01/28/20 14:35	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Flashpoint	**>200**		1.00		Degrees F			01/28/20 09:20	1
Cyanide, Total	<0.64		0.64		mg/Kg	☼	01/29/20 09:55	01/29/20 13:22	1
Sulfide	<37		37		mg/Kg	☼	01/27/20 07:57	01/27/20 12:56	1
pH	**5.0**	**HF**	0.1		SU			01/27/20 16:23	1
Free Liquid	**CNF**		0.10		NONE			02/05/20 16:59	1
Percent Moisture	**18.2**		0.1		%			01/27/20 17:38	1

Client Sample Results

Client: Leidos, Inc.
Project/Site: NASA PBS Waste - FR3 + 4

Job ID: 240-125349-1

Client Sample ID: FR34-WC-005

Date Collected: 01/23/20 14:50
Date Received: 01/24/20 10:40

Lab Sample ID: 240-125349-5

Matrix: Solid
Percent Solids: 83.5

Method: 8260B - Volatile Organic Compounds (GC/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
1,1,1,2-Tetrachloroethane	<5.5		5.5		ug/Kg	☼	01/29/20 12:38	01/29/20 21:40	1
1,1,1-Trichloroethane	<5.5		5.5		ug/Kg	☼	01/29/20 12:38	01/29/20 21:40	1
1,1,2,2-Tetrachloroethane	<5.5	*	5.5		ug/Kg	☼	01/29/20 12:38	01/29/20 21:40	1
1,1,2-Trichloro-1,2,2-trichfluoroethane	<5.5		5.5		ug/Kg	☼	01/29/20 12:38	01/29/20 21:40	1
1,1,2-Trichloroethane	<5.5		5.5		ug/Kg	☼	01/29/20 12:38	01/29/20 21:40	1
1,1-Dichloroethane	<5.5		5.5		ug/Kg	☼	01/29/20 12:38	01/29/20 21:40	1
1,1-Dichloroethene	<5.5		5.5		ug/Kg	☼	01/29/20 12:38	01/29/20 21:40	1
1,1-Dichloropropene	<5.5		5.5		ug/Kg	☼	01/29/20 12:38	01/29/20 21:40	1
1,2,3-Trichlorobenzene	<5.5	*	5.5		ug/Kg	☼	01/29/20 12:38	01/29/20 21:40	1
1,2,3-Trichloropropane	<5.5	*	5.5		ug/Kg	☼	01/29/20 12:38	01/29/20 21:40	1
1,2,4-Trimethylbenzene	<5.5	*	5.5		ug/Kg	☼	01/29/20 12:38	01/29/20 21:40	1
1,2-Dibromo-3-Chloropropane	<11	*	11		ug/Kg	☼	01/29/20 12:38	01/29/20 21:40	1
1,2-Dichlorobenzene	<5.5	*	5.5		ug/Kg	☼	01/29/20 12:38	01/29/20 21:40	1
1,2-Dichloroethane	<5.5		5.5		ug/Kg	☼	01/29/20 12:38	01/29/20 21:40	1
1,2-Dichloropropane	<5.5		5.5		ug/Kg	☼	01/29/20 12:38	01/29/20 21:40	1
2-Nitropropane	<11		11		ug/Kg	☼	01/29/20 12:38	01/29/20 21:40	1
2,2-Dichloropropane	<5.5		5.5		ug/Kg	☼	01/29/20 12:38	01/29/20 21:40	1
2-Chlorotoluene	<5.5	*	5.5		ug/Kg	☼	01/29/20 12:38	01/29/20 21:40	1
2-Hexanone	<22		22		ug/Kg	☼	01/29/20 12:38	01/29/20 21:40	1
Bromobenzene	<5.5	*	5.5		ug/Kg	☼	01/29/20 12:38	01/29/20 21:40	1
Chlorobromomethane	<5.5		5.5		ug/Kg	☼	01/29/20 12:38	01/29/20 21:40	1
4-Chlorotoluene	<5.5	*	5.5		ug/Kg	☼	01/29/20 12:38	01/29/20 21:40	1
4-Isopropyltoluene	<5.5	*	5.5		ug/Kg	☼	01/29/20 12:38	01/29/20 21:40	1
Acetone	<27	F1	27		ug/Kg	☼	01/29/20 12:38	01/29/20 21:40	1
Benzene	<5.5		5.5		ug/Kg	☼	01/29/20 12:38	01/29/20 21:40	1
Bromoform	<5.5		5.5		ug/Kg	☼	01/29/20 12:38	01/29/20 21:40	1
Bromomethane	<5.5		5.5		ug/Kg	☼	01/29/20 12:38	01/29/20 21:40	1
Carbon disulfide	<5.5		5.5		ug/Kg	☼	01/29/20 12:38	01/29/20 21:40	1
Carbon tetrachloride	<5.5		5.5		ug/Kg	☼	01/29/20 12:38	01/29/20 21:40	1
Chlorobenzene	<5.5		5.5		ug/Kg	☼	01/29/20 12:38	01/29/20 21:40	1
Chloroethane	<5.5		5.5		ug/Kg	☼	01/29/20 12:38	01/29/20 21:40	1
Chloroform	<5.5		5.5		ug/Kg	☼	01/29/20 12:38	01/29/20 21:40	1
Chloromethane	<5.5		5.5		ug/Kg	☼	01/29/20 12:38	01/29/20 21:40	1
cis-1,2-Dichloroethene	<5.5		5.5		ug/Kg	☼	01/29/20 12:38	01/29/20 21:40	1
Ethyl acetate	<22		22		ug/Kg	☼	01/29/20 12:38	01/29/20 21:40	1
cis-1,3-Dichloropropene	<5.5		5.5		ug/Kg	☼	01/29/20 12:38	01/29/20 21:40	1
Cyclohexanone	<110	F1	110		ug/Kg	☼	01/29/20 12:38	01/29/20 21:40	1
Dibromomethane	<5.5		5.5		ug/Kg	☼	01/29/20 12:38	01/29/20 21:40	1
Dichlorobromomethane	<5.5		5.5		ug/Kg	☼	01/29/20 12:38	01/29/20 21:40	1
Dichlorodifluoromethane	<5.5		5.5		ug/Kg	☼	01/29/20 12:38	01/29/20 21:40	1
Ethyl ether	<5.5		5.5		ug/Kg	☼	01/29/20 12:38	01/29/20 21:40	1
Ethylbenzene	<5.5		5.5		ug/Kg	☼	01/29/20 12:38	01/29/20 21:40	1
Ethylene Dibromide	<5.5		5.5		ug/Kg	☼	01/29/20 12:38	01/29/20 21:40	1
Isobutyl alcohol	<220		220		ug/Kg	☼	01/29/20 12:38	01/29/20 21:40	1
m-Xylene & p-Xylene	<11		11		ug/Kg	☼	01/29/20 12:38	01/29/20 21:40	1
n-Butylbenzene	<5.5	*	5.5		ug/Kg	☼	01/29/20 12:38	01/29/20 21:40	1
Isopropylbenzene	<5.5		5.5		ug/Kg	☼	01/29/20 12:38	01/29/20 21:40	1
N-Propylbenzene	<5.5	*	5.5		ug/Kg	☼	01/29/20 12:38	01/29/20 21:40	1
2-Butanone (MEK)	<22		22		ug/Kg	☼	01/29/20 12:38	01/29/20 21:40	1

Client Sample ID: FR34-WC-005

Date Collected: 01/23/20 14:50
Date Received: 01/24/20 10:40

Lab Sample ID: 240-125349-5

Matrix: Solid
Percent Solids: 83.5

Method: 8260B - Volatile Organic Compounds (GC/MS) (Continued)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
4-Methyl-2-pentanone (MIBK)	<22		22		ug/Kg	☼	01/29/20 12:38	01/29/20 21:40	1
sec-Butylbenzene	<5.5	*	5.5		ug/Kg	☼	01/29/20 12:38	01/29/20 21:40	1
Methyl tert-butyl ether	<5.5		5.5		ug/Kg	☼	01/29/20 12:38	01/29/20 21:40	1
Methylene Chloride	<27		27		ug/Kg	☼	01/29/20 12:38	01/29/20 21:40	1
n-Butanol	<1100	F2	1100		ug/Kg	☼	01/29/20 12:38	01/29/20 21:40	1
o-Xylene	<5.5		5.5		ug/Kg	☼	01/29/20 12:38	01/29/20 21:40	1
Styrene	<5.5		5.5		ug/Kg	☼	01/29/20 12:38	01/29/20 21:40	1
tert-Butylbenzene	<5.5	*	5.5		ug/Kg	☼	01/29/20 12:38	01/29/20 21:40	1
Tetrachloroethene	<5.5		5.5		ug/Kg	☼	01/29/20 12:38	01/29/20 21:40	1
Toluene	<5.5		5.5		ug/Kg	☼	01/29/20 12:38	01/29/20 21:40	1
trans-1,2-Dichloroethene	<5.5		5.5		ug/Kg	☼	01/29/20 12:38	01/29/20 21:40	1
trans-1,3-Dichloropropene	<5.5		5.5		ug/Kg	☼	01/29/20 12:38	01/29/20 21:40	1
Trichloroethene	<5.5		5.5		ug/Kg	☼	01/29/20 12:38	01/29/20 21:40	1
Trichlorofluoromethane	<5.5		5.5		ug/Kg	☼	01/29/20 12:38	01/29/20 21:40	1
Vinyl chloride	<5.5		5.5		ug/Kg	☼	01/29/20 12:38	01/29/20 21:40	1
Xylenes, Total	<11		11		ug/Kg	☼	01/29/20 12:38	01/29/20 21:40	1
Chlorodibromomethane	<5.5		5.5		ug/Kg	☼	01/29/20 12:38	01/29/20 21:40	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
1,2-Dichloroethane-d4 (Surr)	*109*		*59 - 120*	*01/29/20 12:38*	*01/29/20 21:40*	*1*
4-Bromofluorobenzene (Surr)	*115*	*	*51 - 127*	*01/29/20 12:38*	*01/29/20 21:40*	*1*
Toluene-d8 (Surr)	*116*		*64 - 124*	*01/29/20 12:38*	*01/29/20 21:40*	*1*
Dibromofluoromethane (Surr)	*92*		*56 - 122*	*01/29/20 12:38*	*01/29/20 21:40*	*1*

Method: 8260B - Volatile Organic Compounds (GC/MS) - TCLP

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
1,1-Dichloroethene	<0.025		0.025		mg/L			01/28/20 22:02	1
1,2-Dichloroethane	<0.025		0.025		mg/L			01/28/20 22:02	1
2-Butanone (MEK)	<0.25		0.25		mg/L			01/28/20 22:02	1
Benzene	<0.025		0.025		mg/L			01/28/20 22:02	1
Carbon tetrachloride	<0.025		0.025		mg/L			01/28/20 22:02	1
Chlorobenzene	<0.025		0.025		mg/L			01/28/20 22:02	1
Chloroform	<0.025		0.025		mg/L			01/28/20 22:02	1
Tetrachloroethene	<0.025		0.025		mg/L			01/28/20 22:02	1
Trichloroethene	<0.025		0.025		mg/L			01/28/20 22:02	1
Vinyl chloride	<0.025		0.025		mg/L			01/28/20 22:02	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
1,2-Dichloroethane-d4 (Surr)	*87*		*74 - 124*		*01/28/20 22:02*	*1*
4-Bromofluorobenzene (Surr)	*86*		*77 - 120*		*01/28/20 22:02*	*1*
Toluene-d8 (Surr)	*90*		*80 - 120*		*01/28/20 22:02*	*1*
Dibromofluoromethane (Surr)	*95*		*80 - 120*		*01/28/20 22:02*	*1*

Method: 8270C - Semivolatile Organic Compounds (GC/MS) - TCLP

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
1,4-Dichlorobenzene	<0.0040		0.0040		mg/L		01/28/20 10:40	01/30/20 11:43	1
2,4,5-Trichlorophenol	<0.0040		0.0040		mg/L		01/28/20 10:40	01/30/20 11:43	1
2,4,6-Trichlorophenol	<0.0040		0.0040		mg/L		01/28/20 10:40	01/30/20 11:43	1
2,4-Dinitrotoluene	<0.0040		0.0040		mg/L		01/28/20 10:40	01/30/20 11:43	1
Hexachlorobenzene	<0.00080		0.00080		mg/L		01/28/20 10:40	01/30/20 11:43	1

Client Sample Results

Client: Leidos, Inc.
Project/Site: NASA PBS Waste - FR3 + 4

Job ID: 240-125349-1

Client Sample ID: FR34-WC-005

Date Collected: 01/23/20 14:50
Date Received: 01/24/20 10:40

Lab Sample ID: 240-125349-5

Matrix: Solid
Percent Solids: 83.5

Method: 8270C - Semivolatile Organic Compounds (GC/MS) - TCLP (Continued)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Hexachlorobutadiene	<0.0040		0.0040		mg/L		01/28/20 10:40	01/30/20 11:43	1
Hexachloroethane	<0.0040		0.0040		mg/L		01/28/20 10:40	01/30/20 11:43	1
3 & 4 Methylphenol	<0.0040		0.0040		mg/L		01/28/20 10:40	01/30/20 11:43	1
2-Methylphenol	<0.0040		0.0040		mg/L		01/28/20 10:40	01/30/20 11:43	1
Nitrobenzene	<0.0040		0.0040		mg/L		01/28/20 10:40	01/30/20 11:43	1
Pentachlorophenol	<0.016		0.016		mg/L		01/28/20 10:40	01/30/20 11:43	1
Pyridine	<0.0040		0.0040		mg/L		01/28/20 10:40	01/30/20 11:43	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
2-Fluorobiphenyl (Surr)	*78*		*39 - 120*	*01/28/20 10:40*	*01/30/20 11:43*	*1*
2-Fluorophenol (Surr)	*69*		*10 - 120*	*01/28/20 10:40*	*01/30/20 11:43*	*1*
2,4,6-Tribromophenol (Surr)	*87*		*33 - 120*	*01/28/20 10:40*	*01/30/20 11:43*	*1*
Nitrobenzene-d5 (Surr)	*75*		*33 - 120*	*01/28/20 10:40*	*01/30/20 11:43*	*1*
Phenol-d5 (Surr)	*57*		*10 - 120*	*01/28/20 10:40*	*01/30/20 11:43*	*1*
Terphenyl-d14 (Surr)	*88*		*36 - 122*	*01/28/20 10:40*	*01/30/20 11:43*	*1*

Method: 8270D - Semivolatile Organic Compounds (GC/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Acenaphthene	**78**		36		ug/Kg	☼	01/28/20 09:56	02/06/20 11:35	2
Acenaphthylene	**180**		36		ug/Kg	☼	01/28/20 09:56	02/06/20 11:35	2
Anthracene	**980**		36		ug/Kg	☼	01/28/20 09:56	02/06/20 11:35	2
Benzo[a]anthracene	**3200**		36		ug/Kg	☼	01/28/20 09:56	02/06/20 11:35	2
Benzo[a]pyrene	**1600**		36		ug/Kg	☼	01/28/20 09:56	02/06/20 11:35	2
Benzo[g,h,i]perylene	**730**		36		ug/Kg	☼	01/28/20 09:56	02/06/20 11:35	2
Benzoic acid	<1700		1700		ug/Kg	☼	01/28/20 09:56	02/06/20 11:35	2
Benzo[k]fluoranthene	**1900**		36		ug/Kg	☼	01/28/20 09:56	02/06/20 11:35	2
Benzyl alcohol	<780		780		ug/Kg	☼	01/28/20 09:56	02/06/20 11:35	2
Bis(2-chloroethoxy)methane	<240		240		ug/Kg	☼	01/28/20 09:56	02/06/20 11:35	2
Bis(2-chloroethyl)ether	<240		240		ug/Kg	☼	01/28/20 09:56	02/06/20 11:35	2
bis (2-chloroisopropyl) ether	<240		240		ug/Kg	☼	01/28/20 09:56	02/06/20 11:35	2
Bis(2-ethylhexyl) phthalate	<170		170		ug/Kg	☼	01/28/20 09:56	02/06/20 11:35	2
4-Bromophenyl phenyl ether	<120		120		ug/Kg	☼	01/28/20 09:56	02/06/20 11:35	2
Butyl benzyl phthalate	<170		170		ug/Kg	☼	01/28/20 09:56	02/06/20 11:35	2
Carbazole	**370**		120		ug/Kg	☼	01/28/20 09:56	02/06/20 11:35	2
4-Chloroaniline	<360		360		ug/Kg	☼	01/28/20 09:56	02/06/20 11:35	2
4-Chloro-3-methylphenol	<360		360		ug/Kg	☼	01/28/20 09:56	02/06/20 11:35	2
2-Chloronaphthalene	<120		120		ug/Kg	☼	01/28/20 09:56	02/06/20 11:35	2
2-Chlorophenol	<120		120		ug/Kg	☼	01/28/20 09:56	02/06/20 11:35	2
4-Chlorophenyl phenyl ether	<120		120		ug/Kg	☼	01/28/20 09:56	02/06/20 11:35	2
Chrysene	**3800**		36		ug/Kg	☼	01/28/20 09:56	02/06/20 11:35	2
Dibenz(a,h)anthracene	**330**		36		ug/Kg	☼	01/28/20 09:56	02/06/20 11:35	2
Dibenzofuran	**240**		120		ug/Kg	☼	01/28/20 09:56	02/06/20 11:35	2
1,3-Dichlorobenzene	<120		120		ug/Kg	☼	01/28/20 09:56	02/06/20 11:35	2
1,4-Dichlorobenzene	<120		120		ug/Kg	☼	01/28/20 09:56	02/06/20 11:35	2
3,3'-Dichlorobenzidine	<240		240		ug/Kg	☼	01/28/20 09:56	02/06/20 11:35	2
2,4-Dichlorophenol	<360		360		ug/Kg	☼	01/28/20 09:56	02/06/20 11:35	2
Diethyl phthalate	<170		170		ug/Kg	☼	01/28/20 09:56	02/06/20 11:35	2
2,4-Dimethylphenol	<360		360		ug/Kg	☼	01/28/20 09:56	02/06/20 11:35	2
Dimethyl phthalate	<170		170		ug/Kg	☼	01/28/20 09:56	02/06/20 11:35	2
Di-n-butyl phthalate	<170		170		ug/Kg	☼	01/28/20 09:56	02/06/20 11:35	2

Client Sample Results

Client: Leidos, Inc.
Project/Site: NASA PBS Waste - FR3 + 4

Job ID: 240-125349-1

Client Sample ID: FR34-WC-005

Date Collected: 01/23/20 14:50
Date Received: 01/24/20 10:40

Lab Sample ID: 240-125349-5

Matrix: Solid
Percent Solids: 83.5

Method: 8270D - Semivolatile Organic Compounds (GC/MS) (Continued)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
4,6-Dinitro-2-methylphenol	<780		780		ug/Kg	☼	01/28/20 09:56	02/06/20 11:35	2
2,4-Dinitrophenol	<780		780		ug/Kg	☼	01/28/20 09:56	02/06/20 11:35	2
2,4-Dinitrotoluene	<470		470		ug/Kg	☼	01/28/20 09:56	02/06/20 11:35	2
2,6-Dinitrotoluene	<470		470		ug/Kg	☼	01/28/20 09:56	02/06/20 11:35	2
Di-n-octyl phthalate	<170		170		ug/Kg	☼	01/28/20 09:56	02/06/20 11:35	2
Fluorene	<36		36		ug/Kg	☼	01/28/20 09:56	02/06/20 11:35	2
Hexachlorobenzene	<36		36		ug/Kg	☼	01/28/20 09:56	02/06/20 11:35	2
Hexachlorobutadiene	<120		120		ug/Kg	☼	01/28/20 09:56	02/06/20 11:35	2
Hexachlorocyclopentadiene	<780		780		ug/Kg	☼	01/28/20 09:56	02/06/20 11:35	2
Hexachloroethane	<120		120		ug/Kg	☼	01/28/20 09:56	02/06/20 11:35	2
Indeno[1,2,3-cd]pyrene	**840**		36		ug/Kg	☼	01/28/20 09:56	02/06/20 11:35	2
Isophorone	<120		120		ug/Kg	☼	01/28/20 09:56	02/06/20 11:35	2
2-Methylnaphthalene	**450**		36		ug/Kg	☼	01/28/20 09:56	02/06/20 11:35	2
2-Methylphenol	<470		470		ug/Kg	☼	01/28/20 09:56	02/06/20 11:35	2
3 & 4 Methylphenol	<950		950		ug/Kg	☼	01/28/20 09:56	02/06/20 11:35	2
Naphthalene	**200**		36		ug/Kg	☼	01/28/20 09:56	02/06/20 11:35	2
2-Nitroaniline	<470		470		ug/Kg	☼	01/28/20 09:56	02/06/20 11:35	2
3-Nitroaniline	<470		470		ug/Kg	☼	01/28/20 09:56	02/06/20 11:35	2
4-Nitroaniline	<470		470		ug/Kg	☼	01/28/20 09:56	02/06/20 11:35	2
Nitrobenzene	<240		240		ug/Kg	☼	01/28/20 09:56	02/06/20 11:35	2
2-Nitrophenol	<120		120		ug/Kg	☼	01/28/20 09:56	02/06/20 11:35	2
4-Nitrophenol	<780		780		ug/Kg	☼	01/28/20 09:56	02/06/20 11:35	2
N-Nitrosodi-n-propylamine	<120		120		ug/Kg	☼	01/28/20 09:56	02/06/20 11:35	2
N-Nitrosodiphenylamine	<120		120		ug/Kg	☼	01/28/20 09:56	02/06/20 11:35	2
Pentachlorophenol	<360		360		ug/Kg	☼	01/28/20 09:56	02/06/20 11:35	2
Phenanthrene	**1200**		36		ug/Kg	☼	01/28/20 09:56	02/06/20 11:35	2
Phenol	<120		120		ug/Kg	☼	01/28/20 09:56	02/06/20 11:35	2
Pyrene	**3800**		36		ug/Kg	☼	01/28/20 09:56	02/06/20 11:35	2
Pyridine	<360		360		ug/Kg	☼	01/28/20 09:56	02/06/20 11:35	2
1,2,4-Trichlorobenzene	<120		120		ug/Kg	☼	01/28/20 09:56	02/06/20 11:35	2
2,4,5-Trichlorophenol	<360		360		ug/Kg	☼	01/28/20 09:56	02/06/20 11:35	2
2,4,6-Trichlorophenol	<360		360		ug/Kg	☼	01/28/20 09:56	02/06/20 11:35	2

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
2-Fluorobiphenyl (Surr)	*78*		*35 - 120*	*01/28/20 09:56*	*02/06/20 11:35*	*2*
2-Fluorophenol (Surr)	*85*		*26 - 120*	*01/28/20 09:56*	*02/06/20 11:35*	*2*
Nitrobenzene-d5 (Surr)	*81*		*28 - 120*	*01/28/20 09:56*	*02/06/20 11:35*	*2*
Phenol-d5 (Surr)	*87*		*28 - 120*	*01/28/20 09:56*	*02/06/20 11:35*	*2*
Terphenyl-d14 (Surr)	*85*		*39 - 120*	*01/28/20 09:56*	*02/06/20 11:35*	*2*
2,4,6-Tribromophenol (Surr)	*91*		*10 - 120*	*01/28/20 09:56*	*02/06/20 11:35*	*2*

Method: 8270D - Semivolatile Organic Compounds (GC/MS) - RA

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Benzo[b]fluoranthene	**4700**		89		ug/Kg	☼	01/28/20 09:56	02/05/20 20:31	5
Fluoranthene	**4400**		89		ug/Kg	☼	01/28/20 09:56	02/05/20 20:31	5

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
2-Fluorobiphenyl (Surr)	*76*		*35 - 120*	*01/28/20 09:56*	*02/05/20 20:31*	*5*
2-Fluorophenol (Surr)	*79*		*26 - 120*	*01/28/20 09:56*	*02/05/20 20:31*	*5*
Nitrobenzene-d5 (Surr)	*81*		*28 - 120*	*01/28/20 09:56*	*02/05/20 20:31*	*5*

Client Sample ID: FR34-WC-005

Date Collected: 01/23/20 14:50
Date Received: 01/24/20 10:40

Lab Sample ID: 240-125349-5

Matrix: Solid
Percent Solids: 83.5

Method: 8270D - Semivolatile Organic Compounds (GC/MS) - RA (Continued)

Surrogate	%Recovery	Qualifier	Limits	Prepared	Analyzed	Dil Fac
Phenol-d5 (Surr)	82		28 - 120	01/28/20 09:56	02/05/20 20:31	5
Terphenyl-d14 (Surr)	83		39 - 120	01/28/20 09:56	02/05/20 20:31	5
2,4,6-Tribromophenol (Surr)	79		10 - 120	01/28/20 09:56	02/05/20 20:31	5

Method: 8015B - Nonhalogenated Organic Compounds - Direct Injection (GC) - Soluble

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
2-Ethoxyethanol	<6.0		6.0		mg/Kg	☼		01/27/20 12:28	1
Methanol	<6.0		6.0		mg/Kg	☼		01/27/20 13:53	1

Method: 8081A - Organochlorine Pesticides (GC) - TCLP

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chlordane (technical)	<0.0050		0.0050		mg/L		01/28/20 10:42	02/03/20 13:28	1
Endrin	<0.00050		0.00050		mg/L		01/28/20 10:42	02/03/20 13:28	1
Heptachlor	<0.00050		0.00050		mg/L		01/28/20 10:42	02/03/20 13:28	1
Heptachlor epoxide	<0.00050		0.00050		mg/L		01/28/20 10:42	02/03/20 13:28	1
gamma-BHC (Lindane)	<0.00050		0.00050		mg/L		01/28/20 10:42	02/03/20 13:28	1
Methoxychlor	<0.0010		0.0010		mg/L		01/28/20 10:42	02/03/20 13:28	1
Toxaphene	<0.020		0.020		mg/L		01/28/20 10:42	02/03/20 13:28	1

Surrogate	%Recovery	Qualifier	Limits	Prepared	Analyzed	Dil Fac
Tetrachloro-m-xylene	68		33 - 123	01/28/20 10:42	02/03/20 13:28	1
Tetrachloro-m-xylene	67		33 - 123	01/28/20 10:42	02/03/20 13:28	1
DCB Decachlorobiphenyl	75		21 - 135	01/28/20 10:42	02/03/20 13:28	1
DCB Decachlorobiphenyl	68		21 - 135	01/28/20 10:42	02/03/20 13:28	1

Method: 8082 - Polychlorinated Biphenyls (PCBs) by Gas Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Aroclor-1016	<20		20		ug/Kg	☼	01/27/20 09:29	01/29/20 10:35	1
Aroclor-1221	<20		20		ug/Kg	☼	01/27/20 09:29	01/29/20 10:35	1
Aroclor-1232	<20		20		ug/Kg	☼	01/27/20 09:29	01/29/20 10:35	1
Aroclor-1242	<20		20		ug/Kg	☼	01/27/20 09:29	01/29/20 10:35	1
Aroclor-1248	<20		20		ug/Kg	☼	01/27/20 09:29	01/29/20 10:35	1
Aroclor-1254	<20		20		ug/Kg	☼	01/27/20 09:29	01/29/20 10:35	1
Aroclor-1260	<20		20		ug/Kg	☼	01/27/20 09:29	01/29/20 10:35	1
Aroclor-1262	<20		20		ug/Kg	☼	01/27/20 09:29	01/29/20 10:35	1
Aroclor-1268	<20		20		ug/Kg	☼	01/27/20 09:29	01/29/20 10:35	1
Polychlorinated biphenyls, Total	<20		20		ug/Kg	☼	01/27/20 09:29	01/29/20 10:35	1

Surrogate	%Recovery	Qualifier	Limits	Prepared	Analyzed	Dil Fac
Tetrachloro-m-xylene	48		14 - 128	01/27/20 09:29	01/29/20 10:35	1
DCB Decachlorobiphenyl	170	X	10 - 132	01/27/20 09:29	01/29/20 10:35	1

Method: 8151A - Herbicides (GC) - TCLP

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
2,4-D	<0.040		0.040		mg/L		02/03/20 10:51	02/05/20 14:03	1
Silvex (2,4,5-TP)	<0.010		0.010		mg/L		02/03/20 10:51	02/05/20 14:03	1

Surrogate	%Recovery	Qualifier	Limits	Prepared	Analyzed	Dil Fac
2,4-Dichlorophenylacetic acid	84		41 - 130	02/03/20 10:51	02/05/20 14:03	1
2,4-Dichlorophenylacetic acid	89		41 - 130	02/03/20 10:51	02/05/20 14:03	1

Client Sample Results

Client: Leidos, Inc.
Project/Site: NASA PBS Waste - FR3 + 4

Job ID: 240-125349-1

Client Sample ID: FR34-WC-005

Date Collected: 01/23/20 14:50
Date Received: 01/24/20 10:40

Lab Sample ID: 240-125349-5

Matrix: Solid
Percent Solids: 83.5

Method: 6010C - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	**29**		1.3		mg/Kg	☼	01/27/20 14:00	01/28/20 19:07	1
Barium	**55**		17		mg/Kg	☼	01/27/20 14:00	01/28/20 19:07	1
Cadmium	<0.42		0.42		mg/Kg	☼	01/27/20 14:00	01/28/20 19:07	1
Chromium	**8.3**		0.84		mg/Kg	☼	01/27/20 14:00	01/28/20 19:07	1
Lead	**4500**		4.2		mg/Kg	☼	01/27/20 14:00	01/29/20 12:10	5
Nickel	**25**		3.4		mg/Kg	☼	01/27/20 14:00	01/28/20 19:07	1
Selenium	<1.7		1.7		mg/Kg	☼	01/27/20 14:00	01/28/20 19:07	1
Silver	<0.84		0.84		mg/Kg	☼	01/27/20 14:00	01/28/20 19:07	1

Method: 6010C - Metals (ICP) - TCLP

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Silver	<0.050		0.050		mg/L		01/28/20 14:00	01/29/20 16:11	1
Arsenic	**0.46**		0.050		mg/L		01/28/20 14:00	01/29/20 16:11	1
Barium	<0.50		0.50		mg/L		01/28/20 14:00	01/29/20 16:11	1
Cadmium	<0.050		0.050		mg/L		01/28/20 14:00	01/29/20 16:11	1
Chromium	<0.050		0.050		mg/L		01/28/20 14:00	01/29/20 16:11	1
Nickel	**0.12**		0.040		mg/L		01/28/20 14:00	01/29/20 16:11	1
Lead	**590**		5.0		mg/L		01/28/20 14:00	01/30/20 19:05	100
Selenium	<0.050		0.050		mg/L		01/28/20 14:00	01/29/20 16:11	1

Method: 7470A - Mercury (CVAA) - TCLP

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	<0.0020		0.0020		mg/L		01/28/20 12:00	01/29/20 13:37	1

Method: 7471B - Mercury (CVAA)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	<0.12		0.12		mg/Kg	☼	01/27/20 16:00	01/28/20 14:37	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Flashpoint	**>200**		1.00		Degrees F			01/28/20 09:52	1
Cyanide, Total	<0.62		0.62		mg/Kg	☼	01/29/20 09:55	01/29/20 13:19	1
Sulfide	<36		36		mg/Kg	☼	01/27/20 07:57	01/27/20 13:02	1
pH	**3.7**	**HF**	0.1		SU			01/27/20 16:35	1
Free Liquid	**CNF**		0.10		NONE			02/05/20 16:59	1
Percent Moisture	**16.5**		0.1		%			01/27/20 17:38	1

Client Sample Results

Client: Leidos, Inc.
Project/Site: NASA PBS Waste - FR3 + 4

Job ID: 240-125349-1

Client Sample ID: FR34-WC-006

Date Collected: 01/23/20 16:15
Date Received: 01/24/20 10:40

Lab Sample ID: 240-125349-6

Matrix: Solid
Percent Solids: 84.1

Method: 8260B - Volatile Organic Compounds (GC/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
1,1,1,2-Tetrachloroethane	<5.0		5.0		ug/Kg	☼	01/29/20 12:38	01/29/20 22:57	1
1,1,1-Trichloroethane	<5.0		5.0		ug/Kg	☼	01/29/20 12:38	01/29/20 22:57	1
1,1,2,2-Tetrachloroethane	<5.0		5.0		ug/Kg	☼	01/29/20 12:38	01/29/20 22:57	1
1,1,2-Trichloro-1,2,2-trichfluoroethane	<5.0		5.0		ug/Kg	☼	01/29/20 12:38	01/29/20 22:57	1
1,1,2-Trichloroethane	<5.0		5.0		ug/Kg	☼	01/29/20 12:38	01/29/20 22:57	1
1,1-Dichloroethane	<5.0		5.0		ug/Kg	☼	01/29/20 12:38	01/29/20 22:57	1
1,1-Dichloroethene	<5.0		5.0		ug/Kg	☼	01/29/20 12:38	01/29/20 22:57	1
1,1-Dichloropropene	<5.0		5.0		ug/Kg	☼	01/29/20 12:38	01/29/20 22:57	1
1,2,3-Trichlorobenzene	<5.0		5.0		ug/Kg	☼	01/29/20 12:38	01/29/20 22:57	1
1,2,3-Trichloropropane	<5.0		5.0		ug/Kg	☼	01/29/20 12:38	01/29/20 22:57	1
1,2,4-Trimethylbenzene	<5.0		5.0		ug/Kg	☼	01/29/20 12:38	01/29/20 22:57	1
1,2-Dibromo-3-Chloropropane	<10		10		ug/Kg	☼	01/29/20 12:38	01/29/20 22:57	1
1,2-Dichlorobenzene	<5.0		5.0		ug/Kg	☼	01/29/20 12:38	01/29/20 22:57	1
1,2-Dichloroethane	<5.0		5.0		ug/Kg	☼	01/29/20 12:38	01/29/20 22:57	1
1,2-Dichloropropane	<5.0		5.0		ug/Kg	☼	01/29/20 12:38	01/29/20 22:57	1
2-Nitropropane	<10		10		ug/Kg	☼	01/29/20 12:38	01/29/20 22:57	1
2,2-Dichloropropane	<5.0		5.0		ug/Kg	☼	01/29/20 12:38	01/29/20 22:57	1
2-Chlorotoluene	<5.0		5.0		ug/Kg	☼	01/29/20 12:38	01/29/20 22:57	1
2-Hexanone	<20		20		ug/Kg	☼	01/29/20 12:38	01/29/20 22:57	1
Bromobenzene	<5.0		5.0		ug/Kg	☼	01/29/20 12:38	01/29/20 22:57	1
Chlorobromomethane	<5.0		5.0		ug/Kg	☼	01/29/20 12:38	01/29/20 22:57	1
4-Chlorotoluene	<5.0		5.0		ug/Kg	☼	01/29/20 12:38	01/29/20 22:57	1
4-Isopropyltoluene	<5.0		5.0		ug/Kg	☼	01/29/20 12:38	01/29/20 22:57	1
Acetone	<25		25		ug/Kg	☼	01/29/20 12:38	01/29/20 22:57	1
Benzene	<5.0		5.0		ug/Kg	☼	01/29/20 12:38	01/29/20 22:57	1
Bromoform	<5.0		5.0		ug/Kg	☼	01/29/20 12:38	01/29/20 22:57	1
Bromomethane	<5.0		5.0		ug/Kg	☼	01/29/20 12:38	01/29/20 22:57	1
Carbon disulfide	<5.0		5.0		ug/Kg	☼	01/29/20 12:38	01/29/20 22:57	1
Carbon tetrachloride	<5.0		5.0		ug/Kg	☼	01/29/20 12:38	01/29/20 22:57	1
Chlorobenzene	<5.0		5.0		ug/Kg	☼	01/29/20 12:38	01/29/20 22:57	1
Chloroethane	<5.0		5.0		ug/Kg	☼	01/29/20 12:38	01/29/20 22:57	1
Chloroform	<5.0		5.0		ug/Kg	☼	01/29/20 12:38	01/29/20 22:57	1
Chloromethane	<5.0		5.0		ug/Kg	☼	01/29/20 12:38	01/29/20 22:57	1
cis-1,2-Dichloroethene	<5.0		5.0		ug/Kg	☼	01/29/20 12:38	01/29/20 22:57	1
Ethyl acetate	<20		20		ug/Kg	☼	01/29/20 12:38	01/29/20 22:57	1
cis-1,3-Dichloropropene	<5.0		5.0		ug/Kg	☼	01/29/20 12:38	01/29/20 22:57	1
Cyclohexanone	<100		100		ug/Kg	☼	01/29/20 12:38	01/29/20 22:57	1
Dibromomethane	<5.0		5.0		ug/Kg	☼	01/29/20 12:38	01/29/20 22:57	1
Dichlorobromomethane	<5.0		5.0		ug/Kg	☼	01/29/20 12:38	01/29/20 22:57	1
Dichlorodifluoromethane	<5.0		5.0		ug/Kg	☼	01/29/20 12:38	01/29/20 22:57	1
Ethyl ether	<5.0		5.0		ug/Kg	☼	01/29/20 12:38	01/29/20 22:57	1
Ethylbenzene	<5.0		5.0		ug/Kg	☼	01/29/20 12:38	01/29/20 22:57	1
Ethylene Dibromide	<5.0		5.0		ug/Kg	☼	01/29/20 12:38	01/29/20 22:57	1
Isobutyl alcohol	<200		200		ug/Kg	☼	01/29/20 12:38	01/29/20 22:57	1
m-Xylene & p-Xylene	<10		10		ug/Kg	☼	01/29/20 12:38	01/29/20 22:57	1
n-Butylbenzene	<5.0		5.0		ug/Kg	☼	01/29/20 12:38	01/29/20 22:57	1
Isopropylbenzene	<5.0		5.0		ug/Kg	☼	01/29/20 12:38	01/29/20 22:57	1
N-Propylbenzene	<5.0		5.0		ug/Kg	☼	01/29/20 12:38	01/29/20 22:57	1
2-Butanone (MEK)	<20		20		ug/Kg	☼	01/29/20 12:38	01/29/20 22:57	1

Client Sample ID: FR34-WC-006

Date Collected: 01/23/20 16:15
Date Received: 01/24/20 10:40

Lab Sample ID: 240-125349-6

Matrix: Solid
Percent Solids: 84.1

Method: 8260B - Volatile Organic Compounds (GC/MS) (Continued)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
4-Methyl-2-pentanone (MIBK)	<20		20		ug/Kg	☼	01/29/20 12:38	01/29/20 22:57	1
sec-Butylbenzene	<5.0		5.0		ug/Kg	☼	01/29/20 12:38	01/29/20 22:57	1
Methyl tert-butyl ether	<5.0		5.0		ug/Kg	☼	01/29/20 12:38	01/29/20 22:57	1
Methylene Chloride	**28**		25		ug/Kg	☼	01/29/20 12:38	01/29/20 22:57	1
n-Butanol	<1000		1000		ug/Kg	☼	01/29/20 12:38	01/29/20 22:57	1
o-Xylene	<5.0		5.0		ug/Kg	☼	01/29/20 12:38	01/29/20 22:57	1
Styrene	<5.0		5.0		ug/Kg	☼	01/29/20 12:38	01/29/20 22:57	1
tert-Butylbenzene	<5.0		5.0		ug/Kg	☼	01/29/20 12:38	01/29/20 22:57	1
Tetrachloroethene	<5.0		5.0		ug/Kg	☼	01/29/20 12:38	01/29/20 22:57	1
Toluene	<5.0		5.0		ug/Kg	☼	01/29/20 12:38	01/29/20 22:57	1
trans-1,2-Dichloroethene	<5.0		5.0		ug/Kg	☼	01/29/20 12:38	01/29/20 22:57	1
trans-1,3-Dichloropropene	<5.0		5.0		ug/Kg	☼	01/29/20 12:38	01/29/20 22:57	1
Trichloroethene	<5.0		5.0		ug/Kg	☼	01/29/20 12:38	01/29/20 22:57	1
Trichlorofluoromethane	<5.0		5.0		ug/Kg	☼	01/29/20 12:38	01/29/20 22:57	1
Vinyl chloride	<5.0		5.0		ug/Kg	☼	01/29/20 12:38	01/29/20 22:57	1
Xylenes, Total	<10		10		ug/Kg	☼	01/29/20 12:38	01/29/20 22:57	1
Chlorodibromomethane	<5.0		5.0		ug/Kg	☼	01/29/20 12:38	01/29/20 22:57	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
1,2-Dichloroethane-d4 (Surr)	*114*		*59 - 120*	*01/29/20 12:38*	*01/29/20 22:57*	*1*
4-Bromofluorobenzene (Surr)	*103*		*51 - 127*	*01/29/20 12:38*	*01/29/20 22:57*	*1*
Toluene-d8 (Surr)	*108*		*64 - 124*	*01/29/20 12:38*	*01/29/20 22:57*	*1*
Dibromofluoromethane (Surr)	*97*		*56 - 122*	*01/29/20 12:38*	*01/29/20 22:57*	*1*

Method: 8260B - Volatile Organic Compounds (GC/MS) - TCLP

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
1,1-Dichloroethene	<0.025		0.025		mg/L			01/29/20 21:09	1
1,2-Dichloroethane	<0.025		0.025		mg/L			01/29/20 21:09	1
2-Butanone (MEK)	<0.25		0.25		mg/L			01/29/20 21:09	1
Benzene	<0.025		0.025		mg/L			01/29/20 21:09	1
Carbon tetrachloride	<0.025		0.025		mg/L			01/29/20 21:09	1
Chlorobenzene	<0.025		0.025		mg/L			01/29/20 21:09	1
Chloroform	<0.025		0.025		mg/L			01/29/20 21:09	1
Tetrachloroethene	<0.025		0.025		mg/L			01/29/20 21:09	1
Trichloroethene	<0.025		0.025		mg/L			01/29/20 21:09	1
Vinyl chloride	<0.025		0.025		mg/L			01/29/20 21:09	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
1,2-Dichloroethane-d4 (Surr)	*86*		*74 - 124*		*01/29/20 21:09*	*1*
4-Bromofluorobenzene (Surr)	*90*		*77 - 120*		*01/29/20 21:09*	*1*
Toluene-d8 (Surr)	*96*		*80 - 120*		*01/29/20 21:09*	*1*
Dibromofluoromethane (Surr)	*96*		*80 - 120*		*01/29/20 21:09*	*1*

Method: 8270C - Semivolatile Organic Compounds (GC/MS) - TCLP

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
1,4-Dichlorobenzene	<0.0040		0.0040		mg/L		01/28/20 10:40	01/30/20 12:06	1
2,4,5-Trichlorophenol	<0.0040		0.0040		mg/L		01/28/20 10:40	01/30/20 12:06	1
2,4,6-Trichlorophenol	<0.0040		0.0040		mg/L		01/28/20 10:40	01/30/20 12:06	1
2,4-Dinitrotoluene	<0.0040		0.0040		mg/L		01/28/20 10:40	01/30/20 12:06	1
Hexachlorobenzene	<0.00080		0.00080		mg/L		01/28/20 10:40	01/30/20 12:06	1

Client Sample Results

Client: Leidos, Inc.
Project/Site: NASA PBS Waste - FR3 + 4

Job ID: 240-125349-1

Client Sample ID: FR34-WC-006

Date Collected: 01/23/20 16:15
Date Received: 01/24/20 10:40

Lab Sample ID: 240-125349-6

Matrix: Solid
Percent Solids: 84.1

Method: 8270C - Semivolatile Organic Compounds (GC/MS) - TCLP (Continued)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Hexachlorobutadiene	<0.0040		0.0040		mg/L		01/28/20 10:40	01/30/20 12:06	1
Hexachloroethane	<0.0040		0.0040		mg/L		01/28/20 10:40	01/30/20 12:06	1
3 & 4 Methylphenol	<0.0040		0.0040		mg/L		01/28/20 10:40	01/30/20 12:06	1
2-Methylphenol	<0.0040		0.0040		mg/L		01/28/20 10:40	01/30/20 12:06	1
Nitrobenzene	<0.0040		0.0040		mg/L		01/28/20 10:40	01/30/20 12:06	1
Pentachlorophenol	<0.016		0.016		mg/L		01/28/20 10:40	01/30/20 12:06	1
Pyridine	<0.0040		0.0040		mg/L		01/28/20 10:40	01/30/20 12:06	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
2-Fluorobiphenyl (Surr)	*91*		*39 - 120*	*01/28/20 10:40*	*01/30/20 12:06*	*1*
2-Fluorophenol (Surr)	*78*		*10 - 120*	*01/28/20 10:40*	*01/30/20 12:06*	*1*
2,4,6-Tribromophenol (Surr)	*101*		*33 - 120*	*01/28/20 10:40*	*01/30/20 12:06*	*1*
Nitrobenzene-d5 (Surr)	*86*		*33 - 120*	*01/28/20 10:40*	*01/30/20 12:06*	*1*
Phenol-d5 (Surr)	*65*		*10 - 120*	*01/28/20 10:40*	*01/30/20 12:06*	*1*
Terphenyl-d14 (Surr)	*99*		*36 - 122*	*01/28/20 10:40*	*01/30/20 12:06*	*1*

Method: 8270D - Semivolatile Organic Compounds (GC/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Acenaphthene	<18		18		ug/Kg	☼	01/28/20 09:56	02/05/20 17:43	1
Acenaphthylene	**19**		18		ug/Kg	☼	01/28/20 09:56	02/05/20 17:43	1
Anthracene	**47**		18		ug/Kg	☼	01/28/20 09:56	02/05/20 17:43	1
Benzo[a]anthracene	**200**		18		ug/Kg	☼	01/28/20 09:56	02/05/20 17:43	1
Benzo[a]pyrene	**140**		18		ug/Kg	☼	01/28/20 09:56	02/05/20 17:43	1
Benzo[b]fluoranthene	**380**		18		ug/Kg	☼	01/28/20 09:56	02/05/20 17:43	1
Benzo[g,h,i]perylene	**50**		18		ug/Kg	☼	01/28/20 09:56	02/05/20 17:43	1
Benzoic acid	<820		820		ug/Kg	☼	01/28/20 09:56	02/05/20 17:43	1
Benzo[k]fluoranthene	**150**		18		ug/Kg	☼	01/28/20 09:56	02/05/20 17:43	1
Benzyl alcohol	<390		390		ug/Kg	☼	01/28/20 09:56	02/05/20 17:43	1
Bis(2-chloroethoxy)methane	<120		120		ug/Kg	☼	01/28/20 09:56	02/05/20 17:43	1
Bis(2-chloroethyl)ether	<120		120		ug/Kg	☼	01/28/20 09:56	02/05/20 17:43	1
bis (2-chloroisopropyl) ether	<120		120		ug/Kg	☼	01/28/20 09:56	02/05/20 17:43	1
Bis(2-ethylhexyl) phthalate	<82		82		ug/Kg	☼	01/28/20 09:56	02/05/20 17:43	1
4-Bromophenyl phenyl ether	<59		59		ug/Kg	☼	01/28/20 09:56	02/05/20 17:43	1
Butyl benzyl phthalate	<82		82		ug/Kg	☼	01/28/20 09:56	02/05/20 17:43	1
Carbazole	<59		59		ug/Kg	☼	01/28/20 09:56	02/05/20 17:43	1
4-Chloroaniline	<180		180		ug/Kg	☼	01/28/20 09:56	02/05/20 17:43	1
4-Chloro-3-methylphenol	<180		180		ug/Kg	☼	01/28/20 09:56	02/05/20 17:43	1
2-Chloronaphthalene	<59		59		ug/Kg	☼	01/28/20 09:56	02/05/20 17:43	1
2-Chlorophenol	<59		59		ug/Kg	☼	01/28/20 09:56	02/05/20 17:43	1
4-Chlorophenyl phenyl ether	<59		59		ug/Kg	☼	01/28/20 09:56	02/05/20 17:43	1
Chrysene	**270**		18		ug/Kg	☼	01/28/20 09:56	02/05/20 17:43	1
Dibenz(a,h)anthracene	**22**		18		ug/Kg	☼	01/28/20 09:56	02/05/20 17:43	1
Dibenzofuran	<59		59		ug/Kg	☼	01/28/20 09:56	02/05/20 17:43	1
1,3-Dichlorobenzene	<59		59		ug/Kg	☼	01/28/20 09:56	02/05/20 17:43	1
1,4-Dichlorobenzene	<59		59		ug/Kg	☼	01/28/20 09:56	02/05/20 17:43	1
3,3'-Dichlorobenzidine	<120		120		ug/Kg	☼	01/28/20 09:56	02/05/20 17:43	1
2,4-Dichlorophenol	<180		180		ug/Kg	☼	01/28/20 09:56	02/05/20 17:43	1
Diethyl phthalate	<82		82		ug/Kg	☼	01/28/20 09:56	02/05/20 17:43	1
2,4-Dimethylphenol	<180		180		ug/Kg	☼	01/28/20 09:56	02/05/20 17:43	1
Dimethyl phthalate	<82		82		ug/Kg	☼	01/28/20 09:56	02/05/20 17:43	1

Client Sample Results

Client: Leidos, Inc.
Project/Site: NASA PBS Waste - FR3 + 4

Job ID: 240-125349-1

Client Sample ID: FR34-WC-006

Date Collected: 01/23/20 16:15
Date Received: 01/24/20 10:40

Lab Sample ID: 240-125349-6

Matrix: Solid
Percent Solids: 84.1

Method: 8270D - Semivolatile Organic Compounds (GC/MS) (Continued)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Di-n-butyl phthalate	<82		82		ug/Kg	☼	01/28/20 09:56	02/05/20 17:43	1
4,6-Dinitro-2-methylphenol	<390		390		ug/Kg	☼	01/28/20 09:56	02/05/20 17:43	1
2,4-Dinitrophenol	<390		390		ug/Kg	☼	01/28/20 09:56	02/05/20 17:43	1
2,4-Dinitrotoluene	<230		230		ug/Kg	☼	01/28/20 09:56	02/05/20 17:43	1
2,6-Dinitrotoluene	<230		230		ug/Kg	☼	01/28/20 09:56	02/05/20 17:43	1
Di-n-octyl phthalate	<82		82		ug/Kg	☼	01/28/20 09:56	02/05/20 17:43	1
Fluoranthene	**210**		18		ug/Kg	☼	01/28/20 09:56	02/05/20 17:43	1
Fluorene	<18		18		ug/Kg	☼	01/28/20 09:56	02/05/20 17:43	1
Hexachlorobenzene	<18		18		ug/Kg	☼	01/28/20 09:56	02/05/20 17:43	1
Hexachlorobutadiene	<59		59		ug/Kg	☼	01/28/20 09:56	02/05/20 17:43	1
Hexachlorocyclopentadiene	<390		390		ug/Kg	☼	01/28/20 09:56	02/05/20 17:43	1
Hexachloroethane	<59		59		ug/Kg	☼	01/28/20 09:56	02/05/20 17:43	1
Indeno[1,2,3-cd]pyrene	**66**		18		ug/Kg	☼	01/28/20 09:56	02/05/20 17:43	1
Isophorone	<59		59		ug/Kg	☼	01/28/20 09:56	02/05/20 17:43	1
2-Methylnaphthalene	**49**		18		ug/Kg	☼	01/28/20 09:56	02/05/20 17:43	1
2-Methylphenol	<230		230		ug/Kg	☼	01/28/20 09:56	02/05/20 17:43	1
3 & 4 Methylphenol	<470		470		ug/Kg	☼	01/28/20 09:56	02/05/20 17:43	1
Naphthalene	<18		18		ug/Kg	☼	01/28/20 09:56	02/05/20 17:43	1
2-Nitroaniline	<230		230		ug/Kg	☼	01/28/20 09:56	02/05/20 17:43	1
3-Nitroaniline	<230		230		ug/Kg	☼	01/28/20 09:56	02/05/20 17:43	1
4-Nitroaniline	<230		230		ug/Kg	☼	01/28/20 09:56	02/05/20 17:43	1
Nitrobenzene	<120		120		ug/Kg	☼	01/28/20 09:56	02/05/20 17:43	1
2-Nitrophenol	<59		59		ug/Kg	☼	01/28/20 09:56	02/05/20 17:43	1
4-Nitrophenol	<390		390		ug/Kg	☼	01/28/20 09:56	02/05/20 17:43	1
N-Nitrosodi-n-propylamine	<59		59		ug/Kg	☼	01/28/20 09:56	02/05/20 17:43	1
N-Nitrosodiphenylamine	<59		59		ug/Kg	☼	01/28/20 09:56	02/05/20 17:43	1
Pentachlorophenol	<180		180		ug/Kg	☼	01/28/20 09:56	02/05/20 17:43	1
Phenanthrene	**39**		18		ug/Kg	☼	01/28/20 09:56	02/05/20 17:43	1
Phenol	<59		59		ug/Kg	☼	01/28/20 09:56	02/05/20 17:43	1
Pyrene	**250**		18		ug/Kg	☼	01/28/20 09:56	02/05/20 17:43	1
Pyridine	<180		180		ug/Kg	☼	01/28/20 09:56	02/05/20 17:43	1
1,2,4-Trichlorobenzene	<59		59		ug/Kg	☼	01/28/20 09:56	02/05/20 17:43	1
2,4,5-Trichlorophenol	<180		180		ug/Kg	☼	01/28/20 09:56	02/05/20 17:43	1
2,4,6-Trichlorophenol	<180		180		ug/Kg	☼	01/28/20 09:56	02/05/20 17:43	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
2-Fluorobiphenyl (Surr)	*72*		*35 - 120*	*01/28/20 09:56*	*02/05/20 17:43*	*1*
2-Fluorophenol (Surr)	*75*		*26 - 120*	*01/28/20 09:56*	*02/05/20 17:43*	*1*
Nitrobenzene-d5 (Surr)	*65*		*28 - 120*	*01/28/20 09:56*	*02/05/20 17:43*	*1*
Phenol-d5 (Surr)	*78*		*28 - 120*	*01/28/20 09:56*	*02/05/20 17:43*	*1*
Terphenyl-d14 (Surr)	*83*		*39 - 120*	*01/28/20 09:56*	*02/05/20 17:43*	*1*
2,4,6-Tribromophenol (Surr)	*78*		*10 - 120*	*01/28/20 09:56*	*02/05/20 17:43*	*1*

Method: 8015B - Nonhalogenated Organic Compounds - Direct Injection (GC) - Soluble

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
2-Ethoxyethanol	<5.9		5.9		mg/Kg	☼		01/27/20 12:41	1
Methanol	<5.9		5.9		mg/Kg	☼		01/27/20 14:07	1

Client Sample Results

Client: Leidos, Inc.
Project/Site: NASA PBS Waste - FR3 + 4

Job ID: 240-125349-1

Client Sample ID: FR34-WC-006

Date Collected: 01/23/20 16:15
Date Received: 01/24/20 10:40

Lab Sample ID: 240-125349-6

Matrix: Solid
Percent Solids: 84.1

Method: 8081A - Organochlorine Pesticides (GC) - TCLP

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chlordane (technical)	<0.0050		0.0050		mg/L		01/28/20 10:42	02/03/20 13:41	1
Endrin	<0.00050		0.00050		mg/L		01/28/20 10:42	02/03/20 13:41	1
Heptachlor	<0.00050		0.00050		mg/L		01/28/20 10:42	02/03/20 13:41	1
Heptachlor epoxide	<0.00050		0.00050		mg/L		01/28/20 10:42	02/03/20 13:41	1
gamma-BHC (Lindane)	<0.00050		0.00050		mg/L		01/28/20 10:42	02/03/20 13:41	1
Methoxychlor	<0.0010		0.0010		mg/L		01/28/20 10:42	02/03/20 13:41	1
Toxaphene	<0.020		0.020		mg/L		01/28/20 10:42	02/03/20 13:41	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Tetrachloro-m-xylene	*59*		*33 - 123*	*01/28/20 10:42*	*02/03/20 13:41*	*1*
Tetrachloro-m-xylene	*56*		*33 - 123*	*01/28/20 10:42*	*02/03/20 13:41*	*1*
DCB Decachlorobiphenyl	*66*		*21 - 135*	*01/28/20 10:42*	*02/03/20 13:41*	*1*
DCB Decachlorobiphenyl	*55*		*21 - 135*	*01/28/20 10:42*	*02/03/20 13:41*	*1*

Method: 8082 - Polychlorinated Biphenyls (PCBs) by Gas Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Aroclor-1016	<20		20		ug/Kg	☼	01/27/20 09:29	01/29/20 10:49	1
Aroclor-1221	<20		20		ug/Kg	☼	01/27/20 09:29	01/29/20 10:49	1
Aroclor-1232	<20		20		ug/Kg	☼	01/27/20 09:29	01/29/20 10:49	1
Aroclor-1242	<20		20		ug/Kg	☼	01/27/20 09:29	01/29/20 10:49	1
Aroclor-1248	<20		20		ug/Kg	☼	01/27/20 09:29	01/29/20 10:49	1
Aroclor-1254	<20		20		ug/Kg	☼	01/27/20 09:29	01/29/20 10:49	1
Aroclor-1260	<20		20		ug/Kg	☼	01/27/20 09:29	01/29/20 10:49	1
Aroclor-1262	<20		20		ug/Kg	☼	01/27/20 09:29	01/29/20 10:49	1
Aroclor-1268	<20		20		ug/Kg	☼	01/27/20 09:29	01/29/20 10:49	1
Polychlorinated biphenyls, Total	<20		20		ug/Kg	☼	01/27/20 09:29	01/29/20 10:49	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Tetrachloro-m-xylene	*52*		*14 - 128*	*01/27/20 09:29*	*01/29/20 10:49*	*1*
DCB Decachlorobiphenyl	*65*		*10 - 132*	*01/27/20 09:29*	*01/29/20 10:49*	*1*

Method: 8151A - Herbicides (GC) - TCLP

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
2,4-D	<0.040		0.040		mg/L		02/03/20 10:51	02/05/20 14:25	1
Silvex (2,4,5-TP)	<0.010		0.010		mg/L		02/03/20 10:51	02/05/20 14:25	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
2,4-Dichlorophenylacetic acid	*89*		*41 - 130*	*02/03/20 10:51*	*02/05/20 14:25*	*1*
2,4-Dichlorophenylacetic acid	*91*		*41 - 130*	*02/03/20 10:51*	*02/05/20 14:25*	*1*

Method: 6010C - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	**15**		1.3		mg/Kg	☼	01/27/20 14:00	01/28/20 19:11	1
Barium	**83**		17		mg/Kg	☼	01/27/20 14:00	01/28/20 19:11	1
Cadmium	<0.42		0.42		mg/Kg	☼	01/27/20 14:00	01/28/20 19:11	1
Chromium	**9.8**		0.85		mg/Kg	☼	01/27/20 14:00	01/28/20 19:11	1
Lead	**86**		0.85		mg/Kg	☼	01/27/20 14:00	01/28/20 19:11	1
Nickel	**35**		3.4		mg/Kg	☼	01/27/20 14:00	01/28/20 19:11	1
Selenium	<1.7		1.7		mg/Kg	☼	01/27/20 14:00	01/28/20 19:11	1
Silver	<0.85		0.85		mg/Kg	☼	01/27/20 14:00	01/28/20 19:11	1

Client Sample Results

Client: Leidos, Inc.
Project/Site: NASA PBS Waste - FR3 + 4

Job ID: 240-125349-1

Client Sample ID: FR34-WC-006

Date Collected: 01/23/20 16:15
Date Received: 01/24/20 10:40

Lab Sample ID: 240-125349-6

Matrix: Solid
Percent Solids: 84.1

Method: 6010C - Metals (ICP) - TCLP

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Silver	<0.050		0.050		mg/L		01/28/20 14:00	01/29/20 16:15	1
Arsenic	<0.050		0.050		mg/L		01/28/20 14:00	01/29/20 16:15	1
Barium	<0.50		0.50		mg/L		01/28/20 14:00	01/29/20 16:15	1
Cadmium	<0.050		0.050		mg/L		01/28/20 14:00	01/29/20 16:15	1
Chromium	<0.050		0.050		mg/L		01/28/20 14:00	01/29/20 16:15	1
Nickel	**0.094**		0.040		mg/L		01/28/20 14:00	01/29/20 16:15	1
Lead	**3.6**		0.050		mg/L		01/28/20 14:00	01/29/20 16:15	1
Selenium	<0.050		0.050		mg/L		01/28/20 14:00	01/29/20 16:15	1

Method: 7470A - Mercury (CVAA) - TCLP

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	<0.0020		0.0020		mg/L		01/28/20 12:00	01/29/20 13:40	1

Method: 7471B - Mercury (CVAA)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	<0.13		0.13		mg/Kg	☼	01/27/20 16:00	01/28/20 14:39	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Flashpoint	**>200**		1.00		Degrees F			01/28/20 10:25	1
Cyanide, Total	<0.65		0.65		mg/Kg	☼	01/29/20 09:55	01/29/20 13:17	1
Sulfide	<36		36		mg/Kg	☼	01/27/20 07:57	01/27/20 13:08	1
pH	**4.4**	**HF**	0.1		SU			01/27/20 16:46	1
Free Liquid	**CNF**		0.10		NONE			02/05/20 16:59	1
Percent Moisture	**15.9**		0.1		%			01/27/20 17:38	1

Client Sample Results

Client: Leidos, Inc.
Project/Site: NASA PBS Waste - FR3 + 4

Job ID: 240-125349-1

Client Sample ID: FR34-WC-007

Date Collected: 01/23/20 15:45
Date Received: 01/24/20 10:40

Lab Sample ID: 240-125349-7

Matrix: Solid
Percent Solids: 83.5

Method: 8260B - Volatile Organic Compounds (GC/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
1,1,1,2-Tetrachloroethane	<5.4		5.4		ug/Kg	☼	01/28/20 12:56	01/28/20 22:18	1
1,1,1-Trichloroethane	<5.4		5.4		ug/Kg	☼	01/28/20 12:56	01/28/20 22:18	1
1,1,2,2-Tetrachloroethane	<5.4	*	5.4		ug/Kg	☼	01/28/20 12:56	01/28/20 22:18	1
1,1,2-Trichloro-1,2,2-trichfluoroethane	<5.4		5.4		ug/Kg	☼	01/28/20 12:56	01/28/20 22:18	1
1,1,2-Trichloroethane	<5.4		5.4		ug/Kg	☼	01/28/20 12:56	01/28/20 22:18	1
1,1-Dichloroethane	<5.4		5.4		ug/Kg	☼	01/28/20 12:56	01/28/20 22:18	1
1,1-Dichloroethene	<5.4		5.4		ug/Kg	☼	01/28/20 12:56	01/28/20 22:18	1
1,1-Dichloropropene	<5.4		5.4		ug/Kg	☼	01/28/20 12:56	01/28/20 22:18	1
1,2,3-Trichlorobenzene	<5.4	*	5.4		ug/Kg	☼	01/28/20 12:56	01/28/20 22:18	1
1,2,3-Trichloropropane	<5.4	*	5.4		ug/Kg	☼	01/28/20 12:56	01/28/20 22:18	1
1,2,4-Trimethylbenzene	**6.9**	*	5.4		ug/Kg	☼	01/28/20 12:56	01/28/20 22:18	1
1,2-Dibromo-3-Chloropropane	<11	*	11		ug/Kg	☼	01/28/20 12:56	01/28/20 22:18	1
1,2-Dichlorobenzene	<5.4	*	5.4		ug/Kg	☼	01/28/20 12:56	01/28/20 22:18	1
1,2-Dichloroethane	<5.4		5.4		ug/Kg	☼	01/28/20 12:56	01/28/20 22:18	1
1,2-Dichloropropane	<5.4		5.4		ug/Kg	☼	01/28/20 12:56	01/28/20 22:18	1
2-Nitropropane	<11		11		ug/Kg	☼	01/28/20 12:56	01/28/20 22:18	1
2,2-Dichloropropane	<5.4		5.4		ug/Kg	☼	01/28/20 12:56	01/28/20 22:18	1
2-Chlorotoluene	<5.4	*	5.4		ug/Kg	☼	01/28/20 12:56	01/28/20 22:18	1
2-Hexanone	<22		22		ug/Kg	☼	01/28/20 12:56	01/28/20 22:18	1
Bromobenzene	<5.4	*	5.4		ug/Kg	☼	01/28/20 12:56	01/28/20 22:18	1
Chlorobromomethane	<5.4		5.4		ug/Kg	☼	01/28/20 12:56	01/28/20 22:18	1
4-Chlorotoluene	<5.4	*	5.4		ug/Kg	☼	01/28/20 12:56	01/28/20 22:18	1
4-Isopropyltoluene	<5.4	*	5.4		ug/Kg	☼	01/28/20 12:56	01/28/20 22:18	1
Acetone	<27		27		ug/Kg	☼	01/28/20 12:56	01/28/20 22:18	1
Benzene	<5.4		5.4		ug/Kg	☼	01/28/20 12:56	01/28/20 22:18	1
Bromoform	<5.4		5.4		ug/Kg	☼	01/28/20 12:56	01/28/20 22:18	1
Bromomethane	<5.4		5.4		ug/Kg	☼	01/28/20 12:56	01/28/20 22:18	1
Carbon disulfide	<5.4		5.4		ug/Kg	☼	01/28/20 12:56	01/28/20 22:18	1
Carbon tetrachloride	<5.4		5.4		ug/Kg	☼	01/28/20 12:56	01/28/20 22:18	1
Chlorobenzene	<5.4		5.4		ug/Kg	☼	01/28/20 12:56	01/28/20 22:18	1
Chloroethane	<5.4		5.4		ug/Kg	☼	01/28/20 12:56	01/28/20 22:18	1
Chloroform	<5.4		5.4		ug/Kg	☼	01/28/20 12:56	01/28/20 22:18	1
Chloromethane	<5.4		5.4		ug/Kg	☼	01/28/20 12:56	01/28/20 22:18	1
cis-1,2-Dichloroethene	<5.4		5.4		ug/Kg	☼	01/28/20 12:56	01/28/20 22:18	1
Ethyl acetate	<22		22		ug/Kg	☼	01/28/20 12:56	01/28/20 22:18	1
cis-1,3-Dichloropropene	<5.4		5.4		ug/Kg	☼	01/28/20 12:56	01/28/20 22:18	1
Cyclohexanone	<110		110		ug/Kg	☼	01/28/20 12:56	01/28/20 22:18	1
Dibromomethane	<5.4		5.4		ug/Kg	☼	01/28/20 12:56	01/28/20 22:18	1
Dichlorobromomethane	<5.4		5.4		ug/Kg	☼	01/28/20 12:56	01/28/20 22:18	1
Dichlorodifluoromethane	<5.4		5.4		ug/Kg	☼	01/28/20 12:56	01/28/20 22:18	1
Ethyl ether	<5.4		5.4		ug/Kg	☼	01/28/20 12:56	01/28/20 22:18	1
Ethylbenzene	<5.4		5.4		ug/Kg	☼	01/28/20 12:56	01/28/20 22:18	1
Ethylene Dibromide	<5.4		5.4		ug/Kg	☼	01/28/20 12:56	01/28/20 22:18	1
Isobutyl alcohol	<220		220		ug/Kg	☼	01/28/20 12:56	01/28/20 22:18	1
m-Xylene & p-Xylene	<11		11		ug/Kg	☼	01/28/20 12:56	01/28/20 22:18	1
n-Butylbenzene	<5.4	*	5.4		ug/Kg	☼	01/28/20 12:56	01/28/20 22:18	1
Isopropylbenzene	<5.4		5.4		ug/Kg	☼	01/28/20 12:56	01/28/20 22:18	1
N-Propylbenzene	<5.4	*	5.4		ug/Kg	☼	01/28/20 12:56	01/28/20 22:18	1
2-Butanone (MEK)	<22		22		ug/Kg	☼	01/28/20 12:56	01/28/20 22:18	1

Client Sample ID: FR34-WC-007

Date Collected: 01/23/20 15:45
Date Received: 01/24/20 10:40

Lab Sample ID: 240-125349-7

Matrix: Solid
Percent Solids: 83.5

Method: 8260B - Volatile Organic Compounds (GC/MS) (Continued)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
4-Methyl-2-pentanone (MIBK)	<22		22		ug/Kg	☼	01/28/20 12:56	01/28/20 22:18	1
sec-Butylbenzene	<5.4	*	5.4		ug/Kg	☼	01/28/20 12:56	01/28/20 22:18	1
Methyl tert-butyl ether	<5.4		5.4		ug/Kg	☼	01/28/20 12:56	01/28/20 22:18	1
Methylene Chloride	<27		27		ug/Kg	☼	01/28/20 12:56	01/28/20 22:18	1
n-Butanol	<1100		1100		ug/Kg	☼	01/28/20 12:56	01/28/20 22:18	1
o-Xylene	<5.4		5.4		ug/Kg	☼	01/28/20 12:56	01/28/20 22:18	1
Styrene	<5.4		5.4		ug/Kg	☼	01/28/20 12:56	01/28/20 22:18	1
tert-Butylbenzene	<5.4	*	5.4		ug/Kg	☼	01/28/20 12:56	01/28/20 22:18	1
Tetrachloroethene	<5.4		5.4		ug/Kg	☼	01/28/20 12:56	01/28/20 22:18	1
Toluene	**9.5**		5.4		ug/Kg	☼	01/28/20 12:56	01/28/20 22:18	1
trans-1,2-Dichloroethene	<5.4		5.4		ug/Kg	☼	01/28/20 12:56	01/28/20 22:18	1
trans-1,3-Dichloropropene	<5.4		5.4		ug/Kg	☼	01/28/20 12:56	01/28/20 22:18	1
Trichloroethene	<5.4		5.4		ug/Kg	☼	01/28/20 12:56	01/28/20 22:18	1
Trichlorofluoromethane	<5.4		5.4		ug/Kg	☼	01/28/20 12:56	01/28/20 22:18	1
Vinyl chloride	<5.4		5.4		ug/Kg	☼	01/28/20 12:56	01/28/20 22:18	1
Xylenes, Total	<11		11		ug/Kg	☼	01/28/20 12:56	01/28/20 22:18	1
Chlorodibromomethane	<5.4		5.4		ug/Kg	☼	01/28/20 12:56	01/28/20 22:18	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
1,2-Dichloroethane-d4 (Surr)	*95*		*59 - 120*	*01/28/20 12:56*	*01/28/20 22:18*	*1*
4-Bromofluorobenzene (Surr)	*125*	*	*51 - 127*	*01/28/20 12:56*	*01/28/20 22:18*	*1*
Toluene-d8 (Surr)	*119*		*64 - 124*	*01/28/20 12:56*	*01/28/20 22:18*	*1*
Dibromofluoromethane (Surr)	*87*		*56 - 122*	*01/28/20 12:56*	*01/28/20 22:18*	*1*

Method: 8260B - Volatile Organic Compounds (GC/MS) - TCLP

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
1,1-Dichloroethene	<0.025		0.025		mg/L			01/29/20 21:31	1
1,2-Dichloroethane	<0.025		0.025		mg/L			01/29/20 21:31	1
2-Butanone (MEK)	<0.25		0.25		mg/L			01/29/20 21:31	1
Benzene	<0.025		0.025		mg/L			01/29/20 21:31	1
Carbon tetrachloride	<0.025		0.025		mg/L			01/29/20 21:31	1
Chlorobenzene	<0.025		0.025		mg/L			01/29/20 21:31	1
Chloroform	<0.025		0.025		mg/L			01/29/20 21:31	1
Tetrachloroethene	<0.025		0.025		mg/L			01/29/20 21:31	1
Trichloroethene	<0.025		0.025		mg/L			01/29/20 21:31	1
Vinyl chloride	<0.025		0.025		mg/L			01/29/20 21:31	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
1,2-Dichloroethane-d4 (Surr)	*83*		*74 - 124*		*01/29/20 21:31*	*1*
4-Bromofluorobenzene (Surr)	*87*		*77 - 120*		*01/29/20 21:31*	*1*
Toluene-d8 (Surr)	*92*		*80 - 120*		*01/29/20 21:31*	*1*
Dibromofluoromethane (Surr)	*90*		*80 - 120*		*01/29/20 21:31*	*1*

Method: 8270C - Semivolatile Organic Compounds (GC/MS) - TCLP

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
1,4-Dichlorobenzene	<0.0040		0.0040		mg/L		01/28/20 10:40	01/30/20 12:30	1
2,4,5-Trichlorophenol	<0.0040		0.0040		mg/L		01/28/20 10:40	01/30/20 12:30	1
2,4,6-Trichlorophenol	<0.0040		0.0040		mg/L		01/28/20 10:40	01/30/20 12:30	1
2,4-Dinitrotoluene	<0.0040		0.0040		mg/L		01/28/20 10:40	01/30/20 12:30	1
Hexachlorobenzene	<0.00080		0.00080		mg/L		01/28/20 10:40	01/30/20 12:30	1

Client Sample Results

Client: Leidos, Inc.
Project/Site: NASA PBS Waste - FR3 + 4

Job ID: 240-125349-1

Client Sample ID: FR34-WC-007

Date Collected: 01/23/20 15:45
Date Received: 01/24/20 10:40

Lab Sample ID: 240-125349-7

Matrix: Solid
Percent Solids: 83.5

Method: 8270C - Semivolatile Organic Compounds (GC/MS) - TCLP (Continued)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Hexachlorobutadiene	<0.0040		0.0040		mg/L		01/28/20 10:40	01/30/20 12:30	1
Hexachloroethane	<0.0040		0.0040		mg/L		01/28/20 10:40	01/30/20 12:30	1
3 & 4 Methylphenol	<0.0040		0.0040		mg/L		01/28/20 10:40	01/30/20 12:30	1
2-Methylphenol	<0.0040		0.0040		mg/L		01/28/20 10:40	01/30/20 12:30	1
Nitrobenzene	<0.0040		0.0040		mg/L		01/28/20 10:40	01/30/20 12:30	1
Pentachlorophenol	<0.016		0.016		mg/L		01/28/20 10:40	01/30/20 12:30	1
Pyridine	<0.0040		0.0040		mg/L		01/28/20 10:40	01/30/20 12:30	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
2-Fluorobiphenyl (Surr)	*87*		*39 - 120*	*01/28/20 10:40*	*01/30/20 12:30*	*1*
2-Fluorophenol (Surr)	*68*		*10 - 120*	*01/28/20 10:40*	*01/30/20 12:30*	*1*
2,4,6-Tribromophenol (Surr)	*94*		*33 - 120*	*01/28/20 10:40*	*01/30/20 12:30*	*1*
Nitrobenzene-d5 (Surr)	*84*		*33 - 120*	*01/28/20 10:40*	*01/30/20 12:30*	*1*
Phenol-d5 (Surr)	*54*		*10 - 120*	*01/28/20 10:40*	*01/30/20 12:30*	*1*
Terphenyl-d14 (Surr)	*93*		*36 - 122*	*01/28/20 10:40*	*01/30/20 12:30*	*1*

Method: 8270D - Semivolatile Organic Compounds (GC/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Acenaphthene	<44		44		ug/Kg	☼	01/28/20 09:56	02/05/20 20:07	2.5
Acenaphthylene	**49**		44		ug/Kg	☼	01/28/20 09:56	02/05/20 20:07	2.5
Anthracene	**210**		44		ug/Kg	☼	01/28/20 09:56	02/05/20 20:07	2.5
Benzo[a]anthracene	**1000**		44		ug/Kg	☼	01/28/20 09:56	02/05/20 20:07	2.5
Benzo[a]pyrene	**490**		44		ug/Kg	☼	01/28/20 09:56	02/05/20 20:07	2.5
Benzo[b]fluoranthene	**1300**		44		ug/Kg	☼	01/28/20 09:56	02/05/20 20:07	2.5
Benzo[g,h,i]perylene	**130**		44		ug/Kg	☼	01/28/20 09:56	02/05/20 20:07	2.5
Benzoic acid	<2100		2100		ug/Kg	☼	01/28/20 09:56	02/05/20 20:07	2.5
Benzo[k]fluoranthene	**510**		44		ug/Kg	☼	01/28/20 09:56	02/05/20 20:07	2.5
Benzyl alcohol	<970		970		ug/Kg	☼	01/28/20 09:56	02/05/20 20:07	2.5
Bis(2-chloroethoxy)methane	<290		290		ug/Kg	☼	01/28/20 09:56	02/05/20 20:07	2.5
Bis(2-chloroethyl)ether	<290		290		ug/Kg	☼	01/28/20 09:56	02/05/20 20:07	2.5
bis (2-chloroisopropyl) ether	<290		290		ug/Kg	☼	01/28/20 09:56	02/05/20 20:07	2.5
Bis(2-ethylhexyl) phthalate	<210		210		ug/Kg	☼	01/28/20 09:56	02/05/20 20:07	2.5
4-Bromophenyl phenyl ether	<150		150		ug/Kg	☼	01/28/20 09:56	02/05/20 20:07	2.5
Butyl benzyl phthalate	<210		210		ug/Kg	☼	01/28/20 09:56	02/05/20 20:07	2.5
Carbazole	<150		150		ug/Kg	☼	01/28/20 09:56	02/05/20 20:07	2.5
4-Chloroaniline	<440		440		ug/Kg	☼	01/28/20 09:56	02/05/20 20:07	2.5
4-Chloro-3-methylphenol	<440		440		ug/Kg	☼	01/28/20 09:56	02/05/20 20:07	2.5
2-Chloronaphthalene	<150		150		ug/Kg	☼	01/28/20 09:56	02/05/20 20:07	2.5
2-Chlorophenol	<150		150		ug/Kg	☼	01/28/20 09:56	02/05/20 20:07	2.5
4-Chlorophenyl phenyl ether	<150		150		ug/Kg	☼	01/28/20 09:56	02/05/20 20:07	2.5
Chrysene	**1400**		44		ug/Kg	☼	01/28/20 09:56	02/05/20 20:07	2.5
Dibenz(a,h)anthracene	**73**		44		ug/Kg	☼	01/28/20 09:56	02/05/20 20:07	2.5
Dibenzofuran	<150		150		ug/Kg	☼	01/28/20 09:56	02/05/20 20:07	2.5
1,3-Dichlorobenzene	<150		150		ug/Kg	☼	01/28/20 09:56	02/05/20 20:07	2.5
1,4-Dichlorobenzene	<150		150		ug/Kg	☼	01/28/20 09:56	02/05/20 20:07	2.5
3,3'-Dichlorobenzidine	<290		290		ug/Kg	☼	01/28/20 09:56	02/05/20 20:07	2.5
2,4-Dichlorophenol	<440		440		ug/Kg	☼	01/28/20 09:56	02/05/20 20:07	2.5
Diethyl phthalate	<210		210		ug/Kg	☼	01/28/20 09:56	02/05/20 20:07	2.5
2,4-Dimethylphenol	<440		440		ug/Kg	☼	01/28/20 09:56	02/05/20 20:07	2.5
Dimethyl phthalate	<210		210		ug/Kg	☼	01/28/20 09:56	02/05/20 20:07	2.5

Client Sample Results

Client: Leidos, Inc.
Project/Site: NASA PBS Waste - FR3 + 4

Job ID: 240-125349-1

Client Sample ID: FR34-WC-007

Date Collected: 01/23/20 15:45
Date Received: 01/24/20 10:40

Lab Sample ID: 240-125349-7

Matrix: Solid
Percent Solids: 83.5

Method: 8270D - Semivolatile Organic Compounds (GC/MS) (Continued)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Di-n-butyl phthalate	<210		210		ug/Kg	☼	01/28/20 09:56	02/05/20 20:07	2.5
4,6-Dinitro-2-methylphenol	<970		970		ug/Kg	☼	01/28/20 09:56	02/05/20 20:07	2.5
2,4-Dinitrophenol	<970		970		ug/Kg	☼	01/28/20 09:56	02/05/20 20:07	2.5
2,4-Dinitrotoluene	<590		590		ug/Kg	☼	01/28/20 09:56	02/05/20 20:07	2.5
2,6-Dinitrotoluene	<590		590		ug/Kg	☼	01/28/20 09:56	02/05/20 20:07	2.5
Di-n-octyl phthalate	<210		210		ug/Kg	☼	01/28/20 09:56	02/05/20 20:07	2.5
Fluoranthene	**1400**		44		ug/Kg	☼	01/28/20 09:56	02/05/20 20:07	2.5
Fluorene	<44		44		ug/Kg	☼	01/28/20 09:56	02/05/20 20:07	2.5
Hexachlorobenzene	<44		44		ug/Kg	☼	01/28/20 09:56	02/05/20 20:07	2.5
Hexachlorobutadiene	<150		150		ug/Kg	☼	01/28/20 09:56	02/05/20 20:07	2.5
Hexachlorocyclopentadiene	<970		970		ug/Kg	☼	01/28/20 09:56	02/05/20 20:07	2.5
Hexachloroethane	<150		150		ug/Kg	☼	01/28/20 09:56	02/05/20 20:07	2.5
Indeno[1,2,3-cd]pyrene	**160**		44		ug/Kg	☼	01/28/20 09:56	02/05/20 20:07	2.5
Isophorone	<150		150		ug/Kg	☼	01/28/20 09:56	02/05/20 20:07	2.5
2-Methylnaphthalene	**290**		44		ug/Kg	☼	01/28/20 09:56	02/05/20 20:07	2.5
2-Methylphenol	<590		590		ug/Kg	☼	01/28/20 09:56	02/05/20 20:07	2.5
3 & 4 Methylphenol	<1200		1200		ug/Kg	☼	01/28/20 09:56	02/05/20 20:07	2.5
Naphthalene	**100**		44		ug/Kg	☼	01/28/20 09:56	02/05/20 20:07	2.5
2-Nitroaniline	<590		590		ug/Kg	☼	01/28/20 09:56	02/05/20 20:07	2.5
3-Nitroaniline	<590		590		ug/Kg	☼	01/28/20 09:56	02/05/20 20:07	2.5
4-Nitroaniline	<590		590		ug/Kg	☼	01/28/20 09:56	02/05/20 20:07	2.5
Nitrobenzene	<290		290		ug/Kg	☼	01/28/20 09:56	02/05/20 20:07	2.5
2-Nitrophenol	<150		150		ug/Kg	☼	01/28/20 09:56	02/05/20 20:07	2.5
4-Nitrophenol	<970		970		ug/Kg	☼	01/28/20 09:56	02/05/20 20:07	2.5
N-Nitrosodi-n-propylamine	<150		150		ug/Kg	☼	01/28/20 09:56	02/05/20 20:07	2.5
N-Nitrosodiphenylamine	<150		150		ug/Kg	☼	01/28/20 09:56	02/05/20 20:07	2.5
Pentachlorophenol	<440		440		ug/Kg	☼	01/28/20 09:56	02/05/20 20:07	2.5
Phenanthrene	**350**		44		ug/Kg	☼	01/28/20 09:56	02/05/20 20:07	2.5
Phenol	<150		150		ug/Kg	☼	01/28/20 09:56	02/05/20 20:07	2.5
Pyrene	**1100**		44		ug/Kg	☼	01/28/20 09:56	02/05/20 20:07	2.5
Pyridine	<440		440		ug/Kg	☼	01/28/20 09:56	02/05/20 20:07	2.5
1,2,4-Trichlorobenzene	<150		150		ug/Kg	☼	01/28/20 09:56	02/05/20 20:07	2.5
2,4,5-Trichlorophenol	<440		440		ug/Kg	☼	01/28/20 09:56	02/05/20 20:07	2.5
2,4,6-Trichlorophenol	<440		440		ug/Kg	☼	01/28/20 09:56	02/05/20 20:07	2.5

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
2-Fluorobiphenyl (Surr)	*76*		*35 - 120*	*01/28/20 09:56*	*02/05/20 20:07*	*2.5*
2-Fluorophenol (Surr)	*79*		*26 - 120*	*01/28/20 09:56*	*02/05/20 20:07*	*2.5*
Nitrobenzene-d5 (Surr)	*73*		*28 - 120*	*01/28/20 09:56*	*02/05/20 20:07*	*2.5*
Phenol-d5 (Surr)	*81*		*28 - 120*	*01/28/20 09:56*	*02/05/20 20:07*	*2.5*
Terphenyl-d14 (Surr)	*82*		*39 - 120*	*01/28/20 09:56*	*02/05/20 20:07*	*2.5*
2,4,6-Tribromophenol (Surr)	*78*		*10 - 120*	*01/28/20 09:56*	*02/05/20 20:07*	*2.5*

Method: 8015B - Nonhalogenated Organic Compounds - Direct Injection (GC) - Soluble

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
2-Ethoxyethanol	<6.0		6.0		mg/Kg	☼		01/27/20 12:41	1
Methanol	<6.0		6.0		mg/Kg	☼		01/27/20 14:14	1

Client Sample Results

Client: Leidos, Inc.
Project/Site: NASA PBS Waste - FR3 + 4

Job ID: 240-125349-1

Client Sample ID: FR34-WC-007

Date Collected: 01/23/20 15:45
Date Received: 01/24/20 10:40

Lab Sample ID: 240-125349-7

Matrix: Solid
Percent Solids: 83.5

Method: 8081A - Organochlorine Pesticides (GC) - TCLP

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chlordane (technical)	<0.0050		0.0050		mg/L		01/28/20 10:42	02/03/20 13:54	1
Endrin	<0.00050		0.00050		mg/L		01/28/20 10:42	02/03/20 13:54	1
Heptachlor	<0.00050		0.00050		mg/L		01/28/20 10:42	02/03/20 13:54	1
Heptachlor epoxide	<0.00050		0.00050		mg/L		01/28/20 10:42	02/03/20 13:54	1
gamma-BHC (Lindane)	<0.00050		0.00050		mg/L		01/28/20 10:42	02/03/20 13:54	1
Methoxychlor	<0.0010		0.0010		mg/L		01/28/20 10:42	02/03/20 13:54	1
Toxaphene	<0.020		0.020		mg/L		01/28/20 10:42	02/03/20 13:54	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Tetrachloro-m-xylene	*77*		*33 - 123*	*01/28/20 10:42*	*02/03/20 13:54*	*1*
Tetrachloro-m-xylene	*69*		*33 - 123*	*01/28/20 10:42*	*02/03/20 13:54*	*1*
DCB Decachlorobiphenyl	*87*		*21 - 135*	*01/28/20 10:42*	*02/03/20 13:54*	*1*
DCB Decachlorobiphenyl	*69*		*21 - 135*	*01/28/20 10:42*	*02/03/20 13:54*	*1*

Method: 8082 - Polychlorinated Biphenyls (PCBs) by Gas Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Aroclor-1016	<20		20		ug/Kg	☼	01/27/20 09:29	01/29/20 11:03	1
Aroclor-1221	<20		20		ug/Kg	☼	01/27/20 09:29	01/29/20 11:03	1
Aroclor-1232	<20		20		ug/Kg	☼	01/27/20 09:29	01/29/20 11:03	1
Aroclor-1242	<20		20		ug/Kg	☼	01/27/20 09:29	01/29/20 11:03	1
Aroclor-1248	<20		20		ug/Kg	☼	01/27/20 09:29	01/29/20 11:03	1
Aroclor-1254	<20		20		ug/Kg	☼	01/27/20 09:29	01/29/20 11:03	1
Aroclor-1260	<20		20		ug/Kg	☼	01/27/20 09:29	01/29/20 11:03	1
Aroclor-1262	<20		20		ug/Kg	☼	01/27/20 09:29	01/29/20 11:03	1
Aroclor-1268	<20		20		ug/Kg	☼	01/27/20 09:29	01/29/20 11:03	1
Polychlorinated biphenyls, Total	<20		20		ug/Kg	☼	01/27/20 09:29	01/29/20 11:03	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Tetrachloro-m-xylene	*46*		*14 - 128*	*01/27/20 09:29*	*01/29/20 11:03*	*1*
DCB Decachlorobiphenyl	*69*		*10 - 132*	*01/27/20 09:29*	*01/29/20 11:03*	*1*

Method: 8151A - Herbicides (GC) - TCLP

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
2,4-D	<0.040		0.040		mg/L		02/03/20 10:51	02/05/20 14:47	1
Silvex (2,4,5-TP)	<0.010		0.010		mg/L		02/03/20 10:51	02/05/20 14:47	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
2,4-Dichlorophenylacetic acid	*86*		*41 - 130*	*02/03/20 10:51*	*02/05/20 14:47*	*1*
2,4-Dichlorophenylacetic acid	*90*		*41 - 130*	*02/03/20 10:51*	*02/05/20 14:47*	*1*

Method: 6010C - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	**25**		1.6		mg/Kg	☼	01/27/20 14:00	01/28/20 19:24	1
Barium	**57**		21		mg/Kg	☼	01/27/20 14:00	01/28/20 19:24	1
Cadmium	<0.52		0.52		mg/Kg	☼	01/27/20 14:00	01/28/20 19:24	1
Chromium	**9.4**		1.0		mg/Kg	☼	01/27/20 14:00	01/28/20 19:24	1
Lead	**1900**		1.0		mg/Kg	☼	01/27/20 14:00	01/28/20 19:24	1
Nickel	**34**		4.2		mg/Kg	☼	01/27/20 14:00	01/28/20 19:24	1
Selenium	<2.1		2.1		mg/Kg	☼	01/27/20 14:00	01/28/20 19:24	1
Silver	<1.0		1.0		mg/Kg	☼	01/27/20 14:00	01/28/20 19:24	1

Client Sample Results

Client: Leidos, Inc.
Project/Site: NASA PBS Waste - FR3 + 4

Job ID: 240-125349-1

Client Sample ID: FR34-WC-007

Date Collected: 01/23/20 15:45
Date Received: 01/24/20 10:40

Lab Sample ID: 240-125349-7

Matrix: Solid
Percent Solids: 83.5

Method: 6010C - Metals (ICP) - TCLP

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Silver	<0.050		0.050		mg/L		01/28/20 14:00	01/29/20 16:20	1
Arsenic	**0.086**		0.050		mg/L		01/28/20 14:00	01/29/20 16:20	1
Barium	<0.50		0.50		mg/L		01/28/20 14:00	01/29/20 16:20	1
Cadmium	<0.050		0.050		mg/L		01/28/20 14:00	01/29/20 16:20	1
Chromium	<0.050		0.050		mg/L		01/28/20 14:00	01/29/20 16:20	1
Nickel	**0.28**		0.040		mg/L		01/28/20 14:00	01/29/20 16:20	1
Lead	**100**		0.50		mg/L		01/28/20 14:00	01/30/20 19:09	10
Selenium	<0.050		0.050		mg/L		01/28/20 14:00	01/29/20 16:20	1

Method: 7470A - Mercury (CVAA) - TCLP

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	<0.0020		0.0020		mg/L		01/28/20 12:00	01/29/20 13:42	1

Method: 7471B - Mercury (CVAA)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	<0.13		0.13		mg/Kg	☼	01/27/20 16:00	01/28/20 14:46	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Flashpoint	**>200**		1.00		Degrees F			01/28/20 10:57	1
Cyanide, Total	<0.60		0.60		mg/Kg	☼	01/29/20 09:55	01/29/20 13:35	1
Sulfide	<36		36		mg/Kg	☼	01/27/20 07:57	01/27/20 13:15	1
pH	**3.8**	**HF**	0.1		SU			01/27/20 17:10	1
Free Liquid	**CNF**		0.10		NONE			02/05/20 16:59	1
Percent Moisture	**16.5**		0.1		%			01/27/20 17:38	1

Client Sample Results

Client: Leidos, Inc.
Project/Site: NASA PBS Waste - FR3 + 4

Job ID: 240-125349-1

Client Sample ID: FR34-WC-008

Date Collected: 01/23/20 16:00
Date Received: 01/24/20 10:40

Lab Sample ID: 240-125349-8

Matrix: Solid
Percent Solids: 79.2

Method: 8260B - Volatile Organic Compounds (GC/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
1,1,1,2-Tetrachloroethane	<2800		2800		ug/Kg	☼	01/29/20 23:34	01/30/20 18:55	1
1,1,1-Trichloroethane	<2800		2800		ug/Kg	☼	01/29/20 23:34	01/30/20 18:55	1
1,1,2,2-Tetrachloroethane	<2800		2800		ug/Kg	☼	01/29/20 23:34	01/30/20 18:55	1
1,1,2-Trichloro-1,2,2-trichfluoroethane	<2800		2800		ug/Kg	☼	01/29/20 23:34	01/30/20 18:55	1
1,1,2-Trichloroethane	<2800		2800		ug/Kg	☼	01/29/20 23:34	01/30/20 18:55	1
1,1-Dichloroethane	<2800		2800		ug/Kg	☼	01/29/20 23:34	01/30/20 18:55	1
1,1-Dichloroethene	<2800		2800		ug/Kg	☼	01/29/20 23:34	01/30/20 18:55	1
1,1-Dichloropropene	<2800		2800		ug/Kg	☼	01/29/20 23:34	01/30/20 18:55	1
1,2,3-Trichlorobenzene	<2800		2800		ug/Kg	☼	01/29/20 23:34	01/30/20 18:55	1
1,2,3-Trichloropropane	<2800		2800		ug/Kg	☼	01/29/20 23:34	01/30/20 18:55	1
1,2,4-Trimethylbenzene	<2800		2800		ug/Kg	☼	01/29/20 23:34	01/30/20 18:55	1
1,2-Dibromo-3-Chloropropane	<5700		5700		ug/Kg	☼	01/29/20 23:34	01/30/20 18:55	1
1,2-Dichlorobenzene	<2800		2800		ug/Kg	☼	01/29/20 23:34	01/30/20 18:55	1
1,2-Dichloroethane	<2800		2800		ug/Kg	☼	01/29/20 23:34	01/30/20 18:55	1
1,2-Dichloropropane	<2800		2800		ug/Kg	☼	01/29/20 23:34	01/30/20 18:55	1
2-Nitropropane	<5700		5700		ug/Kg	☼	01/29/20 23:34	01/30/20 18:55	1
2,2-Dichloropropane	<2800		2800		ug/Kg	☼	01/29/20 23:34	01/30/20 18:55	1
2-Chlorotoluene	<2800		2800		ug/Kg	☼	01/29/20 23:34	01/30/20 18:55	1
2-Hexanone	<11000		11000		ug/Kg	☼	01/29/20 23:34	01/30/20 18:55	1
Bromobenzene	<2800		2800		ug/Kg	☼	01/29/20 23:34	01/30/20 18:55	1
Chlorobromomethane	<2800		2800		ug/Kg	☼	01/29/20 23:34	01/30/20 18:55	1
4-Chlorotoluene	<2800		2800		ug/Kg	☼	01/29/20 23:34	01/30/20 18:55	1
4-Isopropyltoluene	<2800		2800		ug/Kg	☼	01/29/20 23:34	01/30/20 18:55	1
Acetone	<11000	*	11000		ug/Kg	☼	01/29/20 23:34	01/30/20 18:55	1
Benzene	<2800		2800		ug/Kg	☼	01/29/20 23:34	01/30/20 18:55	1
Bromoform	<2800		2800		ug/Kg	☼	01/29/20 23:34	01/30/20 18:55	1
Bromomethane	<2800		2800		ug/Kg	☼	01/29/20 23:34	01/30/20 18:55	1
Carbon disulfide	<2800		2800		ug/Kg	☼	01/29/20 23:34	01/30/20 18:55	1
Carbon tetrachloride	<2800		2800		ug/Kg	☼	01/29/20 23:34	01/30/20 18:55	1
Chlorobenzene	<2800		2800		ug/Kg	☼	01/29/20 23:34	01/30/20 18:55	1
Chloroethane	<2800		2800		ug/Kg	☼	01/29/20 23:34	01/30/20 18:55	1
Chloroform	<2800		2800		ug/Kg	☼	01/29/20 23:34	01/30/20 18:55	1
Chloromethane	<2800		2800		ug/Kg	☼	01/29/20 23:34	01/30/20 18:55	1
cis-1,2-Dichloroethene	<2800		2800		ug/Kg	☼	01/29/20 23:34	01/30/20 18:55	1
Ethyl acetate	<11000		11000		ug/Kg	☼	01/29/20 23:34	01/30/20 18:55	1
cis-1,3-Dichloropropene	<2800		2800		ug/Kg	☼	01/29/20 23:34	01/30/20 18:55	1
Cyclohexanone	<57000		57000		ug/Kg	☼	01/29/20 23:34	01/30/20 18:55	1
Dibromomethane	<2800		2800		ug/Kg	☼	01/29/20 23:34	01/30/20 18:55	1
Dichlorobromomethane	<2800		2800		ug/Kg	☼	01/29/20 23:34	01/30/20 18:55	1
Dichlorodifluoromethane	<2800		2800		ug/Kg	☼	01/29/20 23:34	01/30/20 18:55	1
Ethyl ether	<5700		5700		ug/Kg	☼	01/29/20 23:34	01/30/20 18:55	1
Ethylbenzene	<2800		2800		ug/Kg	☼	01/29/20 23:34	01/30/20 18:55	1
Ethylene Dibromide	<2800		2800		ug/Kg	☼	01/29/20 23:34	01/30/20 18:55	1
Isobutyl alcohol	<110000		110000		ug/Kg	☼	01/29/20 23:34	01/30/20 18:55	1
m-Xylene & p-Xylene	<2800		2800		ug/Kg	☼	01/29/20 23:34	01/30/20 18:55	1
n-Butylbenzene	<2800		2800		ug/Kg	☼	01/29/20 23:34	01/30/20 18:55	1
Isopropylbenzene	<2800		2800		ug/Kg	☼	01/29/20 23:34	01/30/20 18:55	1
N-Propylbenzene	<2800		2800		ug/Kg	☼	01/29/20 23:34	01/30/20 18:55	1
2-Butanone (MEK)	<11000		11000		ug/Kg	☼	01/29/20 23:34	01/30/20 18:55	1

Client Sample ID: FR34-WC-008

Date Collected: 01/23/20 16:00
Date Received: 01/24/20 10:40

Lab Sample ID: 240-125349-8

Matrix: Solid
Percent Solids: 79.2

Method: 8260B - Volatile Organic Compounds (GC/MS) (Continued)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
4-Methyl-2-pentanone (MIBK)	<11000		11000		ug/Kg	☼	01/29/20 23:34	01/30/20 18:55	1
sec-Butylbenzene	<2800		2800		ug/Kg	☼	01/29/20 23:34	01/30/20 18:55	1
Methyl tert-butyl ether	<2800		2800		ug/Kg	☼	01/29/20 23:34	01/30/20 18:55	1
Methylene Chloride	<5700		5700		ug/Kg	☼	01/29/20 23:34	01/30/20 18:55	1
n-Butanol	<110000		110000		ug/Kg	☼	01/29/20 23:34	01/30/20 18:55	1
o-Xylene	<2800		2800		ug/Kg	☼	01/29/20 23:34	01/30/20 18:55	1
Styrene	<2800		2800		ug/Kg	☼	01/29/20 23:34	01/30/20 18:55	1
tert-Butylbenzene	<2800		2800		ug/Kg	☼	01/29/20 23:34	01/30/20 18:55	1
Tetrachloroethene	<2800		2800		ug/Kg	☼	01/29/20 23:34	01/30/20 18:55	1
Toluene	<2800		2800		ug/Kg	☼	01/29/20 23:34	01/30/20 18:55	1
trans-1,2-Dichloroethene	<2800		2800		ug/Kg	☼	01/29/20 23:34	01/30/20 18:55	1
trans-1,3-Dichloropropene	<2800		2800		ug/Kg	☼	01/29/20 23:34	01/30/20 18:55	1
Trichloroethene	<2800		2800		ug/Kg	☼	01/29/20 23:34	01/30/20 18:55	1
Trichlorofluoromethane	<2800		2800		ug/Kg	☼	01/29/20 23:34	01/30/20 18:55	1
Vinyl chloride	<2800		2800		ug/Kg	☼	01/29/20 23:34	01/30/20 18:55	1
Xylenes, Total	<5700		5700		ug/Kg	☼	01/29/20 23:34	01/30/20 18:55	1
Chlorodibromomethane	<2800		2800		ug/Kg	☼	01/29/20 23:34	01/30/20 18:55	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
1,2-Dichloroethane-d4 (Surr)	*79*		*59 - 120*	*01/29/20 23:34*	*01/30/20 18:55*	*1*
4-Bromofluorobenzene (Surr)	*81*		*51 - 127*	*01/29/20 23:34*	*01/30/20 18:55*	*1*
Toluene-d8 (Surr)	*79*		*64 - 124*	*01/29/20 23:34*	*01/30/20 18:55*	*1*
Dibromofluoromethane (Surr)	*74*		*56 - 122*	*01/29/20 23:34*	*01/30/20 18:55*	*1*

Method: 8260B - Volatile Organic Compounds (GC/MS) - TCLP

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
1,1-Dichloroethene	<0.050		0.050		mg/L			01/29/20 21:54	2
1,2-Dichloroethane	<0.050		0.050		mg/L			01/29/20 21:54	2
Benzene	<0.050		0.050		mg/L			01/29/20 21:54	2
Carbon tetrachloride	<0.050		0.050		mg/L			01/29/20 21:54	2
Chlorobenzene	<0.050		0.050		mg/L			01/29/20 21:54	2
Chloroform	<0.050		0.050		mg/L			01/29/20 21:54	2
2-Butanone (MEK)	<0.50		0.50		mg/L			01/29/20 21:54	2
Tetrachloroethene	<0.050		0.050		mg/L			01/29/20 21:54	2
Trichloroethene	<0.050		0.050		mg/L			01/29/20 21:54	2
Vinyl chloride	<0.050		0.050		mg/L			01/29/20 21:54	2

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
1,2-Dichloroethane-d4 (Surr)	*88*		*74 - 124*		*01/29/20 21:54*	*2*
4-Bromofluorobenzene (Surr)	*92*		*77 - 120*		*01/29/20 21:54*	*2*
Toluene-d8 (Surr)	*95*		*80 - 120*		*01/29/20 21:54*	*2*
Dibromofluoromethane (Surr)	*97*		*80 - 120*		*01/29/20 21:54*	*2*

Method: 8270C - Semivolatile Organic Compounds (GC/MS) - TCLP

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
1,4-Dichlorobenzene	<0.0040		0.0040		mg/L		01/29/20 09:24	02/04/20 15:50	1
2,4,5-Trichlorophenol	<0.0040		0.0040		mg/L		01/29/20 09:24	02/04/20 15:50	1
2,4,6-Trichlorophenol	<0.0040		0.0040		mg/L		01/29/20 09:24	02/04/20 15:50	1
2,4-Dinitrotoluene	<0.0040		0.0040		mg/L		01/29/20 09:24	02/04/20 15:50	1
Hexachlorobenzene	<0.00080		0.00080		mg/L		01/29/20 09:24	02/04/20 15:50	1

Client Sample ID: FR34-WC-008

Date Collected: 01/23/20 16:00
Date Received: 01/24/20 10:40

Lab Sample ID: 240-125349-8

Matrix: Solid
Percent Solids: 79.2

Method: 8270C - Semivolatile Organic Compounds (GC/MS) - TCLP (Continued)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Hexachlorobutadiene	<0.0040		0.0040		mg/L		01/29/20 09:24	02/04/20 15:50	1
Hexachloroethane	<0.0040		0.0040		mg/L		01/29/20 09:24	02/04/20 15:50	1
3 & 4 Methylphenol	<0.0040		0.0040		mg/L		01/29/20 09:24	02/04/20 15:50	1
2-Methylphenol	<0.0040		0.0040		mg/L		01/29/20 09:24	02/04/20 15:50	1
Nitrobenzene	<0.0040		0.0040		mg/L		01/29/20 09:24	02/04/20 15:50	1
Pentachlorophenol	<0.016		0.016		mg/L		01/29/20 09:24	02/04/20 15:50	1
Pyridine	<0.0040		0.0040		mg/L		01/29/20 09:24	02/04/20 15:50	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
2-Fluorobiphenyl (Surr)	*68*		*39 - 120*	*01/29/20 09:24*	*02/04/20 15:50*	*1*
2-Fluorophenol (Surr)	*58*		*10 - 120*	*01/29/20 09:24*	*02/04/20 15:50*	*1*
2,4,6-Tribromophenol (Surr)	*90*		*33 - 120*	*01/29/20 09:24*	*02/04/20 15:50*	*1*
Nitrobenzene-d5 (Surr)	*56*		*33 - 120*	*01/29/20 09:24*	*02/04/20 15:50*	*1*
Phenol-d5 (Surr)	*48*		*10 - 120*	*01/29/20 09:24*	*02/04/20 15:50*	*1*
Terphenyl-d14 (Surr)	*86*		*36 - 122*	*01/29/20 09:24*	*02/04/20 15:50*	*1*

Method: 8270D - Semivolatile Organic Compounds (GC/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
1,2,4-Trichlorobenzene	<18000		18000		ug/Kg	☼	01/28/20 09:56	02/05/20 16:07	50
1,3-Dichlorobenzene	<18000		18000		ug/Kg	☼	01/28/20 09:56	02/05/20 16:07	50
1,4-Dichlorobenzene	<18000		18000		ug/Kg	☼	01/28/20 09:56	02/05/20 16:07	50
2,4,6-Trichlorophenol	<54000		54000		ug/Kg	☼	01/28/20 09:56	02/05/20 16:07	50
2,4,5-Trichlorophenol	<54000		54000		ug/Kg	☼	01/28/20 09:56	02/05/20 16:07	50
2,4-Dichlorophenol	<54000		54000		ug/Kg	☼	01/28/20 09:56	02/05/20 16:07	50
2,4-Dimethylphenol	<54000		54000		ug/Kg	☼	01/28/20 09:56	02/05/20 16:07	50
2,4-Dinitrophenol	<120000		120000		ug/Kg	☼	01/28/20 09:56	02/05/20 16:07	50
2,4-Dinitrotoluene	<72000		72000		ug/Kg	☼	01/28/20 09:56	02/05/20 16:07	50
2-Chloronaphthalene	<18000		18000		ug/Kg	☼	01/28/20 09:56	02/05/20 16:07	50
2-Chlorophenol	<18000		18000		ug/Kg	☼	01/28/20 09:56	02/05/20 16:07	50
2-Methylnaphthalene	<5400		5400		ug/Kg	☼	01/28/20 09:56	02/05/20 16:07	50
2-Methylphenol	<72000		72000		ug/Kg	☼	01/28/20 09:56	02/05/20 16:07	50
2-Nitroaniline	<72000		72000		ug/Kg	☼	01/28/20 09:56	02/05/20 16:07	50
2-Nitrophenol	<18000		18000		ug/Kg	☼	01/28/20 09:56	02/05/20 16:07	50
3 & 4 Methylphenol	<140000		140000		ug/Kg	☼	01/28/20 09:56	02/05/20 16:07	50
3,3'-Dichlorobenzidine	<36000		36000		ug/Kg	☼	01/28/20 09:56	02/05/20 16:07	50
3-Nitroaniline	<72000		72000		ug/Kg	☼	01/28/20 09:56	02/05/20 16:07	50
4,6-Dinitro-2-methylphenol	<120000		120000		ug/Kg	☼	01/28/20 09:56	02/05/20 16:07	50
4-Bromophenyl phenyl ether	<18000		18000		ug/Kg	☼	01/28/20 09:56	02/05/20 16:07	50
4-Chloro-3-methylphenol	<54000		54000		ug/Kg	☼	01/28/20 09:56	02/05/20 16:07	50
4-Chloroaniline	<54000		54000		ug/Kg	☼	01/28/20 09:56	02/05/20 16:07	50
4-Chlorophenyl phenyl ether	<18000		18000		ug/Kg	☼	01/28/20 09:56	02/05/20 16:07	50
4-Nitroaniline	<72000		72000		ug/Kg	☼	01/28/20 09:56	02/05/20 16:07	50
Acenaphthene	**240000**		5400		ug/Kg	☼	01/28/20 09:56	02/05/20 16:07	50
Acenaphthylene	**23000**		5400		ug/Kg	☼	01/28/20 09:56	02/05/20 16:07	50
Anthracene	**190000**		5400		ug/Kg	☼	01/28/20 09:56	02/05/20 16:07	50
Benzo[a]pyrene	**290000**		5400		ug/Kg	☼	01/28/20 09:56	02/05/20 16:07	50
Benzo[g,h,i]perylene	**140000**		5400		ug/Kg	☼	01/28/20 09:56	02/05/20 16:07	50
Benzo[k]fluoranthene	**290000**		5400		ug/Kg	☼	01/28/20 09:56	02/05/20 16:07	50
Benzoic acid	<250000		250000		ug/Kg	☼	01/28/20 09:56	02/05/20 16:07	50
Benzyl alcohol	<120000		120000		ug/Kg	☼	01/28/20 09:56	02/05/20 16:07	50

Client Sample Results

Client: Leidos, Inc.
Project/Site: NASA PBS Waste - FR3 + 4

Job ID: 240-125349-1

Client Sample ID: FR34-WC-008

Date Collected: 01/23/20 16:00
Date Received: 01/24/20 10:40

Lab Sample ID: 240-125349-8

Matrix: Solid
Percent Solids: 79.2

Method: 8270D - Semivolatile Organic Compounds (GC/MS) (Continued)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Bis(2-chloroethoxy)methane	<36000		36000		ug/Kg	☼	01/28/20 09:56	02/05/20 16:07	50
Bis(2-chloroethyl)ether	<36000		36000		ug/Kg	☼	01/28/20 09:56	02/05/20 16:07	50
Bis(2-ethylhexyl) phthalate	<25000		25000		ug/Kg	☼	01/28/20 09:56	02/05/20 16:07	50
Butyl benzyl phthalate	<25000		25000		ug/Kg	☼	01/28/20 09:56	02/05/20 16:07	50
Carbazole	**140000**		18000		ug/Kg	☼	01/28/20 09:56	02/05/20 16:07	50
Di-n-butyl phthalate	<25000		25000		ug/Kg	☼	01/28/20 09:56	02/05/20 16:07	50
Di-n-octyl phthalate	<25000		25000		ug/Kg	☼	01/28/20 09:56	02/05/20 16:07	50
Dibenz(a,h)anthracene	**48000**		5400		ug/Kg	☼	01/28/20 09:56	02/05/20 16:07	50
Dibenzofuran	**96000**		18000		ug/Kg	☼	01/28/20 09:56	02/05/20 16:07	50
Diethyl phthalate	<25000		25000		ug/Kg	☼	01/28/20 09:56	02/05/20 16:07	50
Dimethyl phthalate	<25000		25000		ug/Kg	☼	01/28/20 09:56	02/05/20 16:07	50
Fluorene	**260000**		5400		ug/Kg	☼	01/28/20 09:56	02/05/20 16:07	50
Hexachlorobenzene	<5400		5400		ug/Kg	☼	01/28/20 09:56	02/05/20 16:07	50
Hexachlorobutadiene	<18000		18000		ug/Kg	☼	01/28/20 09:56	02/05/20 16:07	50
Hexachlorocyclopentadiene	<120000		120000		ug/Kg	☼	01/28/20 09:56	02/05/20 16:07	50
Hexachloroethane	<18000		18000		ug/Kg	☼	01/28/20 09:56	02/05/20 16:07	50
Indeno[1,2,3-cd]pyrene	**150000**		5400		ug/Kg	☼	01/28/20 09:56	02/05/20 16:07	50
Isophorone	<18000		18000		ug/Kg	☼	01/28/20 09:56	02/05/20 16:07	50
N-Nitrosodi-n-propylamine	<18000		18000		ug/Kg	☼	01/28/20 09:56	02/05/20 16:07	50
N-Nitrosodiphenylamine	<18000		18000		ug/Kg	☼	01/28/20 09:56	02/05/20 16:07	50
Naphthalene	<5400		5400		ug/Kg	☼	01/28/20 09:56	02/05/20 16:07	50
Nitrobenzene	<36000		36000		ug/Kg	☼	01/28/20 09:56	02/05/20 16:07	50
Pentachlorophenol	<54000		54000		ug/Kg	☼	01/28/20 09:56	02/05/20 16:07	50
Phenol	<18000		18000		ug/Kg	☼	01/28/20 09:56	02/05/20 16:07	50
Pyridine	<54000		54000		ug/Kg	☼	01/28/20 09:56	02/05/20 16:07	50
bis (2-chloroisopropyl) ether	<36000		36000		ug/Kg	☼	01/28/20 09:56	02/05/20 16:07	50
2,6-Dinitrotoluene	<72000		72000		ug/Kg	☼	01/28/20 09:56	02/05/20 16:07	50
4-Nitrophenol	<120000		120000		ug/Kg	☼	01/28/20 09:56	02/05/20 16:07	50

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Terphenyl-d14 (Surr)	*158*	*X*	*39 - 120*	*01/28/20 09:56*	*02/05/20 16:07*	*50*
Phenol-d5 (Surr)	*77*		*28 - 120*	*01/28/20 09:56*	*02/05/20 16:07*	*50*
Nitrobenzene-d5 (Surr)	*77*		*28 - 120*	*01/28/20 09:56*	*02/05/20 16:07*	*50*
2-Fluorophenol (Surr)	*50*		*26 - 120*	*01/28/20 09:56*	*02/05/20 16:07*	*50*
2-Fluorobiphenyl (Surr)	*75*		*35 - 120*	*01/28/20 09:56*	*02/05/20 16:07*	*50*
2,4,6-Tribromophenol (Surr)	*75*		*10 - 120*	*01/28/20 09:56*	*02/05/20 16:07*	*50*

Method: 8270D - Semivolatile Organic Compounds (GC/MS) - RA

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Benzo[a]anthracene	**690000**		54000		ug/Kg	☼	01/28/20 09:56	02/05/20 16:31	500
Benzo[b]fluoranthene	**900000**		54000		ug/Kg	☼	01/28/20 09:56	02/05/20 16:31	500
Chrysene	**1300000**		54000		ug/Kg	☼	01/28/20 09:56	02/05/20 16:31	500
Fluoranthene	**4100000**		54000		ug/Kg	☼	01/28/20 09:56	02/05/20 16:31	500
Phenanthrene	**2700000**		54000		ug/Kg	☼	01/28/20 09:56	02/05/20 16:31	500
Pyrene	**3200000**		54000		ug/Kg	☼	01/28/20 09:56	02/05/20 16:31	500

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Terphenyl-d14 (Surr)	*0*	*X*	*39 - 120*	*01/28/20 09:56*	*02/05/20 16:31*	*500*
Phenol-d5 (Surr)	*0*	*X*	*28 - 120*	*01/28/20 09:56*	*02/05/20 16:31*	*500*
Nitrobenzene-d5 (Surr)	*0*	*X*	*28 - 120*	*01/28/20 09:56*	*02/05/20 16:31*	*500*

Client Sample ID: FR34-WC-008

Date Collected: 01/23/20 16:00
Date Received: 01/24/20 10:40

Lab Sample ID: 240-125349-8

Matrix: Solid
Percent Solids: 79.2

Method: 8270D - Semivolatile Organic Compounds (GC/MS) - RA (Continued)

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
2-Fluorophenol (Surr)	*0*	*X*	*26 - 120*	*01/28/20 09:56*	*02/05/20 16:31*	*500*
2-Fluorobiphenyl (Surr)	*0*	*X*	*35 - 120*	*01/28/20 09:56*	*02/05/20 16:31*	*500*
2,4,6-Tribromophenol (Surr)	*0*	*X*	*10 - 120*	*01/28/20 09:56*	*02/05/20 16:31*	*500*

Method: 8015B - Nonhalogenated Organic Compounds - Direct Injection (GC) - Soluble

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
2-Ethoxyethanol	<13		13		mg/Kg	☼		01/29/20 11:13	1
Methanol	<13		13		mg/Kg	☼		01/29/20 10:04	1

Method: 8081A - Organochlorine Pesticides (GC) - TCLP

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chlordane (technical)	<0.042		0.042		mg/L		01/29/20 09:27	01/31/20 14:47	5
Endrin	<0.0042		0.0042		mg/L		01/29/20 09:27	01/31/20 14:47	5
Heptachlor	<0.0042		0.0042		mg/L		01/29/20 09:27	01/31/20 14:47	5
Heptachlor epoxide	<0.0042		0.0042		mg/L		01/29/20 09:27	01/31/20 14:47	5
gamma-BHC (Lindane)	<0.0042		0.0042		mg/L		01/29/20 09:27	01/31/20 14:47	5
Methoxychlor	<0.0083		0.0083		mg/L		01/29/20 09:27	01/31/20 14:47	5
Toxaphene	<0.17		0.17		mg/L		01/29/20 09:27	01/31/20 14:47	5

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Tetrachloro-m-xylene	*33*		*33 - 123*	*01/29/20 09:27*	*01/31/20 14:47*	*5*
Tetrachloro-m-xylene	*33*		*33 - 123*	*01/29/20 09:27*	*01/31/20 14:47*	*5*
DCB Decachlorobiphenyl	*36*		*21 - 135*	*01/29/20 09:27*	*01/31/20 14:47*	*5*
DCB Decachlorobiphenyl	*38*		*21 - 135*	*01/29/20 09:27*	*01/31/20 14:47*	*5*

Method: 8082 - Polychlorinated Biphenyls (PCBs) by Gas Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Aroclor-1016	<130		130		ug/Kg	☼	01/28/20 08:43	01/30/20 15:53	1
Aroclor-1221	<130		130		ug/Kg	☼	01/28/20 08:43	01/30/20 15:53	1
Aroclor-1232	<130		130		ug/Kg	☼	01/28/20 08:43	01/30/20 15:53	1
Aroclor-1242	<130		130		ug/Kg	☼	01/28/20 08:43	01/30/20 15:53	1
Aroclor-1248	<130		130		ug/Kg	☼	01/28/20 08:43	01/30/20 15:53	1
Aroclor-1254	<130		130		ug/Kg	☼	01/28/20 08:43	01/30/20 15:53	1
Aroclor-1260	<130		130		ug/Kg	☼	01/28/20 08:43	01/30/20 15:53	1
Aroclor-1262	<130		130		ug/Kg	☼	01/28/20 08:43	01/30/20 15:53	1
Aroclor-1268	<130		130		ug/Kg	☼	01/28/20 08:43	01/30/20 15:53	1
Polychlorinated biphenyls, Total	<130		130		ug/Kg	☼	01/28/20 08:43	01/30/20 15:53	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Tetrachloro-m-xylene	*83*		*14 - 128*	*01/28/20 08:43*	*01/30/20 15:53*	*1*
DCB Decachlorobiphenyl	*94*		*10 - 132*	*01/28/20 08:43*	*01/30/20 15:53*	*1*

Method: 8151A - Herbicides (GC) - TCLP

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
2,4-D	<0.040		0.040		mg/L		01/29/20 09:30	02/04/20 12:44	1
Silvex (2,4,5-TP)	<0.010		0.010		mg/L		01/29/20 09:30	02/04/20 12:44	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
2,4-Dichlorophenylacetic acid	*84*		*41 - 130*	*01/29/20 09:30*	*02/04/20 12:44*	*1*
2,4-Dichlorophenylacetic acid	*90*		*41 - 130*	*01/29/20 09:30*	*02/04/20 12:44*	*1*

Client Sample Results

Client: Leidos, Inc.
Project/Site: NASA PBS Waste - FR3 + 4

Job ID: 240-125349-1

Client Sample ID: FR34-WC-008

Date Collected: 01/23/20 16:00
Date Received: 01/24/20 10:40

Lab Sample ID: 240-125349-8

Matrix: Solid
Percent Solids: 79.2

Method: 6010C - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Silver	<1.2		1.2		mg/Kg	☼	01/29/20 14:00	01/30/20 17:35	1
Arsenic	**6.2**		1.8		mg/Kg	☼	01/29/20 14:00	01/30/20 17:35	1
Barium	<24		24		mg/Kg	☼	01/29/20 14:00	01/30/20 17:35	1
Cadmium	<0.60		0.60		mg/Kg	☼	01/29/20 14:00	01/30/20 17:35	1
Chromium	<1.2		1.2		mg/Kg	☼	01/29/20 14:00	01/30/20 17:35	1
Nickel	**4.8**		4.8		mg/Kg	☼	01/29/20 14:00	01/30/20 17:35	1
Lead	**5300**		6.0		mg/Kg	☼	01/29/20 14:00	01/31/20 08:11	5
Selenium	<2.4		2.4		mg/Kg	☼	01/29/20 14:00	01/30/20 17:35	1

Method: 6010C - Metals (ICP) - TCLP

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Silver	<0.050		0.050		mg/L		01/29/20 14:00	01/30/20 13:15	1
Arsenic	**0.32**		0.050		mg/L		01/29/20 14:00	01/30/20 13:15	1
Barium	<0.50		0.50		mg/L		01/29/20 14:00	01/30/20 13:15	1
Cadmium	<0.050		0.050		mg/L		01/29/20 14:00	01/30/20 13:15	1
Chromium	<0.050		0.050		mg/L		01/29/20 14:00	01/30/20 13:15	1
Nickel	**0.041**		0.040		mg/L		01/29/20 14:00	01/30/20 13:15	1
Lead	**28**		0.050		mg/L		01/29/20 14:00	01/30/20 13:15	1
Selenium	<0.050		0.050		mg/L		01/29/20 14:00	01/30/20 13:15	1
Antimony	**0.47**		0.30		mg/L		01/29/20 14:00	01/30/20 13:15	1
Beryllium	<0.0050		0.0050		mg/L		01/29/20 14:00	01/30/20 13:15	1
Thallium	<2.0		2.0		mg/L		01/29/20 14:00	01/30/20 13:15	1

Method: 7470A - Mercury (CVAA) - TCLP

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	<0.0020		0.0020		mg/L		01/29/20 12:00	01/30/20 12:32	1

Method: 7471B - Mercury (CVAA)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	<0.14		0.14		mg/Kg	☼	01/29/20 16:00	01/30/20 12:49	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Flashpoint	**>200**		1.00		Degrees F			01/29/20 15:41	1
Cyanide, Total	<0.63		0.63		mg/Kg	☼	01/29/20 09:55	01/29/20 13:47	1
Sulfide	**150**		38		mg/Kg	☼	01/30/20 09:05	01/30/20 09:54	1
pH	**6.4**	**HF**	0.1		SU			01/28/20 20:44	1
Free Liquid	**CNF**		0.10		NONE			02/05/20 16:59	1
Percent Moisture	**20.8**		0.1		%			01/27/20 17:38	1

Surrogate Summary

Client: Leidos, Inc.
Project/Site: NASA PBS Waste - FR3 + 4

Job ID: 240-125349-1

Method: 8260B - Volatile Organic Compounds (GC/MS)

Matrix: Solid **Prep Type: Total/NA**

		Percent Surrogate Recovery (Acceptance Limits)			
		DCA	BFB	TOL	DBFM
Lab Sample ID	Client Sample ID	(59-120)	(51-127)	(64-124)	(56-122)
240-125349-1	FR34-WC-001	102	105	110	91
240-125349-2	FR34-WC-002	110	95	100	96
240-125349-3	FR34-WC-003	99	113	105	90
240-125349-4	FR34-WC-004	102	110	107	93
240-125349-4 MS	FR34-WC-004	97	88	91	91
240-125349-4 MSD	FR34-WC-004	107	94	98	98
240-125349-5	FR34-WC-005	109	115 *	116	92
240-125349-5 MS	FR34-WC-005	108	96	106	99
240-125349-5 MSD	FR34-WC-005	111	109	109	101
240-125349-6	FR34-WC-006	114	103	108	97
240-125349-7	FR34-WC-007	95	125 *	119	87
240-125349-8	FR34-WC-008	79	81	79	74
240-125349-8 MS	FR34-WC-008	82	80	80	79
240-125349-8 MSD	FR34-WC-008	73	70	72	72
LCS 240-420489/5	Lab Control Sample	93	82	89	89
LCS 240-420489/8	Lab Control Sample	102	90	99	94
LCS 240-420675/5	Lab Control Sample	107	87	100	101
LCS 240-420675/8	Lab Control Sample	108	88	100	98
LCS 240-420776/2-A	Lab Control Sample	80	83	82	80
MB 240-420489/7	Method Blank	102	89	98	92
MB 240-420675/7	Method Blank	109	87	101	97
MB 240-420776/1-A	Method Blank	80	79	78	75

Surrogate Legend

DCA = 1,2-Dichloroethane-d4 (Surr)
BFB = 4-Bromofluorobenzene (Surr)
TOL = Toluene-d8 (Surr)
DBFM = Dibromofluoromethane (Surr)

Method: 8260B - Volatile Organic Compounds (GC/MS)

Matrix: Solid **Prep Type: Total/NA**

		Percent Surrogate Recovery (Acceptance Limits)			
		DCA	BFB	TOL	DBFM
Lab Sample ID	Client Sample ID	(74-124)	(77-120)	(80-120)	(80-120)
LCS 240-420538/11	Lab Control Sample	84	91	93	92
LCS 240-420751/10	Lab Control Sample	82	92	94	92

Surrogate Legend

DCA = 1,2-Dichloroethane-d4 (Surr)
BFB = 4-Bromofluorobenzene (Surr)
TOL = Toluene-d8 (Surr)
DBFM = Dibromofluoromethane (Surr)

Method: 8260B - Volatile Organic Compounds (GC/MS)

Matrix: Solid **Prep Type: TCLP**

		Percent Surrogate Recovery (Acceptance Limits)			
		DCA	BFB	TOL	DBFM
Lab Sample ID	Client Sample ID	(74-124)	(77-120)	(80-120)	(80-120)
240-125349-1	FR34-WC-001	87	92	94	97

Surrogate Summary

Client: Leidos, Inc.
Job ID: 240-125349-1
Project/Site: NASA PBS Waste - FR3 + 4

Method: 8260B - Volatile Organic Compounds (GC/MS) (Continued)

Matrix: Solid **Prep Type: TCLP**

		Percent Surrogate Recovery (Acceptance Limits)			
		DCA	BFB	TOL	DBFM
Lab Sample ID	Client Sample ID	(74-124)	(77-120)	(80-120)	(80-120)
240-125349-2	FR34-WC-002	87	95	95	98
240-125349-3	FR34-WC-003	91	94	95	98
240-125349-4	FR34-WC-004	90	95	99	99
240-125349-5	FR34-WC-005	87	86	90	95
240-125349-5 MS	FR34-WC-005	82	93	93	91
240-125349-5 MSD	FR34-WC-005	83	91	93	92
240-125349-6	FR34-WC-006	86	90	96	96
240-125349-7	FR34-WC-007	83	87	92	90
240-125349-8	FR34-WC-008	88	92	95	97
LB 240-420397/1-A MB	Method Blank	81	88	91	87
LB 240-420578/1-A MB	Method Blank	88	95	95	95

Surrogate Legend

DCA = 1,2-Dichloroethane-d4 (Surr)
BFB = 4-Bromofluorobenzene (Surr)
TOL = Toluene-d8 (Surr)
DBFM = Dibromofluoromethane (Surr)

Method: 8270C - Semivolatile Organic Compounds (GC/MS)

Matrix: Solid **Prep Type: Total/NA**

		Percent Surrogate Recovery (Acceptance Limits)					
		FBP	2FP	TBP	NBZ	PHL	TPHL
Lab Sample ID	Client Sample ID	(39-120)	(10-120)	(33-120)	(33-120)	(10-120)	(36-122)
LCS 240-420513/22-A	Lab Control Sample	91	77	100	93	68	95
LCS 240-420669/17-A	Lab Control Sample	87	92	97	76	76	97
MB 240-420513/21-A	Method Blank	89	76	96	88	62	95
MB 240-420669/16-A	Method Blank	94	92	104	78	71	108

Surrogate Legend

FBP = 2-Fluorobiphenyl (Surr)
2FP = 2-Fluorophenol (Surr)
TBP = 2,4,6-Tribromophenol (Surr)
NBZ = Nitrobenzene-d5 (Surr)
PHL = Phenol-d5 (Surr)
TPHL = Terphenyl-d14 (Surr)

Method: 8270C - Semivolatile Organic Compounds (GC/MS)

Matrix: Solid **Prep Type: TCLP**

		Percent Surrogate Recovery (Acceptance Limits)					
		FBP	2FP	TBP	NBZ	PHL	TPHL
Lab Sample ID	Client Sample ID	(39-120)	(10-120)	(33-120)	(33-120)	(10-120)	(36-122)
240-125349-1	FR34-WC-001	84	75	100	84	60	96
240-125349-2	FR34-WC-002	79	71	90	77	59	89
240-125349-3	FR34-WC-003	85	77	100	84	64	98
240-125349-4	FR34-WC-004	82	64	94	79	51	91
240-125349-5	FR34-WC-005	78	69	87	75	57	88
240-125349-6	FR34-WC-006	91	78	101	86	65	99
240-125349-7	FR34-WC-007	87	68	94	84	54	93
240-125349-8	FR34-WC-008	68	58	90	56	48	86

Surrogate Summary

Client: Leidos, Inc.
Project/Site: NASA PBS Waste - FR3 + 4

Job ID: 240-125349-1

Surrogate Legend

FBP = 2-Fluorobiphenyl (Surr)
2FP = 2-Fluorophenol (Surr)
TBP = 2,4,6-Tribromophenol (Surr)
NBZ = Nitrobenzene-d5 (Surr)
PHL = Phenol-d5 (Surr)
TPHL = Terphenyl-d14 (Surr)

Method: 8270D - Semivolatile Organic Compounds (GC/MS)

Matrix: Solid **Prep Type: Total/NA**

		Percent Surrogate Recovery (Acceptance Limits)					
		FBP	2FP	NBZ	PHL	TPHL	TBP
Lab Sample ID	Client Sample ID	(35-120)	(26-120)	(28-120)	(28-120)	(39-120)	(10-120)
240-125349-1	FR34-WC-001	66	58	60	71	71	67
240-125349-1 MS	FR34-WC-001	74	68	65	74	78	70
240-125349-1 MSD	FR34-WC-001	74	82	76	78	77	69
240-125349-2	FR34-WC-002	83	82	82	76	89	72
240-125349-2 - RA	FR34-WC-002	81	58	80	81	96	68
240-125349-3	FR34-WC-003	62	67	61	69	63	55
240-125349-3 - RA	FR34-WC-003	72	76	62	78	66	54
240-125349-4 - RA	FR34-WC-004	71	66	72	81	82	82
240-125349-4	FR34-WC-004	82	81	75	84	90	87
240-125349-5 - RA	FR34-WC-005	76	79	81	82	83	79
240-125349-5	FR34-WC-005	78	85	81	87	85	91
240-125349-6	FR34-WC-006	72	75	65	78	83	78
240-125349-7	FR34-WC-007	76	79	73	81	82	78
240-125349-8	FR34-WC-008	75	50	77	77	158 X	75
240-125349-8 - RA	FR34-WC-008	0 X	0 X	0 X	0 X	0 X	0 X
LCS 240-420483/23-A	Lab Control Sample	84	85	88	88	93	55
MB 240-420483/22-A	Method Blank	80	64	69	74	86	33

Surrogate Legend

FBP = 2-Fluorobiphenyl (Surr)
2FP = 2-Fluorophenol (Surr)
NBZ = Nitrobenzene-d5 (Surr)
PHL = Phenol-d5 (Surr)
TPHL = Terphenyl-d14 (Surr)
TBP = 2,4,6-Tribromophenol (Surr)

Method: 8081A - Organochlorine Pesticides (GC)

Matrix: Solid **Prep Type: Total/NA**

		Percent Surrogate Recovery (Acceptance Limits)			
		TCX1	TCX2	DCBP1	DCBP2
Lab Sample ID	Client Sample ID	(33-123)	(33-123)	(21-135)	(21-135)
LCS 240-420514/11-A	Lab Control Sample	69	64	78	67
LCS 240-420670/12-A	Lab Control Sample	86	71	75	69
LCS 240-420670/13-A	Lab Control Sample	67	62	68	60
LCS 240-420670/15-A	Lab Control Sample	74	67	72	64
LCSD 240-420670/14-A	Lab Control Sample Dup	81	58	69	60
LCSD 240-420670/16-A	Lab Control Sample Dup	69	63	71	63
MB 240-420514/10-A	Method Blank	67	66	77	67
MB 240-420670/11-A	Method Blank	54	50	59	54

Surrogate Legend

TCX = Tetrachloro-m-xylene

Surrogate Summary

Client: Leidos, Inc.
Job ID: 240-125349-1
Project/Site: NASA PBS Waste - FR3 + 4

DCBP = DCB Decachlorobiphenyl

Method: 8081A - Organochlorine Pesticides (GC)

Matrix: Solid **Prep Type: TCLP**

		Percent Surrogate Recovery (Acceptance Limits)			
		TCX1	TCX2	DCBP1	DCBP2
Lab Sample ID	Client Sample ID	(33-123)	(33-123)	(21-135)	(21-135)
240-125349-1	FR34-WC-001	65	62	72	64
240-125349-2	FR34-WC-002	67	59	77	66
240-125349-3	FR34-WC-003	62	61	68	62
240-125349-4	FR34-WC-004	78	68	80	64
240-125349-5	FR34-WC-005	68	67	75	68
240-125349-6	FR34-WC-006	59	56	66	55
240-125349-7	FR34-WC-007	77	69	87	69
240-125349-8	FR34-WC-008	33	33	36	38

Surrogate Legend

TCX = Tetrachloro-m-xylene

DCBP = DCB Decachlorobiphenyl

Method: 8082 - Polychlorinated Biphenyls (PCBs) by Gas Chromatography

Matrix: Solid **Prep Type: Total/NA**

		Percent Surrogate Recovery (Acceptance Limits)	
		TCX1	DCBP1
Lab Sample ID	Client Sample ID	(14-128)	(10-132)
240-125349-1	FR34-WC-001	80	116
240-125349-1 MS	FR34-WC-001	46	48
240-125349-1 MSD	FR34-WC-001	65	85
240-125349-2	FR34-WC-002	102	86 p
240-125349-3	FR34-WC-003	53	22 p
240-125349-4	FR34-WC-004	48	157 X
240-125349-5	FR34-WC-005	48	170 X
240-125349-6	FR34-WC-006	52	65
240-125349-7	FR34-WC-007	46	69
LCS 240-420318/24-A	Lab Control Sample	47	79
MB 240-420318/23-A	Method Blank	77	99

Surrogate Legend

TCX = Tetrachloro-m-xylene

DCBP = DCB Decachlorobiphenyl

Method: 8082 - Polychlorinated Biphenyls (PCBs) by Gas Chromatography

Matrix: Solid **Prep Type: Total/NA**

		Percent Surrogate Recovery (Acceptance Limits)	
		TCX2	DCBP2
Lab Sample ID	Client Sample ID	(14-128)	(10-132)
240-125349-8	FR34-WC-008	83	94
LCS 240-420468/24-A	Lab Control Sample	53	58
MB 240-420468/23-A	Method Blank	70	82

Surrogate Legend

TCX = Tetrachloro-m-xylene

DCBP = DCB Decachlorobiphenyl

Surrogate Summary

Client: Leidos, Inc.
Job ID: 240-125349-1
Project/Site: NASA PBS Waste - FR3 + 4

Method: 8151A - Herbicides (GC)

Matrix: Solid **Prep Type: Total/NA**

		Percent Surrogate Recovery (Acceptance Limits)	
Lab Sample ID	**Client Sample ID**	**DCPAA1 (41-130)**	**DCPAA2 (41-130)**
LCS 240-420673/12-A	Lab Control Sample	80	87
LCS 240-421213/11-A	Lab Control Sample	71	72
MB 240-420673/11-A	Method Blank	76	83
MB 240-421213/10-A	Method Blank	82	89

Surrogate Legend

DCPAA = 2,4-Dichlorophenylacetic acid

Method: 8151A - Herbicides (GC)

Matrix: Solid **Prep Type: TCLP**

		Percent Surrogate Recovery (Acceptance Limits)	
Lab Sample ID	**Client Sample ID**	**DCPAA1 (41-130)**	**DCPAA2 (41-130)**
240-125349-1	FR34-WC-001	73	75
240-125349-1 MS	FR34-WC-001	84	87
240-125349-2	FR34-WC-002	80	85
240-125349-3	FR34-WC-003	78	80
240-125349-4	FR34-WC-004	87	90
240-125349-5	FR34-WC-005	84	89
240-125349-6	FR34-WC-006	89	91
240-125349-7	FR34-WC-007	86	90
240-125349-8	FR34-WC-008	84	90

Surrogate Legend

DCPAA = 2,4-Dichlorophenylacetic acid

Method: 8260B - Volatile Organic Compounds (GC/MS)

Lab Sample ID: MB 240-420489/7
Matrix: Solid
Analysis Batch: 420489

Client Sample ID: Method Blank
Prep Type: Total/NA

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
1,1,1,2-Tetrachloroethane	<5.0		5.0		ug/Kg			01/28/20 14:05	1
1,1,1-Trichloroethane	<5.0		5.0		ug/Kg			01/28/20 14:05	1
1,1,2,2-Tetrachloroethane	<5.0		5.0		ug/Kg			01/28/20 14:05	1
1,1,2-Trichloro-1,2,2-trichfluoroethane	<5.0		5.0		ug/Kg			01/28/20 14:05	1
1,1,2-Trichloroethane	<5.0		5.0		ug/Kg			01/28/20 14:05	1
1,1-Dichloroethane	<5.0		5.0		ug/Kg			01/28/20 14:05	1
1,1-Dichloroethene	<5.0		5.0		ug/Kg			01/28/20 14:05	1
1,1-Dichloropropene	<5.0		5.0		ug/Kg			01/28/20 14:05	1
1,2,3-Trichlorobenzene	<5.0		5.0		ug/Kg			01/28/20 14:05	1
1,2,3-Trichloropropane	<5.0		5.0		ug/Kg			01/28/20 14:05	1
1,2,4-Trimethylbenzene	<5.0		5.0		ug/Kg			01/28/20 14:05	1
1,2-Dibromo-3-Chloropropane	<10		10		ug/Kg			01/28/20 14:05	1
1,2-Dichlorobenzene	<5.0		5.0		ug/Kg			01/28/20 14:05	1
1,2-Dichloroethane	<5.0		5.0		ug/Kg			01/28/20 14:05	1
1,2-Dichloropropane	<5.0		5.0		ug/Kg			01/28/20 14:05	1
2-Nitropropane	<10		10		ug/Kg			01/28/20 14:05	1
2,2-Dichloropropane	<5.0		5.0		ug/Kg			01/28/20 14:05	1
2-Chlorotoluene	<5.0		5.0		ug/Kg			01/28/20 14:05	1
2-Hexanone	<20		20		ug/Kg			01/28/20 14:05	1
Bromobenzene	<5.0		5.0		ug/Kg			01/28/20 14:05	1
Chlorobromomethane	<5.0		5.0		ug/Kg			01/28/20 14:05	1
4-Chlorotoluene	<5.0		5.0		ug/Kg			01/28/20 14:05	1
4-Isopropyltoluene	<5.0		5.0		ug/Kg			01/28/20 14:05	1
Acetone	<25		25		ug/Kg			01/28/20 14:05	1
Benzene	<5.0		5.0		ug/Kg			01/28/20 14:05	1
Bromoform	<5.0		5.0		ug/Kg			01/28/20 14:05	1
Bromomethane	<5.0		5.0		ug/Kg			01/28/20 14:05	1
Carbon disulfide	<5.0		5.0		ug/Kg			01/28/20 14:05	1
Carbon tetrachloride	<5.0		5.0		ug/Kg			01/28/20 14:05	1
Chlorobenzene	<5.0		5.0		ug/Kg			01/28/20 14:05	1
Chloroethane	<5.0		5.0		ug/Kg			01/28/20 14:05	1
Chloroform	<5.0		5.0		ug/Kg			01/28/20 14:05	1
Chloromethane	<5.0		5.0		ug/Kg			01/28/20 14:05	1
cis-1,2-Dichloroethene	<5.0		5.0		ug/Kg			01/28/20 14:05	1
Ethyl acetate	<20		20		ug/Kg			01/28/20 14:05	1
cis-1,3-Dichloropropene	<5.0		5.0		ug/Kg			01/28/20 14:05	1
Cyclohexanone	<100		100		ug/Kg			01/28/20 14:05	1
Dibromomethane	<5.0		5.0		ug/Kg			01/28/20 14:05	1
Dichlorobromomethane	<5.0		5.0		ug/Kg			01/28/20 14:05	1
Dichlorodifluoromethane	<5.0		5.0		ug/Kg			01/28/20 14:05	1
Ethyl ether	<5.0		5.0		ug/Kg			01/28/20 14:05	1
Ethylbenzene	<5.0		5.0		ug/Kg			01/28/20 14:05	1
Ethylene Dibromide	<5.0		5.0		ug/Kg			01/28/20 14:05	1
Isobutyl alcohol	<200		200		ug/Kg			01/28/20 14:05	1
m-Xylene & p-Xylene	<10		10		ug/Kg			01/28/20 14:05	1
n-Butylbenzene	<5.0		5.0		ug/Kg			01/28/20 14:05	1
Isopropylbenzene	<5.0		5.0		ug/Kg			01/28/20 14:05	1
N-Propylbenzene	<5.0		5.0		ug/Kg			01/28/20 14:05	1

Method: 8260B - Volatile Organic Compounds (GC/MS) (Continued)

Lab Sample ID: MB 240-420489/7
Matrix: Solid
Analysis Batch: 420489

Client Sample ID: Method Blank
Prep Type: Total/NA

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
2-Butanone (MEK)	<20		20		ug/Kg			01/28/20 14:05	1
4-Methyl-2-pentanone (MIBK)	<20		20		ug/Kg			01/28/20 14:05	1
sec-Butylbenzene	<5.0		5.0		ug/Kg			01/28/20 14:05	1
Methyl tert-butyl ether	<5.0		5.0		ug/Kg			01/28/20 14:05	1
Methylene Chloride	<25		25		ug/Kg			01/28/20 14:05	1
n-Butanol	<1000		1000		ug/Kg			01/28/20 14:05	1
o-Xylene	<5.0		5.0		ug/Kg			01/28/20 14:05	1
Styrene	<5.0		5.0		ug/Kg			01/28/20 14:05	1
tert-Butylbenzene	<5.0		5.0		ug/Kg			01/28/20 14:05	1
Tetrachloroethene	<5.0		5.0		ug/Kg			01/28/20 14:05	1
Toluene	<5.0		5.0		ug/Kg			01/28/20 14:05	1
trans-1,2-Dichloroethene	<5.0		5.0		ug/Kg			01/28/20 14:05	1
trans-1,3-Dichloropropene	<5.0		5.0		ug/Kg			01/28/20 14:05	1
Trichloroethene	<5.0		5.0		ug/Kg			01/28/20 14:05	1
Trichlorofluoromethane	<5.0		5.0		ug/Kg			01/28/20 14:05	1
Vinyl chloride	<5.0		5.0		ug/Kg			01/28/20 14:05	1
Xylenes, Total	<10		10		ug/Kg			01/28/20 14:05	1
Chlorodibromomethane	<5.0		5.0		ug/Kg			01/28/20 14:05	1

Surrogate	*MB %Recovery*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
1,2-Dichloroethane-d4 (Surr)	*102*		*59 - 120*		*01/28/20 14:05*	*1*
4-Bromofluorobenzene (Surr)	*89*		*51 - 127*		*01/28/20 14:05*	*1*
Toluene-d8 (Surr)	*98*		*64 - 124*		*01/28/20 14:05*	*1*
Dibromofluoromethane (Surr)	*92*		*56 - 122*		*01/28/20 14:05*	*1*

Lab Sample ID: LCS 240-420489/5
Matrix: Solid
Analysis Batch: 420489

Client Sample ID: Lab Control Sample
Prep Type: Total/NA

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
1,1,1,2-Tetrachloroethane	50.0	48.4		ug/Kg		97	72 - 120
1,1,1-Trichloroethane	50.0	48.4		ug/Kg		97	60 - 126
1,1,2,2-Tetrachloroethane	50.0	48.3		ug/Kg		97	61 - 134
1,1,2-Trichloro-1,2,2-trichfluoroethane	50.0	49.4		ug/Kg		99	58 - 144
1,1,2-Trichloroethane	50.0	50.0		ug/Kg		100	78 - 120
1,1-Dichloroethane	50.0	48.1		ug/Kg		96	69 - 120
1,1-Dichloroethene	50.0	48.2		ug/Kg		96	48 - 140
1,1-Dichloropropene	50.0	47.6		ug/Kg		95	69 - 120
1,2,3-Trichlorobenzene	50.0	50.6		ug/Kg		101	55 - 124
1,2,3-Trichloropropane	50.0	56.0		ug/Kg		112	68 - 130
1,2,4-Trimethylbenzene	50.0	46.4		ug/Kg		93	69 - 122
1,2-Dibromo-3-Chloropropane	50.0	48.0		ug/Kg		96	35 - 137
1,2-Dichlorobenzene	50.0	46.7		ug/Kg		93	74 - 120
1,2-Dichloroethane	50.0	57.8		ug/Kg		116	66 - 120
1,2-Dichloropropane	50.0	48.2		ug/Kg		96	77 - 120
2,2-Dichloropropane	50.0	40.9		ug/Kg		82	47 - 131
2-Chlorotoluene	50.0	45.8		ug/Kg		92	72 - 121
2-Hexanone	100	126		ug/Kg		126	54 - 135

Method: 8260B - Volatile Organic Compounds (GC/MS) (Continued)

Lab Sample ID: LCS 240-420489/5
Matrix: Solid
Analysis Batch: 420489

Client Sample ID: Lab Control Sample
Prep Type: Total/NA

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Bromobenzene	50.0	47.3		ug/Kg		95	73 - 120
Chlorobromomethane	50.0	50.6		ug/Kg		101	74 - 120
4-Chlorotoluene	50.0	46.8		ug/Kg		94	72 - 124
4-Isopropyltoluene	50.0	48.6		ug/Kg		97	70 - 121
Acetone	100	155		ug/Kg		155	47 - 157
Benzene	50.0	46.4		ug/Kg		93	75 - 120
Bromoform	50.0	49.8		ug/Kg		100	44 - 131
Bromomethane	20.0	13.4		ug/Kg		67	10 - 158
Carbon disulfide	50.0	43.6		ug/Kg		87	33 - 144
Carbon tetrachloride	50.0	49.2		ug/Kg		98	54 - 130
Chlorobenzene	50.0	48.2		ug/Kg		96	79 - 120
Chloroethane	20.0	15.3		ug/Kg		76	10 - 159
Chloroform	50.0	48.7		ug/Kg		97	74 - 120
Chloromethane	20.0	13.9		ug/Kg		70	40 - 127
cis-1,2-Dichloroethene	50.0	47.9		ug/Kg		96	76 - 120
cis-1,3-Dichloropropene	50.0	47.3		ug/Kg		95	62 - 124
Dibromomethane	50.0	55.9		ug/Kg		112	74 - 120
Dichlorobromomethane	50.0	49.1		ug/Kg		98	63 - 121
Dichlorodifluoromethane	20.0	16.0		ug/Kg		80	18 - 137
Ethylbenzene	50.0	48.4		ug/Kg		97	75 - 120
Ethylene Dibromide	50.0	53.0		ug/Kg		106	73 - 126
m-Xylene & p-Xylene	50.0	48.8		ug/Kg		98	76 - 120
n-Butylbenzene	50.0	46.4		ug/Kg		93	64 - 123
Isopropylbenzene	50.0	51.4		ug/Kg		103	74 - 120
N-Propylbenzene	50.0	47.1		ug/Kg		94	70 - 122
2-Butanone (MEK)	100	128		ug/Kg		128	61 - 131
4-Methyl-2-pentanone (MIBK)	100	123		ug/Kg		123	56 - 124
sec-Butylbenzene	50.0	46.7		ug/Kg		93	69 - 122
Methyl tert-butyl ether	50.0	44.9		ug/Kg		90	66 - 120
Methylene Chloride	50.0	42.8		ug/Kg		86	48 - 142
o-Xylene	50.0	48.1		ug/Kg		96	76 - 120
Styrene	50.0	48.4		ug/Kg		97	70 - 120
tert-Butylbenzene	50.0	47.3		ug/Kg		95	68 - 121
Tetrachloroethene	50.0	52.9		ug/Kg		106	75 - 124
Toluene	50.0	46.4		ug/Kg		93	76 - 120
trans-1,2-Dichloroethene	50.0	48.8		ug/Kg		98	74 - 125
trans-1,3-Dichloropropene	50.0	45.0		ug/Kg		90	58 - 120
Trichloroethene	50.0	52.4		ug/Kg		105	75 - 123
Trichlorofluoromethane	20.0	16.0		ug/Kg		80	33 - 152
Vinyl chloride	20.0	16.4		ug/Kg		82	39 - 140
Xylenes, Total	100	96.9		ug/Kg		97	77 - 120

Surrogate	*LCS %Recovery*	*LCS Qualifier*	*Limits*
1,2-Dichloroethane-d4 (Surr)	*93*		*59 - 120*
4-Bromofluorobenzene (Surr)	*82*		*51 - 127*
Toluene-d8 (Surr)	*89*		*64 - 124*
Dibromofluoromethane (Surr)	*89*		*56 - 122*

Method: 8260B - Volatile Organic Compounds (GC/MS) (Continued)

Lab Sample ID: LCS 240-420489/8
Matrix: Solid
Analysis Batch: 420489

Client Sample ID: Lab Control Sample
Prep Type: Total/NA

Surrogate	*LCS %Recovery*	*LCS Qualifier*	*Limits*
1,2-Dichloroethane-d4 (Surr)	*102*		*59 - 120*
4-Bromofluorobenzene (Surr)	*90*		*51 - 127*
Toluene-d8 (Surr)	*99*		*64 - 124*
Dibromofluoromethane (Surr)	*94*		*56 - 122*

Lab Sample ID: LCS 240-420538/11
Matrix: Solid
Analysis Batch: 420538

Client Sample ID: Lab Control Sample
Prep Type: Total/NA

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
1,1-Dichloroethene	1.00	0.919		mg/L		92	80 - 128
1,2-Dichloroethane	1.00	0.808		mg/L		81	67 - 125
Benzene	1.00	0.928		mg/L		93	80 - 122
Carbon tetrachloride	1.00	0.864		mg/L		86	67 - 126
Chlorobenzene	1.00	0.874		mg/L		87	80 - 120
Chloroform	1.00	0.876		mg/L		88	80 - 120
2-Butanone (MEK)	2.00	1.61		mg/L		80	55 - 127
Tetrachloroethene	1.00	0.912		mg/L		91	76 - 120
Trichloroethene	1.00	0.893		mg/L		89	77 - 120
Vinyl chloride	1.00	0.810		mg/L		81	60 - 134

Surrogate	*LCS %Recovery*	*LCS Qualifier*	*Limits*
1,2-Dichloroethane-d4 (Surr)	*84*		*74 - 124*
4-Bromofluorobenzene (Surr)	*91*		*77 - 120*
Toluene-d8 (Surr)	*93*		*80 - 120*
Dibromofluoromethane (Surr)	*92*		*80 - 120*

Lab Sample ID: 240-125349-4 MS
Matrix: Solid
Analysis Batch: 420489

Client Sample ID: FR34-WC-004
Prep Type: Total/NA
Prep Batch: 420546

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
1,1,1,2-Tetrachloroethane	<5.9		54.8	30.8		ug/Kg	☼	56	19 - 129
1,1,1-Trichloroethane	<5.9		54.8	33.7		ug/Kg	☼	62	27 - 131
1,1,2,2-Tetrachloroethane	<5.9		54.8	34.6		ug/Kg	☼	63	10 - 168
1,1,2-Trichloro-1,2,2-trichfluoroethane	<5.9		54.8	36.6		ug/Kg	☼	67	30 - 145
1,1,2-Trichloroethane	<5.9		54.8	38.2		ug/Kg	☼	70	17 - 152
1,1-Dichloroethane	<5.9		54.8	36.9		ug/Kg	☼	67	35 - 129
1,1-Dichloroethene	<5.9		54.8	36.7		ug/Kg	☼	67	20 - 150
1,1-Dichloropropene	<5.9		54.8	31.7		ug/Kg	☼	58	36 - 120
1,2,3-Trichlorobenzene	<5.9		54.8	12.6		ug/Kg	☼	23	10 - 120
1,2,3-Trichloropropane	<5.9		54.8	42.3		ug/Kg	☼	77	38 - 146
1,2,4-Trimethylbenzene	<5.9		54.8	23.5		ug/Kg	☼	43	10 - 138
1,2-Dibromo-3-Chloropropane	<12		54.8	26.2		ug/Kg	☼	48	10 - 135
1,2-Dichlorobenzene	<5.9		54.8	20.1		ug/Kg	☼	37	10 - 131
1,2-Dichloroethane	<5.9		54.8	46.8		ug/Kg	☼	85	33 - 130
1,2-Dichloropropane	<5.9		54.8	36.0		ug/Kg	☼	66	33 - 134

Method: 8260B - Volatile Organic Compounds (GC/MS) (Continued)

Lab Sample ID: 240-125349-4 MS
Matrix: Solid
Analysis Batch: 420489

Client Sample ID: FR34-WC-004
Prep Type: Total/NA
Prep Batch: 420546

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
2,2-Dichloropropane	<5.9		54.8	26.2		ug/Kg	☼	48	34 - 124
2-Chlorotoluene	<5.9		54.8	23.5		ug/Kg	☼	43	12 - 139
2-Hexanone	<24		110	80.7		ug/Kg	☼	74	23 - 149
Bromobenzene	<5.9		54.8	26.3		ug/Kg	☼	48	16 - 136
Chlorobromomethane	<5.9		54.8	40.6		ug/Kg	☼	74	50 - 125
4-Chlorotoluene	<5.9		54.8	21.6		ug/Kg	☼	39	14 - 128
4-Isopropyltoluene	<5.9		54.8	19.5		ug/Kg	☼	36	10 - 135
Acetone	<30		110	99.6		ug/Kg	☼	91	18 - 167
Benzene	<5.9		54.8	34.1		ug/Kg	☼	62	32 - 131
Bromoform	<5.9		54.8	29.7		ug/Kg	☼	54	10 - 122
Bromomethane	<5.9		21.9	10.0		ug/Kg	☼	46	10 - 149
Carbon disulfide	<5.9		54.8	31.5		ug/Kg	☼	58	10 - 134
Carbon tetrachloride	<5.9		54.8	32.0		ug/Kg	☼	58	13 - 131
Chlorobenzene	<5.9		54.8	28.5		ug/Kg	☼	52	16 - 129
Chloroethane	<5.9		21.9	12.2		ug/Kg	☼	56	10 - 155
Chloroform	<5.9		54.8	37.3		ug/Kg	☼	68	38 - 129
Chloromethane	<5.9		21.9	10.0		ug/Kg	☼	46	20 - 140
cis-1,2-Dichloroethene	<5.9		54.8	36.4		ug/Kg	☼	67	35 - 130
cis-1,3-Dichloropropene	<5.9		54.8	29.1		ug/Kg	☼	53	12 - 131
Dibromomethane	<5.9		54.8	43.6		ug/Kg	☼	79	30 - 126
Dichlorobromomethane	<5.9		54.8	34.9		ug/Kg	☼	64	18 - 125
Dichlorodifluoromethane	<5.9		21.9	12.2		ug/Kg	☼	56	10 - 141
Ethylbenzene	<5.9		54.8	26.5		ug/Kg	☼	48	12 - 133
Ethylene Dibromide	<5.9		54.8	38.1		ug/Kg	☼	70	24 - 138
m-Xylene & p-Xylene	<12		54.8	26.3		ug/Kg	☼	48	10 - 132
n-Butylbenzene	<5.9		54.8	15.4		ug/Kg	☼	28	10 - 141
Isopropylbenzene	<5.9		54.8	25.4		ug/Kg	☼	46	10 - 135
N-Propylbenzene	<5.9		54.8	21.6		ug/Kg	☼	39	10 - 135
2-Butanone (MEK)	<24		110	93.6		ug/Kg	☼	85	31 - 148
4-Methyl-2-pentanone (MIBK)	<24		110	96.8		ug/Kg	☼	88	29 - 140
sec-Butylbenzene	<5.9		54.8	20.3		ug/Kg	☼	37	10 - 142
Methyl tert-butyl ether	<5.9		54.8	39.0		ug/Kg	☼	71	42 - 127
Methylene Chloride	<30		54.8	42.2		ug/Kg	☼	77	22 - 153
o-Xylene	<5.9		54.8	27.5		ug/Kg	☼	50	11 - 134
Styrene	<5.9		54.8	23.6		ug/Kg	☼	43	10 - 127
tert-Butylbenzene	<5.9		54.8	23.5		ug/Kg	☼	43	10 - 142
Tetrachloroethene	<5.9		54.8	30.9		ug/Kg	☼	56	13 - 144
Toluene	<5.9		54.8	30.9		ug/Kg	☼	56	20 - 141
trans-1,2-Dichloroethene	<5.9		54.8	36.5		ug/Kg	☼	67	31 - 138
trans-1,3-Dichloropropene	<5.9		54.8	27.2		ug/Kg	☼	50	10 - 123
Trichloroethene	<5.9		54.8	33.4		ug/Kg	☼	61	10 - 162
Trichlorofluoromethane	<5.9		21.9	10.6		ug/Kg	☼	49	16 - 148
Vinyl chloride	<5.9		21.9	13.3		ug/Kg	☼	61	15 - 150
Xylenes, Total	<12		110	53.8		ug/Kg	☼	49	10 - 134

Surrogate	*MS %Recovery*	*MS Qualifier*	*Limits*
1,2-Dichloroethane-d4 (Surr)	*97*		*59 - 120*
4-Bromofluorobenzene (Surr)	*88*		*51 - 127*

Method: 8260B - Volatile Organic Compounds (GC/MS) (Continued)

Lab Sample ID: 240-125349-4 MS
Matrix: Solid
Analysis Batch: 420489

Client Sample ID: FR34-WC-004
Prep Type: Total/NA
Prep Batch: 420546

Surrogate	*MS %Recovery*	*MS Qualifier*	*Limits*
Toluene-d8 (Surr)	*91*		*64 - 124*
Dibromofluoromethane (Surr)	*91*		*56 - 122*

Lab Sample ID: 240-125349-4 MSD
Matrix: Solid
Analysis Batch: 420489

Client Sample ID: FR34-WC-004
Prep Type: Total/NA
Prep Batch: 420546

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
1,1,1,2-Tetrachloroethane	<5.9		55.6	31.5		ug/Kg	☼	57	19 - 129	2	40
1,1,1-Trichloroethane	<5.9		55.6	33.5		ug/Kg	☼	60	27 - 131	1	40
1,1,2,2-Tetrachloroethane	<5.9		55.6	33.8		ug/Kg	☼	61	10 - 168	2	40
1,1,2-Trichloro-1,2,2-trichfluoroethane	<5.9		55.6	35.5		ug/Kg	☼	64	30 - 145	3	40
1,1,2-Trichloroethane	<5.9		55.6	38.7		ug/Kg	☼	70	17 - 152	1	40
1,1-Dichloroethane	<5.9		55.6	35.7		ug/Kg	☼	64	35 - 129	3	40
1,1-Dichloroethene	<5.9		55.6	34.2		ug/Kg	☼	62	20 - 150	7	40
1,1-Dichloropropene	<5.9		55.6	30.5		ug/Kg	☼	55	36 - 120	4	39
1,2,3-Trichlorobenzene	<5.9		55.6	13.1		ug/Kg	☼	23	10 - 120	4	40
1,2,3-Trichloropropane	<5.9		55.6	41.3		ug/Kg	☼	74	38 - 146	2	40
1,2,4-Trimethylbenzene	<5.9		55.6	23.3		ug/Kg	☼	42	10 - 138	1	40
1,2-Dibromo-3-Chloropropane	<12		55.6	24.0		ug/Kg	☼	43	10 - 135	9	40
1,2-Dichlorobenzene	<5.9		55.6	21.1		ug/Kg	☼	38	10 - 131	5	40
1,2-Dichloroethane	<5.9		55.6	45.9		ug/Kg	☼	83	33 - 130	2	40
1,2-Dichloropropane	<5.9		55.6	36.0		ug/Kg	☼	65	33 - 134	0	40
2,2-Dichloropropane	<5.9		55.6	27.3		ug/Kg	☼	49	34 - 124	4	40
2-Chlorotoluene	<5.9		55.6	24.4		ug/Kg	☼	44	12 - 139	4	40
2-Hexanone	<24		111	73.5		ug/Kg	☼	66	23 - 149	9	40
Bromobenzene	<5.9		55.6	26.6		ug/Kg	☼	48	16 - 136	1	40
Chlorobromomethane	<5.9		55.6	39.9		ug/Kg	☼	72	50 - 125	2	39
4-Chlorotoluene	<5.9		55.6	23.2		ug/Kg	☼	42	14 - 128	7	40
4-Isopropyltoluene	<5.9		55.6	21.8		ug/Kg	☼	39	10 - 135	11	40
Acetone	<30		111	123		ug/Kg	☼	110	18 - 167	21	40
Benzene	<5.9		55.6	33.3		ug/Kg	☼	60	32 - 131	2	40
Bromoform	<5.9		55.6	29.1		ug/Kg	☼	52	10 - 122	2	40
Bromomethane	<5.9		22.2	9.51		ug/Kg	☼	43	10 - 149	5	40
Carbon disulfide	<5.9		55.6	28.9		ug/Kg	☼	52	10 - 134	9	40
Carbon tetrachloride	<5.9		55.6	31.4		ug/Kg	☼	56	13 - 131	2	40
Chlorobenzene	<5.9		55.6	28.7		ug/Kg	☼	52	16 - 129	1	40
Chloroethane	<5.9		22.2	12.2		ug/Kg	☼	55	10 - 155	1	40
Chloroform	<5.9		55.6	36.8		ug/Kg	☼	66	38 - 129	1	40
Chloromethane	<5.9		22.2	9.65		ug/Kg	☼	43	20 - 140	4	40
cis-1,2-Dichloroethene	<5.9		55.6	35.3		ug/Kg	☼	63	35 - 130	3	40
cis-1,3-Dichloropropene	<5.9		55.6	28.4		ug/Kg	☼	51	12 - 131	3	40
Dibromomethane	<5.9		55.6	43.0		ug/Kg	☼	77	30 - 126	1	39
Dichlorobromomethane	<5.9		55.6	34.8		ug/Kg	☼	63	18 - 125	0	40
Dichlorodifluoromethane	<5.9		22.2	11.9		ug/Kg	☼	54	10 - 141	2	40
Ethylbenzene	<5.9		55.6	27.6		ug/Kg	☼	50	12 - 133	4	40
Ethylene Dibromide	<5.9		55.6	37.7		ug/Kg	☼	68	24 - 138	1	40
m-Xylene & p-Xylene	<12		55.6	27.2		ug/Kg	☼	49	10 - 132	3	40

Method: 8260B - Volatile Organic Compounds (GC/MS) (Continued)

Lab Sample ID: 240-125349-4 MSD
Matrix: Solid
Analysis Batch: 420489

Client Sample ID: FR34-WC-004
Prep Type: Total/NA
Prep Batch: 420546

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
n-Butylbenzene	<5.9		55.6	18.5		ug/Kg	☼	33	10 - 141	18	40
Isopropylbenzene	<5.9		55.6	26.9		ug/Kg	☼	48	10 - 135	6	40
N-Propylbenzene	<5.9		55.6	23.6		ug/Kg	☼	42	10 - 135	9	40
2-Butanone (MEK)	<24		111	98.2		ug/Kg	☼	88	31 - 148	5	40
4-Methyl-2-pentanone (MIBK)	<24		111	90.3		ug/Kg	☼	81	29 - 140	7	40
sec-Butylbenzene	<5.9		55.6	22.0		ug/Kg	☼	40	10 - 142	8	40
Methyl tert-butyl ether	<5.9		55.6	38.4		ug/Kg	☼	69	42 - 127	2	40
Methylene Chloride	<30		55.6	41.4		ug/Kg	☼	74	22 - 153	2	40
o-Xylene	<5.9		55.6	28.2		ug/Kg	☼	51	11 - 134	3	40
Styrene	<5.9		55.6	24.6		ug/Kg	☼	44	10 - 127	4	40
tert-Butylbenzene	<5.9		55.6	24.4		ug/Kg	☼	44	10 - 142	4	40
Tetrachloroethene	<5.9		55.6	31.0		ug/Kg	☼	56	13 - 144	0	40
Toluene	<5.9		55.6	30.5		ug/Kg	☼	55	20 - 141	1	40
trans-1,2-Dichloroethene	<5.9		55.6	35.1		ug/Kg	☼	63	31 - 138	4	40
trans-1,3-Dichloropropene	<5.9		55.6	27.4		ug/Kg	☼	49	10 - 123	1	40
Trichloroethene	<5.9		55.6	32.8		ug/Kg	☼	59	10 - 162	2	40
Trichlorofluoromethane	<5.9		22.2	10.3		ug/Kg	☼	46	16 - 148	3	40
Vinyl chloride	<5.9		22.2	12.8		ug/Kg	☼	58	15 - 150	4	40
Xylenes, Total	<12		111	55.4		ug/Kg	☼	50	10 - 134	3	40

Surrogate	*MSD %Recovery*	*MSD Qualifier*	*Limits*
1,2-Dichloroethane-d4 (Surr)	*107*		*59 - 120*
4-Bromofluorobenzene (Surr)	*94*		*51 - 127*
Toluene-d8 (Surr)	*98*		*64 - 124*
Dibromofluoromethane (Surr)	*98*		*56 - 122*

Lab Sample ID: MB 240-420675/7
Matrix: Solid
Analysis Batch: 420675

Client Sample ID: Method Blank
Prep Type: Total/NA

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
1,1,1,2-Tetrachloroethane	<5.0		5.0		ug/Kg			01/29/20 13:29	1
1,1,1-Trichloroethane	<5.0		5.0		ug/Kg			01/29/20 13:29	1
1,1,2,2-Tetrachloroethane	<5.0		5.0		ug/Kg			01/29/20 13:29	1
1,1,2-Trichloro-1,2,2-trichfluoroethane	<5.0		5.0		ug/Kg			01/29/20 13:29	1
1,1,2-Trichloroethane	<5.0		5.0		ug/Kg			01/29/20 13:29	1
1,1-Dichloroethane	<5.0		5.0		ug/Kg			01/29/20 13:29	1
1,1-Dichloroethene	<5.0		5.0		ug/Kg			01/29/20 13:29	1
1,1-Dichloropropene	<5.0		5.0		ug/Kg			01/29/20 13:29	1
1,2,3-Trichlorobenzene	<5.0		5.0		ug/Kg			01/29/20 13:29	1
1,2,3-Trichloropropane	<5.0		5.0		ug/Kg			01/29/20 13:29	1
1,2,4-Trimethylbenzene	<5.0		5.0		ug/Kg			01/29/20 13:29	1
1,2-Dibromo-3-Chloropropane	<10		10		ug/Kg			01/29/20 13:29	1
1,2-Dichlorobenzene	<5.0		5.0		ug/Kg			01/29/20 13:29	1
1,2-Dichloroethane	<5.0		5.0		ug/Kg			01/29/20 13:29	1
1,2-Dichloropropane	<5.0		5.0		ug/Kg			01/29/20 13:29	1
2-Nitropropane	<10		10		ug/Kg			01/29/20 13:29	1
2,2-Dichloropropane	<5.0		5.0		ug/Kg			01/29/20 13:29	1

Method: 8260B - Volatile Organic Compounds (GC/MS) (Continued)

Lab Sample ID: MB 240-420675/7
Matrix: Solid
Analysis Batch: 420675

Client Sample ID: Method Blank
Prep Type: Total/NA

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
2-Chlorotoluene	<5.0		5.0		ug/Kg			01/29/20 13:29	1
2-Hexanone	<20		20		ug/Kg			01/29/20 13:29	1
Bromobenzene	<5.0		5.0		ug/Kg			01/29/20 13:29	1
Chlorobromomethane	<5.0		5.0		ug/Kg			01/29/20 13:29	1
4-Chlorotoluene	<5.0		5.0		ug/Kg			01/29/20 13:29	1
4-Isopropyltoluene	<5.0		5.0		ug/Kg			01/29/20 13:29	1
Acetone	<25		25		ug/Kg			01/29/20 13:29	1
Benzene	<5.0		5.0		ug/Kg			01/29/20 13:29	1
Bromoform	<5.0		5.0		ug/Kg			01/29/20 13:29	1
Bromomethane	<5.0		5.0		ug/Kg			01/29/20 13:29	1
Carbon disulfide	<5.0		5.0		ug/Kg			01/29/20 13:29	1
Carbon tetrachloride	<5.0		5.0		ug/Kg			01/29/20 13:29	1
Chlorobenzene	<5.0		5.0		ug/Kg			01/29/20 13:29	1
Chloroethane	<5.0		5.0		ug/Kg			01/29/20 13:29	1
Chloroform	<5.0		5.0		ug/Kg			01/29/20 13:29	1
Chloromethane	<5.0		5.0		ug/Kg			01/29/20 13:29	1
cis-1,2-Dichloroethene	<5.0		5.0		ug/Kg			01/29/20 13:29	1
Ethyl acetate	<20		20		ug/Kg			01/29/20 13:29	1
cis-1,3-Dichloropropene	<5.0		5.0		ug/Kg			01/29/20 13:29	1
Cyclohexanone	<100		100		ug/Kg			01/29/20 13:29	1
Dibromomethane	<5.0		5.0		ug/Kg			01/29/20 13:29	1
Dichlorobromomethane	<5.0		5.0		ug/Kg			01/29/20 13:29	1
Dichlorodifluoromethane	<5.0		5.0		ug/Kg			01/29/20 13:29	1
Ethyl ether	<5.0		5.0		ug/Kg			01/29/20 13:29	1
Ethylbenzene	<5.0		5.0		ug/Kg			01/29/20 13:29	1
Ethylene Dibromide	<5.0		5.0		ug/Kg			01/29/20 13:29	1
Isobutyl alcohol	<200		200		ug/Kg			01/29/20 13:29	1
m-Xylene & p-Xylene	<10		10		ug/Kg			01/29/20 13:29	1
n-Butylbenzene	<5.0		5.0		ug/Kg			01/29/20 13:29	1
Isopropylbenzene	<5.0		5.0		ug/Kg			01/29/20 13:29	1
N-Propylbenzene	<5.0		5.0		ug/Kg			01/29/20 13:29	1
2-Butanone (MEK)	<20		20		ug/Kg			01/29/20 13:29	1
4-Methyl-2-pentanone (MIBK)	<20		20		ug/Kg			01/29/20 13:29	1
sec-Butylbenzene	<5.0		5.0		ug/Kg			01/29/20 13:29	1
Methyl tert-butyl ether	<5.0		5.0		ug/Kg			01/29/20 13:29	1
Methylene Chloride	<25		25		ug/Kg			01/29/20 13:29	1
n-Butanol	<1000		1000		ug/Kg			01/29/20 13:29	1
o-Xylene	<5.0		5.0		ug/Kg			01/29/20 13:29	1
Styrene	<5.0		5.0		ug/Kg			01/29/20 13:29	1
tert-Butylbenzene	<5.0		5.0		ug/Kg			01/29/20 13:29	1
Tetrachloroethene	<5.0		5.0		ug/Kg			01/29/20 13:29	1
Toluene	<5.0		5.0		ug/Kg			01/29/20 13:29	1
trans-1,2-Dichloroethene	<5.0		5.0		ug/Kg			01/29/20 13:29	1
trans-1,3-Dichloropropene	<5.0		5.0		ug/Kg			01/29/20 13:29	1
Trichloroethene	<5.0		5.0		ug/Kg			01/29/20 13:29	1
Trichlorofluoromethane	<5.0		5.0		ug/Kg			01/29/20 13:29	1
Vinyl chloride	<5.0		5.0		ug/Kg			01/29/20 13:29	1
Xylenes, Total	<10		10		ug/Kg			01/29/20 13:29	1
Chlorodibromomethane	<5.0		5.0		ug/Kg			01/29/20 13:29	1

Method: 8260B - Volatile Organic Compounds (GC/MS) (Continued)

Surrogate	MB %Recovery	MB Qualifier	Limits	Prepared	Analyzed	Dil Fac
1,2-Dichloroethane-d4 (Surr)	109		59 - 120		01/29/20 13:29	1
4-Bromofluorobenzene (Surr)	87		51 - 127		01/29/20 13:29	1
Toluene-d8 (Surr)	101		64 - 124		01/29/20 13:29	1
Dibromofluoromethane (Surr)	97		56 - 122		01/29/20 13:29	1

Lab Sample ID: LCS 240-420675/5
Matrix: Solid
Analysis Batch: 420675

Client Sample ID: Lab Control Sample
Prep Type: Total/NA

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
1,1,1,2-Tetrachloroethane	50.0	47.0		ug/Kg		94	72 - 120
1,1,1-Trichloroethane	50.0	48.0		ug/Kg		96	60 - 126
1,1,2,2-Tetrachloroethane	50.0	46.0		ug/Kg		92	61 - 134
1,1,2-Trichloro-1,2,2-trichfluoroethane	50.0	46.5		ug/Kg		93	58 - 144
1,1,2-Trichloroethane	50.0	49.7		ug/Kg		99	78 - 120
1,1-Dichloroethane	50.0	47.2		ug/Kg		94	69 - 120
1,1-Dichloroethene	50.0	48.4		ug/Kg		97	48 - 140
1,1-Dichloropropene	50.0	46.6		ug/Kg		93	69 - 120
1,2,3-Trichlorobenzene	50.0	47.8		ug/Kg		96	55 - 124
1,2,3-Trichloropropane	50.0	53.9		ug/Kg		108	68 - 130
1,2,4-Trimethylbenzene	50.0	45.2		ug/Kg		90	69 - 122
1,2-Dibromo-3-Chloropropane	50.0	45.4		ug/Kg		91	35 - 137
1,2-Dichlorobenzene	50.0	45.4		ug/Kg		91	74 - 120
1,2-Dichloroethane	50.0	57.1		ug/Kg		114	66 - 120
1,2-Dichloropropane	50.0	46.8		ug/Kg		94	77 - 120
2,2-Dichloropropane	50.0	39.2		ug/Kg		78	47 - 131
2-Chlorotoluene	50.0	45.0		ug/Kg		90	72 - 121
2-Hexanone	100	118		ug/Kg		118	54 - 135
Bromobenzene	50.0	47.6		ug/Kg		95	73 - 120
Chlorobromomethane	50.0	49.8		ug/Kg		100	74 - 120
4-Chlorotoluene	50.0	44.9		ug/Kg		90	72 - 124
4-Isopropyltoluene	50.0	46.6		ug/Kg		93	70 - 121
Acetone	100	146		ug/Kg		146	47 - 157
Benzene	50.0	45.8		ug/Kg		92	75 - 120
Bromoform	50.0	49.7		ug/Kg		99	44 - 131
Bromomethane	20.0	13.6		ug/Kg		68	10 - 158
Carbon disulfide	50.0	43.7		ug/Kg		87	33 - 144
Carbon tetrachloride	50.0	48.5		ug/Kg		97	54 - 130
Chlorobenzene	50.0	47.5		ug/Kg		95	79 - 120
Chloroethane	20.0	15.5		ug/Kg		78	10 - 159
Chloroform	50.0	48.4		ug/Kg		97	74 - 120
Chloromethane	20.0	13.6		ug/Kg		68	40 - 127
cis-1,2-Dichloroethene	50.0	47.1		ug/Kg		94	76 - 120
cis-1,3-Dichloropropene	50.0	46.0		ug/Kg		92	62 - 124
Dibromomethane	50.0	55.0		ug/Kg		110	74 - 120
Dichlorobromomethane	50.0	48.5		ug/Kg		97	63 - 121
Dichlorodifluoromethane	20.0	15.2		ug/Kg		76	18 - 137
Ethylbenzene	50.0	47.3		ug/Kg		95	75 - 120
Ethylene Dibromide	50.0	51.8		ug/Kg		104	73 - 126
m-Xylene & p-Xylene	50.0	47.3		ug/Kg		95	76 - 120
n-Butylbenzene	50.0	45.2		ug/Kg		90	64 - 123

Method: 8260B - Volatile Organic Compounds (GC/MS) (Continued)

Lab Sample ID: LCS 240-420675/5
Matrix: Solid
Analysis Batch: 420675

Client Sample ID: Lab Control Sample
Prep Type: Total/NA

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Isopropylbenzene	50.0	50.0		ug/Kg		100	74 - 120
N-Propylbenzene	50.0	45.3		ug/Kg		91	70 - 122
2-Butanone (MEK)	100	121		ug/Kg		121	61 - 131
4-Methyl-2-pentanone (MIBK)	100	116		ug/Kg		116	56 - 124
sec-Butylbenzene	50.0	46.0		ug/Kg		92	69 - 122
Methyl tert-butyl ether	50.0	46.0		ug/Kg		92	66 - 120
Methylene Chloride	50.0	45.3		ug/Kg		91	48 - 142
o-Xylene	50.0	47.1		ug/Kg		94	76 - 120
Styrene	50.0	46.7		ug/Kg		93	70 - 120
tert-Butylbenzene	50.0	46.2		ug/Kg		92	68 - 121
Tetrachloroethene	50.0	52.6		ug/Kg		105	75 - 124
Toluene	50.0	45.6		ug/Kg		91	76 - 120
trans-1,2-Dichloroethene	50.0	47.7		ug/Kg		95	74 - 125
trans-1,3-Dichloropropene	50.0	43.3		ug/Kg		87	58 - 120
Trichloroethene	50.0	50.6		ug/Kg		101	75 - 123
Trichlorofluoromethane	20.0	15.8		ug/Kg		79	33 - 152
Vinyl chloride	20.0	16.2		ug/Kg		81	39 - 140
Xylenes, Total	100	94.4		ug/Kg		94	77 - 120

Surrogate	*LCS %Recovery*	*LCS Qualifier*	*Limits*
1,2-Dichloroethane-d4 (Surr)	*107*		*59 - 120*
4-Bromofluorobenzene (Surr)	*87*		*51 - 127*
Toluene-d8 (Surr)	*100*		*64 - 124*
Dibromofluoromethane (Surr)	*101*		*56 - 122*

Lab Sample ID: LCS 240-420675/8
Matrix: Solid
Analysis Batch: 420675

Client Sample ID: Lab Control Sample
Prep Type: Total/NA

Surrogate	*LCS %Recovery*	*LCS Qualifier*	*Limits*
1,2-Dichloroethane-d4 (Surr)	*108*		*59 - 120*
4-Bromofluorobenzene (Surr)	*88*		*51 - 127*
Toluene-d8 (Surr)	*100*		*64 - 124*
Dibromofluoromethane (Surr)	*98*		*56 - 122*

Lab Sample ID: 240-125349-5 MS
Matrix: Solid
Analysis Batch: 420675

Client Sample ID: FR34-WC-005
Prep Type: Total/NA
Prep Batch: 420722

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
1,1,1,2-Tetrachloroethane	<5.5		51.5	29.4		ug/Kg	☼	57	19 - 129
1,1,1-Trichloroethane	<5.5		51.5	29.9		ug/Kg	☼	58	27 - 131
1,1,2,2-Tetrachloroethane	<5.5	*	51.5	34.6		ug/Kg	☼	67	10 - 168
1,1,2-Trichloro-1,2,2-trichfluoroethane	<5.5		51.5	33.4		ug/Kg	☼	65	30 - 145
1,1,2-Trichloroethane	<5.5		51.5	36.2		ug/Kg	☼	70	17 - 152
1,1-Dichloroethane	<5.5		51.5	34.3		ug/Kg	☼	67	35 - 129
1,1-Dichloroethene	<5.5		51.5	32.1		ug/Kg	☼	62	20 - 150

Method: 8260B - Volatile Organic Compounds (GC/MS) (Continued)

Lab Sample ID: 240-125349-5 MS
Matrix: Solid
Analysis Batch: 420675

Client Sample ID: FR34-WC-005
Prep Type: Total/NA
Prep Batch: 420722

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
1,1-Dichloropropene	<5.5		51.5	29.5		ug/Kg	☼	57	36 - 120
1,2,3-Trichlorobenzene	<5.5	*	51.5	12.7		ug/Kg	☼	25	10 - 120
1,2,3-Trichloropropane	<5.5	*	51.5	41.8		ug/Kg	☼	81	38 - 146
1,2,4-Trimethylbenzene	<5.5	*	51.5	25.9		ug/Kg	☼	50	10 - 138
1,2-Dibromo-3-Chloropropane	<11	*	51.5	22.0		ug/Kg	☼	43	10 - 135
1,2-Dichlorobenzene	<5.5	*	51.5	20.8		ug/Kg	☼	40	10 - 131
1,2-Dichloroethane	<5.5		51.5	42.5		ug/Kg	☼	82	33 - 130
1,2-Dichloropropane	<5.5		51.5	33.1		ug/Kg	☼	64	33 - 134
2,2-Dichloropropane	<5.5		51.5	23.5		ug/Kg	☼	46	34 - 124
2-Chlorotoluene	<5.5	*	51.5	26.0		ug/Kg	☼	51	12 - 139
2-Hexanone	<22		103	76.7		ug/Kg	☼	74	23 - 149
Bromobenzene	<5.5	*	51.5	26.9		ug/Kg	☼	52	16 - 136
Chlorobromomethane	<5.5		51.5	36.8		ug/Kg	☼	71	50 - 125
4-Chlorotoluene	<5.5	*	51.5	24.0		ug/Kg	☼	47	14 - 128
4-Isopropyltoluene	<5.5	*	51.5	24.0		ug/Kg	☼	47	10 - 135
Acetone	<27	F1	103	329	F1	ug/Kg	☼	319	18 - 167
Benzene	<5.5		51.5	31.8		ug/Kg	☼	62	32 - 131
Bromoform	<5.5		51.5	22.2		ug/Kg	☼	43	10 - 122
Bromomethane	<5.5		20.6	9.50		ug/Kg	☼	46	10 - 149
Carbon disulfide	<5.5		51.5	26.1		ug/Kg	☼	51	10 - 134
Carbon tetrachloride	<5.5		51.5	27.6		ug/Kg	☼	54	13 - 131
Chlorobenzene	<5.5		51.5	27.4		ug/Kg	☼	53	16 - 129
Chloroethane	<5.5		20.6	10.9		ug/Kg	☼	53	10 - 155
Chloroform	<5.5		51.5	34.7		ug/Kg	☼	67	38 - 129
Chloromethane	<5.5		20.6	10.8		ug/Kg	☼	52	20 - 140
cis-1,2-Dichloroethene	<5.5		51.5	34.0		ug/Kg	☼	66	35 - 130
cis-1,3-Dichloropropene	<5.5		51.5	25.8		ug/Kg	☼	50	12 - 131
Dibromomethane	<5.5		51.5	37.9		ug/Kg	☼	74	30 - 126
Dichlorobromomethane	<5.5		51.5	30.0		ug/Kg	☼	58	18 - 125
Dichlorodifluoromethane	<5.5		20.6	11.4		ug/Kg	☼	55	10 - 141
Ethylbenzene	<5.5		51.5	27.3		ug/Kg	☼	53	12 - 133
Ethylene Dibromide	<5.5		51.5	33.7		ug/Kg	☼	65	24 - 138
m-Xylene & p-Xylene	<11		51.5	26.8		ug/Kg	☼	49	10 - 132
n-Butylbenzene	<5.5	*	51.5	19.5		ug/Kg	☼	38	10 - 141
Isopropylbenzene	<5.5		51.5	26.5		ug/Kg	☼	52	10 - 135
N-Propylbenzene	<5.5	*	51.5	25.6		ug/Kg	☼	50	10 - 135
2-Butanone (MEK)	<22		103	82.0		ug/Kg	☼	80	31 - 148
4-Methyl-2-pentanone (MIBK)	<22		103	95.3		ug/Kg	☼	93	29 - 140
sec-Butylbenzene	<5.5	*	51.5	24.8		ug/Kg	☼	48	10 - 142
Methyl tert-butyl ether	<5.5		51.5	41.0		ug/Kg	☼	80	42 - 127
Methylene Chloride	<27		51.5	36.6		ug/Kg	☼	71	22 - 153
o-Xylene	<5.5		51.5	27.3		ug/Kg	☼	53	11 - 134
Styrene	<5.5		51.5	22.7		ug/Kg	☼	44	10 - 127
tert-Butylbenzene	<5.5	*	51.5	37.5		ug/Kg	☼	73	10 - 142
Tetrachloroethene	<5.5		51.5	36.7		ug/Kg	☼	71	13 - 144
Toluene	<5.5		51.5	30.4		ug/Kg	☼	57	20 - 141
trans-1,2-Dichloroethene	<5.5		51.5	33.4		ug/Kg	☼	65	31 - 138
trans-1,3-Dichloropropene	<5.5		51.5	24.4		ug/Kg	☼	47	10 - 123
Trichloroethene	<5.5		51.5	30.8		ug/Kg	☼	60	10 - 162

Method: 8260B - Volatile Organic Compounds (GC/MS) (Continued)

Lab Sample ID: 240-125349-5 MS
Matrix: Solid
Analysis Batch: 420675

Client Sample ID: FR34-WC-005
Prep Type: Total/NA
Prep Batch: 420722

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
Trichlorofluoromethane	<5.5		20.6	10.1		ug/Kg	☼	49	16 - 148
Vinyl chloride	<5.5		20.6	12.3		ug/Kg	☼	60	15 - 150
Xylenes, Total	<11		103	54.1		ug/Kg	☼	53	10 - 134

Surrogate	*MS %Recovery*	*MS Qualifier*	*Limits*
1,2-Dichloroethane-d4 (Surr)	*108*		*59 - 120*
4-Bromofluorobenzene (Surr)	*96*		*51 - 127*
Toluene-d8 (Surr)	*106*		*64 - 124*
Dibromofluoromethane (Surr)	*99*		*56 - 122*

Lab Sample ID: 240-125349-5 MSD
Matrix: Solid
Analysis Batch: 420675

Client Sample ID: FR34-WC-005
Prep Type: Total/NA
Prep Batch: 420722

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
1,1,1,2-Tetrachloroethane	<5.5		54.3	34.0		ug/Kg	☼	63	19 - 129	15	40
1,1,1-Trichloroethane	<5.5		54.3	32.8		ug/Kg	☼	60	27 - 131	9	40
1,1,2,2-Tetrachloroethane	<5.5	*	54.3	45.8		ug/Kg	☼	84	10 - 168	28	40
1,1,2-Trichloro-1,2,2-trichfluoroethane	<5.5		54.3	36.4		ug/Kg	☼	67	30 - 145	9	40
1,1,2-Trichloroethane	<5.5		54.3	40.4		ug/Kg	☼	74	17 - 152	11	40
1,1-Dichloroethane	<5.5		54.3	37.8		ug/Kg	☼	70	35 - 129	10	40
1,1-Dichloroethene	<5.5		54.3	35.4		ug/Kg	☼	65	20 - 150	10	40
1,1-Dichloropropene	<5.5		54.3	33.1		ug/Kg	☼	61	36 - 120	12	39
1,2,3-Trichlorobenzene	<5.5	*	54.3	13.6		ug/Kg	☼	25	10 - 120	7	40
1,2,3-Trichloropropane	<5.5	*	54.3	54.6		ug/Kg	☼	101	38 - 146	27	40
1,2,4-Trimethylbenzene	<5.5	*	54.3	33.6		ug/Kg	☼	62	10 - 138	26	40
1,2-Dibromo-3-Chloropropane	<11	*	54.3	28.3		ug/Kg	☼	52	10 - 135	25	40
1,2-Dichlorobenzene	<5.5	*	54.3	25.5		ug/Kg	☼	47	10 - 131	20	40
1,2-Dichloroethane	<5.5		54.3	47.3		ug/Kg	☼	87	33 - 130	11	40
1,2-Dichloropropane	<5.5		54.3	36.3		ug/Kg	☼	67	33 - 134	9	40
2,2-Dichloropropane	<5.5		54.3	27.5		ug/Kg	☼	51	34 - 124	16	40
2-Chlorotoluene	<5.5	*	54.3	34.2		ug/Kg	☼	63	12 - 139	27	40
2-Hexanone	<22		109	79.8		ug/Kg	☼	73	23 - 149	4	40
Bromobenzene	<5.5	*	54.3	35.6		ug/Kg	☼	66	16 - 136	28	40
Chlorobromomethane	<5.5		54.3	41.3		ug/Kg	☼	76	50 - 125	11	39
4-Chlorotoluene	<5.5	*	54.3	30.6		ug/Kg	☼	56	14 - 128	24	40
4-Isopropyltoluene	<5.5	*	54.3	29.4		ug/Kg	☼	54	10 - 135	20	40
Acetone	<27	F1	109	402	F1	ug/Kg	☼	370	18 - 167	20	40
Benzene	<5.5		54.3	35.1		ug/Kg	☼	65	32 - 131	10	40
Bromoform	<5.5		54.3	24.6		ug/Kg	☼	45	10 - 122	10	40
Bromomethane	<5.5		21.7	10.5		ug/Kg	☼	48	10 - 149	10	40
Carbon disulfide	<5.5		54.3	29.3		ug/Kg	☼	54	10 - 134	11	40
Carbon tetrachloride	<5.5		54.3	31.3		ug/Kg	☼	58	13 - 131	12	40
Chlorobenzene	<5.5		54.3	30.8		ug/Kg	☼	57	16 - 129	12	40
Chloroethane	<5.5		21.7	12.2		ug/Kg	☼	56	10 - 155	11	40
Chloroform	<5.5		54.3	38.3		ug/Kg	☼	70	38 - 129	10	40
Chloromethane	<5.5		21.7	11.5		ug/Kg	☼	53	20 - 140	6	40
cis-1,2-Dichloroethene	<5.5		54.3	37.7		ug/Kg	☼	70	35 - 130	11	40

Method: 8260B - Volatile Organic Compounds (GC/MS) (Continued)

Lab Sample ID: 240-125349-5 MSD
Matrix: Solid
Analysis Batch: 420675

Client Sample ID: FR34-WC-005
Prep Type: Total/NA
Prep Batch: 420722

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
cis-1,3-Dichloropropene	<5.5		54.3	29.2		ug/Kg	☼	54	12 - 131	12	40
Dibromomethane	<5.5		54.3	42.7		ug/Kg	☼	79	30 - 126	12	39
Dichlorobromomethane	<5.5		54.3	34.1		ug/Kg	☼	63	18 - 125	13	40
Dichlorodifluoromethane	<5.5		21.7	11.8		ug/Kg	☼	54	10 - 141	4	40
Ethylbenzene	<5.5		54.3	30.4		ug/Kg	☼	56	12 - 133	11	40
Ethylene Dibromide	<5.5		54.3	38.3		ug/Kg	☼	71	24 - 138	13	40
m-Xylene & p-Xylene	<11		54.3	30.3		ug/Kg	☼	53	10 - 132	12	40
n-Butylbenzene	<5.5	*	54.3	22.2		ug/Kg	☼	41	10 - 141	13	40
Isopropylbenzene	<5.5		54.3	29.2		ug/Kg	☼	54	10 - 135	10	40
N-Propylbenzene	<5.5	*	54.3	32.3		ug/Kg	☼	59	10 - 135	23	40
2-Butanone (MEK)	<22		109	88.0		ug/Kg	☼	81	31 - 148	7	40
4-Methyl-2-pentanone (MIBK)	<22		109	106		ug/Kg	☼	98	29 - 140	11	40
sec-Butylbenzene	<5.5	*	54.3	30.9		ug/Kg	☼	57	10 - 142	22	40
Methyl tert-butyl ether	<5.5		54.3	44.9		ug/Kg	☼	83	42 - 127	9	40
Methylene Chloride	<27		54.3	40.9		ug/Kg	☼	75	22 - 153	11	40
o-Xylene	<5.5		54.3	31.0		ug/Kg	☼	57	11 - 134	13	40
Styrene	<5.5		54.3	25.1		ug/Kg	☼	46	10 - 127	10	40
tert-Butylbenzene	<5.5	*	54.3	49.1		ug/Kg	☼	90	10 - 142	27	40
Tetrachloroethene	<5.5		54.3	41.7		ug/Kg	☼	77	13 - 144	13	40
Toluene	<5.5		54.3	34.8		ug/Kg	☼	62	20 - 141	14	40
trans-1,2-Dichloroethene	<5.5		54.3	36.1		ug/Kg	☼	66	31 - 138	8	40
trans-1,3-Dichloropropene	<5.5		54.3	28.8		ug/Kg	☼	53	10 - 123	17	40
Trichloroethene	<5.5		54.3	35.2		ug/Kg	☼	65	10 - 162	13	40
Trichlorofluoromethane	<5.5		21.7	11.1		ug/Kg	☼	51	16 - 148	10	40
Vinyl chloride	<5.5		21.7	12.7		ug/Kg	☼	59	15 - 150	3	40
Xylenes, Total	<11		109	61.3		ug/Kg	☼	56	10 - 134	12	40

Surrogate	*MSD %Recovery*	*MSD Qualifier*	*Limits*
1,2-Dichloroethane-d4 (Surr)	*111*		*59 - 120*
4-Bromofluorobenzene (Surr)	*109*		*51 - 127*
Toluene-d8 (Surr)	*109*		*64 - 124*
Dibromofluoromethane (Surr)	*101*		*56 - 122*

Lab Sample ID: LCS 240-420751/10
Matrix: Solid
Analysis Batch: 420751

Client Sample ID: Lab Control Sample
Prep Type: Total/NA

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
1,1-Dichloroethene	1.00	0.963		mg/L		96	80 - 128
1,2-Dichloroethane	1.00	0.869		mg/L		87	67 - 125
Benzene	1.00	1.01		mg/L		101	80 - 122
Carbon tetrachloride	1.00	0.925		mg/L		93	67 - 126
Chlorobenzene	1.00	0.970		mg/L		97	80 - 120
Chloroform	1.00	0.942		mg/L		94	80 - 120
2-Butanone (MEK)	2.00	1.69		mg/L		85	55 - 127
Tetrachloroethene	1.00	1.00		mg/L		100	76 - 120
Trichloroethene	1.00	0.974		mg/L		97	77 - 120
Vinyl chloride	1.00	0.828		mg/L		83	60 - 134

Method: 8260B - Volatile Organic Compounds (GC/MS) (Continued)

Lab Sample ID: LCS 240-420751/10
Matrix: Solid
Analysis Batch: 420751

Client Sample ID: Lab Control Sample
Prep Type: Total/NA

Surrogate	*LCS %Recovery*	*LCS Qualifier*	*Limits*
1,2-Dichloroethane-d4 (Surr)	*82*		*74 - 124*
4-Bromofluorobenzene (Surr)	*92*		*77 - 120*
Toluene-d8 (Surr)	*94*		*80 - 120*
Dibromofluoromethane (Surr)	*92*		*80 - 120*

Lab Sample ID: MB 240-420776/1-A
Matrix: Solid
Analysis Batch: 420897

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 420776

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
1,1,1,2-Tetrachloroethane	<250		250		ug/Kg		01/29/20 23:34	01/30/20 18:33	1
1,1,1-Trichloroethane	<250		250		ug/Kg		01/29/20 23:34	01/30/20 18:33	1
1,1,2,2-Tetrachloroethane	<250		250		ug/Kg		01/29/20 23:34	01/30/20 18:33	1
1,1,2-Trichloro-1,2,2-trichfluoroethane	<250		250		ug/Kg		01/29/20 23:34	01/30/20 18:33	1
1,1,2-Trichloroethane	<250		250		ug/Kg		01/29/20 23:34	01/30/20 18:33	1
1,1-Dichloroethane	<250		250		ug/Kg		01/29/20 23:34	01/30/20 18:33	1
1,1-Dichloroethene	<250		250		ug/Kg		01/29/20 23:34	01/30/20 18:33	1
1,1-Dichloropropene	<250		250		ug/Kg		01/29/20 23:34	01/30/20 18:33	1
1,2,3-Trichlorobenzene	<250		250		ug/Kg		01/29/20 23:34	01/30/20 18:33	1
1,2,3-Trichloropropane	<250		250		ug/Kg		01/29/20 23:34	01/30/20 18:33	1
1,2,4-Trimethylbenzene	<250		250		ug/Kg		01/29/20 23:34	01/30/20 18:33	1
1,2-Dibromo-3-Chloropropane	<500		500		ug/Kg		01/29/20 23:34	01/30/20 18:33	1
1,2-Dichlorobenzene	<250		250		ug/Kg		01/29/20 23:34	01/30/20 18:33	1
1,2-Dichloroethane	<250		250		ug/Kg		01/29/20 23:34	01/30/20 18:33	1
1,2-Dichloropropane	<250		250		ug/Kg		01/29/20 23:34	01/30/20 18:33	1
2-Nitropropane	<500		500		ug/Kg		01/29/20 23:34	01/30/20 18:33	1
2,2-Dichloropropane	<250		250		ug/Kg		01/29/20 23:34	01/30/20 18:33	1
2-Chlorotoluene	<250		250		ug/Kg		01/29/20 23:34	01/30/20 18:33	1
2-Hexanone	<1000		1000		ug/Kg		01/29/20 23:34	01/30/20 18:33	1
Bromobenzene	<250		250		ug/Kg		01/29/20 23:34	01/30/20 18:33	1
Chlorobromomethane	<250		250		ug/Kg		01/29/20 23:34	01/30/20 18:33	1
4-Chlorotoluene	<250		250		ug/Kg		01/29/20 23:34	01/30/20 18:33	1
4-Isopropyltoluene	<250		250		ug/Kg		01/29/20 23:34	01/30/20 18:33	1
Acetone	<1000		1000		ug/Kg		01/29/20 23:34	01/30/20 18:33	1
Benzene	<250		250		ug/Kg		01/29/20 23:34	01/30/20 18:33	1
Bromoform	<250		250		ug/Kg		01/29/20 23:34	01/30/20 18:33	1
Bromomethane	<250		250		ug/Kg		01/29/20 23:34	01/30/20 18:33	1
Carbon disulfide	<250		250		ug/Kg		01/29/20 23:34	01/30/20 18:33	1
Carbon tetrachloride	<250		250		ug/Kg		01/29/20 23:34	01/30/20 18:33	1
Chlorobenzene	<250		250		ug/Kg		01/29/20 23:34	01/30/20 18:33	1
Chloroethane	<250		250		ug/Kg		01/29/20 23:34	01/30/20 18:33	1
Chloroform	<250		250		ug/Kg		01/29/20 23:34	01/30/20 18:33	1
Chloromethane	<250		250		ug/Kg		01/29/20 23:34	01/30/20 18:33	1
cis-1,2-Dichloroethene	<250		250		ug/Kg		01/29/20 23:34	01/30/20 18:33	1
Ethyl acetate	<1000		1000		ug/Kg		01/29/20 23:34	01/30/20 18:33	1
cis-1,3-Dichloropropene	<250		250		ug/Kg		01/29/20 23:34	01/30/20 18:33	1
Cyclohexanone	<5000		5000		ug/Kg		01/29/20 23:34	01/30/20 18:33	1
Dibromomethane	<250		250		ug/Kg		01/29/20 23:34	01/30/20 18:33	1

Method: 8260B - Volatile Organic Compounds (GC/MS) (Continued)

Lab Sample ID: MB 240-420776/1-A
Matrix: Solid
Analysis Batch: 420897

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 420776

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Dichlorobromomethane	<250		250		ug/Kg		01/29/20 23:34	01/30/20 18:33	1
Dichlorodifluoromethane	<250		250		ug/Kg		01/29/20 23:34	01/30/20 18:33	1
Ethyl ether	<500		500		ug/Kg		01/29/20 23:34	01/30/20 18:33	1
Ethylbenzene	<250		250		ug/Kg		01/29/20 23:34	01/30/20 18:33	1
Ethylene Dibromide	<250		250		ug/Kg		01/29/20 23:34	01/30/20 18:33	1
Isobutyl alcohol	<10000		10000		ug/Kg		01/29/20 23:34	01/30/20 18:33	1
m-Xylene & p-Xylene	<250		250		ug/Kg		01/29/20 23:34	01/30/20 18:33	1
n-Butylbenzene	<250		250		ug/Kg		01/29/20 23:34	01/30/20 18:33	1
Isopropylbenzene	<250		250		ug/Kg		01/29/20 23:34	01/30/20 18:33	1
N-Propylbenzene	<250		250		ug/Kg		01/29/20 23:34	01/30/20 18:33	1
2-Butanone (MEK)	<1000		1000		ug/Kg		01/29/20 23:34	01/30/20 18:33	1
4-Methyl-2-pentanone (MIBK)	<1000		1000		ug/Kg		01/29/20 23:34	01/30/20 18:33	1
sec-Butylbenzene	<250		250		ug/Kg		01/29/20 23:34	01/30/20 18:33	1
Methyl tert-butyl ether	<250		250		ug/Kg		01/29/20 23:34	01/30/20 18:33	1
Methylene Chloride	<500		500		ug/Kg		01/29/20 23:34	01/30/20 18:33	1
n-Butanol	<10000		10000		ug/Kg		01/29/20 23:34	01/30/20 18:33	1
o-Xylene	<250		250		ug/Kg		01/29/20 23:34	01/30/20 18:33	1
Styrene	<250		250		ug/Kg		01/29/20 23:34	01/30/20 18:33	1
tert-Butylbenzene	<250		250		ug/Kg		01/29/20 23:34	01/30/20 18:33	1
Tetrachloroethene	<250		250		ug/Kg		01/29/20 23:34	01/30/20 18:33	1
Toluene	<250		250		ug/Kg		01/29/20 23:34	01/30/20 18:33	1
trans-1,2-Dichloroethene	<250		250		ug/Kg		01/29/20 23:34	01/30/20 18:33	1
trans-1,3-Dichloropropene	<250		250		ug/Kg		01/29/20 23:34	01/30/20 18:33	1
Trichloroethene	<250		250		ug/Kg		01/29/20 23:34	01/30/20 18:33	1
Trichlorofluoromethane	<250		250		ug/Kg		01/29/20 23:34	01/30/20 18:33	1
Vinyl chloride	<250		250		ug/Kg		01/29/20 23:34	01/30/20 18:33	1
Xylenes, Total	<500		500		ug/Kg		01/29/20 23:34	01/30/20 18:33	1
Chlorodibromomethane	<250		250		ug/Kg		01/29/20 23:34	01/30/20 18:33	1

Surrogate	*MB %Recovery*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
1,2-Dichloroethane-d4 (Surr)	*80*		*59 - 120*	*01/29/20 23:34*	*01/30/20 18:33*	*1*
4-Bromofluorobenzene (Surr)	*79*		*51 - 127*	*01/29/20 23:34*	*01/30/20 18:33*	*1*
Toluene-d8 (Surr)	*78*		*64 - 124*	*01/29/20 23:34*	*01/30/20 18:33*	*1*
Dibromofluoromethane (Surr)	*75*		*56 - 122*	*01/29/20 23:34*	*01/30/20 18:33*	*1*

Lab Sample ID: LCS 240-420776/2-A
Matrix: Solid
Analysis Batch: 420897

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 420776

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
1,1,1,2-Tetrachloroethane	1000	900		ug/Kg		90	72 - 120
1,1,1-Trichloroethane	1000	857		ug/Kg		86	60 - 126
1,1,2,2-Tetrachloroethane	1000	961		ug/Kg		96	61 - 134
1,1,2-Trichloro-1,2,2-trichfluoroethane	1000	696		ug/Kg		70	58 - 144
1,1,2-Trichloroethane	1000	1000		ug/Kg		100	78 - 120
1,1-Dichloroethane	1000	878		ug/Kg		88	69 - 120
1,1-Dichloroethene	1000	627		ug/Kg		63	48 - 140
1,1-Dichloropropene	1000	931		ug/Kg		93	69 - 120

Method: 8260B - Volatile Organic Compounds (GC/MS) (Continued)

Lab Sample ID: LCS 240-420776/2-A
Matrix: Solid
Analysis Batch: 420897

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 420776

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
1,2,3-Trichlorobenzene	1000	885		ug/Kg		88	55 - 124
1,2,3-Trichloropropane	1000	966		ug/Kg		97	68 - 130
1,2,4-Trimethylbenzene	1000	998		ug/Kg		100	69 - 122
1,2-Dibromo-3-Chloropropane	1000	815		ug/Kg		82	35 - 137
1,2-Dichlorobenzene	1000	950		ug/Kg		95	74 - 120
1,2-Dichloroethane	1000	889		ug/Kg		89	66 - 120
1,2-Dichloropropane	1000	914		ug/Kg		91	77 - 120
2,2-Dichloropropane	1000	834		ug/Kg		83	47 - 131
2-Chlorotoluene	1000	999		ug/Kg		100	72 - 121
2-Hexanone	2000	1670		ug/Kg		84	54 - 135
Bromobenzene	1000	1030		ug/Kg		103	73 - 120
Chlorobromomethane	1000	950		ug/Kg		95	74 - 120
4-Chlorotoluene	1000	934		ug/Kg		93	72 - 124
4-Isopropyltoluene	1000	1000		ug/Kg		100	70 - 121
Acetone	2000	675	J *	ug/Kg		34	47 - 157
Benzene	1000	955		ug/Kg		96	75 - 120
Bromoform	1000	952		ug/Kg		95	44 - 131
Bromomethane	1000	296		ug/Kg		30	10 - 158
Carbon disulfide	1000	803		ug/Kg		80	33 - 144
Carbon tetrachloride	1000	756		ug/Kg		76	54 - 130
Chlorobenzene	1000	973		ug/Kg		97	79 - 120
Chloroethane	1000	331		ug/Kg		33	10 - 159
Chloroform	1000	931		ug/Kg		93	74 - 120
Chloromethane	1000	583		ug/Kg		58	40 - 127
cis-1,2-Dichloroethene	1000	977		ug/Kg		98	76 - 120
cis-1,3-Dichloropropene	1000	874		ug/Kg		87	62 - 124
Dibromomethane	1000	968		ug/Kg		97	74 - 120
Dichlorobromomethane	1000	915		ug/Kg		91	63 - 121
Dichlorodifluoromethane	1000	498		ug/Kg		50	18 - 137
Ethylbenzene	1000	963		ug/Kg		96	75 - 120
Ethylene Dibromide	1000	978		ug/Kg		98	73 - 126
m-Xylene & p-Xylene	1000	957		ug/Kg		96	76 - 120
n-Butylbenzene	1000	971		ug/Kg		97	64 - 123
Isopropylbenzene	1000	1020		ug/Kg		102	74 - 120
N-Propylbenzene	1000	990		ug/Kg		99	70 - 122
2-Butanone (MEK)	2000	1610		ug/Kg		81	61 - 131
4-Methyl-2-pentanone (MIBK)	2000	1620		ug/Kg		81	56 - 124
sec-Butylbenzene	1000	1050		ug/Kg		105	69 - 122
Methyl tert-butyl ether	1000	904		ug/Kg		90	66 - 120
Methylene Chloride	1000	877		ug/Kg		88	48 - 142
o-Xylene	1000	963		ug/Kg		96	76 - 120
Styrene	1000	922		ug/Kg		92	70 - 120
tert-Butylbenzene	1000	1020		ug/Kg		102	68 - 121
Tetrachloroethene	1000	998		ug/Kg		100	75 - 124
Toluene	1000	948		ug/Kg		95	76 - 120
trans-1,2-Dichloroethene	1000	936		ug/Kg		94	74 - 125
trans-1,3-Dichloropropene	1000	789		ug/Kg		79	58 - 120
Trichloroethene	1000	987		ug/Kg		99	75 - 123
Trichlorofluoromethane	1000	551		ug/Kg		55	33 - 152

Method: 8260B - Volatile Organic Compounds (GC/MS) (Continued)

Lab Sample ID: LCS 240-420776/2-A
Matrix: Solid
Analysis Batch: 420897

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 420776

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Vinyl chloride	1000	696		ug/Kg		70	39 - 140
Xylenes, Total	2000	1920		ug/Kg		96	77 - 120

Surrogate	*LCS %Recovery*	*LCS Qualifier*	*Limits*
1,2-Dichloroethane-d4 (Surr)	*80*		*59 - 120*
4-Bromofluorobenzene (Surr)	*83*		*51 - 127*
Toluene-d8 (Surr)	*82*		*64 - 124*
Dibromofluoromethane (Surr)	*80*		*56 - 122*

Lab Sample ID: 240-125349-8 MS
Matrix: Solid
Analysis Batch: 420897

Client Sample ID: FR34-WC-008
Prep Type: Total/NA
Prep Batch: 420776

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
1,1,1,2-Tetrachloroethane	<2800		10900	8070		ug/Kg	☼	74	19 - 129
1,1,1-Trichloroethane	<2800		10900	8290		ug/Kg	☼	76	27 - 131
1,1,2,2-Tetrachloroethane	<2800		10900	9600		ug/Kg	☼	88	10 - 168
1,1,2-Trichloro-1,2,2-trichfluoroethane	<2800		10900	9360		ug/Kg	☼	86	30 - 145
1,1,2-Trichloroethane	<2800		10900	10200		ug/Kg	☼	93	17 - 152
1,1-Dichloroethane	<2800		10900	9260		ug/Kg	☼	85	35 - 129
1,1-Dichloroethene	<2800		10900	8140		ug/Kg	☼	75	20 - 150
1,1-Dichloropropene	<2800		10900	9570		ug/Kg	☼	88	36 - 120
1,2,3-Trichlorobenzene	<2800		10900	9100		ug/Kg	☼	84	10 - 120
1,2,3-Trichloropropane	<2800		10900	9430		ug/Kg	☼	87	38 - 146
1,2,4-Trimethylbenzene	<2800		10900	10100		ug/Kg	☼	93	10 - 138
1,2-Dibromo-3-Chloropropane	<5700		10900	6630		ug/Kg	☼	61	10 - 135
1,2-Dichlorobenzene	<2800		10900	9400		ug/Kg	☼	86	10 - 131
1,2-Dichloroethane	<2800		10900	9610		ug/Kg	☼	88	33 - 130
1,2-Dichloropropane	<2800		10900	9510		ug/Kg	☼	87	33 - 134
2,2-Dichloropropane	<2800		10900	8340		ug/Kg	☼	77	34 - 124
2-Chlorotoluene	<2800		10900	10100		ug/Kg	☼	93	12 - 139
2-Hexanone	<11000		21800	17800		ug/Kg	☼	82	23 - 149
Bromobenzene	<2800		10900	10200		ug/Kg	☼	94	16 - 136
Chlorobromomethane	<2800		10900	10100		ug/Kg	☼	93	50 - 125
4-Chlorotoluene	<2800		10900	9350		ug/Kg	☼	86	14 - 128
4-Isopropyltoluene	<2800		10900	10400		ug/Kg	☼	95	10 - 135
Acetone	<11000	*	21800	13700		ug/Kg	☼	63	18 - 167
Benzene	<2800		10900	9900		ug/Kg	☼	91	32 - 131
Bromoform	<2800		10900	8070		ug/Kg	☼	74	10 - 122
Bromomethane	<2800		10900	<3000		ug/Kg	☼	27	10 - 149
Carbon disulfide	<2800		10900	8550		ug/Kg	☼	79	10 - 134
Carbon tetrachloride	<2800		10900	6580		ug/Kg	☼	60	13 - 131
Chlorobenzene	<2800		10900	9880		ug/Kg	☼	91	16 - 129
Chloroethane	<2800		10900	3610		ug/Kg	☼	33	10 - 155
Chloroform	<2800		10900	9660		ug/Kg	☼	89	38 - 129
Chloromethane	<2800		10900	7170		ug/Kg	☼	66	20 - 140
cis-1,2-Dichloroethene	<2800		10900	10200		ug/Kg	☼	94	35 - 130
cis-1,3-Dichloropropene	<2800		10900	8310		ug/Kg	☼	76	12 - 131

Method: 8260B - Volatile Organic Compounds (GC/MS) (Continued)

Lab Sample ID: 240-125349-8 MS
Matrix: Solid
Analysis Batch: 420897

Client Sample ID: FR34-WC-008
Prep Type: Total/NA
Prep Batch: 420776

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
Dibromomethane	<2800		10900	9860		ug/Kg	☼	91	30 - 126
Dichlorobromomethane	<2800		10900	8740		ug/Kg	☼	80	18 - 125
Dichlorodifluoromethane	<2800		10900	6160		ug/Kg	☼	57	10 - 141
Ethylbenzene	<2800		10900	9990		ug/Kg	☼	92	12 - 133
Ethylene Dibromide	<2800		10900	9650		ug/Kg	☼	89	24 - 138
m-Xylene & p-Xylene	<2800		10900	9810		ug/Kg	☼	90	10 - 132
n-Butylbenzene	<2800		10900	10300		ug/Kg	☼	95	10 - 141
Isopropylbenzene	<2800		10900	10700		ug/Kg	☼	98	10 - 135
N-Propylbenzene	<2800		10900	10100		ug/Kg	☼	93	10 - 135
2-Butanone (MEK)	<11000		21800	16700		ug/Kg	☼	77	31 - 148
4-Methyl-2-pentanone (MIBK)	<11000		21800	16900		ug/Kg	☼	78	29 - 140
sec-Butylbenzene	<2800		10900	10900		ug/Kg	☼	100	10 - 142
Methyl tert-butyl ether	<2800		10900	9810		ug/Kg	☼	90	42 - 127
Methylene Chloride	<5700		10900	9750		ug/Kg	☼	90	22 - 153
o-Xylene	<2800		10900	9710		ug/Kg	☼	89	11 - 134
Styrene	<2800		10900	9360		ug/Kg	☼	86	10 - 127
tert-Butylbenzene	<2800		10900	10800		ug/Kg	☼	99	10 - 142
Tetrachloroethene	<2800		10900	9920		ug/Kg	☼	91	13 - 144
Toluene	<2800		10900	9800		ug/Kg	☼	90	20 - 141
trans-1,2-Dichloroethene	<2800		10900	9500		ug/Kg	☼	87	31 - 138
trans-1,3-Dichloropropene	<2800		10900	7300		ug/Kg	☼	67	10 - 123
Trichloroethene	<2800		10900	10100		ug/Kg	☼	93	10 - 162
Trichlorofluoromethane	<2800		10900	6130		ug/Kg	☼	56	16 - 148
Vinyl chloride	<2800		10900	8470		ug/Kg	☼	78	15 - 150
Xylenes, Total	<5700		21800	19500		ug/Kg	☼	90	10 - 134

Surrogate	*MS %Recovery*	*MS Qualifier*	*Limits*
1,2-Dichloroethane-d4 (Surr)	*82*		*59 - 120*
4-Bromofluorobenzene (Surr)	*80*		*51 - 127*
Toluene-d8 (Surr)	*80*		*64 - 124*
Dibromofluoromethane (Surr)	*79*		*56 - 122*

Lab Sample ID: 240-125349-8 MSD
Matrix: Solid
Analysis Batch: 420897

Client Sample ID: FR34-WC-008
Prep Type: Total/NA
Prep Batch: 420776

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
1,1,1,2-Tetrachloroethane	<2800		10000	7620		ug/Kg	☼	76	19 - 129	6	40
1,1,1-Trichloroethane	<2800		10000	7900		ug/Kg	☼	79	27 - 131	5	40
1,1,2,2-Tetrachloroethane	<2800		10000	8730		ug/Kg	☼	87	10 - 168	9	40
1,1,2-Trichloro-1,2,2-trichfluoroethane	<2800		10000	8780		ug/Kg	☼	88	30 - 145	6	40
1,1,2-Trichloroethane	<2800		10000	9370		ug/Kg	☼	93	17 - 152	8	40
1,1-Dichloroethane	<2800		10000	8620		ug/Kg	☼	86	35 - 129	7	40
1,1-Dichloroethene	<2800		10000	9220		ug/Kg	☼	92	20 - 150	12	40
1,1-Dichloropropene	<2800		10000	8740		ug/Kg	☼	87	36 - 120	9	39
1,2,3-Trichlorobenzene	<2800		10000	8360		ug/Kg	☼	83	10 - 120	9	40
1,2,3-Trichloropropane	<2800		10000	8870		ug/Kg	☼	89	38 - 146	6	40
1,2,4-Trimethylbenzene	<2800		10000	9490		ug/Kg	☼	95	10 - 138	6	40

Method: 8260B - Volatile Organic Compounds (GC/MS) (Continued)

Lab Sample ID: 240-125349-8 MSD
Matrix: Solid
Analysis Batch: 420897

Client Sample ID: FR34-WC-008
Prep Type: Total/NA
Prep Batch: 420776

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
1,2-Dibromo-3-Chloropropane	<5700		10000	6490		ug/Kg	☼	65	10 - 135	2	40
1,2-Dichlorobenzene	<2800		10000	8900		ug/Kg	☼	89	10 - 131	5	40
1,2-Dichloroethane	<2800		10000	8890		ug/Kg	☼	89	33 - 130	8	40
1,2-Dichloropropane	<2800		10000	8590		ug/Kg	☼	86	33 - 134	10	40
2,2-Dichloropropane	<2800		10000	7680		ug/Kg	☼	77	34 - 124	8	40
2-Chlorotoluene	<2800		10000	9310		ug/Kg	☼	93	12 - 139	8	40
2-Hexanone	<11000		20000	15900		ug/Kg	☼	79	23 - 149	11	40
Bromobenzene	<2800		10000	9420		ug/Kg	☼	94	16 - 136	8	40
Chlorobromomethane	<2800		10000	9130		ug/Kg	☼	91	50 - 125	10	39
4-Chlorotoluene	<2800		10000	8590		ug/Kg	☼	86	14 - 128	8	40
4-Isopropyltoluene	<2800		10000	9750		ug/Kg	☼	97	10 - 135	6	40
Acetone	<11000	*	20000	<11000		ug/Kg	☼	51	18 - 167	30	40
Benzene	<2800		10000	8960		ug/Kg	☼	89	32 - 131	10	40
Bromoform	<2800		10000	7540		ug/Kg	☼	75	10 - 122	7	40
Bromomethane	<2800		10000	<2700		ug/Kg	☼	27	10 - 149	9	40
Carbon disulfide	<2800		10000	6870		ug/Kg	☼	69	10 - 134	22	40
Carbon tetrachloride	<2800		10000	6570		ug/Kg	☼	66	13 - 131	0	40
Chlorobenzene	<2800		10000	9190		ug/Kg	☼	92	16 - 129	7	40
Chloroethane	<2800		10000	3230		ug/Kg	☼	32	10 - 155	11	40
Chloroform	<2800		10000	8900		ug/Kg	☼	89	38 - 129	8	40
Chloromethane	<2800		10000	6690		ug/Kg	☼	67	20 - 140	7	40
cis-1,2-Dichloroethene	<2800		10000	9270		ug/Kg	☼	92	35 - 130	9	40
cis-1,3-Dichloropropene	<2800		10000	7740		ug/Kg	☼	77	12 - 131	7	40
Dibromomethane	<2800		10000	8740		ug/Kg	☼	87	30 - 126	12	39
Dichlorobromomethane	<2800		10000	8160		ug/Kg	☼	81	18 - 125	7	40
Dichlorodifluoromethane	<2800		10000	5640		ug/Kg	☼	56	10 - 141	9	40
Ethylbenzene	<2800		10000	9070		ug/Kg	☼	91	12 - 133	10	40
Ethylene Dibromide	<2800		10000	8830		ug/Kg	☼	88	24 - 138	9	40
m-Xylene & p-Xylene	<2800		10000	9020		ug/Kg	☼	90	10 - 132	8	40
n-Butylbenzene	<2800		10000	9460		ug/Kg	☼	94	10 - 141	9	40
Isopropylbenzene	<2800		10000	9940		ug/Kg	☼	99	10 - 135	7	40
N-Propylbenzene	<2800		10000	9230		ug/Kg	☼	92	10 - 135	9	40
2-Butanone (MEK)	<11000		20000	13800		ug/Kg	☼	69	31 - 148	19	40
4-Methyl-2-pentanone (MIBK)	<11000		20000	15800		ug/Kg	☼	79	29 - 140	7	40
sec-Butylbenzene	<2800		10000	10200		ug/Kg	☼	102	10 - 142	7	40
Methyl tert-butyl ether	<2800		10000	9120		ug/Kg	☼	91	42 - 127	7	40
Methylene Chloride	<5700		10000	9050		ug/Kg	☼	90	22 - 153	8	40
o-Xylene	<2800		10000	9100		ug/Kg	☼	91	11 - 134	7	40
Styrene	<2800		10000	8510		ug/Kg	☼	85	10 - 127	10	40
tert-Butylbenzene	<2800		10000	9960		ug/Kg	☼	99	10 - 142	8	40
Tetrachloroethene	<2800		10000	9120		ug/Kg	☼	91	13 - 144	8	40
Toluene	<2800		10000	8950		ug/Kg	☼	89	20 - 141	9	40
trans-1,2-Dichloroethene	<2800		10000	8790		ug/Kg	☼	88	31 - 138	8	40
trans-1,3-Dichloropropene	<2800		10000	6790		ug/Kg	☼	68	10 - 123	7	40
Trichloroethene	<2800		10000	9230		ug/Kg	☼	92	10 - 162	9	40
Trichlorofluoromethane	<2800		10000	5760		ug/Kg	☼	57	16 - 148	6	40
Vinyl chloride	<2800		10000	7670		ug/Kg	☼	77	15 - 150	10	40
Xylenes, Total	<5700		20000	18100		ug/Kg	☼	90	10 - 134	7	40

Method: 8260B - Volatile Organic Compounds (GC/MS) (Continued)

Lab Sample ID: 240-125349-8 MSD
Matrix: Solid
Analysis Batch: 420897

Client Sample ID: FR34-WC-008
Prep Type: Total/NA
Prep Batch: 420776

Surrogate	MSD %Recovery	MSD Qualifier	Limits
1,2-Dichloroethane-d4 (Surr)	*73*		*59 - 120*
4-Bromofluorobenzene (Surr)	*70*		*51 - 127*
Toluene-d8 (Surr)	*72*		*64 - 124*
Dibromofluoromethane (Surr)	*72*		*56 - 122*

Lab Sample ID: LB 240-420397/1-A MB
Matrix: Solid
Analysis Batch: 420538

Client Sample ID: Method Blank
Prep Type: TCLP

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
1,1-Dichloroethene	<0.025		0.025		mg/L			01/28/20 15:19	1
1,2-Dichloroethane	<0.025		0.025		mg/L			01/28/20 15:19	1
Benzene	<0.025		0.025		mg/L			01/28/20 15:19	1
Carbon tetrachloride	<0.025		0.025		mg/L			01/28/20 15:19	1
Chlorobenzene	<0.025		0.025		mg/L			01/28/20 15:19	1
Chloroform	<0.025		0.025		mg/L			01/28/20 15:19	1
2-Butanone (MEK)	<0.25		0.25		mg/L			01/28/20 15:19	1
Tetrachloroethene	<0.025		0.025		mg/L			01/28/20 15:19	1
Trichloroethene	<0.025		0.025		mg/L			01/28/20 15:19	1
Vinyl chloride	<0.025		0.025		mg/L			01/28/20 15:19	1

Surrogate	MB %Recovery	MB Qualifier	Limits	Prepared	Analyzed	Dil Fac
1,2-Dichloroethane-d4 (Surr)	*81*		*74 - 124*		*01/28/20 15:19*	*1*
4-Bromofluorobenzene (Surr)	*88*		*77 - 120*		*01/28/20 15:19*	*1*
Toluene-d8 (Surr)	*91*		*80 - 120*		*01/28/20 15:19*	*1*
Dibromofluoromethane (Surr)	*87*		*80 - 120*		*01/28/20 15:19*	*1*

Lab Sample ID: 240-125349-5 MS
Matrix: Solid
Analysis Batch: 420538

Client Sample ID: FR34-WC-005
Prep Type: TCLP

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
1,1-Dichloroethene	<0.025		1.00	0.867		mg/L		87	80 - 130
1,2-Dichloroethane	<0.025		1.00	0.800		mg/L		80	72 - 124
Benzene	<0.025		1.00	0.885		mg/L		89	80 - 122
Carbon tetrachloride	<0.025		1.00	0.782		mg/L		78	68 - 126
Chlorobenzene	<0.025		1.00	0.838		mg/L		84	80 - 120
Chloroform	<0.025		1.00	0.852		mg/L		85	80 - 122
2-Butanone (MEK)	<0.25		2.00	1.56		mg/L		78	54 - 134
Tetrachloroethene	<0.025		1.00	0.835		mg/L		84	73 - 120
Trichloroethene	<0.025		1.00	0.837		mg/L		84	69 - 129
Vinyl chloride	<0.025		1.00	0.837		mg/L		84	58 - 141

Surrogate	MS %Recovery	MS Qualifier	Limits
1,2-Dichloroethane-d4 (Surr)	*82*		*74 - 124*
4-Bromofluorobenzene (Surr)	*93*		*77 - 120*
Toluene-d8 (Surr)	*93*		*80 - 120*
Dibromofluoromethane (Surr)	*91*		*80 - 120*

Method: 8260B - Volatile Organic Compounds (GC/MS)

Lab Sample ID: 240-125349-5 MSD
Matrix: Solid
Analysis Batch: 420538

Client Sample ID: FR34-WC-005
Prep Type: TCLP

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
1,1-Dichloroethene	<0.025		1.00	0.941		mg/L		94	80 - 130	8	12
1,2-Dichloroethane	<0.025		1.00	0.863		mg/L		86	72 - 124	8	11
Benzene	<0.025		1.00	0.961		mg/L		96	80 - 122	8	11
Carbon tetrachloride	<0.025		1.00	0.861		mg/L		86	68 - 126	10	13
Chlorobenzene	<0.025		1.00	0.900		mg/L		90	80 - 120	7	11
Chloroform	<0.025		1.00	0.941		mg/L		94	80 - 122	10	11
2-Butanone (MEK)	<0.25		2.00	1.68		mg/L		84	54 - 134	8	18
Tetrachloroethene	<0.025		1.00	0.894		mg/L		89	73 - 120	7	14
Trichloroethene	<0.025		1.00	0.896		mg/L		90	69 - 129	7	12
Vinyl chloride	<0.025		1.00	0.856		mg/L		86	58 - 141	2	12

Surrogate	*MSD %Recovery*	*MSD Qualifier*	*Limits*
1,2-Dichloroethane-d4 (Surr)	*83*		*74 - 124*
4-Bromofluorobenzene (Surr)	*91*		*77 - 120*
Toluene-d8 (Surr)	*93*		*80 - 120*
Dibromofluoromethane (Surr)	*92*		*80 - 120*

Lab Sample ID: LB 240-420578/1-A MB
Matrix: Solid
Analysis Batch: 420751

Client Sample ID: Method Blank
Prep Type: TCLP

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
1,1-Dichloroethene	<0.025		0.025		mg/L			01/29/20 18:10	1
1,2-Dichloroethane	<0.025		0.025		mg/L			01/29/20 18:10	1
Benzene	<0.025		0.025		mg/L			01/29/20 18:10	1
Carbon tetrachloride	<0.025		0.025		mg/L			01/29/20 18:10	1
Chlorobenzene	<0.025		0.025		mg/L			01/29/20 18:10	1
Chloroform	<0.025		0.025		mg/L			01/29/20 18:10	1
2-Butanone (MEK)	<0.25		0.25		mg/L			01/29/20 18:10	1
Tetrachloroethene	<0.025		0.025		mg/L			01/29/20 18:10	1
Trichloroethene	<0.025		0.025		mg/L			01/29/20 18:10	1
Vinyl chloride	<0.025		0.025		mg/L			01/29/20 18:10	1

Surrogate	*MB %Recovery*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
1,2-Dichloroethane-d4 (Surr)	*88*		*74 - 124*		*01/29/20 18:10*	*1*
4-Bromofluorobenzene (Surr)	*95*		*77 - 120*		*01/29/20 18:10*	*1*
Toluene-d8 (Surr)	*95*		*80 - 120*		*01/29/20 18:10*	*1*
Dibromofluoromethane (Surr)	*95*		*80 - 120*		*01/29/20 18:10*	*1*

Method: 8270C - Semivolatile Organic Compounds (GC/MS)

Lab Sample ID: MB 240-420513/21-A
Matrix: Solid
Analysis Batch: 420777

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 420513

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
1,4-Dichlorobenzene	<0.0040		0.0040		mg/L		01/28/20 10:40	01/30/20 05:00	1
2,4,5-Trichlorophenol	<0.0040		0.0040		mg/L		01/28/20 10:40	01/30/20 05:00	1

Method: 8270C - Semivolatile Organic Compounds (GC/MS) (Continued)

Lab Sample ID: MB 240-420513/21-A
Matrix: Solid
Analysis Batch: 420777

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 420513

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
2,4,6-Trichlorophenol	<0.0040		0.0040		mg/L		01/28/20 10:40	01/30/20 05:00	1
2,4-Dinitrotoluene	<0.0040		0.0040		mg/L		01/28/20 10:40	01/30/20 05:00	1
Hexachlorobenzene	<0.00080		0.00080		mg/L		01/28/20 10:40	01/30/20 05:00	1
Hexachlorobutadiene	<0.0040		0.0040		mg/L		01/28/20 10:40	01/30/20 05:00	1
Hexachloroethane	<0.0040		0.0040		mg/L		01/28/20 10:40	01/30/20 05:00	1
3 & 4 Methylphenol	<0.0040		0.0040		mg/L		01/28/20 10:40	01/30/20 05:00	1
2-Methylphenol	<0.0040		0.0040		mg/L		01/28/20 10:40	01/30/20 05:00	1
Nitrobenzene	<0.0040		0.0040		mg/L		01/28/20 10:40	01/30/20 05:00	1
Pentachlorophenol	<0.016		0.016		mg/L		01/28/20 10:40	01/30/20 05:00	1
Pyridine	<0.0040		0.0040		mg/L		01/28/20 10:40	01/30/20 05:00	1

Surrogate	*MB %Recovery*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
2-Fluorobiphenyl (Surr)	*89*		*39 - 120*	*01/28/20 10:40*	*01/30/20 05:00*	*1*
2-Fluorophenol (Surr)	*76*		*10 - 120*	*01/28/20 10:40*	*01/30/20 05:00*	*1*
2,4,6-Tribromophenol (Surr)	*96*		*33 - 120*	*01/28/20 10:40*	*01/30/20 05:00*	*1*
Nitrobenzene-d5 (Surr)	*88*		*33 - 120*	*01/28/20 10:40*	*01/30/20 05:00*	*1*
Phenol-d5 (Surr)	*62*		*10 - 120*	*01/28/20 10:40*	*01/30/20 05:00*	*1*
Terphenyl-d14 (Surr)	*95*		*36 - 122*	*01/28/20 10:40*	*01/30/20 05:00*	*1*

Lab Sample ID: LCS 240-420513/22-A
Matrix: Solid
Analysis Batch: 420777

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 420513

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
1,4-Dichlorobenzene	0.0800	0.0615		mg/L		77	46 - 120
2,4,5-Trichlorophenol	0.0800	0.0697		mg/L		87	61 - 120
2,4,6-Trichlorophenol	0.0800	0.0661		mg/L		83	63 - 120
2,4-Dinitrotoluene	0.0800	0.0694		mg/L		87	66 - 120
Hexachlorobenzene	0.0800	0.0655		mg/L		82	57 - 120
Hexachlorobutadiene	0.0800	0.0635		mg/L		79	39 - 120
Hexachloroethane	0.0800	0.0601		mg/L		75	40 - 120
3 & 4 Methylphenol	0.0800	0.0664		mg/L		83	45 - 120
2-Methylphenol	0.0800	0.0617		mg/L		77	50 - 120
Nitrobenzene	0.0800	0.0673		mg/L		84	56 - 120
Pentachlorophenol	0.160	0.120		mg/L		75	32 - 120
Pyridine	0.160	0.0988		mg/L		62	18 - 120

Surrogate	*LCS %Recovery*	*LCS Qualifier*	*Limits*
2-Fluorobiphenyl (Surr)	*91*		*39 - 120*
2-Fluorophenol (Surr)	*77*		*10 - 120*
2,4,6-Tribromophenol (Surr)	*100*		*33 - 120*
Nitrobenzene-d5 (Surr)	*93*		*33 - 120*
Phenol-d5 (Surr)	*68*		*10 - 120*
Terphenyl-d14 (Surr)	*95*		*36 - 122*

Method: 8270C - Semivolatile Organic Compounds (GC/MS) (Continued)

Lab Sample ID: MB 240-420669/16-A
Matrix: Solid
Analysis Batch: 421339

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 420669

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
1,4-Dichlorobenzene	<0.0040		0.0040		mg/L		01/29/20 09:24	02/04/20 09:16	1
2,4,5-Trichlorophenol	<0.0040		0.0040		mg/L		01/29/20 09:24	02/04/20 09:16	1
2,4,6-Trichlorophenol	<0.0040		0.0040		mg/L		01/29/20 09:24	02/04/20 09:16	1
2,4-Dinitrotoluene	<0.0040		0.0040		mg/L		01/29/20 09:24	02/04/20 09:16	1
Hexachlorobenzene	<0.00080		0.00080		mg/L		01/29/20 09:24	02/04/20 09:16	1
Hexachlorobutadiene	<0.0040		0.0040		mg/L		01/29/20 09:24	02/04/20 09:16	1
Hexachloroethane	<0.0040		0.0040		mg/L		01/29/20 09:24	02/04/20 09:16	1
3 & 4 Methylphenol	<0.0040		0.0040		mg/L		01/29/20 09:24	02/04/20 09:16	1
2-Methylphenol	<0.0040		0.0040		mg/L		01/29/20 09:24	02/04/20 09:16	1
Nitrobenzene	<0.0040		0.0040		mg/L		01/29/20 09:24	02/04/20 09:16	1
Pentachlorophenol	<0.016		0.016		mg/L		01/29/20 09:24	02/04/20 09:16	1
Pyridine	<0.0040		0.0040		mg/L		01/29/20 09:24	02/04/20 09:16	1

Surrogate	*MB %Recovery*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
2-Fluorobiphenyl (Surr)	*94*		*39 - 120*	*01/29/20 09:24*	*02/04/20 09:16*	*1*
2-Fluorophenol (Surr)	*92*		*10 - 120*	*01/29/20 09:24*	*02/04/20 09:16*	*1*
2,4,6-Tribromophenol (Surr)	*104*		*33 - 120*	*01/29/20 09:24*	*02/04/20 09:16*	*1*
Nitrobenzene-d5 (Surr)	*78*		*33 - 120*	*01/29/20 09:24*	*02/04/20 09:16*	*1*
Phenol-d5 (Surr)	*71*		*10 - 120*	*01/29/20 09:24*	*02/04/20 09:16*	*1*
Terphenyl-d14 (Surr)	*108*		*36 - 122*	*01/29/20 09:24*	*02/04/20 09:16*	*1*

Lab Sample ID: LCS 240-420669/17-A
Matrix: Solid
Analysis Batch: 421339

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 420669

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
1,4-Dichlorobenzene	0.0800	0.0633		mg/L		79	46 - 120
2,4,5-Trichlorophenol	0.0800	0.0677		mg/L		85	61 - 120
2,4,6-Trichlorophenol	0.0800	0.0661		mg/L		83	63 - 120
2,4-Dinitrotoluene	0.0800	0.0699		mg/L		87	66 - 120
Hexachlorobenzene	0.0800	0.0612		mg/L		76	57 - 120
Hexachlorobutadiene	0.0800	0.0535		mg/L		67	39 - 120
Hexachloroethane	0.0800	0.0608		mg/L		76	40 - 120
3 & 4 Methylphenol	0.0800	0.0710		mg/L		89	45 - 120
2-Methylphenol	0.0800	0.0721		mg/L		90	50 - 120
Nitrobenzene	0.0800	0.0592		mg/L		74	56 - 120
Pentachlorophenol	0.160	0.103		mg/L		64	32 - 120
Pyridine	0.160	0.125		mg/L		78	18 - 120

Surrogate	*LCS %Recovery*	*LCS Qualifier*	*Limits*
2-Fluorobiphenyl (Surr)	*87*		*39 - 120*
2-Fluorophenol (Surr)	*92*		*10 - 120*
2,4,6-Tribromophenol (Surr)	*97*		*33 - 120*
Nitrobenzene-d5 (Surr)	*76*		*33 - 120*
Phenol-d5 (Surr)	*76*		*10 - 120*
Terphenyl-d14 (Surr)	*97*		*36 - 122*

Method: 8270D - Semivolatile Organic Compounds (GC/MS)

Lab Sample ID: MB 240-420483/22-A
Matrix: Solid
Analysis Batch: 421566

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 420483

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
2-Chloronaphthalene	<50		50		ug/Kg		01/28/20 09:56	02/05/20 10:32	1
2-Chlorophenol	<50		50		ug/Kg		01/28/20 09:56	02/05/20 10:32	1
1,3-Dichlorobenzene	<50		50		ug/Kg		01/28/20 09:56	02/05/20 10:32	1
4-Bromophenyl phenyl ether	<50		50		ug/Kg		01/28/20 09:56	02/05/20 10:32	1
1,4-Dichlorobenzene	<50		50		ug/Kg		01/28/20 09:56	02/05/20 10:32	1
4-Chloro-3-methylphenol	<150		150		ug/Kg		01/28/20 09:56	02/05/20 10:32	1
3,3'-Dichlorobenzidine	<100		100		ug/Kg		01/28/20 09:56	02/05/20 10:32	1
4-Chloroaniline	<150		150		ug/Kg		01/28/20 09:56	02/05/20 10:32	1
2,4-Dichlorophenol	<150		150		ug/Kg		01/28/20 09:56	02/05/20 10:32	1
4-Chlorophenyl phenyl ether	<50		50		ug/Kg		01/28/20 09:56	02/05/20 10:32	1
2,4-Dimethylphenol	<150		150		ug/Kg		01/28/20 09:56	02/05/20 10:32	1
Acenaphthene	<15		15		ug/Kg		01/28/20 09:56	02/05/20 10:32	1
Acenaphthylene	<15		15		ug/Kg		01/28/20 09:56	02/05/20 10:32	1
Anthracene	<15		15		ug/Kg		01/28/20 09:56	02/05/20 10:32	1
4,6-Dinitro-2-methylphenol	<330		330		ug/Kg		01/28/20 09:56	02/05/20 10:32	1
Benzo[a]anthracene	<15		15		ug/Kg		01/28/20 09:56	02/05/20 10:32	1
2,4-Dinitrophenol	<330		330		ug/Kg		01/28/20 09:56	02/05/20 10:32	1
Benzo[a]pyrene	<15		15		ug/Kg		01/28/20 09:56	02/05/20 10:32	1
2,4-Dinitrotoluene	<200		200		ug/Kg		01/28/20 09:56	02/05/20 10:32	1
Benzo[b]fluoranthene	<15		15		ug/Kg		01/28/20 09:56	02/05/20 10:32	1
Benzo[g,h,i]perylene	<15		15		ug/Kg		01/28/20 09:56	02/05/20 10:32	1
Benzo[k]fluoranthene	<15		15		ug/Kg		01/28/20 09:56	02/05/20 10:32	1
Benzoic acid	<700		700		ug/Kg		01/28/20 09:56	02/05/20 10:32	1
Benzyl alcohol	<330		330		ug/Kg		01/28/20 09:56	02/05/20 10:32	1
Bis(2-chloroethoxy)methane	<100		100		ug/Kg		01/28/20 09:56	02/05/20 10:32	1
Bis(2-chloroethyl)ether	<100		100		ug/Kg		01/28/20 09:56	02/05/20 10:32	1
Bis(2-ethylhexyl) phthalate	<70		70		ug/Kg		01/28/20 09:56	02/05/20 10:32	1
Butyl benzyl phthalate	<70		70		ug/Kg		01/28/20 09:56	02/05/20 10:32	1
Carbazole	<50		50		ug/Kg		01/28/20 09:56	02/05/20 10:32	1
Chrysene	<15		15		ug/Kg		01/28/20 09:56	02/05/20 10:32	1
Di-n-butyl phthalate	<70		70		ug/Kg		01/28/20 09:56	02/05/20 10:32	1
Di-n-octyl phthalate	<70		70		ug/Kg		01/28/20 09:56	02/05/20 10:32	1
2-Methylnaphthalene	<15		15		ug/Kg		01/28/20 09:56	02/05/20 10:32	1
Dibenz(a,h)anthracene	<15		15		ug/Kg		01/28/20 09:56	02/05/20 10:32	1
2-Methylphenol	<200		200		ug/Kg		01/28/20 09:56	02/05/20 10:32	1
Dibenzofuran	<50		50		ug/Kg		01/28/20 09:56	02/05/20 10:32	1
3 & 4 Methylphenol	<400		400		ug/Kg		01/28/20 09:56	02/05/20 10:32	1
Diethyl phthalate	<70		70		ug/Kg		01/28/20 09:56	02/05/20 10:32	1
Dimethyl phthalate	<70		70		ug/Kg		01/28/20 09:56	02/05/20 10:32	1
2-Nitroaniline	<200		200		ug/Kg		01/28/20 09:56	02/05/20 10:32	1
Fluoranthene	<15		15		ug/Kg		01/28/20 09:56	02/05/20 10:32	1
3-Nitroaniline	<200		200		ug/Kg		01/28/20 09:56	02/05/20 10:32	1
Fluorene	<15		15		ug/Kg		01/28/20 09:56	02/05/20 10:32	1
4-Nitroaniline	<200		200		ug/Kg		01/28/20 09:56	02/05/20 10:32	1
Hexachlorobenzene	<15		15		ug/Kg		01/28/20 09:56	02/05/20 10:32	1
Hexachlorobutadiene	<50		50		ug/Kg		01/28/20 09:56	02/05/20 10:32	1
Hexachlorocyclopentadiene	<330		330		ug/Kg		01/28/20 09:56	02/05/20 10:32	1
2-Nitrophenol	<50		50		ug/Kg		01/28/20 09:56	02/05/20 10:32	1

Method: 8270D - Semivolatile Organic Compounds (GC/MS) (Continued)

Lab Sample ID: MB 240-420483/22-A
Matrix: Solid
Analysis Batch: 421566

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 420483

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Hexachloroethane	<50		50		ug/Kg		01/28/20 09:56	02/05/20 10:32	1
Indeno[1,2,3-cd]pyrene	<15		15		ug/Kg		01/28/20 09:56	02/05/20 10:32	1
Isophorone	<50		50		ug/Kg		01/28/20 09:56	02/05/20 10:32	1
N-Nitrosodi-n-propylamine	<50		50		ug/Kg		01/28/20 09:56	02/05/20 10:32	1
N-Nitrosodiphenylamine	<50		50		ug/Kg		01/28/20 09:56	02/05/20 10:32	1
Naphthalene	<15		15		ug/Kg		01/28/20 09:56	02/05/20 10:32	1
Nitrobenzene	<100		100		ug/Kg		01/28/20 09:56	02/05/20 10:32	1
Pentachlorophenol	<150		150		ug/Kg		01/28/20 09:56	02/05/20 10:32	1
Phenanthrene	<15		15		ug/Kg		01/28/20 09:56	02/05/20 10:32	1
Phenol	<50		50		ug/Kg		01/28/20 09:56	02/05/20 10:32	1
Pyrene	<15		15		ug/Kg		01/28/20 09:56	02/05/20 10:32	1
Pyridine	<150		150		ug/Kg		01/28/20 09:56	02/05/20 10:32	1
1,2,4-Trichlorobenzene	<50		50		ug/Kg		01/28/20 09:56	02/05/20 10:32	1
bis (2-chloroisopropyl) ether	<100		100		ug/Kg		01/28/20 09:56	02/05/20 10:32	1
2,4,5-Trichlorophenol	<150		150		ug/Kg		01/28/20 09:56	02/05/20 10:32	1
2,6-Dinitrotoluene	<200		200		ug/Kg		01/28/20 09:56	02/05/20 10:32	1
2,4,6-Trichlorophenol	<150		150		ug/Kg		01/28/20 09:56	02/05/20 10:32	1
4-Nitrophenol	<330		330		ug/Kg		01/28/20 09:56	02/05/20 10:32	1

Surrogate	*MB %Recovery*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
2-Fluorobiphenyl (Surr)	*80*		*35 - 120*	*01/28/20 09:56*	*02/05/20 10:32*	*1*
2-Fluorophenol (Surr)	*64*		*26 - 120*	*01/28/20 09:56*	*02/05/20 10:32*	*1*
Nitrobenzene-d5 (Surr)	*69*		*28 - 120*	*01/28/20 09:56*	*02/05/20 10:32*	*1*
Phenol-d5 (Surr)	*74*		*28 - 120*	*01/28/20 09:56*	*02/05/20 10:32*	*1*
Terphenyl-d14 (Surr)	*86*		*39 - 120*	*01/28/20 09:56*	*02/05/20 10:32*	*1*
2,4,6-Tribromophenol (Surr)	*33*		*10 - 120*	*01/28/20 09:56*	*02/05/20 10:32*	*1*

Lab Sample ID: LCS 240-420483/23-A
Matrix: Solid
Analysis Batch: 421566

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 420483

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
2-Chloronaphthalene	667	501		ug/Kg		75	42 - 120
2-Chlorophenol	667	520		ug/Kg		78	42 - 120
1,3-Dichlorobenzene	667	498		ug/Kg		75	39 - 120
4-Bromophenyl phenyl ether	667	550		ug/Kg		82	47 - 120
1,4-Dichlorobenzene	667	482		ug/Kg		72	39 - 120
4-Chloro-3-methylphenol	667	523		ug/Kg		78	39 - 120
3,3'-Dichlorobenzidine	1330	1120		ug/Kg		84	29 - 120
4-Chloroaniline	667	451		ug/Kg		68	30 - 120
2,4-Dichlorophenol	667	507		ug/Kg		76	40 - 120
4-Chlorophenyl phenyl ether	667	523		ug/Kg		78	46 - 120
2,4-Dimethylphenol	667	436		ug/Kg		65	31 - 120
Acenaphthene	667	511		ug/Kg		77	45 - 120
Acenaphthylene	667	521		ug/Kg		78	45 - 120
Anthracene	667	562		ug/Kg		84	52 - 120
4,6-Dinitro-2-methylphenol	1330	855		ug/Kg		64	27 - 120
Benzo[a]anthracene	667	554		ug/Kg		83	52 - 120

Method: 8270D - Semivolatile Organic Compounds (GC/MS) (Continued)

Lab Sample ID: LCS 240-420483/23-A
Matrix: Solid
Analysis Batch: 421566

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 420483

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
2,4-Dinitrophenol	1330	385		ug/Kg		29	10 - 120
Benzo[a]pyrene	667	580		ug/Kg		87	50 - 120
2,4-Dinitrotoluene	667	579		ug/Kg		87	49 - 120
Benzo[b]fluoranthene	667	562		ug/Kg		84	52 - 120
Benzo[g,h,i]perylene	667	573		ug/Kg		86	54 - 120
Benzo[k]fluoranthene	667	595		ug/Kg		89	54 - 120
Benzoic acid	1330	163	J	ug/Kg		12	10 - 120
Benzyl alcohol	667	503		ug/Kg		76	10 - 126
Bis(2-chloroethoxy)methane	667	553		ug/Kg		83	43 - 120
Bis(2-chloroethyl)ether	667	502		ug/Kg		75	41 - 120
Bis(2-ethylhexyl) phthalate	667	622		ug/Kg		93	47 - 124
Butyl benzyl phthalate	667	613		ug/Kg		92	47 - 120
Carbazole	667	587		ug/Kg		88	51 - 120
Chrysene	667	561		ug/Kg		84	53 - 120
Di-n-butyl phthalate	667	616		ug/Kg		92	50 - 120
Di-n-octyl phthalate	667	617		ug/Kg		93	38 - 122
2-Methylnaphthalene	667	529		ug/Kg		79	42 - 120
Dibenz(a,h)anthracene	667	580		ug/Kg		87	50 - 120
2-Methylphenol	667	513		ug/Kg		77	42 - 120
Dibenzofuran	667	505		ug/Kg		76	46 - 120
3 & 4 Methylphenol	667	516		ug/Kg		77	43 - 120
Diethyl phthalate	667	560		ug/Kg		84	45 - 120
Dimethyl phthalate	667	540		ug/Kg		81	47 - 120
2-Nitroaniline	667	544		ug/Kg		82	44 - 120
Fluoranthene	667	573		ug/Kg		86	54 - 120
3-Nitroaniline	667	480		ug/Kg		72	41 - 120
Fluorene	667	511		ug/Kg		77	48 - 120
4-Nitroaniline	667	521		ug/Kg		78	47 - 120
Hexachlorobenzene	667	517		ug/Kg		77	45 - 120
Hexachlorobutadiene	667	513		ug/Kg		77	34 - 120
Hexachlorocyclopentadiene	667	274	J	ug/Kg		41	10 - 120
2-Nitrophenol	667	516		ug/Kg		77	41 - 120
Hexachloroethane	667	453		ug/Kg		68	36 - 120
Indeno[1,2,3-cd]pyrene	667	614		ug/Kg		92	52 - 120
Isophorone	667	534		ug/Kg		80	42 - 120
N-Nitrosodi-n-propylamine	667	524		ug/Kg		79	39 - 120
N-Nitrosodiphenylamine	667	550		ug/Kg		83	50 - 120
Naphthalene	667	525		ug/Kg		79	39 - 120
Nitrobenzene	667	534		ug/Kg		80	42 - 120
Pentachlorophenol	1330	457		ug/Kg		34	16 - 120
Phenanthrene	667	549		ug/Kg		82	50 - 120
Phenol	667	510		ug/Kg		77	39 - 120
Pyrene	667	576		ug/Kg		86	50 - 120
Pyridine	1330	612		ug/Kg		46	18 - 120
1,2,4-Trichlorobenzene	667	526		ug/Kg		79	39 - 120
bis (2-chloroisopropyl) ether	667	520		ug/Kg		78	29 - 120
2,4,5-Trichlorophenol	667	424		ug/Kg		64	28 - 120
2,6-Dinitrotoluene	667	550		ug/Kg		83	49 - 120
2,4,6-Trichlorophenol	667	357		ug/Kg		54	14 - 120

Method: 8270D - Semivolatile Organic Compounds (GC/MS) (Continued)

Lab Sample ID: LCS 240-420483/23-A
Matrix: Solid
Analysis Batch: 421566

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 420483

Analyte			Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits		
4-Nitrophenol			1330	916		ug/Kg		69	29 - 120		

Surrogate	*LCS %Recovery*	*LCS Qualifier*	*Limits*
2-Fluorobiphenyl (Surr)	*84*		*35 - 120*
2-Fluorophenol (Surr)	*85*		*26 - 120*
Nitrobenzene-d5 (Surr)	*88*		*28 - 120*
Phenol-d5 (Surr)	*88*		*28 - 120*
Terphenyl-d14 (Surr)	*93*		*39 - 120*
2,4,6-Tribromophenol (Surr)	*55*		*10 - 120*

Lab Sample ID: 240-125349-1 MS
Matrix: Solid
Analysis Batch: 421566

Client Sample ID: FR34-WC-001
Prep Type: Total/NA
Prep Batch: 420483

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits		
2-Chloronaphthalene	<250		819	543		ug/Kg	☼	66	39 - 120		
2-Chlorophenol	<250		819	477		ug/Kg	☼	58	30 - 120		
1,3-Dichlorobenzene	<250		819	451		ug/Kg	☼	55	24 - 120		
4-Bromophenyl phenyl ether	<250		819	557		ug/Kg	☼	68	47 - 120		
1,4-Dichlorobenzene	<250		819	407		ug/Kg	☼	50	28 - 120		
4-Chloro-3-methylphenol	<750		819	<740		ug/Kg	☼	69	33 - 120		
3,3'-Dichlorobenzidine	<500	F1	1640	<490	F1	ug/Kg	☼	0	10 - 120		
4-Chloroaniline	<750		819	<740		ug/Kg	☼	35	21 - 120		
2,4-Dichlorophenol	<750		819	<740		ug/Kg	☼	65	30 - 120		
4-Chlorophenyl phenyl ether	<250		819	561		ug/Kg	☼	68	47 - 120		
2,4-Dimethylphenol	<750		819	<740		ug/Kg	☼	65	25 - 120		
Acenaphthene	<75		819	559		ug/Kg	☼	68	41 - 120		
Acenaphthylene	<75		819	625		ug/Kg	☼	71	39 - 120		
Anthracene	<75		819	609		ug/Kg	☼	71	43 - 106		
4,6-Dinitro-2-methylphenol	<1700	F1	1640	<1600	F1	ug/Kg	☼	0	10 - 123		
Benzo[a]anthracene	110		819	717		ug/Kg	☼	75	32 - 120		
2,4-Dinitrophenol	<1700	F1	1640	<1600	F1	ug/Kg	☼	0	10 - 120		
Benzo[a]pyrene	100		819	712		ug/Kg	☼	74	35 - 120		
2,4-Dinitrotoluene	<1000		819	<980		ug/Kg	☼	78	51 - 120		
Benzo[b]fluoranthene	190		819	815		ug/Kg	☼	77	27 - 126		
Benzo[g,h,i]perylene	<75		819	394		ug/Kg	☼	43	29 - 122		
Benzo[k]fluoranthene	<75		819	721		ug/Kg	☼	79	39 - 120		
Benzoic acid	<3500		1640	<3400		ug/Kg	☼	88	10 - 120		
Benzyl alcohol	<1700		819	<1600		ug/Kg	☼	62	10 - 120		
Bis(2-chloroethoxy)methane	<500		819	<490		ug/Kg	☼	59	36 - 120		
Bis(2-chloroethyl)ether	<500		819	<490		ug/Kg	☼	49	32 - 120		
Bis(2-ethylhexyl) phthalate	<350		819	665		ug/Kg	☼	81	42 - 129		
Butyl benzyl phthalate	<350		819	607		ug/Kg	☼	74	39 - 121		
Carbazole	<250		819	593		ug/Kg	☼	72	46 - 120		
Chrysene	170		819	759		ug/Kg	☼	72	31 - 121		
Di-n-butyl phthalate	<350		819	628		ug/Kg	☼	77	46 - 120		
Di-n-octyl phthalate	<350		819	688		ug/Kg	☼	84	44 - 120		
2-Methylnaphthalene	300		819	726		ug/Kg	☼	52	10 - 133		

Method: 8270D - Semivolatile Organic Compounds (GC/MS) (Continued)

Lab Sample ID: 240-125349-1 MS
Matrix: Solid
Analysis Batch: 421566

Client Sample ID: FR34-WC-001
Prep Type: Total/NA
Prep Batch: 420483

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
Dibenz(a,h)anthracene	<75		819	453		ug/Kg	☼	55	36 - 120
2-Methylphenol	<1000		819	<980		ug/Kg	☼	69	28 - 120
Dibenzofuran	<250		819	584		ug/Kg	☼	71	45 - 120
3 & 4 Methylphenol	<2000		819	<2000		ug/Kg	☼	70	34 - 120
Diethyl phthalate	<350		819	634		ug/Kg	☼	77	45 - 120
Dimethyl phthalate	<350		819	572		ug/Kg	☼	70	47 - 120
2-Nitroaniline	<1000		819	<980		ug/Kg	☼	74	49 - 120
Fluoranthene	220		819	898		ug/Kg	☼	83	30 - 125
3-Nitroaniline	<1000		819	<980		ug/Kg	☼	41	20 - 120
Fluorene	<75		819	567		ug/Kg	☼	69	44 - 120
4-Nitroaniline	<1000	F1	819	<980	F1	ug/Kg	☼	0	20 - 120
Hexachlorobenzene	<75		819	520		ug/Kg	☼	63	47 - 120
Hexachlorobutadiene	<250		819	418		ug/Kg	☼	51	27 - 120
Hexachlorocyclopentadiene	<1700	F1	819	<1600	F1	ug/Kg	☼	0	10 - 120
2-Nitrophenol	<250		819	426		ug/Kg	☼	52	25 - 120
Hexachloroethane	<250		819	272		ug/Kg	☼	33	10 - 120
Indeno[1,2,3-cd]pyrene	<75		819	483		ug/Kg	☼	54	34 - 120
Isophorone	<250		819	486		ug/Kg	☼	59	32 - 120
N-Nitrosodi-n-propylamine	<250		819	524		ug/Kg	☼	64	30 - 120
N-Nitrosodiphenylamine	<250		819	659		ug/Kg	☼	73	46 - 120
Naphthalene	97		819	539		ug/Kg	☼	54	30 - 120
Nitrobenzene	<500		819	<490		ug/Kg	☼	53	32 - 120
Pentachlorophenol	<750		1640	<740		ug/Kg	☼	22	10 - 120
Phenanthrene	240		819	825		ug/Kg	☼	72	31 - 120
Phenol	<250		819	512		ug/Kg	☼	63	25 - 120
Pyrene	180		819	817		ug/Kg	☼	78	28 - 122
Pyridine	<750		1640	<740		ug/Kg	☼	30	12 - 120
1,2,4-Trichlorobenzene	<250		819	438		ug/Kg	☼	53	32 - 120
bis (2-chloroisopropyl) ether	<500		819	<490		ug/Kg	☼	54	27 - 120
2,4,5-Trichlorophenol	<750		819	<740		ug/Kg	☼	69	22 - 120
2,6-Dinitrotoluene	<1000		819	<980		ug/Kg	☼	61	51 - 120
2,4,6-Trichlorophenol	<750		819	<740		ug/Kg	☼	64	15 - 120
4-Nitrophenol	<1700		1640	<1600		ug/Kg	☼	64	14 - 125

Surrogate	*MS %Recovery*	*MS Qualifier*	*Limits*
2-Fluorobiphenyl (Surr)	*74*		*35 - 120*
2-Fluorophenol (Surr)	*68*		*26 - 120*
Nitrobenzene-d5 (Surr)	*65*		*28 - 120*
Phenol-d5 (Surr)	*74*		*28 - 120*
Terphenyl-d14 (Surr)	*78*		*39 - 120*
2,4,6-Tribromophenol (Surr)	*70*		*10 - 120*

Lab Sample ID: 240-125349-1 MSD
Matrix: Solid
Analysis Batch: 421566

Client Sample ID: FR34-WC-001
Prep Type: Total/NA
Prep Batch: 420483

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
2-Chloronaphthalene	<250		815	568		ug/Kg	☼	70	39 - 120	5	32

Method: 8270D - Semivolatile Organic Compounds (GC/MS) (Continued)

Lab Sample ID: 240-125349-1 MSD
Matrix: Solid
Analysis Batch: 421566

Client Sample ID: FR34-WC-001
Prep Type: Total/NA
Prep Batch: 420483

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
2-Chlorophenol	<250		815	587		ug/Kg	☼	72	30 - 120	21	40
1,3-Dichlorobenzene	<250		815	528		ug/Kg	☼	65	24 - 120	16	36
4-Bromophenyl phenyl ether	<250		815	574		ug/Kg	☼	70	47 - 120	3	20
1,4-Dichlorobenzene	<250		815	491		ug/Kg	☼	60	28 - 120	19	35
4-Chloro-3-methylphenol	<750		815	<730		ug/Kg	☼	70	33 - 120	1	40
3,3'-Dichlorobenzidine	<500	F1	1630	<490	F1	ug/Kg	☼	0	10 - 120	NC	40
4-Chloroaniline	<750		815	<730		ug/Kg	☼	29	21 - 120	17	40
2,4-Dichlorophenol	<750		815	<730		ug/Kg	☼	68	30 - 120	5	40
4-Chlorophenyl phenyl ether	<250		815	531		ug/Kg	☼	65	47 - 120	6	21
2,4-Dimethylphenol	<750		815	<730		ug/Kg	☼	68	25 - 120	4	36
Acenaphthene	<75		815	563		ug/Kg	☼	69	41 - 120	1	34
Acenaphthylene	<75		815	584		ug/Kg	☼	66	39 - 120	7	34
Anthracene	<75		815	622		ug/Kg	☼	73	43 - 106	2	32
4,6-Dinitro-2-methylphenol	<1700	F1	1630	<1600	F1	ug/Kg	☼	0	10 - 123	NC	40
Benzo[a]anthracene	110		815	715		ug/Kg	☼	75	32 - 120	0	37
2,4-Dinitrophenol	<1700	F1	1630	<1600	F1	ug/Kg	☼	0	10 - 120	NC	40
Benzo[a]pyrene	100		815	717		ug/Kg	☼	75	35 - 120	1	38
2,4-Dinitrotoluene	<1000		815	<980		ug/Kg	☼	83	51 - 120	6	21
Benzo[b]fluoranthene	190		815	809		ug/Kg	☼	77	27 - 126	1	40
Benzo[g,h,i]perylene	<75		815	381		ug/Kg	☼	42	29 - 122	3	40
Benzo[k]fluoranthene	<75		815	740		ug/Kg	☼	82	39 - 120	3	37
Benzoic acid	<3500		1630	<3400		ug/Kg	☼	91	10 - 120	3	38
Benzyl alcohol	<1700		815	<1600		ug/Kg	☼	77	10 - 120	21	31
Bis(2-chloroethoxy)methane	<500		815	574		ug/Kg	☼	70	36 - 120	18	39
Bis(2-chloroethyl)ether	<500		815	547		ug/Kg	☼	67	32 - 120	30	40
Bis(2-ethylhexyl) phthalate	<350		815	645		ug/Kg	☼	79	42 - 129	3	40
Butyl benzyl phthalate	<350		815	651		ug/Kg	☼	80	39 - 121	7	24
Carbazole	<250		815	620		ug/Kg	☼	76	46 - 120	4	28
Chrysene	170		815	749		ug/Kg	☼	71	31 - 121	1	37
Di-n-butyl phthalate	<350		815	662		ug/Kg	☼	81	46 - 120	5	21
Di-n-octyl phthalate	<350		815	741		ug/Kg	☼	91	44 - 120	7	25
2-Methylnaphthalene	300		815	1020		ug/Kg	☼	89	10 - 133	34	40
Dibenz(a,h)anthracene	<75		815	436		ug/Kg	☼	53	36 - 120	4	38
2-Methylphenol	<1000		815	<980		ug/Kg	☼	75	28 - 120	8	40
Dibenzofuran	<250		815	576		ug/Kg	☼	71	45 - 120	1	26
3 & 4 Methylphenol	<2000		815	<2000		ug/Kg	☼	75	34 - 120	6	40
Diethyl phthalate	<350		815	654		ug/Kg	☼	80	45 - 120	3	19
Dimethyl phthalate	<350		815	582		ug/Kg	☼	71	47 - 120	2	20
2-Nitroaniline	<1000		815	<980		ug/Kg	☼	81	49 - 120	9	19
Fluoranthene	220		815	870		ug/Kg	☼	80	30 - 125	3	31
3-Nitroaniline	<1000		815	<980		ug/Kg	☼	33	20 - 120	22	40
Fluorene	<75		815	553		ug/Kg	☼	68	44 - 120	3	32
4-Nitroaniline	<1000	F1	815	<980	F1	ug/Kg	☼	0	20 - 120	NC	40
Hexachlorobenzene	<75		815	542		ug/Kg	☼	66	47 - 120	4	23
Hexachlorobutadiene	<250		815	526		ug/Kg	☼	65	27 - 120	23	40
Hexachlorocyclopentadiene	<1700	F1	815	<1600	F1	ug/Kg	☼	0	10 - 120	NC	40
2-Nitrophenol	<250		815	512		ug/Kg	☼	63	25 - 120	18	40
Hexachloroethane	<250		815	362		ug/Kg	☼	44	10 - 120	28	40
Indeno[1,2,3-cd]pyrene	<75		815	477		ug/Kg	☼	53	34 - 120	1	40

Method: 8270D - Semivolatile Organic Compounds (GC/MS) (Continued)

Lab Sample ID: 240-125349-1 MSD **Client Sample ID: FR34-WC-001**
Matrix: Solid **Prep Type: Total/NA**
Analysis Batch: 421566 **Prep Batch: 420483**

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Isophorone	<250		815	592		ug/Kg	☼	73	32 - 120	20	40
N-Nitrosodi-n-propylamine	<250		815	654		ug/Kg	☼	80	30 - 120	22	40
N-Nitrosodiphenylamine	<250		815	679		ug/Kg	☼	76	46 - 120	3	24
Naphthalene	97		815	722		ug/Kg	☼	77	30 - 120	29	40
Nitrobenzene	<500		815	512		ug/Kg	☼	63	32 - 120	17	40
Pentachlorophenol	<750		1630	<730		ug/Kg	☼	28	10 - 120	22	40
Phenanthrene	240		815	898		ug/Kg	☼	81	31 - 120	8	35
Phenol	<250		815	602		ug/Kg	☼	74	25 - 120	16	40
Pyrene	180		815	789		ug/Kg	☼	75	28 - 122	4	30
Pyridine	<750		1630	<730		ug/Kg	☼	40	12 - 120	29	40
1,2,4-Trichlorobenzene	<250		815	567		ug/Kg	☼	70	32 - 120	26	38
bis (2-chloroisopropyl) ether	<500		815	530		ug/Kg	☼	65	27 - 120	18	40
2,4,5-Trichlorophenol	<750		815	<730		ug/Kg	☼	65	22 - 120	7	40
2,6-Dinitrotoluene	<1000		815	<980		ug/Kg	☼	69	51 - 120	11	20
2,4,6-Trichlorophenol	<750		815	<730		ug/Kg	☼	68	15 - 120	5	34
4-Nitrophenol	<1700		1630	<1600		ug/Kg	☼	76	14 - 125	16	36

Surrogate	*MSD %Recovery*	*MSD Qualifier*	*Limits*
2-Fluorobiphenyl (Surr)	*74*		*35 - 120*
2-Fluorophenol (Surr)	*82*		*26 - 120*
Nitrobenzene-d5 (Surr)	*76*		*28 - 120*
Phenol-d5 (Surr)	*78*		*28 - 120*
Terphenyl-d14 (Surr)	*77*		*39 - 120*
2,4,6-Tribromophenol (Surr)	*69*		*10 - 120*

Method: 8015B - Nonhalogenated Organic Compounds - Direct Injection (GC)

Lab Sample ID: MB 600-286234/2 **Client Sample ID: Method Blank**
Matrix: Solid **Prep Type: Total/NA**
Analysis Batch: 286234

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Methanol	<5.0		5.0		mg/Kg			01/27/20 10:37	1

Lab Sample ID: LCS 600-286234/3 **Client Sample ID: Lab Control Sample**
Matrix: Solid **Prep Type: Total/NA**
Analysis Batch: 286234

Analyte			Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits		
Methanol			50.0	47.8		mg/Kg		96	70 - 130		

Lab Sample ID: LCSD 600-286234/4 **Client Sample ID: Lab Control Sample Dup**
Matrix: Solid **Prep Type: Total/NA**
Analysis Batch: 286234

Analyte			Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Methanol			50.0	48.0		mg/Kg		96	70 - 130	0	30

Method: 8015B - Nonhalogenated Organic Compounds - Direct Injection (GC) (Continued)

Lab Sample ID: MB 600-286237/2 **Client Sample ID: Method Blank**
Matrix: Solid **Prep Type: Total/NA**
Analysis Batch: 286237

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
2-Ethoxyethanol	<5.0		5.0		mg/Kg			01/27/20 09:38	1

Lab Sample ID: LCS 600-286237/3 **Client Sample ID: Lab Control Sample**
Matrix: Solid **Prep Type: Total/NA**
Analysis Batch: 286237

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
2-Ethoxyethanol	50.0	41.3		mg/Kg		83	70 - 130

Lab Sample ID: LCSD 600-286237/4 **Client Sample ID: Lab Control Sample Dup**
Matrix: Solid **Prep Type: Total/NA**
Analysis Batch: 286237

Analyte	Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
2-Ethoxyethanol	50.0	41.2		mg/Kg		82	70 - 130	0	30

Lab Sample ID: MB 600-286244/2 **Client Sample ID: Method Blank**
Matrix: Solid **Prep Type: Total/NA**
Analysis Batch: 286244

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
2-Ethoxyethanol	<5.0		5.0		mg/Kg			01/27/20 09:38	1

Lab Sample ID: LCS 600-286244/3 **Client Sample ID: Lab Control Sample**
Matrix: Solid **Prep Type: Total/NA**
Analysis Batch: 286244

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
2-Ethoxyethanol	50.0	50.0		mg/Kg		100	70 - 130

Lab Sample ID: LCSD 600-286244/4 **Client Sample ID: Lab Control Sample Dup**
Matrix: Solid **Prep Type: Total/NA**
Analysis Batch: 286244

Analyte	Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
2-Ethoxyethanol	50.0	48.5		mg/Kg		97	70 - 130	3	30

Lab Sample ID: MB 600-286429/2 **Client Sample ID: Method Blank**
Matrix: Solid **Prep Type: Total/NA**
Analysis Batch: 286429

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Methanol	<5.0		5.0		mg/Kg			01/29/20 04:11	1

Lab Sample ID: LCS 600-286429/3 **Client Sample ID: Lab Control Sample**
Matrix: Solid **Prep Type: Total/NA**
Analysis Batch: 286429

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Methanol	50.0	38.3		mg/Kg		77	70 - 130

Method: 8015B - Nonhalogenated Organic Compounds - Direct Injection (GC)

Lab Sample ID: LCSD 600-286429/4 **Client Sample ID: Lab Control Sample Dup**
Matrix: Solid **Prep Type: Total/NA**
Analysis Batch: 286429

Analyte			Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Methanol			50.0	45.3		mg/Kg		91	70 - 130	17	30

Lab Sample ID: MB 600-286467/2 **Client Sample ID: Method Blank**
Matrix: Solid **Prep Type: Total/NA**
Analysis Batch: 286467

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
2-Ethoxyethanol	<5.0		5.0		mg/Kg			01/29/20 10:31	1

Lab Sample ID: LCS 600-286467/3 **Client Sample ID: Lab Control Sample**
Matrix: Solid **Prep Type: Total/NA**
Analysis Batch: 286467

Analyte			Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits		
2-Ethoxyethanol			50.0	42.5		mg/Kg		85	70 - 130		

Lab Sample ID: LCSD 600-286467/4 **Client Sample ID: Lab Control Sample Dup**
Matrix: Solid **Prep Type: Total/NA**
Analysis Batch: 286467

Analyte			Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
2-Ethoxyethanol			50.0	42.2		mg/Kg		84	70 - 130	1	30

Method: 8081A - Organochlorine Pesticides (GC)

Lab Sample ID: MB 240-420514/10-A **Client Sample ID: Method Blank**
Matrix: Solid **Prep Type: Total/NA**
Analysis Batch: 421199 **Prep Batch: 420514**

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chlordane (technical)	<0.0050		0.0050		mg/L		01/28/20 10:42	02/03/20 11:44	1
Endrin	<0.00050		0.00050		mg/L		01/28/20 10:42	02/03/20 11:44	1
Heptachlor	<0.00050		0.00050		mg/L		01/28/20 10:42	02/03/20 11:44	1
Heptachlor epoxide	<0.00050		0.00050		mg/L		01/28/20 10:42	02/03/20 11:44	1
gamma-BHC (Lindane)	<0.00050		0.00050		mg/L		01/28/20 10:42	02/03/20 11:44	1
Methoxychlor	<0.0010		0.0010		mg/L		01/28/20 10:42	02/03/20 11:44	1
Toxaphene	<0.020		0.020		mg/L		01/28/20 10:42	02/03/20 11:44	1

Surrogate	*MB %Recovery*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Tetrachloro-m-xylene	*67*		*33 - 123*	*01/28/20 10:42*	*02/03/20 11:44*	*1*
Tetrachloro-m-xylene	*66*		*33 - 123*	*01/28/20 10:42*	*02/03/20 11:44*	*1*
DCB Decachlorobiphenyl	*77*		*21 - 135*	*01/28/20 10:42*	*02/03/20 11:44*	*1*
DCB Decachlorobiphenyl	*67*		*21 - 135*	*01/28/20 10:42*	*02/03/20 11:44*	*1*

Method: 8081A - Organochlorine Pesticides (GC) (Continued)

Lab Sample ID: LCS 240-420514/11-A
Matrix: Solid
Analysis Batch: 421199

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 420514

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Endrin	0.00160	0.00143		mg/L		90	36 - 124
Heptachlor	0.00160	0.00133		mg/L		83	37 - 120
Heptachlor epoxide	0.00160	0.00118		mg/L		74	44 - 120
gamma-BHC (Lindane)	0.00160	0.00103		mg/L		64	23 - 120
Methoxychlor	0.00160	0.00129		mg/L		81	36 - 120

Surrogate	*LCS %Recovery*	*LCS Qualifier*	*Limits*
Tetrachloro-m-xylene	*69*		*33 - 123*
Tetrachloro-m-xylene	*64*		*33 - 123*
DCB Decachlorobiphenyl	*78*		*21 - 135*
DCB Decachlorobiphenyl	*67*		*21 - 135*

Lab Sample ID: MB 240-420670/11-A
Matrix: Solid
Analysis Batch: 420998

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 420670

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chlordane (technical)	<0.0050		0.0050		mg/L		01/29/20 09:27	01/31/20 13:25	1
Endrin	<0.00050		0.00050		mg/L		01/29/20 09:27	01/31/20 13:25	1
Heptachlor	<0.00050		0.00050		mg/L		01/29/20 09:27	01/31/20 13:25	1
Heptachlor epoxide	<0.00050		0.00050		mg/L		01/29/20 09:27	01/31/20 13:25	1
gamma-BHC (Lindane)	<0.00050		0.00050		mg/L		01/29/20 09:27	01/31/20 13:25	1
Methoxychlor	<0.0010		0.0010		mg/L		01/29/20 09:27	01/31/20 13:25	1
Toxaphene	<0.020		0.020		mg/L		01/29/20 09:27	01/31/20 13:25	1

Surrogate	*MB %Recovery*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Tetrachloro-m-xylene	*54*		*33 - 123*	*01/29/20 09:27*	*01/31/20 13:25*	*1*
Tetrachloro-m-xylene	*50*		*33 - 123*	*01/29/20 09:27*	*01/31/20 13:25*	*1*
DCB Decachlorobiphenyl	*59*		*21 - 135*	*01/29/20 09:27*	*01/31/20 13:25*	*1*
DCB Decachlorobiphenyl	*54*		*21 - 135*	*01/29/20 09:27*	*01/31/20 13:25*	*1*

Lab Sample ID: LCS 240-420670/12-A
Matrix: Solid
Analysis Batch: 420998

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 420670

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Endrin	0.00160	0.00149		mg/L		93	36 - 124
Heptachlor	0.00160	0.00138		mg/L		86	37 - 120
Heptachlor epoxide	0.00160	0.00124		mg/L		78	44 - 120
gamma-BHC (Lindane)	0.00160	0.00114		mg/L		71	23 - 120
Methoxychlor	0.00160	0.00133		mg/L		83	36 - 120

Surrogate	*LCS %Recovery*	*LCS Qualifier*	*Limits*
Tetrachloro-m-xylene	*86*		*33 - 123*
Tetrachloro-m-xylene	*71*		*33 - 123*
DCB Decachlorobiphenyl	*75*		*21 - 135*
DCB Decachlorobiphenyl	*69*		*21 - 135*

Method: 8081A - Organochlorine Pesticides (GC) (Continued)

Lab Sample ID: LCS 240-420670/13-A **Client Sample ID: Lab Control Sample**
Matrix: Solid **Prep Type: Total/NA**
Analysis Batch: 420998 **Prep Batch: 420670**

Surrogate	LCS %Recovery	LCS Qualifier	Limits
Tetrachloro-m-xylene	67		33 - 123
Tetrachloro-m-xylene	62		33 - 123
DCB Decachlorobiphenyl	68		21 - 135
DCB Decachlorobiphenyl	60		21 - 135

Lab Sample ID: LCS 240-420670/15-A **Client Sample ID: Lab Control Sample**
Matrix: Solid **Prep Type: Total/NA**
Analysis Batch: 420998 **Prep Batch: 420670**

Surrogate	LCS %Recovery	LCS Qualifier	Limits
Tetrachloro-m-xylene	74		33 - 123
Tetrachloro-m-xylene	67		33 - 123
DCB Decachlorobiphenyl	72		21 - 135
DCB Decachlorobiphenyl	64		21 - 135

Lab Sample ID: LCSD 240-420670/14-A **Client Sample ID: Lab Control Sample Dup**
Matrix: Solid **Prep Type: Total/NA**
Analysis Batch: 420998 **Prep Batch: 420670**

Surrogate	LCSD %Recovery	LCSD Qualifier	Limits
Tetrachloro-m-xylene	81		33 - 123
Tetrachloro-m-xylene	58		33 - 123
DCB Decachlorobiphenyl	69		21 - 135
DCB Decachlorobiphenyl	60		21 - 135

Lab Sample ID: LCSD 240-420670/16-A **Client Sample ID: Lab Control Sample Dup**
Matrix: Solid **Prep Type: Total/NA**
Analysis Batch: 420998 **Prep Batch: 420670**

Surrogate	LCSD %Recovery	LCSD Qualifier	Limits
Tetrachloro-m-xylene	69		33 - 123
Tetrachloro-m-xylene	63		33 - 123
DCB Decachlorobiphenyl	71		21 - 135
DCB Decachlorobiphenyl	63		21 - 135

Method: 8082 - Polychlorinated Biphenyls (PCBs) by Gas Chromatography

Lab Sample ID: MB 240-420318/23-A **Client Sample ID: Method Blank**
Matrix: Solid **Prep Type: Total/NA**
Analysis Batch: 420600 **Prep Batch: 420318**

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Aroclor-1016	<50		50		ug/Kg		01/27/20 09:29	01/29/20 08:43	1
Aroclor-1221	<50		50		ug/Kg		01/27/20 09:29	01/29/20 08:43	1
Aroclor-1232	<50		50		ug/Kg		01/27/20 09:29	01/29/20 08:43	1
Aroclor-1242	<50		50		ug/Kg		01/27/20 09:29	01/29/20 08:43	1
Aroclor-1248	<50		50		ug/Kg		01/27/20 09:29	01/29/20 08:43	1
Aroclor-1254	<50		50		ug/Kg		01/27/20 09:29	01/29/20 08:43	1

Method: 8082 - Polychlorinated Biphenyls (PCBs) by Gas Chromatography (Continued)

Lab Sample ID: MB 240-420318/23-A — **Client Sample ID: Method Blank**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 420600 — **Prep Batch: 420318**

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Aroclor-1260	<50		50		ug/Kg		01/27/20 09:29	01/29/20 08:43	1
Aroclor-1262	<50		50		ug/Kg		01/27/20 09:29	01/29/20 08:43	1
Aroclor-1268	<50		50		ug/Kg		01/27/20 09:29	01/29/20 08:43	1
Polychlorinated biphenyls, Total	<50		50		ug/Kg		01/27/20 09:29	01/29/20 08:43	1

Surrogate	*MB %Recovery*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Tetrachloro-m-xylene	*77*		*14 - 128*	*01/27/20 09:29*	*01/29/20 08:43*	*1*
DCB Decachlorobiphenyl	*99*		*10 - 132*	*01/27/20 09:29*	*01/29/20 08:43*	*1*

Lab Sample ID: LCS 240-420318/24-A — **Client Sample ID: Lab Control Sample**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 420783 — **Prep Batch: 420318**

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Aroclor-1016	1000	509		ug/Kg		51	47 - 120
Aroclor-1260	1000	708		ug/Kg		71	46 - 120

Surrogate	*LCS %Recovery*	*LCS Qualifier*	*Limits*
Tetrachloro-m-xylene	*47*		*14 - 128*
DCB Decachlorobiphenyl	*79*		*10 - 132*

Lab Sample ID: 240-125349-1 MS — **Client Sample ID: FR34-WC-001**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 420600 — **Prep Batch: 420318**

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
Aroclor-1016	<20		408	209		ug/Kg	☼	51	31 - 120
Aroclor-1260	<20	F2	408	194		ug/Kg	☼	47	21 - 122

Surrogate	*MS %Recovery*	*MS Qualifier*	*Limits*
Tetrachloro-m-xylene	*46*		*14 - 128*
DCB Decachlorobiphenyl	*48*		*10 - 132*

Lab Sample ID: 240-125349-1 MSD — **Client Sample ID: FR34-WC-001**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 420600 — **Prep Batch: 420318**

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Aroclor-1016	<20		417	265		ug/Kg	☼	64	31 - 120	23	30
Aroclor-1260	<20		417	299	F2	ug/Kg	☼	72	21 - 122	76	30

Surrogate	*MSD %Recovery*	*MSD Qualifier*	*Limits*
Tetrachloro-m-xylene	*65*		*14 - 128*
DCB Decachlorobiphenyl	*85*		*10 - 132*

Method: 8082 - Polychlorinated Biphenyls (PCBs) by Gas Chromatography (Continued)

Lab Sample ID: MB 240-420468/23-A — **Client Sample ID: Method Blank**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 420734 — **Prep Batch: 420468**

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Aroclor-1016	<50		50		ug/Kg		01/28/20 08:43	01/30/20 09:39	1
Aroclor-1221	<50		50		ug/Kg		01/28/20 08:43	01/30/20 09:39	1
Aroclor-1232	<50		50		ug/Kg		01/28/20 08:43	01/30/20 09:39	1
Aroclor-1242	<50		50		ug/Kg		01/28/20 08:43	01/30/20 09:39	1
Aroclor-1248	<50		50		ug/Kg		01/28/20 08:43	01/30/20 09:39	1
Aroclor-1254	<50		50		ug/Kg		01/28/20 08:43	01/30/20 09:39	1
Aroclor-1260	<50		50		ug/Kg		01/28/20 08:43	01/30/20 09:39	1
Aroclor-1262	<50		50		ug/Kg		01/28/20 08:43	01/30/20 09:39	1
Aroclor-1268	<50		50		ug/Kg		01/28/20 08:43	01/30/20 09:39	1
Polychlorinated biphenyls, Total	<50		50		ug/Kg		01/28/20 08:43	01/30/20 09:39	1

Surrogate	*MB %Recovery*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Tetrachloro-m-xylene	*70*		*14 - 128*	*01/28/20 08:43*	*01/30/20 09:39*	*1*
DCB Decachlorobiphenyl	*82*		*10 - 132*	*01/28/20 08:43*	*01/30/20 09:39*	*1*

Lab Sample ID: LCS 240-420468/24-A — **Client Sample ID: Lab Control Sample**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 420734 — **Prep Batch: 420468**

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Aroclor-1016	1000	511		ug/Kg		51	47 - 120
Aroclor-1260	1000	543		ug/Kg		54	46 - 120

Surrogate	*LCS %Recovery*	*LCS Qualifier*	*Limits*
Tetrachloro-m-xylene	*53*		*14 - 128*
DCB Decachlorobiphenyl	*58*		*10 - 132*

Method: 8151A - Herbicides (GC)

Lab Sample ID: MB 240-420673/11-A — **Client Sample ID: Method Blank**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 421192 — **Prep Batch: 420673**

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
2,4-D	<0.040		0.040		mg/L		01/29/20 09:30	02/04/20 11:44	1
Silvex (2,4,5-TP)	<0.010		0.010		mg/L		01/29/20 09:30	02/04/20 11:44	1

Surrogate	*MB %Recovery*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
2,4-Dichlorophenylacetic acid	*76*		*41 - 130*	*01/29/20 09:30*	*02/04/20 11:44*	*1*
2,4-Dichlorophenylacetic acid	*83*		*41 - 130*	*01/29/20 09:30*	*02/04/20 11:44*	*1*

Lab Sample ID: LCS 240-420673/12-A — **Client Sample ID: Lab Control Sample**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 421192 — **Prep Batch: 420673**

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
2,4-D	0.100	0.0992		mg/L		99	42 - 120
Silvex (2,4,5-TP)	0.0250	0.0250		mg/L		100	41 - 120

Method: 8151A - Herbicides (GC) (Continued)

Surrogate	LCS %Recovery	LCS Qualifier	Limits
2,4-Dichlorophenylacetic acid	80		41 - 130
2,4-Dichlorophenylacetic acid	87		41 - 130

Lab Sample ID: MB 240-421213/10-A — **Client Sample ID: Method Blank**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 421572 — **Prep Batch: 421213**

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
2,4-D	<0.040		0.040		mg/L		02/03/20 10:51	02/05/20 11:50	1
Silvex (2,4,5-TP)	<0.010		0.010		mg/L		02/03/20 10:51	02/05/20 11:50	1

Surrogate	MB %Recovery	MB Qualifier	Limits	Prepared	Analyzed	Dil Fac
2,4-Dichlorophenylacetic acid	82		41 - 130	02/03/20 10:51	02/05/20 11:50	1
2,4-Dichlorophenylacetic acid	89		41 - 130	02/03/20 10:51	02/05/20 11:50	1

Lab Sample ID: LCS 240-421213/11-A — **Client Sample ID: Lab Control Sample**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 421572 — **Prep Batch: 421213**

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
2,4-D	0.100	0.0787		mg/L		79	42 - 120
Silvex (2,4,5-TP)	0.0250	0.0203		mg/L		81	41 - 120

Surrogate	LCS %Recovery	LCS Qualifier	Limits
2,4-Dichlorophenylacetic acid	71		41 - 130
2,4-Dichlorophenylacetic acid	72		41 - 130

Lab Sample ID: 240-125349-1 MS — **Client Sample ID: FR34-WC-001**
Matrix: Solid — **Prep Type: TCLP**
Analysis Batch: 421572 — **Prep Batch: 421213**

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
2,4-D	<0.040		0.100	0.0872		mg/L		87	38 - 120
Silvex (2,4,5-TP)	<0.010		0.0250	0.0223		mg/L		89	36 - 120

Surrogate	MS %Recovery	MS Qualifier	Limits
2,4-Dichlorophenylacetic acid	84		41 - 130
2,4-Dichlorophenylacetic acid	87		41 - 130

Method: 6010C - Metals (ICP)

Lab Sample ID: MB 240-420371/1-A — **Client Sample ID: Method Blank**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 420534 — **Prep Batch: 420371**

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	<1.5		1.5		mg/Kg		01/27/20 14:00	01/28/20 16:32	1
Barium	<20		20		mg/Kg		01/27/20 14:00	01/28/20 16:32	1
Cadmium	<0.50		0.50		mg/Kg		01/27/20 14:00	01/28/20 16:32	1
Chromium	<1.0		1.0		mg/Kg		01/27/20 14:00	01/28/20 16:32	1
Nickel	<4.0		4.0		mg/Kg		01/27/20 14:00	01/28/20 16:32	1

Method: 6010C - Metals (ICP) (Continued)

Lab Sample ID: MB 240-420371/1-A
Matrix: Solid
Analysis Batch: 420534

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 420371

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Lead	<1.0		1.0		mg/Kg		01/27/20 14:00	01/28/20 16:32	1
Silver	<1.0		1.0		mg/Kg		01/27/20 14:00	01/28/20 16:32	1
Selenium	<2.0		2.0		mg/Kg		01/27/20 14:00	01/28/20 16:32	1

Lab Sample ID: LCS 240-420371/2-A
Matrix: Solid
Analysis Batch: 420534

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 420371

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Arsenic	200	192		mg/Kg		96	80 - 120
Barium	200	189		mg/Kg		94	80 - 120
Cadmium	100	94.3		mg/Kg		94	80 - 120
Chromium	100	94.5		mg/Kg		95	80 - 120
Nickel	100	96.2		mg/Kg		96	80 - 120
Lead	100	90.4		mg/Kg		90	80 - 120
Silver	10.0	9.06		mg/Kg		91	80 - 120
Selenium	200	190		mg/Kg		95	80 - 120

Lab Sample ID: MB 240-420496/2-A
Matrix: Solid
Analysis Batch: 420700

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 420496

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	<0.050		0.050		mg/L		01/28/20 14:00	01/29/20 14:20	1
Barium	<0.50		0.50		mg/L		01/28/20 14:00	01/29/20 14:20	1
Cadmium	<0.050		0.050		mg/L		01/28/20 14:00	01/29/20 14:20	1
Chromium	<0.050		0.050		mg/L		01/28/20 14:00	01/29/20 14:20	1
Nickel	<0.040		0.040		mg/L		01/28/20 14:00	01/29/20 14:20	1
Lead	<0.050		0.050		mg/L		01/28/20 14:00	01/29/20 14:20	1
Silver	<0.050		0.050		mg/L		01/28/20 14:00	01/29/20 14:20	1
Selenium	<0.050		0.050		mg/L		01/28/20 14:00	01/29/20 14:20	1

Lab Sample ID: LCS 240-420496/3-A
Matrix: Solid
Analysis Batch: 420700

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 420496

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Arsenic	2.00	2.24		mg/L		112	50 - 150
Barium	2.00	2.08		mg/L		104	50 - 150
Cadmium	1.00	1.06		mg/L		106	50 - 150
Chromium	1.00	1.05		mg/L		105	50 - 150
Nickel	1.00	1.10		mg/L		110	50 - 150
Lead	1.00	0.963		mg/L		96	50 - 150
Silver	0.100	0.108		mg/L		108	50 - 150
Selenium	2.00	2.21		mg/L		111	50 - 150

Method: 6010C - Metals (ICP) (Continued)

Lab Sample ID: MB 240-420632/2-A
Matrix: Solid
Analysis Batch: 420871

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 420632

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	<0.050		0.050		mg/L		01/29/20 14:00	01/30/20 12:28	1
Barium	<0.50		0.50		mg/L		01/29/20 14:00	01/30/20 12:28	1
Cadmium	<0.050		0.050		mg/L		01/29/20 14:00	01/30/20 12:28	1
Chromium	<0.050		0.050		mg/L		01/29/20 14:00	01/30/20 12:28	1
Nickel	<0.040		0.040		mg/L		01/29/20 14:00	01/30/20 12:28	1
Lead	<0.050		0.050		mg/L		01/29/20 14:00	01/30/20 12:28	1
Silver	<0.050		0.050		mg/L		01/29/20 14:00	01/30/20 12:28	1
Selenium	<0.050		0.050		mg/L		01/29/20 14:00	01/30/20 12:28	1
Antimony	<0.30		0.30		mg/L		01/29/20 14:00	01/30/20 12:28	1
Beryllium	<0.0050		0.0050		mg/L		01/29/20 14:00	01/30/20 12:28	1
Thallium	<2.0		2.0		mg/L		01/29/20 14:00	01/30/20 12:28	1

Lab Sample ID: LCS 240-420632/3-A
Matrix: Solid
Analysis Batch: 420871

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 420632

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Arsenic	2.00	2.02		mg/L		101	50 - 150
Barium	2.00	1.94		mg/L		97	50 - 150
Cadmium	1.00	0.977		mg/L		98	50 - 150
Chromium	1.00	0.997		mg/L		100	50 - 150
Nickel	1.00	1.00		mg/L		100	50 - 150
Lead	1.00	0.880		mg/L		88	50 - 150
Silver	0.100	0.102		mg/L		102	50 - 150
Selenium	2.00	2.01		mg/L		101	50 - 150
Antimony	1.00	0.982		mg/L		98	50 - 150
Beryllium	1.00	0.979		mg/L		98	50 - 150
Thallium	2.00	1.87	J	mg/L		94	50 - 150

Lab Sample ID: MB 240-420689/1-A
Matrix: Solid
Analysis Batch: 420871

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 420689

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	<1.5		1.5		mg/Kg		01/29/20 14:00	01/30/20 16:27	1
Barium	<20		20		mg/Kg		01/29/20 14:00	01/30/20 16:27	1
Cadmium	<0.50		0.50		mg/Kg		01/29/20 14:00	01/30/20 16:27	1
Chromium	<1.0		1.0		mg/Kg		01/29/20 14:00	01/30/20 16:27	1
Nickel	<4.0		4.0		mg/Kg		01/29/20 14:00	01/30/20 16:27	1
Lead	<1.0		1.0		mg/Kg		01/29/20 14:00	01/30/20 16:27	1
Silver	<1.0		1.0		mg/Kg		01/29/20 14:00	01/30/20 16:27	1
Selenium	<2.0		2.0		mg/Kg		01/29/20 14:00	01/30/20 16:27	1

Lab Sample ID: LCS 240-420689/2-A
Matrix: Solid
Analysis Batch: 420871

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 420689

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Arsenic	200	185		mg/Kg		93	80 - 120

Method: 6010C - Metals (ICP) (Continued)

Lab Sample ID: LCS 240-420689/2-A **Client Sample ID: Lab Control Sample**
Matrix: Solid **Prep Type: Total/NA**
Analysis Batch: 420871 **Prep Batch: 420689**

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Barium	200	186		mg/Kg		93	80 - 120
Cadmium	100	92.1		mg/Kg		92	80 - 120
Chromium	100	93.6		mg/Kg		94	80 - 120
Nickel	100	92.1		mg/Kg		92	80 - 120
Lead	100	87.4		mg/Kg		87	80 - 120
Silver	10.0	9.15		mg/Kg		91	80 - 120
Selenium	200	182		mg/Kg		91	80 - 120

Lab Sample ID: LB 240-420379/1-B **Client Sample ID: Method Blank**
Matrix: Solid **Prep Type: TCLP**
Analysis Batch: 420700 **Prep Batch: 420496**

Analyte	LB Result	LB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	<0.050		0.050		mg/L		01/28/20 14:00	01/29/20 14:15	1
Barium	<0.50		0.50		mg/L		01/28/20 14:00	01/29/20 14:15	1
Cadmium	<0.050		0.050		mg/L		01/28/20 14:00	01/29/20 14:15	1
Chromium	<0.050		0.050		mg/L		01/28/20 14:00	01/29/20 14:15	1
Nickel	<0.040		0.040		mg/L		01/28/20 14:00	01/29/20 14:15	1
Lead	<0.050		0.050		mg/L		01/28/20 14:00	01/29/20 14:15	1
Silver	<0.050		0.050		mg/L		01/28/20 14:00	01/29/20 14:15	1
Selenium	<0.050		0.050		mg/L		01/28/20 14:00	01/29/20 14:15	1

Lab Sample ID: LB 240-420576/1-B **Client Sample ID: Method Blank**
Matrix: Solid **Prep Type: TCLP**
Analysis Batch: 420871 **Prep Batch: 420632**

Analyte	LB Result	LB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	<0.050		0.050		mg/L		01/29/20 14:00	01/30/20 12:23	1
Barium	<0.50		0.50		mg/L		01/29/20 14:00	01/30/20 12:23	1
Cadmium	<0.050		0.050		mg/L		01/29/20 14:00	01/30/20 12:23	1
Chromium	<0.050		0.050		mg/L		01/29/20 14:00	01/30/20 12:23	1
Nickel	<0.040		0.040		mg/L		01/29/20 14:00	01/30/20 12:23	1
Lead	<0.050		0.050		mg/L		01/29/20 14:00	01/30/20 12:23	1
Silver	<0.050		0.050		mg/L		01/29/20 14:00	01/30/20 12:23	1
Selenium	<0.050		0.050		mg/L		01/29/20 14:00	01/30/20 12:23	1
Antimony	<0.30		0.30		mg/L		01/29/20 14:00	01/30/20 12:23	1
Beryllium	<0.0050		0.0050		mg/L		01/29/20 14:00	01/30/20 12:23	1
Thallium	<2.0		2.0		mg/L		01/29/20 14:00	01/30/20 12:23	1

Method: 7470A - Mercury (CVAA)

Lab Sample ID: MB 240-420499/2-A **Client Sample ID: Method Blank**
Matrix: Solid **Prep Type: Total/NA**
Analysis Batch: 420727 **Prep Batch: 420499**

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	<0.0020		0.0020		mg/L		01/28/20 12:00	01/29/20 12:49	1

Method: 7470A - Mercury (CVAA) (Continued)

Lab Sample ID: LCS 240-420499/3-A — **Client Sample ID: Lab Control Sample**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 420727 — **Prep Batch: 420499**

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Mercury	0.00500	0.00507		mg/L		101	80 - 120

Lab Sample ID: MB 240-420636/2-A — **Client Sample ID: Method Blank**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 420971 — **Prep Batch: 420636**

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	<0.0020		0.0020		mg/L		01/29/20 12:00	01/30/20 12:17	1

Lab Sample ID: LCS 240-420636/3-A — **Client Sample ID: Lab Control Sample**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 420971 — **Prep Batch: 420636**

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Mercury	0.00500	0.00488		mg/L		98	80 - 120

Lab Sample ID: LB 240-420379/1-C — **Client Sample ID: Method Blank**
Matrix: Solid — **Prep Type: TCLP**
Analysis Batch: 420727 — **Prep Batch: 420499**

Analyte	LB Result	LB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	<0.0020		0.0020		mg/L		01/28/20 12:00	01/29/20 12:47	1

Lab Sample ID: LB 240-420576/1-C — **Client Sample ID: Method Blank**
Matrix: Solid — **Prep Type: TCLP**
Analysis Batch: 420971 — **Prep Batch: 420636**

Analyte	LB Result	LB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	<0.0020		0.0020		mg/L		01/29/20 12:00	01/30/20 12:15	1

Method: 7471B - Mercury (CVAA)

Lab Sample ID: MB 240-420377/1-A — **Client Sample ID: Method Blank**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 420630 — **Prep Batch: 420377**

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	<0.10		0.10		mg/Kg		01/27/20 16:00	01/28/20 13:52	1

Lab Sample ID: LCS 240-420377/2-A — **Client Sample ID: Lab Control Sample**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 420630 — **Prep Batch: 420377**

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Mercury	0.833	0.820		mg/Kg		98	80 - 120

Method: 7471B - Mercury (CVAA) (Continued)

Lab Sample ID: MB 240-420694/1-A — **Client Sample ID: Method Blank**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 420912 — **Prep Batch: 420694**

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	<0.10		0.10		mg/Kg		01/29/20 16:00	01/30/20 11:19	1

Lab Sample ID: LCS 240-420694/2-A — **Client Sample ID: Lab Control Sample**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 420912 — **Prep Batch: 420694**

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Mercury	0.833	0.883		mg/Kg		106	80 - 120

Method: 1010 - Ignitability, Pensky-Martens Closed-Cup Method

Lab Sample ID: LCS 240-420527/1 — **Client Sample ID: Lab Control Sample**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 420527

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Flashpoint	81.0	81.00		Degrees F		100	97 - 103

Lab Sample ID: LCS 240-420763/1 — **Client Sample ID: Lab Control Sample**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 420763

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Flashpoint	81.0	81.00		Degrees F		100	97 - 103

Lab Sample ID: LCS 240-420763/2 — **Client Sample ID: Lab Control Sample**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 420763

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Flashpoint	81.0	80.00		Degrees F		99	97 - 103

Lab Sample ID: LCS 240-420763/3 — **Client Sample ID: Lab Control Sample**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 420763

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Flashpoint	81.0	81.00		Degrees F		100	97 - 103

Lab Sample ID: LCS 240-420763/4 — **Client Sample ID: Lab Control Sample**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 420763

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Flashpoint	81.0	82.00		Degrees F		101	97 - 103

Method: 1010 - Ignitability, Pensky-Martens Closed-Cup Method (Continued)

Lab Sample ID: 240-125349-8 DU — **Client Sample ID: FR34-WC-008**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 420763

Analyte	Sample Result	Sample Qualifier		DU Result	DU Qualifier	Unit	D			RPD	RPD Limit
Flashpoint	>200			>200		Degrees F				NC	20

Method: 9012A - Cyanide, Total and/or Amenable

Lab Sample ID: MB 240-420678/1-A — **Client Sample ID: Method Blank**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 420764 — **Prep Batch: 420678**

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cyanide, Total	<0.54		0.54		mg/Kg		01/29/20 09:55	01/29/20 12:53	1

Lab Sample ID: LCS 240-420678/2-A — **Client Sample ID: Lab Control Sample**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 420764 — **Prep Batch: 420678**

Analyte			Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits		
Cyanide, Total			4.66	4.45		mg/Kg		96	65 - 128		

Lab Sample ID: 240-125349-2 MS — **Client Sample ID: FR34-WC-002**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 420764 — **Prep Batch: 420678**

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits		
Cyanide, Total	<0.57	F2	1.27	1.21		mg/Kg	☼	95	24 - 140		

Lab Sample ID: 240-125349-2 MSD — **Client Sample ID: FR34-WC-002**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 420764 — **Prep Batch: 420678**

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Cyanide, Total	<0.57	F2	1.09	<0.57	F4	mg/Kg	☼	36	24 - 140	102	40

Method: 9034 - Sulfide, Acid soluble and Insoluble (Titrimetric)

Lab Sample ID: MB 240-420300/1-A — **Client Sample ID: Method Blank**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 420363 — **Prep Batch: 420300**

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Sulfide	<30		30		mg/Kg		01/27/20 07:57	01/27/20 11:54	1

Lab Sample ID: LCS 240-420300/2-A — **Client Sample ID: Lab Control Sample**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 420363 — **Prep Batch: 420300**

Analyte			Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits		
Sulfide			78.5	73.2		mg/Kg		93	56 - 120		

Method: 9034 - Sulfide, Acid soluble and Insoluble (Titrimetric) (Continued)

Lab Sample ID: MB 240-420831/1-A **Client Sample ID: Method Blank**
Matrix: Solid **Prep Type: Total/NA**
Analysis Batch: 420861 **Prep Batch: 420831**

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Sulfide	<30		30		mg/Kg		01/30/20 09:05	01/30/20 09:54	1

Lab Sample ID: LCS 240-420831/2-A **Client Sample ID: Lab Control Sample**
Matrix: Solid **Prep Type: Total/NA**
Analysis Batch: 420861 **Prep Batch: 420831**

Analyte			Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits		
Sulfide			82.7	78.7		mg/Kg		95	56 - 120		

Method: 9045C - pH

Lab Sample ID: LCS 240-420370/2 **Client Sample ID: Lab Control Sample**
Matrix: Solid **Prep Type: Total/NA**
Analysis Batch: 420370

Analyte			Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits		
pH			6.00	6.1		SU		101	97 - 103		

Lab Sample ID: 240-125349-3 DU **Client Sample ID: FR34-WC-003**
Matrix: Solid **Prep Type: Total/NA**
Analysis Batch: 420370

Analyte	Sample Result	Sample Qualifier		DU Result	DU Qualifier	Unit	D			RPD	RPD Limit
pH	8.4	HF		8.5		SU				0.8	20

Lab Sample ID: LCS 240-420553/39 **Client Sample ID: Lab Control Sample**
Matrix: Solid **Prep Type: Total/NA**
Analysis Batch: 420553

Analyte			Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits		
pH			6.00	6.0		SU		100	97 - 103		

Lab Sample ID: 240-125349-8 DU **Client Sample ID: FR34-WC-008**
Matrix: Solid **Prep Type: Total/NA**
Analysis Batch: 420553

Analyte	Sample Result	Sample Qualifier		DU Result	DU Qualifier	Unit	D			RPD	RPD Limit
pH	6.4	HF		6.5		SU				2	20

Method: 9095A - Paint Filter

Lab Sample ID: 240-125349-1 DU **Client Sample ID: FR34-WC-001**
Matrix: Solid **Prep Type: Total/NA**
Analysis Batch: 421654

Analyte	Sample Result	Sample Qualifier		DU Result	DU Qualifier	Unit	D			RPD	RPD Limit
Free Liquid	CNF			CNF		NONE				NC	20

QC Association Summary

Client: Leidos, Inc.
Project/Site: NASA PBS Waste - FR3 + 4

Job ID: 240-125349-1

GC/MS VOA

Processed Batch: 420314

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
240-125349-8	FR34-WC-008	Total/NA	Solid	Part Size Red	
240-125349-8 MS	FR34-WC-008	Total/NA	Solid	Part Size Red	
240-125349-8 MSD	FR34-WC-008	Total/NA	Solid	Part Size Red	

Processed Batch: 420315

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
240-125349-8	FR34-WC-008	TCLP	Solid	Part Size Red	

Leach Batch: 420397

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
240-125349-1	FR34-WC-001	TCLP	Solid	1311	
240-125349-2	FR34-WC-002	TCLP	Solid	1311	
240-125349-3	FR34-WC-003	TCLP	Solid	1311	
240-125349-4	FR34-WC-004	TCLP	Solid	1311	
240-125349-5	FR34-WC-005	TCLP	Solid	1311	
LB 240-420397/1-A MB	Method Blank	TCLP	Solid	1311	
240-125349-5 MS	FR34-WC-005	TCLP	Solid	1311	
240-125349-5 MSD	FR34-WC-005	TCLP	Solid	1311	

Analysis Batch: 420489

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
240-125349-1	FR34-WC-001	Total/NA	Solid	8260B	420546
240-125349-2	FR34-WC-002	Total/NA	Solid	8260B	420546
240-125349-3	FR34-WC-003	Total/NA	Solid	8260B	420546
240-125349-4	FR34-WC-004	Total/NA	Solid	8260B	420546
240-125349-7	FR34-WC-007	Total/NA	Solid	8260B	420546
MB 240-420489/7	Method Blank	Total/NA	Solid	8260B	
LCS 240-420489/5	Lab Control Sample	Total/NA	Solid	8260B	
LCS 240-420489/8	Lab Control Sample	Total/NA	Solid	8260B	
240-125349-4 MS	FR34-WC-004	Total/NA	Solid	8260B	420546
240-125349-4 MSD	FR34-WC-004	Total/NA	Solid	8260B	420546

Analysis Batch: 420538

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
240-125349-1	FR34-WC-001	TCLP	Solid	8260B	420397
240-125349-2	FR34-WC-002	TCLP	Solid	8260B	420397
240-125349-3	FR34-WC-003	TCLP	Solid	8260B	420397
240-125349-4	FR34-WC-004	TCLP	Solid	8260B	420397
240-125349-5	FR34-WC-005	TCLP	Solid	8260B	420397
LB 240-420397/1-A MB	Method Blank	TCLP	Solid	8260B	420397
LCS 240-420538/11	Lab Control Sample	Total/NA	Solid	8260B	
240-125349-5 MS	FR34-WC-005	TCLP	Solid	8260B	420397
240-125349-5 MSD	FR34-WC-005	TCLP	Solid	8260B	420397

Prep Batch: 420546

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
240-125349-1	FR34-WC-001	Total/NA	Solid	5030A	
240-125349-2	FR34-WC-002	Total/NA	Solid	5030A	
240-125349-3	FR34-WC-003	Total/NA	Solid	5030A	
240-125349-4	FR34-WC-004	Total/NA	Solid	5030A	
240-125349-7	FR34-WC-007	Total/NA	Solid	5030A	

GC/MS VOA (Continued)

Prep Batch: 420546 (Continued)

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
240-125349-4 MS	FR34-WC-004	Total/NA	Solid	5030A	
240-125349-4 MSD	FR34-WC-004	Total/NA	Solid	5030A	

Leach Batch: 420578

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
240-125349-6	FR34-WC-006	TCLP	Solid	1311	
240-125349-7	FR34-WC-007	TCLP	Solid	1311	
240-125349-8	FR34-WC-008	TCLP	Solid	1311	420315
LB 240-420578/1-A MB	Method Blank	TCLP	Solid	1311	

Analysis Batch: 420675

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
240-125349-5	FR34-WC-005	Total/NA	Solid	8260B	420722
240-125349-6	FR34-WC-006	Total/NA	Solid	8260B	420722
MB 240-420675/7	Method Blank	Total/NA	Solid	8260B	
LCS 240-420675/5	Lab Control Sample	Total/NA	Solid	8260B	
LCS 240-420675/8	Lab Control Sample	Total/NA	Solid	8260B	
240-125349-5 MS	FR34-WC-005	Total/NA	Solid	8260B	420722
240-125349-5 MSD	FR34-WC-005	Total/NA	Solid	8260B	420722

Prep Batch: 420722

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
240-125349-5	FR34-WC-005	Total/NA	Solid	5030A	
240-125349-6	FR34-WC-006	Total/NA	Solid	5030A	
240-125349-5 MS	FR34-WC-005	Total/NA	Solid	5030A	
240-125349-5 MSD	FR34-WC-005	Total/NA	Solid	5030A	

Analysis Batch: 420751

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
240-125349-6	FR34-WC-006	TCLP	Solid	8260B	420578
240-125349-7	FR34-WC-007	TCLP	Solid	8260B	420578
240-125349-8	FR34-WC-008	TCLP	Solid	8260B	420578
LB 240-420578/1-A MB	Method Blank	TCLP	Solid	8260B	420578
LCS 240-420751/10	Lab Control Sample	Total/NA	Solid	8260B	

Prep Batch: 420776

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
240-125349-8	FR34-WC-008	Total/NA	Solid	5030B	420314
MB 240-420776/1-A	Method Blank	Total/NA	Solid	5030B	
LCS 240-420776/2-A	Lab Control Sample	Total/NA	Solid	5030B	
240-125349-8 MS	FR34-WC-008	Total/NA	Solid	5030B	420314
240-125349-8 MSD	FR34-WC-008	Total/NA	Solid	5030B	420314

Analysis Batch: 420897

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
240-125349-8	FR34-WC-008	Total/NA	Solid	8260B	420776
MB 240-420776/1-A	Method Blank	Total/NA	Solid	8260B	420776
LCS 240-420776/2-A	Lab Control Sample	Total/NA	Solid	8260B	420776
240-125349-8 MS	FR34-WC-008	Total/NA	Solid	8260B	420776
240-125349-8 MSD	FR34-WC-008	Total/NA	Solid	8260B	420776

QC Association Summary

Client: Leidos, Inc.
Project/Site: NASA PBS Waste - FR3 + 4

Job ID: 240-125349-1

GC/MS Semi VOA

Processed Batch: 420314

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
240-125349-8 - RA	FR34-WC-008	Total/NA	Solid	Part Size Red	
240-125349-8	FR34-WC-008	Total/NA	Solid	Part Size Red	

Processed Batch: 420315

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
240-125349-8	FR34-WC-008	TCLP	Solid	Part Size Red	

Leach Batch: 420379

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
240-125349-1	FR34-WC-001	TCLP	Solid	1311	
240-125349-2	FR34-WC-002	TCLP	Solid	1311	
240-125349-3	FR34-WC-003	TCLP	Solid	1311	
240-125349-4	FR34-WC-004	TCLP	Solid	1311	
240-125349-5	FR34-WC-005	TCLP	Solid	1311	
240-125349-6	FR34-WC-006	TCLP	Solid	1311	
240-125349-7	FR34-WC-007	TCLP	Solid	1311	

Prep Batch: 420483

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
240-125349-1	FR34-WC-001	Total/NA	Solid	3540C	
240-125349-2 - RA	FR34-WC-002	Total/NA	Solid	3540C	
240-125349-2	FR34-WC-002	Total/NA	Solid	3540C	
240-125349-3	FR34-WC-003	Total/NA	Solid	3540C	
240-125349-3 - RA	FR34-WC-003	Total/NA	Solid	3540C	
240-125349-4 - RA	FR34-WC-004	Total/NA	Solid	3540C	
240-125349-4	FR34-WC-004	Total/NA	Solid	3540C	
240-125349-5	FR34-WC-005	Total/NA	Solid	3540C	
240-125349-5 - RA	FR34-WC-005	Total/NA	Solid	3540C	
240-125349-6	FR34-WC-006	Total/NA	Solid	3540C	
240-125349-7	FR34-WC-007	Total/NA	Solid	3540C	
240-125349-8	FR34-WC-008	Total/NA	Solid	3540C	420314
240-125349-8 - RA	FR34-WC-008	Total/NA	Solid	3540C	420314
MB 240-420483/22-A	Method Blank	Total/NA	Solid	3540C	
LCS 240-420483/23-A	Lab Control Sample	Total/NA	Solid	3540C	
240-125349-1 MS	FR34-WC-001	Total/NA	Solid	3540C	
240-125349-1 MSD	FR34-WC-001	Total/NA	Solid	3540C	

Prep Batch: 420513

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
240-125349-1	FR34-WC-001	TCLP	Solid	3510C	420379
240-125349-2	FR34-WC-002	TCLP	Solid	3510C	420379
240-125349-3	FR34-WC-003	TCLP	Solid	3510C	420379
240-125349-4	FR34-WC-004	TCLP	Solid	3510C	420379
240-125349-5	FR34-WC-005	TCLP	Solid	3510C	420379
240-125349-6	FR34-WC-006	TCLP	Solid	3510C	420379
240-125349-7	FR34-WC-007	TCLP	Solid	3510C	420379
MB 240-420513/21-A	Method Blank	Total/NA	Solid	3510C	
LCS 240-420513/22-A	Lab Control Sample	Total/NA	Solid	3510C	

QC Association Summary

Client: Leidos, Inc.
Project/Site: NASA PBS Waste - FR3 + 4

Job ID: 240-125349-1

GC/MS Semi VOA

Leach Batch: 420576

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
240-125349-8	FR34-WC-008	TCLP	Solid	1311	420315

Prep Batch: 420669

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
240-125349-8	FR34-WC-008	TCLP	Solid	3510C	420576
MB 240-420669/16-A	Method Blank	Total/NA	Solid	3510C	
LCS 240-420669/17-A	Lab Control Sample	Total/NA	Solid	3510C	

Analysis Batch: 420777

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
240-125349-1	FR34-WC-001	TCLP	Solid	8270C	420513
240-125349-2	FR34-WC-002	TCLP	Solid	8270C	420513
240-125349-3	FR34-WC-003	TCLP	Solid	8270C	420513
240-125349-4	FR34-WC-004	TCLP	Solid	8270C	420513
240-125349-5	FR34-WC-005	TCLP	Solid	8270C	420513
240-125349-6	FR34-WC-006	TCLP	Solid	8270C	420513
240-125349-7	FR34-WC-007	TCLP	Solid	8270C	420513
MB 240-420513/21-A	Method Blank	Total/NA	Solid	8270C	420513
LCS 240-420513/22-A	Lab Control Sample	Total/NA	Solid	8270C	420513

Analysis Batch: 421339

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
240-125349-8	FR34-WC-008	TCLP	Solid	8270C	420669
MB 240-420669/16-A	Method Blank	Total/NA	Solid	8270C	420669
LCS 240-420669/17-A	Lab Control Sample	Total/NA	Solid	8270C	420669

Analysis Batch: 421566

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
240-125349-1	FR34-WC-001	Total/NA	Solid	8270D	420483
240-125349-2	FR34-WC-002	Total/NA	Solid	8270D	420483
240-125349-2 - RA	FR34-WC-002	Total/NA	Solid	8270D	420483
240-125349-3	FR34-WC-003	Total/NA	Solid	8270D	420483
240-125349-3 - RA	FR34-WC-003	Total/NA	Solid	8270D	420483
240-125349-4 - RA	FR34-WC-004	Total/NA	Solid	8270D	420483
240-125349-5 - RA	FR34-WC-005	Total/NA	Solid	8270D	420483
240-125349-6	FR34-WC-006	Total/NA	Solid	8270D	420483
240-125349-7	FR34-WC-007	Total/NA	Solid	8270D	420483
240-125349-8	FR34-WC-008	Total/NA	Solid	8270D	420483
240-125349-8 - RA	FR34-WC-008	Total/NA	Solid	8270D	420483
MB 240-420483/22-A	Method Blank	Total/NA	Solid	8270D	420483
LCS 240-420483/23-A	Lab Control Sample	Total/NA	Solid	8270D	420483
240-125349-1 MS	FR34-WC-001	Total/NA	Solid	8270D	420483
240-125349-1 MSD	FR34-WC-001	Total/NA	Solid	8270D	420483

Analysis Batch: 421712

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
240-125349-4	FR34-WC-004	Total/NA	Solid	8270D	420483
240-125349-5	FR34-WC-005	Total/NA	Solid	8270D	420483

QC Association Summary

Client: Leidos, Inc.
Project/Site: NASA PBS Waste - FR3 + 4

Job ID: 240-125349-1

GC VOA

Leach Batch: 286233

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
240-125349-1	FR34-WC-001	Soluble	Solid	DI Leach	
240-125349-2	FR34-WC-002	Soluble	Solid	DI Leach	
240-125349-3	FR34-WC-003	Soluble	Solid	DI Leach	
240-125349-4	FR34-WC-004	Soluble	Solid	DI Leach	
240-125349-5	FR34-WC-005	Soluble	Solid	DI Leach	
240-125349-6	FR34-WC-006	Soluble	Solid	DI Leach	
240-125349-7	FR34-WC-007	Soluble	Solid	DI Leach	

Analysis Batch: 286234

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
240-125349-1	FR34-WC-001	Soluble	Solid	8015B	286233
240-125349-2	FR34-WC-002	Soluble	Solid	8015B	286233
240-125349-3	FR34-WC-003	Soluble	Solid	8015B	286233
240-125349-4	FR34-WC-004	Soluble	Solid	8015B	286233
240-125349-5	FR34-WC-005	Soluble	Solid	8015B	286233
240-125349-6	FR34-WC-006	Soluble	Solid	8015B	286233
240-125349-7	FR34-WC-007	Soluble	Solid	8015B	286233
MB 600-286234/2	Method Blank	Total/NA	Solid	8015B	
LCS 600-286234/3	Lab Control Sample	Total/NA	Solid	8015B	
LCSD 600-286234/4	Lab Control Sample Dup	Total/NA	Solid	8015B	

Analysis Batch: 286237

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
240-125349-4	FR34-WC-004	Soluble	Solid	8015B	286233
240-125349-6	FR34-WC-006	Soluble	Solid	8015B	286233
MB 600-286237/2	Method Blank	Total/NA	Solid	8015B	
LCS 600-286237/3	Lab Control Sample	Total/NA	Solid	8015B	
LCSD 600-286237/4	Lab Control Sample Dup	Total/NA	Solid	8015B	

Analysis Batch: 286244

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
240-125349-1	FR34-WC-001	Soluble	Solid	8015B	286233
240-125349-2	FR34-WC-002	Soluble	Solid	8015B	286233
240-125349-3	FR34-WC-003	Soluble	Solid	8015B	286233
240-125349-5	FR34-WC-005	Soluble	Solid	8015B	286233
240-125349-7	FR34-WC-007	Soluble	Solid	8015B	286233
MB 600-286244/2	Method Blank	Total/NA	Solid	8015B	
LCS 600-286244/3	Lab Control Sample	Total/NA	Solid	8015B	
LCSD 600-286244/4	Lab Control Sample Dup	Total/NA	Solid	8015B	

Analysis Batch: 286429

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
240-125349-8	FR34-WC-008	Soluble	Solid	8015B	286450
MB 600-286429/2	Method Blank	Total/NA	Solid	8015B	
LCS 600-286429/3	Lab Control Sample	Total/NA	Solid	8015B	
LCSD 600-286429/4	Lab Control Sample Dup	Total/NA	Solid	8015B	

Leach Batch: 286450

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
240-125349-8	FR34-WC-008	Soluble	Solid	DI Leach	

QC Association Summary

Client: Leidos, Inc.
Project/Site: NASA PBS Waste - FR3 + 4

Job ID: 240-125349-1

GC VOA

Analysis Batch: 286467

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
240-125349-8	FR34-WC-008	Soluble	Solid	8015B	286450
MB 600-286467/2	Method Blank	Total/NA	Solid	8015B	
LCS 600-286467/3	Lab Control Sample	Total/NA	Solid	8015B	
LCSD 600-286467/4	Lab Control Sample Dup	Total/NA	Solid	8015B	

GC Semi VOA

Processed Batch: 420314

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
240-125349-8	FR34-WC-008	Total/NA	Solid	Part Size Red	

Processed Batch: 420315

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
240-125349-8	FR34-WC-008	TCLP	Solid	Part Size Red	

Prep Batch: 420318

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
240-125349-1	FR34-WC-001	Total/NA	Solid	3540C	
240-125349-2	FR34-WC-002	Total/NA	Solid	3540C	
240-125349-3	FR34-WC-003	Total/NA	Solid	3540C	
240-125349-4	FR34-WC-004	Total/NA	Solid	3540C	
240-125349-5	FR34-WC-005	Total/NA	Solid	3540C	
240-125349-6	FR34-WC-006	Total/NA	Solid	3540C	
240-125349-7	FR34-WC-007	Total/NA	Solid	3540C	
MB 240-420318/23-A	Method Blank	Total/NA	Solid	3540C	
LCS 240-420318/24-A	Lab Control Sample	Total/NA	Solid	3540C	
240-125349-1 MS	FR34-WC-001	Total/NA	Solid	3540C	
240-125349-1 MSD	FR34-WC-001	Total/NA	Solid	3540C	

Leach Batch: 420379

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
240-125349-1	FR34-WC-001	TCLP	Solid	1311	
240-125349-2	FR34-WC-002	TCLP	Solid	1311	
240-125349-3	FR34-WC-003	TCLP	Solid	1311	
240-125349-4	FR34-WC-004	TCLP	Solid	1311	
240-125349-5	FR34-WC-005	TCLP	Solid	1311	
240-125349-6	FR34-WC-006	TCLP	Solid	1311	
240-125349-7	FR34-WC-007	TCLP	Solid	1311	
240-125349-1 MS	FR34-WC-001	TCLP	Solid	1311	

Prep Batch: 420468

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
240-125349-8	FR34-WC-008	Total/NA	Solid	3540C	420314
MB 240-420468/23-A	Method Blank	Total/NA	Solid	3540C	
LCS 240-420468/24-A	Lab Control Sample	Total/NA	Solid	3540C	

Prep Batch: 420514

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
240-125349-1	FR34-WC-001	TCLP	Solid	3510C	420379
240-125349-2	FR34-WC-002	TCLP	Solid	3510C	420379
240-125349-3	FR34-WC-003	TCLP	Solid	3510C	420379

GC Semi VOA (Continued)

Prep Batch: 420514 (Continued)

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
240-125349-4	FR34-WC-004	TCLP	Solid	3510C	420379
240-125349-5	FR34-WC-005	TCLP	Solid	3510C	420379
240-125349-6	FR34-WC-006	TCLP	Solid	3510C	420379
240-125349-7	FR34-WC-007	TCLP	Solid	3510C	420379
MB 240-420514/10-A	Method Blank	Total/NA	Solid	3510C	
LCS 240-420514/11-A	Lab Control Sample	Total/NA	Solid	3510C	

Leach Batch: 420576

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
240-125349-8	FR34-WC-008	TCLP	Solid	1311	420315

Analysis Batch: 420600

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
240-125349-1	FR34-WC-001	Total/NA	Solid	8082	420318
240-125349-4	FR34-WC-004	Total/NA	Solid	8082	420318
240-125349-5	FR34-WC-005	Total/NA	Solid	8082	420318
240-125349-6	FR34-WC-006	Total/NA	Solid	8082	420318
240-125349-7	FR34-WC-007	Total/NA	Solid	8082	420318
MB 240-420318/23-A	Method Blank	Total/NA	Solid	8082	420318
240-125349-1 MS	FR34-WC-001	Total/NA	Solid	8082	420318
240-125349-1 MSD	FR34-WC-001	Total/NA	Solid	8082	420318

Prep Batch: 420670

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
240-125349-8	FR34-WC-008	TCLP	Solid	3510C	420576
MB 240-420670/11-A	Method Blank	Total/NA	Solid	3510C	
LCS 240-420670/12-A	Lab Control Sample	Total/NA	Solid	3510C	
LCS 240-420670/13-A	Lab Control Sample	Total/NA	Solid	3510C	
LCS 240-420670/15-A	Lab Control Sample	Total/NA	Solid	3510C	
LCSD 240-420670/14-A	Lab Control Sample Dup	Total/NA	Solid	3510C	
LCSD 240-420670/16-A	Lab Control Sample Dup	Total/NA	Solid	3510C	

Prep Batch: 420673

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
240-125349-8	FR34-WC-008	TCLP	Solid	8151A	420576
MB 240-420673/11-A	Method Blank	Total/NA	Solid	8151A	
LCS 240-420673/12-A	Lab Control Sample	Total/NA	Solid	8151A	

Analysis Batch: 420734

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
240-125349-8	FR34-WC-008	Total/NA	Solid	8082	420468
MB 240-420468/23-A	Method Blank	Total/NA	Solid	8082	420468
LCS 240-420468/24-A	Lab Control Sample	Total/NA	Solid	8082	420468

Analysis Batch: 420783

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
LCS 240-420318/24-A	Lab Control Sample	Total/NA	Solid	8082	420318

Analysis Batch: 420978

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
240-125349-2	FR34-WC-002	Total/NA	Solid	8082	420318

GC Semi VOA (Continued)

Analysis Batch: 420978 (Continued)

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
240-125349-3	FR34-WC-003	Total/NA	Solid	8082	420318

Analysis Batch: 420998

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
240-125349-8	FR34-WC-008	TCLP	Solid	8081A	420670
MB 240-420670/11-A	Method Blank	Total/NA	Solid	8081A	420670
LCS 240-420670/12-A	Lab Control Sample	Total/NA	Solid	8081A	420670
LCS 240-420670/13-A	Lab Control Sample	Total/NA	Solid	8081A	420670
LCS 240-420670/15-A	Lab Control Sample	Total/NA	Solid	8081A	420670
LCSD 240-420670/14-A	Lab Control Sample Dup	Total/NA	Solid	8081A	420670
LCSD 240-420670/16-A	Lab Control Sample Dup	Total/NA	Solid	8081A	420670

Analysis Batch: 421192

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
240-125349-8	FR34-WC-008	TCLP	Solid	8151A	420673
MB 240-420673/11-A	Method Blank	Total/NA	Solid	8151A	420673
LCS 240-420673/12-A	Lab Control Sample	Total/NA	Solid	8151A	420673

Analysis Batch: 421199

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
240-125349-1	FR34-WC-001	TCLP	Solid	8081A	420514
240-125349-2	FR34-WC-002	TCLP	Solid	8081A	420514
240-125349-3	FR34-WC-003	TCLP	Solid	8081A	420514
240-125349-4	FR34-WC-004	TCLP	Solid	8081A	420514
240-125349-5	FR34-WC-005	TCLP	Solid	8081A	420514
240-125349-6	FR34-WC-006	TCLP	Solid	8081A	420514
240-125349-7	FR34-WC-007	TCLP	Solid	8081A	420514
MB 240-420514/10-A	Method Blank	Total/NA	Solid	8081A	420514
LCS 240-420514/11-A	Lab Control Sample	Total/NA	Solid	8081A	420514

Prep Batch: 421213

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
240-125349-1	FR34-WC-001	TCLP	Solid	8151A	420379
240-125349-2	FR34-WC-002	TCLP	Solid	8151A	420379
240-125349-3	FR34-WC-003	TCLP	Solid	8151A	420379
240-125349-4	FR34-WC-004	TCLP	Solid	8151A	420379
240-125349-5	FR34-WC-005	TCLP	Solid	8151A	420379
240-125349-6	FR34-WC-006	TCLP	Solid	8151A	420379
240-125349-7	FR34-WC-007	TCLP	Solid	8151A	420379
MB 240-421213/10-A	Method Blank	Total/NA	Solid	8151A	
LCS 240-421213/11-A	Lab Control Sample	Total/NA	Solid	8151A	
240-125349-1 MS	FR34-WC-001	TCLP	Solid	8151A	420379

Analysis Batch: 421572

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
240-125349-1	FR34-WC-001	TCLP	Solid	8151A	421213
240-125349-2	FR34-WC-002	TCLP	Solid	8151A	421213
240-125349-3	FR34-WC-003	TCLP	Solid	8151A	421213
240-125349-4	FR34-WC-004	TCLP	Solid	8151A	421213
240-125349-5	FR34-WC-005	TCLP	Solid	8151A	421213
240-125349-6	FR34-WC-006	TCLP	Solid	8151A	421213

GC Semi VOA (Continued)

Analysis Batch: 421572 (Continued)

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
240-125349-7	FR34-WC-007	TCLP	Solid	8151A	421213
MB 240-421213/10-A	Method Blank	Total/NA	Solid	8151A	421213
LCS 240-421213/11-A	Lab Control Sample	Total/NA	Solid	8151A	421213
240-125349-1 MS	FR34-WC-001	TCLP	Solid	8151A	421213

Metals

Processed Batch: 420314

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
240-125349-8	FR34-WC-008	Total/NA	Solid	Part Size Red	

Processed Batch: 420315

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
240-125349-8	FR34-WC-008	TCLP	Solid	Part Size Red	

Prep Batch: 420371

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
240-125349-1	FR34-WC-001	Total/NA	Solid	3050B	
240-125349-2	FR34-WC-002	Total/NA	Solid	3050B	
240-125349-3	FR34-WC-003	Total/NA	Solid	3050B	
240-125349-4	FR34-WC-004	Total/NA	Solid	3050B	
240-125349-5	FR34-WC-005	Total/NA	Solid	3050B	
240-125349-6	FR34-WC-006	Total/NA	Solid	3050B	
240-125349-7	FR34-WC-007	Total/NA	Solid	3050B	
MB 240-420371/1-A	Method Blank	Total/NA	Solid	3050B	
LCS 240-420371/2-A	Lab Control Sample	Total/NA	Solid	3050B	

Prep Batch: 420377

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
240-125349-1	FR34-WC-001	Total/NA	Solid	7471B	
240-125349-2	FR34-WC-002	Total/NA	Solid	7471B	
240-125349-3	FR34-WC-003	Total/NA	Solid	7471B	
240-125349-4	FR34-WC-004	Total/NA	Solid	7471B	
240-125349-5	FR34-WC-005	Total/NA	Solid	7471B	
240-125349-6	FR34-WC-006	Total/NA	Solid	7471B	
240-125349-7	FR34-WC-007	Total/NA	Solid	7471B	
MB 240-420377/1-A	Method Blank	Total/NA	Solid	7471B	
LCS 240-420377/2-A	Lab Control Sample	Total/NA	Solid	7471B	

Leach Batch: 420379

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
240-125349-1	FR34-WC-001	TCLP	Solid	1311	
240-125349-2	FR34-WC-002	TCLP	Solid	1311	
240-125349-3	FR34-WC-003	TCLP	Solid	1311	
240-125349-4	FR34-WC-004	TCLP	Solid	1311	
240-125349-5	FR34-WC-005	TCLP	Solid	1311	
240-125349-6	FR34-WC-006	TCLP	Solid	1311	
240-125349-7	FR34-WC-007	TCLP	Solid	1311	
LB 240-420379/1-B	Method Blank	TCLP	Solid	1311	
LB 240-420379/1-C	Method Blank	TCLP	Solid	1311	

QC Association Summary

Client: Leidos, Inc.
Project/Site: NASA PBS Waste - FR3 + 4

Job ID: 240-125349-1

Metals

Prep Batch: 420496

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
240-125349-1	FR34-WC-001	TCLP	Solid	3010A	420379
240-125349-2	FR34-WC-002	TCLP	Solid	3010A	420379
240-125349-3	FR34-WC-003	TCLP	Solid	3010A	420379
240-125349-4	FR34-WC-004	TCLP	Solid	3010A	420379
240-125349-5	FR34-WC-005	TCLP	Solid	3010A	420379
240-125349-6	FR34-WC-006	TCLP	Solid	3010A	420379
240-125349-7	FR34-WC-007	TCLP	Solid	3010A	420379
LB 240-420379/1-B	Method Blank	TCLP	Solid	3010A	420379
MB 240-420496/2-A	Method Blank	Total/NA	Solid	3010A	
LCS 240-420496/3-A	Lab Control Sample	Total/NA	Solid	3010A	

Prep Batch: 420499

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
240-125349-1	FR34-WC-001	TCLP	Solid	7470A	420379
240-125349-2	FR34-WC-002	TCLP	Solid	7470A	420379
240-125349-3	FR34-WC-003	TCLP	Solid	7470A	420379
240-125349-4	FR34-WC-004	TCLP	Solid	7470A	420379
240-125349-5	FR34-WC-005	TCLP	Solid	7470A	420379
240-125349-6	FR34-WC-006	TCLP	Solid	7470A	420379
240-125349-7	FR34-WC-007	TCLP	Solid	7470A	420379
LB 240-420379/1-C	Method Blank	TCLP	Solid	7470A	420379
MB 240-420499/2-A	Method Blank	Total/NA	Solid	7470A	
LCS 240-420499/3-A	Lab Control Sample	Total/NA	Solid	7470A	

Analysis Batch: 420534

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
240-125349-1	FR34-WC-001	Total/NA	Solid	6010C	420371
240-125349-2	FR34-WC-002	Total/NA	Solid	6010C	420371
240-125349-3	FR34-WC-003	Total/NA	Solid	6010C	420371
240-125349-4	FR34-WC-004	Total/NA	Solid	6010C	420371
240-125349-5	FR34-WC-005	Total/NA	Solid	6010C	420371
240-125349-6	FR34-WC-006	Total/NA	Solid	6010C	420371
240-125349-7	FR34-WC-007	Total/NA	Solid	6010C	420371
MB 240-420371/1-A	Method Blank	Total/NA	Solid	6010C	420371
LCS 240-420371/2-A	Lab Control Sample	Total/NA	Solid	6010C	420371

Leach Batch: 420576

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
240-125349-8	FR34-WC-008	TCLP	Solid	1311	420315
LB 240-420576/1-B	Method Blank	TCLP	Solid	1311	
LB 240-420576/1-C	Method Blank	TCLP	Solid	1311	

Analysis Batch: 420630

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
240-125349-1	FR34-WC-001	Total/NA	Solid	7471B	420377
240-125349-2	FR34-WC-002	Total/NA	Solid	7471B	420377
240-125349-3	FR34-WC-003	Total/NA	Solid	7471B	420377
240-125349-4	FR34-WC-004	Total/NA	Solid	7471B	420377
240-125349-5	FR34-WC-005	Total/NA	Solid	7471B	420377
240-125349-6	FR34-WC-006	Total/NA	Solid	7471B	420377
240-125349-7	FR34-WC-007	Total/NA	Solid	7471B	420377

Metals (Continued)

Analysis Batch: 420630 (Continued)

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
MB 240-420377/1-A	Method Blank	Total/NA	Solid	7471B	420377
LCS 240-420377/2-A	Lab Control Sample	Total/NA	Solid	7471B	420377

Prep Batch: 420632

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
240-125349-8	FR34-WC-008	TCLP	Solid	3010A	420576
LB 240-420576/1-B	Method Blank	TCLP	Solid	3010A	420576
MB 240-420632/2-A	Method Blank	Total/NA	Solid	3010A	
LCS 240-420632/3-A	Lab Control Sample	Total/NA	Solid	3010A	

Prep Batch: 420636

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
240-125349-8	FR34-WC-008	TCLP	Solid	7470A	420576
LB 240-420576/1-C	Method Blank	TCLP	Solid	7470A	420576
MB 240-420636/2-A	Method Blank	Total/NA	Solid	7470A	
LCS 240-420636/3-A	Lab Control Sample	Total/NA	Solid	7470A	

Prep Batch: 420689

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
240-125349-8	FR34-WC-008	Total/NA	Solid	3050B	420314
MB 240-420689/1-A	Method Blank	Total/NA	Solid	3050B	
LCS 240-420689/2-A	Lab Control Sample	Total/NA	Solid	3050B	

Prep Batch: 420694

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
240-125349-8	FR34-WC-008	Total/NA	Solid	7471B	420314
MB 240-420694/1-A	Method Blank	Total/NA	Solid	7471B	
LCS 240-420694/2-A	Lab Control Sample	Total/NA	Solid	7471B	

Analysis Batch: 420700

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
240-125349-1	FR34-WC-001	TCLP	Solid	6010C	420496
240-125349-2	FR34-WC-002	TCLP	Solid	6010C	420496
240-125349-3	FR34-WC-003	TCLP	Solid	6010C	420496
240-125349-4	FR34-WC-004	TCLP	Solid	6010C	420496
240-125349-5	FR34-WC-005	TCLP	Solid	6010C	420496
240-125349-5	FR34-WC-005	Total/NA	Solid	6010C	420371
240-125349-6	FR34-WC-006	TCLP	Solid	6010C	420496
240-125349-7	FR34-WC-007	TCLP	Solid	6010C	420496
LB 240-420379/1-B	Method Blank	TCLP	Solid	6010C	420496
MB 240-420496/2-A	Method Blank	Total/NA	Solid	6010C	420496
LCS 240-420496/3-A	Lab Control Sample	Total/NA	Solid	6010C	420496

Analysis Batch: 420727

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
240-125349-1	FR34-WC-001	TCLP	Solid	7470A	420499
240-125349-2	FR34-WC-002	TCLP	Solid	7470A	420499
240-125349-3	FR34-WC-003	TCLP	Solid	7470A	420499
240-125349-4	FR34-WC-004	TCLP	Solid	7470A	420499
240-125349-5	FR34-WC-005	TCLP	Solid	7470A	420499
240-125349-6	FR34-WC-006	TCLP	Solid	7470A	420499

Metals (Continued)

Analysis Batch: 420727 (Continued)

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
240-125349-7	FR34-WC-007	TCLP	Solid	7470A	420499
LB 240-420379/1-C	Method Blank	TCLP	Solid	7470A	420499
MB 240-420499/2-A	Method Blank	Total/NA	Solid	7470A	420499
LCS 240-420499/3-A	Lab Control Sample	Total/NA	Solid	7470A	420499

Analysis Batch: 420871

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
240-125349-4	FR34-WC-004	TCLP	Solid	6010C	420496
240-125349-5	FR34-WC-005	TCLP	Solid	6010C	420496
240-125349-7	FR34-WC-007	TCLP	Solid	6010C	420496
240-125349-8	FR34-WC-008	TCLP	Solid	6010C	420632
240-125349-8	FR34-WC-008	Total/NA	Solid	6010C	420689
240-125349-8	FR34-WC-008	Total/NA	Solid	6010C	420689
LB 240-420576/1-B	Method Blank	TCLP	Solid	6010C	420632
MB 240-420632/2-A	Method Blank	Total/NA	Solid	6010C	420632
MB 240-420689/1-A	Method Blank	Total/NA	Solid	6010C	420689
LCS 240-420632/3-A	Lab Control Sample	Total/NA	Solid	6010C	420632
LCS 240-420689/2-A	Lab Control Sample	Total/NA	Solid	6010C	420689

Analysis Batch: 420912

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
240-125349-8	FR34-WC-008	Total/NA	Solid	7471B	420694
MB 240-420694/1-A	Method Blank	Total/NA	Solid	7471B	420694
LCS 240-420694/2-A	Lab Control Sample	Total/NA	Solid	7471B	420694

Analysis Batch: 420971

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
240-125349-8	FR34-WC-008	TCLP	Solid	7470A	420636
LB 240-420576/1-C	Method Blank	TCLP	Solid	7470A	420636
MB 240-420636/2-A	Method Blank	Total/NA	Solid	7470A	420636
LCS 240-420636/3-A	Lab Control Sample	Total/NA	Solid	7470A	420636

General Chemistry

Prep Batch: 420300

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
240-125349-1	FR34-WC-001	Total/NA	Solid	9030B	
240-125349-2	FR34-WC-002	Total/NA	Solid	9030B	
240-125349-3	FR34-WC-003	Total/NA	Solid	9030B	
240-125349-4	FR34-WC-004	Total/NA	Solid	9030B	
240-125349-5	FR34-WC-005	Total/NA	Solid	9030B	
240-125349-6	FR34-WC-006	Total/NA	Solid	9030B	
240-125349-7	FR34-WC-007	Total/NA	Solid	9030B	
MB 240-420300/1-A	Method Blank	Total/NA	Solid	9030B	
LCS 240-420300/2-A	Lab Control Sample	Total/NA	Solid	9030B	

Processed Batch: 420314

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
240-125349-8	FR34-WC-008	Total/NA	Solid	Part Size Red	
240-125349-8 DU	FR34-WC-008	Total/NA	Solid	Part Size Red	

QC Association Summary

Client: Leidos, Inc.
Project/Site: NASA PBS Waste - FR3 + 4

Job ID: 240-125349-1

General Chemistry

Analysis Batch: 420363

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
240-125349-1	FR34-WC-001	Total/NA	Solid	9034	420300
240-125349-2	FR34-WC-002	Total/NA	Solid	9034	420300
240-125349-3	FR34-WC-003	Total/NA	Solid	9034	420300
240-125349-4	FR34-WC-004	Total/NA	Solid	9034	420300
240-125349-5	FR34-WC-005	Total/NA	Solid	9034	420300
240-125349-6	FR34-WC-006	Total/NA	Solid	9034	420300
240-125349-7	FR34-WC-007	Total/NA	Solid	9034	420300
MB 240-420300/1-A	Method Blank	Total/NA	Solid	9034	420300
LCS 240-420300/2-A	Lab Control Sample	Total/NA	Solid	9034	420300

Analysis Batch: 420370

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
240-125349-1	FR34-WC-001	Total/NA	Solid	9045C	
240-125349-2	FR34-WC-002	Total/NA	Solid	9045C	
240-125349-3	FR34-WC-003	Total/NA	Solid	9045C	
240-125349-4	FR34-WC-004	Total/NA	Solid	9045C	
240-125349-5	FR34-WC-005	Total/NA	Solid	9045C	
240-125349-6	FR34-WC-006	Total/NA	Solid	9045C	
240-125349-7	FR34-WC-007	Total/NA	Solid	9045C	
LCS 240-420370/2	Lab Control Sample	Total/NA	Solid	9045C	
240-125349-3 DU	FR34-WC-003	Total/NA	Solid	9045C	

Analysis Batch: 420404

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
240-125349-1	FR34-WC-001	Total/NA	Solid	Moisture	
240-125349-2	FR34-WC-002	Total/NA	Solid	Moisture	
240-125349-3	FR34-WC-003	Total/NA	Solid	Moisture	
240-125349-4	FR34-WC-004	Total/NA	Solid	Moisture	
240-125349-5	FR34-WC-005	Total/NA	Solid	Moisture	
240-125349-6	FR34-WC-006	Total/NA	Solid	Moisture	
240-125349-7	FR34-WC-007	Total/NA	Solid	Moisture	
240-125349-8	FR34-WC-008	Total/NA	Solid	Moisture	420314

Analysis Batch: 420527

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
240-125349-1	FR34-WC-001	Total/NA	Solid	1010	
240-125349-2	FR34-WC-002	Total/NA	Solid	1010	
240-125349-3	FR34-WC-003	Total/NA	Solid	1010	
240-125349-4	FR34-WC-004	Total/NA	Solid	1010	
240-125349-5	FR34-WC-005	Total/NA	Solid	1010	
240-125349-6	FR34-WC-006	Total/NA	Solid	1010	
240-125349-7	FR34-WC-007	Total/NA	Solid	1010	
LCS 240-420527/1	Lab Control Sample	Total/NA	Solid	1010	

Analysis Batch: 420553

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
240-125349-8	FR34-WC-008	Total/NA	Solid	9045C	420314
LCS 240-420553/39	Lab Control Sample	Total/NA	Solid	9045C	
240-125349-8 DU	FR34-WC-008	Total/NA	Solid	9045C	420314

QC Association Summary

Client: Leidos, Inc.
Project/Site: NASA PBS Waste - FR3 + 4

Job ID: 240-125349-1

General Chemistry

Prep Batch: 420678

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
240-125349-1	FR34-WC-001	Total/NA	Solid	9012A	
240-125349-2	FR34-WC-002	Total/NA	Solid	9012A	
240-125349-3	FR34-WC-003	Total/NA	Solid	9012A	
240-125349-4	FR34-WC-004	Total/NA	Solid	9012A	
240-125349-5	FR34-WC-005	Total/NA	Solid	9012A	
240-125349-6	FR34-WC-006	Total/NA	Solid	9012A	
240-125349-7	FR34-WC-007	Total/NA	Solid	9012A	
240-125349-8	FR34-WC-008	Total/NA	Solid	9012A	420314
MB 240-420678/1-A	Method Blank	Total/NA	Solid	9012A	
LCS 240-420678/2-A	Lab Control Sample	Total/NA	Solid	9012A	
240-125349-2 MS	FR34-WC-002	Total/NA	Solid	9012A	
240-125349-2 MSD	FR34-WC-002	Total/NA	Solid	9012A	

Analysis Batch: 420763

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
240-125349-8	FR34-WC-008	Total/NA	Solid	1010	420314
LCS 240-420763/1	Lab Control Sample	Total/NA	Solid	1010	
LCS 240-420763/2	Lab Control Sample	Total/NA	Solid	1010	
LCS 240-420763/3	Lab Control Sample	Total/NA	Solid	1010	
LCS 240-420763/4	Lab Control Sample	Total/NA	Solid	1010	
240-125349-8 DU	FR34-WC-008	Total/NA	Solid	1010	420314

Analysis Batch: 420764

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
240-125349-1	FR34-WC-001	Total/NA	Solid	9012A	420678
240-125349-2	FR34-WC-002	Total/NA	Solid	9012A	420678
240-125349-3	FR34-WC-003	Total/NA	Solid	9012A	420678
240-125349-4	FR34-WC-004	Total/NA	Solid	9012A	420678
240-125349-5	FR34-WC-005	Total/NA	Solid	9012A	420678
240-125349-6	FR34-WC-006	Total/NA	Solid	9012A	420678
240-125349-7	FR34-WC-007	Total/NA	Solid	9012A	420678
240-125349-8	FR34-WC-008	Total/NA	Solid	9012A	420678
MB 240-420678/1-A	Method Blank	Total/NA	Solid	9012A	420678
LCS 240-420678/2-A	Lab Control Sample	Total/NA	Solid	9012A	420678
MRL 240-420764/10	Lab Control Sample	Total/NA	Solid	9012A	
240-125349-2 MS	FR34-WC-002	Total/NA	Solid	9012A	420678
240-125349-2 MSD	FR34-WC-002	Total/NA	Solid	9012A	420678

Prep Batch: 420831

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
240-125349-8	FR34-WC-008	Total/NA	Solid	9030B	420314
MB 240-420831/1-A	Method Blank	Total/NA	Solid	9030B	
LCS 240-420831/2-A	Lab Control Sample	Total/NA	Solid	9030B	

Analysis Batch: 420861

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
240-125349-8	FR34-WC-008	Total/NA	Solid	9034	420831
MB 240-420831/1-A	Method Blank	Total/NA	Solid	9034	420831
LCS 240-420831/2-A	Lab Control Sample	Total/NA	Solid	9034	420831

QC Association Summary

Client: Leidos, Inc.
Project/Site: NASA PBS Waste - FR3 + 4

Job ID: 240-125349-1

General Chemistry

Analysis Batch: 421654

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
240-125349-1	FR34-WC-001	Total/NA	Solid	9095A	
240-125349-2	FR34-WC-002	Total/NA	Solid	9095A	
240-125349-3	FR34-WC-003	Total/NA	Solid	9095A	
240-125349-4	FR34-WC-004	Total/NA	Solid	9095A	
240-125349-5	FR34-WC-005	Total/NA	Solid	9095A	
240-125349-6	FR34-WC-006	Total/NA	Solid	9095A	
240-125349-7	FR34-WC-007	Total/NA	Solid	9095A	
240-125349-8	FR34-WC-008	Total/NA	Solid	9095A	420314
240-125349-1 DU	FR34-WC-001	Total/NA	Solid	9095A	

Lab Chronicle

Client: Leidos, Inc.
Project/Site: NASA PBS Waste - FR3 + 4

Job ID: 240-125349-1

Client Sample ID: FR34-WC-001

Lab Sample ID: 240-125349-1
Date Collected: 01/23/20 10:30
Matrix: Solid
Date Received: 01/24/20 10:40

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
TCLP	Leach	1311			420397	01/27/20 15:00	DRJ	TAL CAN
TCLP	Analysis	8260B		1	420538	01/28/20 20:32	HMB	TAL CAN
TCLP	Leach	1311			420379	01/27/20 15:00	DRJ	TAL CAN
TCLP	Prep	3510C			420513	01/28/20 10:40	BMB	TAL CAN
TCLP	Analysis	8270C		1	420777	01/30/20 10:08	TMH	TAL CAN
TCLP	Leach	1311			420379	01/27/20 15:00	DRJ	TAL CAN
TCLP	Prep	3510C			420514	01/28/20 10:42	MDH	TAL CAN
TCLP	Analysis	8081A		1	421199	02/03/20 12:36	BPM	TAL CAN
TCLP	Leach	1311			420379	01/27/20 15:00	DRJ	TAL CAN
TCLP	Prep	8151A			421213	02/03/20 10:51	BMB	TAL CAN
TCLP	Analysis	8151A		1	421572	02/05/20 11:06	LKG	TAL CAN
TCLP	Leach	1311			420379	01/27/20 15:00	DRJ	TAL CAN
TCLP	Prep	3010A			420496	01/28/20 14:00	MRL	TAL CAN
TCLP	Analysis	6010C		1	420700	01/29/20 15:44	RKT	TAL CAN
TCLP	Leach	1311			420379	01/27/20 15:00	DRJ	TAL CAN
TCLP	Prep	7470A			420499	01/28/20 12:00	MRL	TAL CAN
TCLP	Analysis	7470A		1	420727	01/29/20 13:25	SLD	TAL CAN
Total/NA	Analysis	1010		1	420527	01/28/20 07:42	TPH	TAL CAN
Total/NA	Analysis	9045C		1	420370	01/27/20 15:37	JR	TAL CAN
Total/NA	Analysis	9095A		1	421654	02/05/20 16:59	JWW	TAL CAN
Total/NA	Analysis	Moisture		1	420404	01/27/20 17:38	AGC	TAL CAN

Client Sample ID: FR34-WC-001

Lab Sample ID: 240-125349-1
Date Collected: 01/23/20 10:30
Matrix: Solid
Date Received: 01/24/20 10:40
Percent Solids: 81.0

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	5030A			420546	01/28/20 12:56	SAM	TAL CAN
Total/NA	Analysis	8260B		1	420489	01/28/20 18:24	SAM	TAL CAN
Total/NA	Prep	3540C			420483	01/28/20 09:56	JMT	TAL CAN
Total/NA	Analysis	8270D		4	421566	02/05/20 18:55	JMG	TAL CAN
Soluble	Leach	DI Leach			286233	01/27/20 08:53	DAW	TAL HOU
Soluble	Analysis	8015B		1	286234	01/27/20 12:29	DAW	TAL HOU
Soluble	Leach	DI Leach			286233	01/27/20 08:53	DAW	TAL HOU
Soluble	Analysis	8015B		1	286244	01/27/20 11:51	DAW	TAL HOU
Total/NA	Prep	3540C			420318	01/27/20 09:29	SDE	TAL CAN
Total/NA	Analysis	8082		1	420600	01/29/20 09:11	KMG	TAL CAN
Total/NA	Prep	3050B			420371	01/27/20 14:00	DEE	TAL CAN
Total/NA	Analysis	6010C		1	420534	01/28/20 18:50	WKD	TAL CAN
Total/NA	Prep	7471B			420377	01/27/20 16:00	DEE	TAL CAN
Total/NA	Analysis	7471B		1	420630	01/28/20 14:29	SLD	TAL CAN
Total/NA	Prep	9012A			420678	01/29/20 09:55	JR	TAL CAN
Total/NA	Analysis	9012A		1	420764	01/29/20 13:29	JR	TAL CAN
Total/NA	Prep	9030B			420300	01/27/20 07:57	BLW	TAL CAN
Total/NA	Analysis	9034		1	420363	01/27/20 12:37	BLW	TAL CAN

Lab Chronicle

Client: Leidos, Inc.
Project/Site: NASA PBS Waste - FR3 + 4

Job ID: 240-125349-1

Client Sample ID: FR34-WC-002

Lab Sample ID: 240-125349-2
Date Collected: 01/23/20 12:00
Matrix: Solid
Date Received: 01/24/20 10:40

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
TCLP	Leach	1311			420397	01/27/20 15:00	DRJ	TAL CAN
TCLP	Analysis	8260B		1	420538	01/28/20 20:54	HMB	TAL CAN
TCLP	Leach	1311			420379	01/27/20 15:00	DRJ	TAL CAN
TCLP	Prep	3510C			420513	01/28/20 10:40	BMB	TAL CAN
TCLP	Analysis	8270C		1	420777	01/30/20 10:32	TMH	TAL CAN
TCLP	Leach	1311			420379	01/27/20 15:00	DRJ	TAL CAN
TCLP	Prep	3510C			420514	01/28/20 10:42	MDH	TAL CAN
TCLP	Analysis	8081A		1	421199	02/03/20 12:49	BPM	TAL CAN
TCLP	Leach	1311			420379	01/27/20 15:00	DRJ	TAL CAN
TCLP	Prep	8151A			421213	02/03/20 10:51	BMB	TAL CAN
TCLP	Analysis	8151A		1	421572	02/05/20 12:57	LKG	TAL CAN
TCLP	Leach	1311			420379	01/27/20 15:00	DRJ	TAL CAN
TCLP	Prep	3010A			420496	01/28/20 14:00	MRL	TAL CAN
TCLP	Analysis	6010C		1	420700	01/29/20 15:57	RKT	TAL CAN
TCLP	Leach	1311			420379	01/27/20 15:00	DRJ	TAL CAN
TCLP	Prep	7470A			420499	01/28/20 12:00	MRL	TAL CAN
TCLP	Analysis	7470A		1	420727	01/29/20 13:27	SLD	TAL CAN
Total/NA	Analysis	1010		1	420527	01/28/20 08:15	TPH	TAL CAN
Total/NA	Analysis	9045C		1	420370	01/27/20 15:48	JR	TAL CAN
Total/NA	Analysis	9095A		1	421654	02/05/20 16:59	JWW	TAL CAN
Total/NA	Analysis	Moisture		1	420404	01/27/20 17:38	AGC	TAL CAN

Client Sample ID: FR34-WC-002

Lab Sample ID: 240-125349-2
Date Collected: 01/23/20 12:00
Matrix: Solid
Date Received: 01/24/20 10:40
Percent Solids: 78.8

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	5030A			420546	01/28/20 12:56	SAM	TAL CAN
Total/NA	Analysis	8260B		1	420489	01/28/20 18:50	SAM	TAL CAN
Total/NA	Prep	3540C			420483	01/28/20 09:56	JMT	TAL CAN
Total/NA	Analysis	8270D		10	421566	02/05/20 15:19	JMG	TAL CAN
Total/NA	Prep	3540C	RA		420483	01/28/20 09:56	JMT	TAL CAN
Total/NA	Analysis	8270D	RA	100	421566	02/05/20 15:43	JMG	TAL CAN
Soluble	Leach	DI Leach			286233	01/27/20 08:53	DAW	TAL HOU
Soluble	Analysis	8015B		1	286234	01/27/20 12:45	DAW	TAL HOU
Soluble	Leach	DI Leach			286233	01/27/20 08:53	DAW	TAL HOU
Soluble	Analysis	8015B		1	286244	01/27/20 12:04	DAW	TAL HOU
Total/NA	Prep	3540C			420318	01/27/20 09:29	SDE	TAL CAN
Total/NA	Analysis	8082		5	420978	01/31/20 12:22	LSH	TAL CAN
Total/NA	Prep	3050B			420371	01/27/20 14:00	DEE	TAL CAN
Total/NA	Analysis	6010C		1	420534	01/28/20 18:54	WKD	TAL CAN
Total/NA	Prep	7471B			420377	01/27/20 16:00	DEE	TAL CAN
Total/NA	Analysis	7471B		1	420630	01/28/20 14:31	SLD	TAL CAN
Total/NA	Prep	9012A			420678	01/29/20 09:55	JR	TAL CAN
Total/NA	Analysis	9012A		1	420764	01/29/20 13:24	JR	TAL CAN

Lab Chronicle

Client: Leidos, Inc.
Project/Site: NASA PBS Waste - FR3 + 4

Job ID: 240-125349-1

Client Sample ID: FR34-WC-002

Lab Sample ID: 240-125349-2
Date Collected: 01/23/20 12:00
Matrix: Solid
Date Received: 01/24/20 10:40
Percent Solids: 78.8

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	9030B			420300	01/27/20 07:57	BLW	TAL CAN
Total/NA	Analysis	9034		1	420363	01/27/20 12:43	BLW	TAL CAN

Client Sample ID: FR34-WC-003

Lab Sample ID: 240-125349-3
Date Collected: 01/23/20 13:00
Matrix: Solid
Date Received: 01/24/20 10:40

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
TCLP	Leach	1311			420397	01/27/20 15:00	DRJ	TAL CAN
TCLP	Analysis	8260B		1	420538	01/28/20 21:17	HMB	TAL CAN
TCLP	Leach	1311			420379	01/27/20 15:00	DRJ	TAL CAN
TCLP	Prep	3510C			420513	01/28/20 10:40	BMB	TAL CAN
TCLP	Analysis	8270C		1	420777	01/30/20 10:55	TMH	TAL CAN
TCLP	Leach	1311			420379	01/27/20 15:00	DRJ	TAL CAN
TCLP	Prep	3510C			420514	01/28/20 10:42	MDH	TAL CAN
TCLP	Analysis	8081A		1	421199	02/03/20 13:02	BPM	TAL CAN
TCLP	Leach	1311			420379	01/27/20 15:00	DRJ	TAL CAN
TCLP	Prep	8151A			421213	02/03/20 10:51	BMB	TAL CAN
TCLP	Analysis	8151A		1	421572	02/05/20 13:19	LKG	TAL CAN
TCLP	Leach	1311			420379	01/27/20 15:00	DRJ	TAL CAN
TCLP	Prep	3010A			420496	01/28/20 14:00	MRL	TAL CAN
TCLP	Analysis	6010C		1	420700	01/29/20 16:02	RKT	TAL CAN
TCLP	Leach	1311			420379	01/27/20 15:00	DRJ	TAL CAN
TCLP	Prep	7470A			420499	01/28/20 12:00	MRL	TAL CAN
TCLP	Analysis	7470A		1	420727	01/29/20 13:29	SLD	TAL CAN
Total/NA	Analysis	1010		1	420527	01/28/20 08:47	TPH	TAL CAN
Total/NA	Analysis	9045C		1	420370	01/27/20 16:00	JR	TAL CAN
Total/NA	Analysis	9095A		1	421654	02/05/20 16:59	JWW	TAL CAN
Total/NA	Analysis	Moisture		1	420404	01/27/20 17:38	AGC	TAL CAN

Client Sample ID: FR34-WC-003

Lab Sample ID: 240-125349-3
Date Collected: 01/23/20 13:00
Matrix: Solid
Date Received: 01/24/20 10:40
Percent Solids: 84.8

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	5030A			420546	01/28/20 12:56	SAM	TAL CAN
Total/NA	Analysis	8260B		1	420489	01/28/20 19:16	SAM	TAL CAN
Total/NA	Prep	3540C			420483	01/28/20 09:56	JMT	TAL CAN
Total/NA	Analysis	8270D		1	421566	02/05/20 16:55	JMG	TAL CAN
Total/NA	Prep	3540C	RA		420483	01/28/20 09:56	JMT	TAL CAN
Total/NA	Analysis	8270D	RA	10	421566	02/05/20 17:19	JMG	TAL CAN
Soluble	Leach	DI Leach			286233	01/27/20 08:53	DAW	TAL HOU
Soluble	Analysis	8015B		1	286234	01/27/20 13:00	DAW	TAL HOU
Soluble	Leach	DI Leach			286233	01/27/20 08:53	DAW	TAL HOU
Soluble	Analysis	8015B		1	286244	01/27/20 12:16	DAW	TAL HOU

Lab Chronicle

Client: Leidos, Inc.
Project/Site: NASA PBS Waste - FR3 + 4

Job ID: 240-125349-1

Client Sample ID: FR34-WC-003

Lab Sample ID: 240-125349-3
Date Collected: 01/23/20 13:00
Matrix: Solid
Date Received: 01/24/20 10:40
Percent Solids: 84.8

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3540C			420318	01/27/20 09:29	SDE	TAL CAN
Total/NA	Analysis	8082		5	420978	01/31/20 12:37	LSH	TAL CAN
Total/NA	Prep	3050B			420371	01/27/20 14:00	DEE	TAL CAN
Total/NA	Analysis	6010C		1	420534	01/28/20 18:59	WKD	TAL CAN
Total/NA	Prep	7471B			420377	01/27/20 16:00	DEE	TAL CAN
Total/NA	Analysis	7471B		1	420630	01/28/20 14:33	SLD	TAL CAN
Total/NA	Prep	9012A			420678	01/29/20 09:55	JR	TAL CAN
Total/NA	Analysis	9012A		1	420764	01/29/20 13:20	JR	TAL CAN
Total/NA	Prep	9030B			420300	01/27/20 07:57	BLW	TAL CAN
Total/NA	Analysis	9034		1	420363	01/27/20 12:50	BLW	TAL CAN

Client Sample ID: FR34-WC-004

Lab Sample ID: 240-125349-4
Date Collected: 01/23/20 13:55
Matrix: Solid
Date Received: 01/24/20 10:40

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
TCLP	Leach	1311			420397	01/27/20 15:00	DRJ	TAL CAN
TCLP	Analysis	8260B		1	420538	01/28/20 21:39	HMB	TAL CAN
TCLP	Leach	1311			420379	01/27/20 15:00	DRJ	TAL CAN
TCLP	Prep	3510C			420513	01/28/20 10:40	BMB	TAL CAN
TCLP	Analysis	8270C		1	420777	01/30/20 11:19	TMH	TAL CAN
TCLP	Leach	1311			420379	01/27/20 15:00	DRJ	TAL CAN
TCLP	Prep	3510C			420514	01/28/20 10:42	MDH	TAL CAN
TCLP	Analysis	8081A		1	421199	02/03/20 13:15	BPM	TAL CAN
TCLP	Leach	1311			420379	01/27/20 15:00	DRJ	TAL CAN
TCLP	Prep	8151A			421213	02/03/20 10:51	BMB	TAL CAN
TCLP	Analysis	8151A		1	421572	02/05/20 13:41	LKG	TAL CAN
TCLP	Leach	1311			420379	01/27/20 15:00	DRJ	TAL CAN
TCLP	Prep	3010A			420496	01/28/20 14:00	MRL	TAL CAN
TCLP	Analysis	6010C		1	420700	01/29/20 16:06	RKT	TAL CAN
TCLP	Leach	1311			420379	01/27/20 15:00	DRJ	TAL CAN
TCLP	Prep	3010A			420496	01/28/20 14:00	MRL	TAL CAN
TCLP	Analysis	6010C		5	420871	01/30/20 19:00	WKD	TAL CAN
TCLP	Leach	1311			420379	01/27/20 15:00	DRJ	TAL CAN
TCLP	Prep	7470A			420499	01/28/20 12:00	MRL	TAL CAN
TCLP	Analysis	7470A		1	420727	01/29/20 13:35	SLD	TAL CAN
Total/NA	Analysis	1010		1	420527	01/28/20 09:20	TPH	TAL CAN
Total/NA	Analysis	9045C		1	420370	01/27/20 16:23	JR	TAL CAN
Total/NA	Analysis	9095A		1	421654	02/05/20 16:59	JWW	TAL CAN
Total/NA	Analysis	Moisture		1	420404	01/27/20 17:38	AGC	TAL CAN

Lab Chronicle

Client: Leidos, Inc.
Project/Site: NASA PBS Waste - FR3 + 4

Job ID: 240-125349-1

Client Sample ID: FR34-WC-004

Lab Sample ID: 240-125349-4

Date Collected: 01/23/20 13:55
Date Received: 01/24/20 10:40

Matrix: Solid
Percent Solids: 81.8

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	5030A			420546	01/28/20 12:56	SAM	TAL CAN
Total/NA	Analysis	8260B		1	420489	01/28/20 19:42	SAM	TAL CAN
Total/NA	Prep	3540C	RA		420483	01/28/20 09:56	JMT	TAL CAN
Total/NA	Analysis	8270D	RA	10	421566	02/05/20 18:31	JMG	TAL CAN
Total/NA	Prep	3540C			420483	01/28/20 09:56	JMT	TAL CAN
Total/NA	Analysis	8270D		1	421712	02/06/20 11:11	JMG	TAL CAN
Soluble	Leach	DI Leach			286233	01/27/20 08:53	DAW	TAL HOU
Soluble	Analysis	8015B		1	286234	01/27/20 13:37	DAW	TAL HOU
Soluble	Leach	DI Leach			286233	01/27/20 08:53	DAW	TAL HOU
Soluble	Analysis	8015B		1	286237	01/27/20 12:28	DAW	TAL HOU
Total/NA	Prep	3540C			420318	01/27/20 09:29	SDE	TAL CAN
Total/NA	Analysis	8082		1	420600	01/29/20 10:21	KMG	TAL CAN
Total/NA	Prep	3050B			420371	01/27/20 14:00	DEE	TAL CAN
Total/NA	Analysis	6010C		1	420534	01/28/20 19:03	WKD	TAL CAN
Total/NA	Prep	7471B			420377	01/27/20 16:00	DEE	TAL CAN
Total/NA	Analysis	7471B		1	420630	01/28/20 14:35	SLD	TAL CAN
Total/NA	Prep	9012A			420678	01/29/20 09:55	JR	TAL CAN
Total/NA	Analysis	9012A		1	420764	01/29/20 13:22	JR	TAL CAN
Total/NA	Prep	9030B			420300	01/27/20 07:57	BLW	TAL CAN
Total/NA	Analysis	9034		1	420363	01/27/20 12:56	BLW	TAL CAN

Client Sample ID: FR34-WC-005

Lab Sample ID: 240-125349-5

Date Collected: 01/23/20 14:50
Date Received: 01/24/20 10:40

Matrix: Solid

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
TCLP	Leach	1311			420397	01/27/20 15:00	DRJ	TAL CAN
TCLP	Analysis	8260B		1	420538	01/28/20 22:02	HMB	TAL CAN
TCLP	Leach	1311			420379	01/27/20 15:00	DRJ	TAL CAN
TCLP	Prep	3510C			420513	01/28/20 10:40	BMB	TAL CAN
TCLP	Analysis	8270C		1	420777	01/30/20 11:43	TMH	TAL CAN
TCLP	Leach	1311			420379	01/27/20 15:00	DRJ	TAL CAN
TCLP	Prep	3510C			420514	01/28/20 10:42	MDH	TAL CAN
TCLP	Analysis	8081A		1	421199	02/03/20 13:28	BPM	TAL CAN
TCLP	Leach	1311			420379	01/27/20 15:00	DRJ	TAL CAN
TCLP	Prep	8151A			421213	02/03/20 10:51	BMB	TAL CAN
TCLP	Analysis	8151A		1	421572	02/05/20 14:03	LKG	TAL CAN
TCLP	Leach	1311			420379	01/27/20 15:00	DRJ	TAL CAN
TCLP	Prep	3010A			420496	01/28/20 14:00	MRL	TAL CAN
TCLP	Analysis	6010C		1	420700	01/29/20 16:11	RKT	TAL CAN
TCLP	Leach	1311			420379	01/27/20 15:00	DRJ	TAL CAN
TCLP	Prep	3010A			420496	01/28/20 14:00	MRL	TAL CAN
TCLP	Analysis	6010C		100	420871	01/30/20 19:05	WKD	TAL CAN

Lab Chronicle

Client: Leidos, Inc.
Project/Site: NASA PBS Waste - FR3 + 4

Job ID: 240-125349-1

Client Sample ID: FR34-WC-005
Date Collected: 01/23/20 14:50
Date Received: 01/24/20 10:40

Lab Sample ID: 240-125349-5
Matrix: Solid

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
TCLP	Leach	1311			420379	01/27/20 15:00	DRJ	TAL CAN
TCLP	Prep	7470A			420499	01/28/20 12:00	MRL	TAL CAN
TCLP	Analysis	7470A		1	420727	01/29/20 13:37	SLD	TAL CAN
Total/NA	Analysis	1010		1	420527	01/28/20 09:52	TPH	TAL CAN
Total/NA	Analysis	9045C		1	420370	01/27/20 16:35	JR	TAL CAN
Total/NA	Analysis	9095A		1	421654	02/05/20 16:59	JWW	TAL CAN
Total/NA	Analysis	Moisture		1	420404	01/27/20 17:38	AGC	TAL CAN

Client Sample ID: FR34-WC-005
Date Collected: 01/23/20 14:50
Date Received: 01/24/20 10:40

Lab Sample ID: 240-125349-5
Matrix: Solid
Percent Solids: 83.5

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	5030A			420722	01/29/20 12:38	SAM	TAL CAN
Total/NA	Analysis	8260B		1	420675	01/29/20 21:40	SAM	TAL CAN
Total/NA	Prep	3540C	RA		420483	01/28/20 09:56	JMT	TAL CAN
Total/NA	Analysis	8270D	RA	5	421566	02/05/20 20:31	JMG	TAL CAN
Total/NA	Prep	3540C			420483	01/28/20 09:56	JMT	TAL CAN
Total/NA	Analysis	8270D		2	421712	02/06/20 11:35	JMG	TAL CAN
Soluble	Leach	DI Leach			286233	01/27/20 08:53	DAW	TAL HOU
Soluble	Analysis	8015B		1	286234	01/27/20 13:53	DAW	TAL HOU
Soluble	Leach	DI Leach			286233	01/27/20 08:53	DAW	TAL HOU
Soluble	Analysis	8015B		1	286244	01/27/20 12:28	DAW	TAL HOU
Total/NA	Prep	3540C			420318	01/27/20 09:29	SDE	TAL CAN
Total/NA	Analysis	8082		1	420600	01/29/20 10:35	KMG	TAL CAN
Total/NA	Prep	3050B			420371	01/27/20 14:00	DEE	TAL CAN
Total/NA	Analysis	6010C		1	420534	01/28/20 19:07	WKD	TAL CAN
Total/NA	Prep	3050B			420371	01/27/20 14:00	DEE	TAL CAN
Total/NA	Analysis	6010C		5	420700	01/29/20 12:10	RKT	TAL CAN
Total/NA	Prep	7471B			420377	01/27/20 16:00	DEE	TAL CAN
Total/NA	Analysis	7471B		1	420630	01/28/20 14:37	SLD	TAL CAN
Total/NA	Prep	9012A			420678	01/29/20 09:55	JR	TAL CAN
Total/NA	Analysis	9012A		1	420764	01/29/20 13:19	JR	TAL CAN
Total/NA	Prep	9030B			420300	01/27/20 07:57	BLW	TAL CAN
Total/NA	Analysis	9034		1	420363	01/27/20 13:02	BLW	TAL CAN

Client Sample ID: FR34-WC-006
Date Collected: 01/23/20 16:15
Date Received: 01/24/20 10:40

Lab Sample ID: 240-125349-6
Matrix: Solid

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
TCLP	Leach	1311			420578	01/28/20 16:00	DRJ	TAL CAN
TCLP	Analysis	8260B		1	420751	01/29/20 21:09	TJL1	TAL CAN

Lab Chronicle

Client: Leidos, Inc.
Project/Site: NASA PBS Waste - FR3 + 4

Job ID: 240-125349-1

Client Sample ID: FR34-WC-006

Lab Sample ID: 240-125349-6

Date Collected: 01/23/20 16:15
Matrix: Solid
Date Received: 01/24/20 10:40

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
TCLP	Leach	1311			420379	01/27/20 15:00	DRJ	TAL CAN
TCLP	Prep	3510C			420513	01/28/20 10:40	BMB	TAL CAN
TCLP	Analysis	8270C		1	420777	01/30/20 12:06	TMH	TAL CAN
TCLP	Leach	1311			420379	01/27/20 15:00	DRJ	TAL CAN
TCLP	Prep	3510C			420514	01/28/20 10:42	MDH	TAL CAN
TCLP	Analysis	8081A		1	421199	02/03/20 13:41	BPM	TAL CAN
TCLP	Leach	1311			420379	01/27/20 15:00	DRJ	TAL CAN
TCLP	Prep	8151A			421213	02/03/20 10:51	BMB	TAL CAN
TCLP	Analysis	8151A		1	421572	02/05/20 14:25	LKG	TAL CAN
TCLP	Leach	1311			420379	01/27/20 15:00	DRJ	TAL CAN
TCLP	Prep	3010A			420496	01/28/20 14:00	MRL	TAL CAN
TCLP	Analysis	6010C		1	420700	01/29/20 16:15	RKT	TAL CAN
TCLP	Leach	1311			420379	01/27/20 15:00	DRJ	TAL CAN
TCLP	Prep	7470A			420499	01/28/20 12:00	MRL	TAL CAN
TCLP	Analysis	7470A		1	420727	01/29/20 13:40	SLD	TAL CAN
Total/NA	Analysis	1010		1	420527	01/28/20 10:25	TPH	TAL CAN
Total/NA	Analysis	9045C		1	420370	01/27/20 16:46	JR	TAL CAN
Total/NA	Analysis	9095A		1	421654	02/05/20 16:59	JWW	TAL CAN
Total/NA	Analysis	Moisture		1	420404	01/27/20 17:38	AGC	TAL CAN

Client Sample ID: FR34-WC-006

Lab Sample ID: 240-125349-6

Date Collected: 01/23/20 16:15
Matrix: Solid
Date Received: 01/24/20 10:40
Percent Solids: 84.1

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	5030A			420722	01/29/20 12:38	SAM	TAL CAN
Total/NA	Analysis	8260B		1	420675	01/29/20 22:57	SAM	TAL CAN
Total/NA	Prep	3540C			420483	01/28/20 09:56	JMT	TAL CAN
Total/NA	Analysis	8270D		1	421566	02/05/20 17:43	JMG	TAL CAN
Soluble	Leach	DI Leach			286233	01/27/20 08:53	DAW	TAL HOU
Soluble	Analysis	8015B		1	286234	01/27/20 14:07	DAW	TAL HOU
Soluble	Leach	DI Leach			286233	01/27/20 08:53	DAW	TAL HOU
Soluble	Analysis	8015B		1	286237	01/27/20 12:41	DAW	TAL HOU
Total/NA	Prep	3540C			420318	01/27/20 09:29	SDE	TAL CAN
Total/NA	Analysis	8082		1	420600	01/29/20 10:49	KMG	TAL CAN
Total/NA	Prep	3050B			420371	01/27/20 14:00	DEE	TAL CAN
Total/NA	Analysis	6010C		1	420534	01/28/20 19:11	WKD	TAL CAN
Total/NA	Prep	7471B			420377	01/27/20 16:00	DEE	TAL CAN
Total/NA	Analysis	7471B		1	420630	01/28/20 14:39	SLD	TAL CAN
Total/NA	Prep	9012A			420678	01/29/20 09:55	JR	TAL CAN
Total/NA	Analysis	9012A		1	420764	01/29/20 13:17	JR	TAL CAN
Total/NA	Prep	9030B			420300	01/27/20 07:57	BLW	TAL CAN
Total/NA	Analysis	9034		1	420363	01/27/20 13:08	BLW	TAL CAN

Lab Chronicle

Client: Leidos, Inc.
Project/Site: NASA PBS Waste - FR3 + 4

Job ID: 240-125349-1

Client Sample ID: FR34-WC-007

Lab Sample ID: 240-125349-7
Date Collected: 01/23/20 15:45
Matrix: Solid
Date Received: 01/24/20 10:40

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
TCLP	Leach	1311			420578	01/28/20 16:00	DRJ	TAL CAN
TCLP	Analysis	8260B		1	420751	01/29/20 21:31	TJL1	TAL CAN
TCLP	Leach	1311			420379	01/27/20 15:00	DRJ	TAL CAN
TCLP	Prep	3510C			420513	01/28/20 10:40	BMB	TAL CAN
TCLP	Analysis	8270C		1	420777	01/30/20 12:30	TMH	TAL CAN
TCLP	Leach	1311			420379	01/27/20 15:00	DRJ	TAL CAN
TCLP	Prep	3510C			420514	01/28/20 10:42	MDH	TAL CAN
TCLP	Analysis	8081A		1	421199	02/03/20 13:54	BPM	TAL CAN
TCLP	Leach	1311			420379	01/27/20 15:00	DRJ	TAL CAN
TCLP	Prep	8151A			421213	02/03/20 10:51	BMB	TAL CAN
TCLP	Analysis	8151A		1	421572	02/05/20 14:47	LKG	TAL CAN
TCLP	Leach	1311			420379	01/27/20 15:00	DRJ	TAL CAN
TCLP	Prep	3010A			420496	01/28/20 14:00	MRL	TAL CAN
TCLP	Analysis	6010C		1	420700	01/29/20 16:20	RKT	TAL CAN
TCLP	Leach	1311			420379	01/27/20 15:00	DRJ	TAL CAN
TCLP	Prep	3010A			420496	01/28/20 14:00	MRL	TAL CAN
TCLP	Analysis	6010C		10	420871	01/30/20 19:09	WKD	TAL CAN
TCLP	Leach	1311			420379	01/27/20 15:00	DRJ	TAL CAN
TCLP	Prep	7470A			420499	01/28/20 12:00	MRL	TAL CAN
TCLP	Analysis	7470A		1	420727	01/29/20 13:42	SLD	TAL CAN
Total/NA	Analysis	1010		1	420527	01/28/20 10:57	TPH	TAL CAN
Total/NA	Analysis	9045C		1	420370	01/27/20 17:10	JR	TAL CAN
Total/NA	Analysis	9095A		1	421654	02/05/20 16:59	JWW	TAL CAN
Total/NA	Analysis	Moisture		1	420404	01/27/20 17:38	AGC	TAL CAN

Client Sample ID: FR34-WC-007

Lab Sample ID: 240-125349-7
Date Collected: 01/23/20 15:45
Matrix: Solid
Date Received: 01/24/20 10:40
Percent Solids: 83.5

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	5030A			420546	01/28/20 12:56	SAM	TAL CAN
Total/NA	Analysis	8260B		1	420489	01/28/20 22:18	SAM	TAL CAN
Total/NA	Prep	3540C			420483	01/28/20 09:56	JMT	TAL CAN
Total/NA	Analysis	8270D		2.5	421566	02/05/20 20:07	JMG	TAL CAN
Soluble	Leach	DI Leach			286233	01/27/20 08:53	DAW	TAL HOU
Soluble	Analysis	8015B		1	286234	01/27/20 14:14	DAW	TAL HOU
Soluble	Leach	DI Leach			286233	01/27/20 08:53	DAW	TAL HOU
Soluble	Analysis	8015B		1	286244	01/27/20 12:41	DAW	TAL HOU
Total/NA	Prep	3540C			420318	01/27/20 09:29	SDE	TAL CAN
Total/NA	Analysis	8082		1	420600	01/29/20 11:03	KMG	TAL CAN
Total/NA	Prep	3050B			420371	01/27/20 14:00	DEE	TAL CAN
Total/NA	Analysis	6010C		1	420534	01/28/20 19:24	WKD	TAL CAN
Total/NA	Prep	7471B			420377	01/27/20 16:00	DEE	TAL CAN
Total/NA	Analysis	7471B		1	420630	01/28/20 14:46	SLD	TAL CAN

Lab Chronicle

Client: Leidos, Inc.
Project/Site: NASA PBS Waste - FR3 + 4

Job ID: 240-125349-1

Client Sample ID: FR34-WC-007

Lab Sample ID: 240-125349-7
Date Collected: 01/23/20 15:45
Matrix: Solid
Date Received: 01/24/20 10:40
Percent Solids: 83.5

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	9012A			420678	01/29/20 09:55	JR	TAL CAN
Total/NA	Analysis	9012A		1	420764	01/29/20 13:35	JR	TAL CAN
Total/NA	Prep	9030B			420300	01/27/20 07:57	BLW	TAL CAN
Total/NA	Analysis	9034		1	420363	01/27/20 13:15	BLW	TAL CAN

Client Sample ID: FR34-WC-008

Lab Sample ID: 240-125349-8
Date Collected: 01/23/20 16:00
Matrix: Solid
Date Received: 01/24/20 10:40

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
TCLP	Processed	Part Size Red			420315	01/27/20 09:09	POP	TAL CAN
TCLP	Leach	1311			420578	01/28/20 16:00	DRJ	TAL CAN
TCLP	Analysis	8260B		2	420751	01/29/20 21:54	TJL1	TAL CAN
TCLP	Processed	Part Size Red			420315	01/27/20 09:09	POP	TAL CAN
TCLP	Leach	1311			420576	01/28/20 16:00	DRJ	TAL CAN
TCLP	Prep	3510C			420669	01/29/20 09:24	MDH	TAL CAN
TCLP	Analysis	8270C		1	421339	02/04/20 15:50	MRU	TAL CAN
TCLP	Processed	Part Size Red			420315	01/27/20 09:09	POP	TAL CAN
TCLP	Leach	1311			420576	01/28/20 16:00	DRJ	TAL CAN
TCLP	Prep	3510C			420670	01/29/20 09:27	BMB	TAL CAN
TCLP	Analysis	8081A		5	420998	01/31/20 14:47	BPM	TAL CAN
TCLP	Processed	Part Size Red			420315	01/27/20 09:09	POP	TAL CAN
TCLP	Leach	1311			420576	01/28/20 16:00	DRJ	TAL CAN
TCLP	Prep	8151A			420673	01/29/20 09:30	BMB	TAL CAN
TCLP	Analysis	8151A		1	421192	02/04/20 12:44	LKG	TAL CAN
TCLP	Processed	Part Size Red			420315	01/27/20 09:09	POP	TAL CAN
TCLP	Leach	1311			420576	01/28/20 16:00	DRJ	TAL CAN
TCLP	Prep	3010A			420632	01/29/20 14:00	MRL	TAL CAN
TCLP	Analysis	6010C		1	420871	01/30/20 13:15	WKD	TAL CAN
TCLP	Processed	Part Size Red			420315	01/27/20 09:09	POP	TAL CAN
TCLP	Leach	1311			420576	01/28/20 16:00	DRJ	TAL CAN
TCLP	Prep	7470A			420636	01/29/20 12:00	MRL	TAL CAN
TCLP	Analysis	7470A		1	420971	01/30/20 12:32	SLD	TAL CAN
Total/NA	Processed	Part Size Red			420314	01/27/20 09:07	POP	TAL CAN
Total/NA	Analysis	1010		1	420763	01/29/20 15:41	JMR	TAL CAN
Total/NA	Processed	Part Size Red			420314	01/27/20 09:07	POP	TAL CAN
Total/NA	Analysis	9045C		1	420553	01/28/20 20:44	AGC	TAL CAN
Total/NA	Processed	Part Size Red			420314	01/27/20 09:07	POP	TAL CAN
Total/NA	Analysis	9095A		1	421654	02/05/20 16:59	JWW	TAL CAN
Total/NA	Processed	Part Size Red			420314	01/27/20 09:07	POP	TAL CAN
Total/NA	Analysis	Moisture		1	420404	01/27/20 17:38	AGC	TAL CAN

Lab Chronicle

Client: Leidos, Inc.
Project/Site: NASA PBS Waste - FR3 + 4

Job ID: 240-125349-1

Client Sample ID: FR34-WC-008

Date Collected: 01/23/20 16:00
Date Received: 01/24/20 10:40

Lab Sample ID: 240-125349-8

Matrix: Solid
Percent Solids: 79.2

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Processed	Part Size Red			420314	01/27/20 09:07	POP	TAL CAN
Total/NA	Prep	5030B			420776	01/29/20 23:34	LAM	TAL CAN
Total/NA	Analysis	8260B		1	420897	01/30/20 18:55	SAM	TAL CAN
Total/NA	Processed	Part Size Red			420314	01/27/20 09:07	POP	TAL CAN
Total/NA	Prep	3540C			420483	01/28/20 09:56	JMT	TAL CAN
Total/NA	Analysis	8270D		50	421566	02/05/20 16:07	JMG	TAL CAN
Total/NA	Processed	Part Size Red	RA		420314	01/27/20 09:07	POP	TAL CAN
Total/NA	Prep	3540C	RA		420483	01/28/20 09:56	JMT	TAL CAN
Total/NA	Analysis	8270D	RA	500	421566	02/05/20 16:31	JMG	TAL CAN
Soluble	Leach	DI Leach			286450	01/29/20 08:39	DAW	TAL HOU
Soluble	Analysis	8015B		1	286429	01/29/20 10:04	DAW	TAL HOU
Soluble	Leach	DI Leach			286450	01/29/20 08:39	DAW	TAL HOU
Soluble	Analysis	8015B		1	286467	01/29/20 11:13	DAW	TAL HOU
Total/NA	Processed	Part Size Red			420314	01/27/20 09:07	POP	TAL CAN
Total/NA	Prep	3540C			420468	01/28/20 08:43	SDE	TAL CAN
Total/NA	Analysis	8082		1	420734	01/30/20 15:53	KMG	TAL CAN
Total/NA	Processed	Part Size Red			420314	01/27/20 09:07	POP	TAL CAN
Total/NA	Prep	3050B			420689	01/29/20 14:00	DEE	TAL CAN
Total/NA	Analysis	6010C		1	420871	01/30/20 17:35	WKD	TAL CAN
Total/NA	Processed	Part Size Red			420314	01/27/20 09:07	POP	TAL CAN
Total/NA	Prep	3050B			420689	01/29/20 14:00	DEE	TAL CAN
Total/NA	Analysis	6010C		5	420871	01/31/20 08:11	WKD	TAL CAN
Total/NA	Processed	Part Size Red			420314	01/27/20 09:07	POP	TAL CAN
Total/NA	Prep	7471B			420694	01/29/20 16:00	DEE	TAL CAN
Total/NA	Analysis	7471B		1	420912	01/30/20 12:49	SLD	TAL CAN
Total/NA	Processed	Part Size Red			420314	01/27/20 09:07	POP	TAL CAN
Total/NA	Prep	9012A			420678	01/29/20 09:55	JR	TAL CAN
Total/NA	Analysis	9012A		1	420764	01/29/20 13:47	JR	TAL CAN
Total/NA	Processed	Part Size Red			420314	01/27/20 09:07	POP	TAL CAN
Total/NA	Prep	9030B			420831	01/30/20 09:05	AMT	TAL CAN
Total/NA	Analysis	9034		1	420861	01/30/20 09:54	AMT	TAL CAN

Laboratory References:

TAL CAN = Eurofins TestAmerica, Canton, 4101 Shuffel Street NW, North Canton, OH 44720, TEL (330)497-9396

TAL HOU = Eurofins TestAmerica, Houston, 6310 Rothway Street, Houston, TX 77040, TEL (713)690-4444

Accreditation/Certification Summary

Client: Leidos, Inc.
Project/Site: NASA PBS Waste - FR3 + 4

Job ID: 240-125349-1

Laboratory: Eurofins TestAmerica, Canton

All accreditations/certifications held by this laboratory are listed. Not all accreditations/certifications are applicable to this report.

Authority	Program	Identification Number	Expiration Date
California	State	2927	02-23-20
Connecticut	State	PH-0590	12-31-21
Florida	NELAP	E87225	06-30-20
Georgia	State	4062	02-23-20
Illinois	NELAP	004498	07-31-20
Iowa	State	421	06-01-21
Kansas	NELAP	E-10336	04-30-20
Kentucky (UST)	State	112225	02-23-20
Kentucky (WW)	State	KY98016	12-31-20
Minnesota	NELAP	OH00048	12-31-20
Minnesota (Petrofund)	State	3506	08-01-21
New Jersey	NELAP	OH001	06-30-20
New York	NELAP	10975	03-31-20
Ohio VAP	State	CL0024	06-05-21
Oregon	NELAP	4062	02-23-20
Pennsylvania	NELAP	68-00340	08-31-20
Texas	NELAP	T104704517-18-10	08-31-20
USDA	US Federal Programs	P330-16-00404	12-28-19 *
Virginia	NELAP	010101	09-14-20
Washington	State	C971	01-12-21
West Virginia DEP	State	210	12-31-20

Laboratory: Eurofins TestAmerica, Houston

All accreditations/certifications held by this laboratory are listed. Not all accreditations/certifications are applicable to this report.

Authority	Program	Identification Number	Expiration Date
Arkansas DEQ	State	88-0759	08-04-20
Louisiana	NELAP	01967	06-30-20
Oklahoma	State	2019-073	08-31-20
Texas	NELAP	T104704223-19-25	10-31-20
USDA	US Federal Programs	P330-18-00130	04-30-21
Utah	NELAP	TX000832019-5	07-31-20

* Accreditation/Certification renewal pending - accreditation/certification considered valid.

1.8/2.5 1.1/1.8 2.0/2.7 1.1/1.8

Eurofins TestAmerica, Canton
4101 Shuffel Street NW
North Canton, OH 44720
Phone (330) 497-9396 Fax (330) 497-0772

Chain of Custody Record

eurofins | Environment Testing TestAmerica

Client Information	Sampler: Gabby Gromofsky	Lab PM: Johnson, Opal	Carrier Tracking No(s):	COC No: 240-68641-28239.1
Client Contact: Rich Sprinzl	Phone: 330-988-5964	E-Mail: opal.johnson@testamericainc.com		Page: Page 1 of 1
Company: Leidos, Inc.				Job #:
Address: 8866 Commons Boulevard Suite 201	Due Date Requested:			
City: Twinsburg	TAT Requested (days): Standard 10 days			
State, Zip: OH, 44087				
Phone: 330-348-1378(Tel)	PO #: Task 3 / P010211384_Mod XXX			
Email: sprinzlr@leidos.com	WO #:			
Project Name: NASA PBS Waste Characterization	Project #: 24016933, AG = Solid IDW			
Site: NASA FRS+4	SSOW#:			

Analysis Requested

Preservation Codes:
A - HCL, B - NaOH, C - Zn Acetate, D - Nitric Acid, E - NaHSO4, F - MeOH, G - Amchlor, H - Ascorbic Acid, I - Ice, J - DI Water, K - EDTA, L - EDA
M - Hexane, N - None, O - AsNaO2, P - Na2O4S, Q - Na2SO3, R - Na2S2O3, S - H2SO4, T - TSP Dodecahydrate, U - Acetone, V - MCAA, W - pH 4-5, Z - other (specify)
Other:

Sample Identification	Sample Date	Sample Time	Sample Type (C=comp, G=grab)	Matrix (W=water, S=solid, O=waste/oil, BT=Tissue, A=Air)	Field Filtered Sample (Yes or No)	Perform MS/MSD (Yes or No)	6010B, 7470A, 8081A, 8151A, 8260B, 8270C - TCLP	6010C, 7471B, 8082, 8270D, 9012A, 9034_Calc, 9045C, Moisture	9095A - Paint Filter	8015C_DAI, 8015C_DAI_GLY	1010 - Flash Point	8260C - MS Volatile	Total Number of containers	Special Instructions/Note:
			Preservation Code:				N	N	N	N	N	N		
FR34-WC-001	01/23/2020	1030	G C	Solid			X	X	X	X	X	X	6	F3S-SB006 HOTSPOT 0-1' BGS
FR34-WC-002		1200	RS 1/23/20 C	Solid			X	X	X	X	X	X	6	F4T-SB006/SB002 HOTSPOTS 0-1' BGS
FR34-WC-003		1300	C	Solid			X	X	X	X	X	X	6	F4T-SB007/SS031/SB001/SB008 HOTSPOTS 0-1' BGS
FR34-WC-004		1355	C	Solid			X	X	X	X	X	X	6	BLAST WALL-WEST HALF 0-2' HORIZ.
FR34-WC-005		1450	C	Solid			X	X	X	X	X	X	6	BLAST WALL-EAST HALF 0-2' HORIZ.
FR34-WC-006		1615	C	Solid			X	X	X	X	X	X	6	BLAST WALL-WEST HALF 2-4' HORIZ.
FR34-WC-007		1545	C	Solid			X	X	X	X	X	X	6	BLAST WALL-EAST HALF 2-4' HORIZ.
FR34-WC-008		1600	C	Solid			X	X	X	X	X	X	4	PSR requested for wood (CREOSOTE?)
	RS	01/23/2020												

240-125349 Chain of Custody

Possible Hazard Identification
☒ Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☐ Unknown ☐ Radiological

Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)
☐ Return To Client ☒ Disposal By Lab ☐ Archive For _____ Months

Deliverable Requested: I, II, III, IV, Other (specify)

Special Instructions/QC Requirements:

Empty Kit Relinquished by:	Date:	Time:	Method of Shipment: DROPOFF

Relinquished by:	Date/Time:	Company	Received by:	Date/Time:	Company
[signature]	01/24/2020 1040	Leidos	[signature]	1-24-20 1040	ETA
Relinquished by:	Date/Time:	Company	Received by:	Date/Time:	Company
Relinquished by:	Date/Time:	Company	Received by:	Date/Time:	Company

Custody Seals Intact: Δ Yes Δ No | Custody Seal No.: | Cooler Temperature(s) °C and Other Remarks:

Ver: 01/16/2019

Eurofins TestAmerica Canton Sample Receipt Form/Narrative
Canton Facility

Login # : 125349

Client Lerdos Site Name _____ Cooler unpacked by: Ryan C

Cooler Received on 1-24-20 Opened on 1-24-20 1040

FedEx: 1st Grd Exp UPS FAS Clipper Client Drop Off TestAmerica Courier Other _____

Receipt After-hours: Drop-off Date/Time _____ Storage Location _____

TestAmerica Cooler # TA Foam Box Client Cooler Box Other _____

Packing material used: Bubble Wrap Foam Plastic Bag None Other _____

COOLANT: Wet Ice Blue Ice Dry Ice Water None

1. Cooler temperature upon receipt ☒ See Multiple Cooler Form
   IR GUN# IR-10 (CF +0.7 °C) Observed Cooler Temp._____°C Corrected Cooler Temp._____°C
   IR GUN #IR-11 (CF +0.9°C) Observed Cooler Temp._____°C Corrected Cooler Temp._____°C
2. Were tamper/custody seals on the outside of the cooler(s)? If Yes Quantity_____ Yes No
   -Were the seals on the outside of the cooler(s) signed & dated? Yes No NA
   -Were tamper/custody seals on the bottle(s) or bottle kits (LLHg/MeHg)? Yes No
   -Were tamper/custody seals intact and uncompromised? Yes No NA
3. Shippers' packing slip attached to the cooler(s)? Yes No
4. Did custody papers accompany the sample(s)? Yes No
5. Were the custody papers relinquished & signed in the appropriate place? Yes No
6. Was/were the person(s) who collected the samples clearly identified on the COC? Yes No
7. Did all bottles arrive in good condition (Unbroken)? Yes No
8. Could all bottle labels be reconciled with the COC? Yes No
9. Were correct bottle(s) used for the test(s) indicated? Yes No
10. Sufficient quantity received to perform indicated analyses? Yes No
11. Are these work share samples? Yes No
    If yes, Questions 12-16 have been checked at the originating laboratory.
12. Were all preserved sample(s) at the correct pH upon receipt? Yes No NA pH Strip Lot# **HC995364**
13. Were VOAs on the COC? Yes No
14. Were air bubbles >6 mm in any VOA vials? ● ⬅ Larger than this. Yes No NA
15. Was a VOA trip blank present in the cooler(s)? Trip Blank Lot #_____ Yes No
16. Was a LL Hg or Me Hg trip blank present? _____ Yes No

Tests that are not checked for pH by Receiving:

VOAs
Oil and Grease
TOC

Contacted PM _____ Date _____ by _____ via Verbal Voice Mail Other

Concerning _____

17. CHAIN OF CUSTODY & SAMPLE DISCREPANCIES

Samples processed by: Ryan C

18. SAMPLE CONDITION

Sample(s) _____ were received after the recommended holding time had expired.

Sample(s) _____ were received in a broken container.

Sample(s) _____ were received with bubble >6 mm in diameter. (Notify PM)

19. SAMPLE PRESERVATION

Sample(s) _____ were further preserved in the laboratory.

Time preserved: _____ Preservative(s) added/Lot number(s): _____

VOA Sample Preservation - Date/Time VOAs Frozen: _____

Login # : _____

Eurofins TestAmerica Canton Sample Receipt Multiple Cooler Form				
Cooler Description (Circle)	IR Gun # (Circle)	Observed Temp °C	Corrected Temp °C	Coolant (Circle)
TA Client Box Other	IR-10 IR-11	1.8	2.5	Wet Ice Blue Ice Dry Ice Water None
TA Client Box Other	IR-10 IR-11	1.1	1.8	Wet Ice Blue Ice Dry Ice Water None
TA Client Box Other	IR-10 IR-11	2.0	2.7	Wet Ice Blue Ice Dry Ice Water None
TA Client Box Other	IR-10 IR-11	1.1	1.8	Wet Ice Blue Ice Dry Ice Water None
TA Client Box Other	IR-10 IR-11			Wet Ice Blue Ice Dry Ice Water None
TA Client Box Other	IR-10 IR-11			Wet Ice Blue Ice Dry Ice Water None
TA Client Box Other	IR-10 IR-11			Wet Ice Blue Ice Dry Ice Water None
TA Client Box Other	IR-10 IR-11			Wet Ice Blue Ice Dry Ice Water None
TA Client Box Other	IR-10 IR-11			Wet Ice Blue Ice Dry Ice Water None
TA Client Box Other	IR-10 IR-11			Wet Ice Blue Ice Dry Ice Water None
TA Client Box Other	IR-10 IR-11			Wet Ice Blue Ice Dry Ice Water None
TA Client Box Other	IR-10 IR-11			Wet Ice Blue Ice Dry Ice Water None
TA Client Box Other	IR-10 IR-11			Wet Ice Blue Ice Dry Ice Water None
TA Client Box Other	IR-10 IR-11			Wet Ice Blue Ice Dry Ice Water None
TA Client Box Other	IR-10 IR-11			Wet Ice Blue Ice Dry Ice Water None
TA Client Box Other	IR-10 IR-11			Wet Ice Blue Ice Dry Ice Water None
TA Client Box Other	IR-10 IR-11			Wet Ice Blue Ice Dry Ice Water None
TA Client Box Other	IR-10 IR-11			Wet Ice Blue Ice Dry Ice Water None
TA Client Box Other	IR-10 IR-11			Wet Ice Blue Ice Dry Ice Water None
TA Client Box Other	IR-10 IR-11			Wet Ice Blue Ice Dry Ice Water None
TA Client Box Other	IR-10 IR-11			Wet Ice Blue Ice Dry Ice Water None
TA Client Box Other	IR-10 IR-11			Wet Ice Blue Ice Dry Ice Water None
TA Client Box Other	IR-10 IR-11			Wet Ice Blue Ice Dry Ice Water None
TA Client Box Other	IR-10 IR-11			Wet Ice Blue Ice Dry Ice Water None
TA Client Box Other	IR-10 IR-11			Wet Ice Blue Ice Dry Ice Water None
TA Client Box Other	IR-10 IR-11			Wet Ice Blue Ice Dry Ice Water None
TA Client Box Other	IR-10 IR-11			Wet Ice Blue Ice Dry Ice Water None
TA Client Box Other	IR-10 IR-11			Wet Ice Blue Ice Dry Ice Water None
TA Client Box Other	IR-10 IR-11			Wet Ice Blue Ice Dry Ice Water None
TA Client Box Other	IR-10 IR-11			Wet Ice Blue Ice Dry Ice Water None
☐ See Temperature Excursion Form				

WI-NC-099 Cooler Receipt Form Page 2 – Multiple Coolers

Eurofins TestAmerica, Canton
4101 Shuffel Street NW
North Canton, OH 44720
Phone: 330-497-9396 Fax: 330-497-0772

Chain of Custody Record

eurofins | Environment Testing TestAmerica

Client Information (Sub Contract Lab)	Sampler:	Lab PM: Johnson, Opal	Carrier Tracking No(s):	COC No: 240-116777.1
Client Contact: Shipping/Receiving	Phone:	E-Mail: opal.johnson@testamericainc.com	State of Origin: Ohio	Page: Page 1 of 1
Company: TestAmerica Laboratories, Inc.		Accreditations Required (See note):		Job #: 240-125349-1
Address: 6310 Rothway Street, ,	Due Date Requested: 2/6/2020			
City: Houston	TAT Requested (days):			
State, Zip: TX, 77040				
Phone: 713-690-4444(Tel) 713-690-5646(Fax)	PO #:			
Email:	WO #:			
Project Name: NASA PBS Waste - FR3 + 4	Project #: 24016933			
Site:	SSOW#:			

Analysis Requested

Preservation Codes:
A - HCL, B - NaOH, C - Zn Acetate, D - Nitric Acid, E - NaHSO4, F - MeOH, G - Amchlor, H - Ascorbic Acid, I - Ice, J - DI Water, K - EDTA, L - EDA, M - Hexane, N - None, O - AsNaO2, P - Na2O4S, Q - Na2SO3, R - Na2S2O3, S - H2SO4, T - TSP Dodecahydrate, U - Acetone, V - MCAA, W - pH 4-5, Z - other (specify)
Other:

Sample Identification - Client ID (Lab ID)	Sample Date	Sample Time	Sample Type (C=comp, G=grab)	Matrix (W=water, S=solid, O=waste/oil, BT=Tissue, A=Air)	Field Filtered Sample (Yes or No)	Perform MS/MSD (Yes or No)	8015D_DAI/DI_LEACH (MOD) Alcohols - MeOH	8015D_DAI/DI_LEACH 2-Ethoxyethanol Only	Total Number of containers	Special Instructions/Note:
			Preservation Code:							
FR34-WC-001 (240-125349-1)	1/23/20	10:30 Eastern		Solid			X	X	1	
FR34-WC-002 (240-125349-2)	1/23/20	12:00 Eastern		Solid			X	X	1	
FR34-WC-003 (240-125349-3)	1/23/20	13:00 Eastern		Solid			X	X		
FR34-WC-004 (240-125349-4)	1/23/20	13:55 Eastern		Solid			X	X		
FR34-WC-005 (240-125349-5)	1/23/20	14:50 Eastern		Solid			X	X		
FR34-WC-006 (240-125349-6)	1/23/20	16:15 Eastern		Solid			X	X		
FR34-WC-007 (240-125349-7)	1/23/20	15:45 Eastern		Solid			X	X	1	

240-125349 Chain of Custody

Note: Since laboratory accreditations are subject to change, Eurofins TestAmerica places the ownership of method, analyte & accreditation compliance upon out subcontract laboratories. This sample shipment is forwarded under chain-of-custody. If the laboratory does not currently maintain accreditation in the State of Origin listed above for analysis/tests/matrix being analyzed, the samples must be shipped back to the Eurofins TestAmerica laboratory or other instructions will be provided. Any changes to accreditation status should be brought to Eurofins TestAmerica attention immediately. If all requested accreditations are current to date, return the signed Chain of Custody attesting to said complicance to Eurofins TestAmerica.

Possible Hazard Identification *Unconfirmed*	***Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)*** ☐ *Return To Client* ☐ *Disposal By Lab* ☐ *Archive For* _____ *Months*
Deliverable Requested: I, II, III, IV, Other (specify) Primary Deliverable Rank: 2	Special Instructions/QC Requirements:

Empty Kit Relinquished by:	Date:	Time:		Method of Shipment:	
Relinquished by:	Date/Time: 1-24-20 1600	Company: 240	Received by:	Date/Time: 1-25-20	Company: 1014
Relinquished by:	Date/Time:	Company:	Received by:	Date/Time:	Company:
Relinquished by:	Date/Time:	Company:	Received by:	Date/Time:	Company:
Custody Seals Intact: Δ Yes Δ No	Custody Seal No.:		Cooler Temperature(s) °C and Other Remarks:		

Ver: 01/16/2019

Eurofins TestAmerica Houston

eurofins | Environment Testing TestAmerica

San Loc: 240 t Checklist

125349

'20 JAN 25 10:14

Date/Time Received: _____

JOB NUMBER: ____ _ CLIENT: [illegible]

UNPACKED BY: [illegible] CARRIER/DRIVER: FED EX

Custody Seal Present: ☑YES ☐NO Number of Coolers Received: 1

Cooler ID	Temp Blank	Trip Blank	Observed Temp (℃)	Therm ID	Therm CF	Corrected Temp (℃)
633	Y / N	Y / N	1.3	679	+0.2	1.5
	Y / N	Y / N				
	Y / N	Y / N				
	Y / N	Y / N				
	Y / N	Y / N				
	Y / N	Y / N				

CF = correction factor

[illegible] 1/25/20

Samples received on ice? ☑YES ☐NO

LABORATORY PRESERVATION OF SAMPLES REQUIRED: ☐NO ☐YES

Base samples are>pH 12: ☐YES ☐NO Acid preserved are<pH 2: ☐YES ☐NO

TX1005 samples frozen upon receipt: ☐ YES DATE & TIME PUT IN FREEZER: _____

pH paper Lot #_____ VOA headspace acceptable (5-6mm): ☐YES ☐NO ☐NA

Did samples meet the laboratory's standard conditions of sample acceptability upon receipt?	☑YES	☐ NO

COMMENTS:

[illegible] 1/25/20

HS-SA-WI-013 Rev. 4A; 08/26/2019

Eurofins TestAmerica, Canton
4101 Shuffel Street NW
North Canton, OH 44720
Phone: 330-497-9396 Fax: 330-497-0772

Chain of Custody Record

eurofins | Environment Testing TestAmerica

Client Information (Sub Contract Lab)	Sampler:	Lab PM: Johnson, Opal	Carrier Tracking No(s):	COC No: 240-116817.1
Client Contact: Shipping/Receiving	Phone:	E-Mail: opal.johnson@testamericainc.com	State of Origin: Ohio	Page: Page 1 of 1
Company: TestAmerica Laboratories, Inc.		Accreditations Required (See note):		Job #: 240-125349-1
Address: 6310 Rothway Street, ,	Due Date Requested: 2/6/2020			
City: Houston	TAT Requested (days):			
State, Zip: TX, 77040				
Phone: 713-690-4444(Tel) 713-690-5646(Fax)	PO #:			
Email:	WO #:			
Project Name: NASA PBS Waste - FR3 + 4	Project #: 24016933			
Site:	SSOW#:			

Analysis Requested

Preservation Codes:
A - HCL, B - NaOH, C - Zn Acetate, D - Nitric Acid, E - NaHSO4, F - MeOH, G - Amchlor, H - Ascorbic Acid, I - Ice, J - DI Water, K - EDTA, L - EDA, M - Hexane, N - None, O - AsNaO2, P - Na2O4S, Q - Na2SO3, R - Na2S2O3, S - H2SO4, T - TSP Dodecahydrate, U - Acetone, V - MCAA, W - pH 4-5, Z - other (specify)
Other:

Sample Identification - Client ID (Lab ID)	Sample Date	Sample Time	Sample Type (C=comp, G=grab)	Matrix (W=water, S=solid, O=waste/oil, BT=Tissue, A=Air)	Field Filtered Sample (Yes or No)	Perform MS/MSD (Yes or No)	8015B_DAI/DI_LEACH (MOD) FSCAN - Methanol	8015B_DAI/DI_LEACH FSCAN - 2- Ethoxyethanol	Total Number of containers	Special Instructions/Note:
			Preservation Code:							
FR34-WC-008 (240-125349-8)	1/23/20	16:00 Eastern		Solid			X	X	1	

240-125349 Chain of Custody

Note: Since laboratory accreditations are subject to change, Eurofins TestAmerica places the ownership of method, analyte & accreditation compliance upon out subcontract laboratories. This sample shipment is forwarded under chain-of-custody. If the laboratory does not currently maintain accreditation in the State of Origin listed above for analysis/tests/matrix being analyzed, the samples must be shipped back to the Eurofins TestAmerica laboratory or other instructions will be provided. Any changes to accreditation status should be brought to Eurofins TestAmerica attention immediately. If all requested accreditations are current to date, return the signed Chain of Custody attesting to said complicance to Eurofins TestAmerica.

Possible Hazard Identification *Unconfirmed*			***Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)*** ☐ *Return To Client* ☐ *Disposal By Lab* ☐ *Archive For* _____ *Months*		
Deliverable Requested: I, II, III, IV, Other (specify)	Primary Deliverable Rank: 2		Special Instructions/QC Requirements:		
Empty Kit Relinquished by:	Date:		Time:	Method of Shipment:	
Relinquished by: Charles D	Date/Time: 1-27-20 1330	Company: 2910	Received by:	Date/Time:	Company
Relinquished by:	Date/Time:	Company	Received by:	Date/Time:	Company
Relinquished by:	Date/Time:	Company	Received by:	Date/Time:	Company
Custody Seals Intact: Δ Yes Δ No	Custody Seal No.:		Cooler Temperature(s) °C and Other Remarks:		

Ver: 01/16/2019

Eurofins TestAmerica Houston

eurofins | Environment Testing TestAmerica

'20 JAN 28 10:32

Sam[illegible]t Checklist

Loc: 240

125349

Date/Time Received: _____

JOB NUMBER: ____ CLIENT: [illegible]

UNPACKED BY: [illegible] CARRIER/DRIVER: [illegible]

Custody Seal Present: ☑YES ☐NO Number of Coolers Received: 1

Cooler ID	Temp Blank	Trip Blank	Observed Temp (℃)	Therm ID	Therm CF	Corrected Temp (℃)
6470	Y / N	Y / N	0.2	678	+0.2	0.4
	Y / N	Y / N				
	Y / N	Y / N				
	Y / N	Y / N				
	Y / N	Y / N				
	Y / N	Y / N				

CF = correction factor

[illegible] 1/28/20

Samples received on ice? ☑YES ☐NO

LABORATORY PRESERVATION OF SAMPLES REQUIRED: ☐NO ☐YES

Base samples are>pH 12: ☐YES ☐NO Acid preserved are<pH 2: ☐YES ☐NO

TX1005 samples frozen upon receipt: ☐ YES DATE & TIME PUT IN FREEZER: _____

pH paper Lot #_____ VOA headspace acceptable (5-6mm): ☐YES ☐NO ☐NA

Did samples meet the laboratory's standard conditions of sample acceptability upon receipt?	☑YES	☐ NO

COMMENTS:

[illegible] 1/28/20

HS-SA-WI-013 Rev. 4A; 08/26/2019

Eurofins TestAmerica, Canton
4101 Shuffel Street NW
North Canton, OH 44720
Phone: 330-497-9396 Fax: 330-497-0772

Chain of Custody Record

eurofins | Environment Testing TestAmerica

Client Information (Sub Contract Lab)	Sampler:	Lab PM: Johnson, Opal	Carrier Tracking No(s):	COC No: 240-116817.1
Client Contact: Shipping/Receiving	Phone:	E-Mail: opal.johnson@testamericainc.com	State of Origin: Ohio	Page: Page 1 of 1
Company: TestAmerica Laboratories, Inc.		Accreditations Required (See note):		Job #: 240-125349-1
Address: 6310 Rothway Street, ,	Due Date Requested: 2/6/2020			
City: Houston	TAT Requested (days):			
State, Zip: TX, 77040				
Phone: 713-690-4444(Tel) 713-690-5646(Fax)	PO #:			
Email:	WO #:			
Project Name: NASA PBS Waste - FR3 + 4	Project #: 24016933			
Site:	SSOW#:			

Analysis Requested

Preservation Codes:

A - HCL, B - NaOH, C - Zn Acetate, D - Nitric Acid, E - NaHSO4, F - MeOH, G - Amchlor, H - Ascorbic Acid, I - Ice, J - DI Water, K - EDTA, L - EDA, M - Hexane, N - None, O - AsNaO2, P - Na2O4S, Q - Na2SO3, R - Na2S2O3, S - H2SO4, T - TSP Dodecahydrate, U - Acetone, V - MCAA, W - pH 4-5, Z - other (specify)

Other:

Sample Identification - Client ID (Lab ID)	Sample Date	Sample Time	Sample Type (C=comp, G=grab)	Matrix (W=water, S=solid, O=wasteoil, BT=Tissue, A=Air)	Field Filtered Sample (Yes or No)	Perform MS/MSD (Yes or No)	8015B_DAI/DI_LEACH (MOD) FSCAN - Methanol	8015B_DAI/DI_LEACH FSCAN - 2- Ethoxyethanol	Total Number of containers	Special Instructions/Note:
			Preservation Code:							
FR34-WC-008 (240-125349-8)	1/23/20	16:00 Eastern		Solid			X	X	1	

240-125349 Chain of Custody

Note: Since laboratory accreditations are subject to change, Eurofins TestAmerica places the ownership of method, analyte & accreditation compliance upon out subcontract laboratories. This sample shipment is forwarded under chain-of-custody. If the laboratory does not currently maintain accreditation in the State of Origin listed above for analysis/tests/matrix being analyzed, the samples must be shipped back to the Eurofins TestAmerica laboratory or other instructions will be provided. Any changes to accreditation status should be brought to Eurofins TestAmerica attention immediately. If all requested accreditations are current to date, return the signed Chain of Custody attesting to said complicance to Eurofins TestAmerica.

Possible Hazard Identification *Unconfirmed*	***Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)*** ☐ *Return To Client* ☐ *Disposal By Lab* ☐ *Archive For* _____ *Months*
Deliverable Requested: I, II, III, IV, Other (specify) Primary Deliverable Rank: 2	Special Instructions/QC Requirements:

Empty Kit Relinquished by:	Date:	Time:	Method of Shipment:		
Relinquished by: Charles B	Date/Time: 1-27-20 1330	Company: 240	Received by:	Date/Time:	Company
Relinquished by:	Date/Time:	Company	Received by:	Date/Time:	Company
Relinquished by:	Date/Time:	Company	Received by:	Date/Time:	Company
Custody Seals Intact: Δ Yes Δ No	Custody Seal No.:		Cooler Temperature(s) °C and Other Remarks:		

Ver: 01/16/2019

Eurofins TestAmerica Houston

eurofins | Environment Testing TestAmerica

'20 JAN 28 10:52

Sam[illegible]t Checklist

Loc: 240

125349

Date/Time Received: _____

JOB NUMBER: ____ CLIENT: [illegible]

UNPACKED BY: [illegible] CARRIER/DRIVER: [illegible]

Custody Seal Present: ☑YES ☐NO Number of Coolers Received: 1

Cooler ID	Temp Blank	Trip Blank	Observed Temp (℃)	Therm ID	Therm CF	Corrected Temp (℃)
6470	Y / N	Y / N	0.2	678	+0.2	0.4
	Y / N	Y / N				
	Y / N	Y / N				
	Y / N	Y / N				
	Y / N	Y / N				
	Y / N	Y / N				

CF = correction factor

[illegible] 1/28/20

Samples received on ice? ☑YES ☐NO

LABORATORY PRESERVATION OF SAMPLES REQUIRED: ☐NO ☐YES

Base samples are>pH 12: ☐YES ☐NO Acid preserved are<pH 2: ☐YES ☐NO

TX1005 samples frozen upon receipt: ☐ YES DATE & TIME PUT IN FREEZER: _____

pH paper Lot #_____ VOA headspace acceptable (5-6mm): ☐YES ☐NO ☐NA

Did samples meet the laboratory's standard conditions of sample acceptability upon receipt?	☑YES	☐ NO

COMMENTS:

[illegible] 1/28/20

HS-SA-WI-013 Rev. 4A; 08/26/2019

Login Sample Receipt Checklist

Client: Leidos, Inc.

Job Number: 240-125349-1

Login Number: 125349
List Number: 2
Creator: Cady, John M

List Source: Eurofins TestAmerica, Houston
List Creation: 01/25/20 01:05 PM

Question	Answer	Comment
Radioactivity wasn't checked or is </= background as measured by a survey meter.	N/A	Lab does not accept radioactive samples.
The cooler's custody seal, if present, is intact.	True	
Sample custody seals, if present, are intact.	True	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	True	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	1.5
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	True	
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time (excluding tests with immediate HTs)	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	True	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	True	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	Check done at department level as required.

Login Sample Receipt Checklist

Client: Leidos, Inc.

Job Number: 240-125349-1

Login Number: 125349
List Number: 3
Creator: Cady, John M

List Source: Eurofins TestAmerica, Houston
List Creation: 01/28/20 03:06 PM

Question	Answer	Comment
Radioactivity wasn't checked or is </= background as measured by a survey meter.	N/A	Lab does not accept radioactive samples.
The cooler's custody seal, if present, is intact.	True	
Sample custody seals, if present, are intact.	True	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	True	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	0.4
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	True	
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time (excluding tests with immediate HTs)	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	True	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	True	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	Check done at department level as required.

Attachment A.4

KEMRON ECCL Firing Range Treatability Study

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Appendix F

NASA ECCL Stabilization Study Treatability Letter Report

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1359-A Ellsworth Industrial Boulevard • Atlanta, GA 30318 • TEL 404-636-0928 • FAX 404-636-7162

December 2, 2019

Mr. Rich Sprinzl, P.E.
LEIDOS, Inc.
Richard.E.Sprinzl@leidos.com
(330) 405-5808

Re: NASA ECCL STABILIZATION STUDY
Treatability Letter Report
KEMRON Project #SH0724

Dear Mr. Sprinzl:

KEMRON Environmental Services, Inc. (KEMRON) is pleased to present this letter report summarizing the results of testing performed for LEIDOS, Inc. (Leidos). The study was conducted on soil materials sampled from the NASA ECCL Site. The primary goal of this study was to identify treatment reagents and additives capable of reducing the leachability of lead in the untreated materials to below treatment criteria of 5.0 mg/L as determined by the Toxicity Characteristic Leaching Procedure (TCLP). The following sections of this report include information regarding the protocols followed during each phase of the study and the results of testing performed.

UNTREATED MATERIAL CHARACTERIZATION

In August of 2019, KEMRON received three distinct soil samples from the site, which were labeled “ECCLSL0301”, “ECCLSL0302”, and “ECCLSL0303”. Immediately following sample receipt, KEMRON logged the materials into a sample-tracking database and placed the materials in secure temperature storage maintained at 4°Celsius (°C). A copy of the chain of custody is included in **Attachment A**.

Prior to initiating the treatability study, KEMRON separately homogenized each site soil to ensure uniform materials for testing. Homogenization was performed by placing each untreated material into a pre-clean, plastic mixing pan and gently mixing with stainless steel utensils until visually homogenous. For treatability testing, KEMRON typically removes oversized particles and debris larger than 0.5 inches in diameter in order to simulate potential full-scale particle reduction and to ensure that the material is practical for bench-scale testing. Approximately 644.5 g of oversized particles and debris was removed from the ECCLSL0301 material, approximately 1,133 g was removed from the ECCLSL0302 material and approximately 2,522.5 g was removed from ECCLSL0303 material.

Once visually homogenous, KEMRON collected representative aliquots of the untreated materials for characterization testing. The establishment of the baseline characteristics of the untreated soil is important for ensuring that the materials are similar to those expected at the site and for evaluating the effectiveness of stabilization treatment. After homogenization, KEMRON performed the following physical properties testing on each of the untreated materials:

Parameter	**Method**
Material pH	EPA Method 9045C
Bulk Unit Weight (Density)	ASTM D7263
Moisture Content	ASTM D2216
Paint Filter	EPA Method 9095

The results of untreated characterization physical properties testing, conducted by KEMRON are summarized in **Table 1** attached to this report and summarized below. Copies of all bench top testing data sheets are included as **Attachment B**.

TABLE 1

TESTING	TEST	UNIT	SAMPLE		
			ECCLSL0301	ECCLSL0302	ECCLSL0303
Material pH	EPA Method 9045	S.U.	6.73	5.09	4.62
Bulk Unit Weight (Density)	ASTM D7263	lb/ft^3	110.3	103.5	118.2
Moisture Content	ASTM D2216				
ASTM Moisture Content		%	23.15	21.18	24.41
Percent Solids		%	81.20	82.53	80.40
Paint Filter	EPA Method 9095		PASS	PASS	PASS

A review of the physical properties testing results presented in **Table 1** indicates that the three site soils exhibited pH values which ranged from 4.62 to 6.73 standard units (s.u.). Specifically site soils ECCLSL0302 (302), and ECCLSL0303 (303) were slightly acidic in nature while ECCLSL0301 (301), had a more neutral pH. The bulk unit weights of the three materials varied from 103.5 pounds per cubic foot (pcf) to 118.2 pcf. Note that these density measurements were performed on re-compacted soils and may not represent true in-situ densities at the site. The moisture contents of the three soils were relatively similar ranging from 21.18 percent (%) to 24.41%, and all three untreated soils passed paint filter testing.

In addition to physical properties characterization, KEMRON submitted aliquots of each untreated site material to Eurofins Test America, in Chicago, Illinois, for analytical characterization testing. The site materials were analyzed for Total Lead by EPA Method 6010 and TCLP Lead by EPA Method 1311/6010.

The results of analytical testing conducted on the untreated site soils are presented in **Table 2** and is also summarized below. Complete analytical data reports are included in **Attachment C**.

TABLE 2

Parameters	Units	ECCLSL0301		ECCLSL0302		ECCLSL0303	
		Result	MDL	Result	MDL	Result	MDL
Total Lead 6010							
Lead	mg/Kg	**5,230**	0.269	**1,980**	0.280	**6,090**	0.274
TCLP Lead 1311/6010							
Lead	mg/L	**114**	0.0375	**14.7**	0.00750	**75.6**	0.00750
TCLP Final Leachate pH							
pH	S.U.	**5.01**		**5.16**		**4.96**	

The data presented in **Table 2** shows that site material 301 exhibited a total lead concentration of 5,230 milligrams per kilogram (mg/Kg) and a corresponding TCLP lead concentration of 114 milligrams per Liter (mg/L). Sample 302 had a much lower total and TCLP lead concentration at 1,980 mg/Kg and 14.7 mg/L respectively. The results of analyses performed on site soil 303 indicated a total lead concentration of 6,090 mg/Kg and a TCLP lead concentration of 75.6 mg/L.

The TCLP Final Leachate pH was requested and reported by KEMRON because lead leachability is highly related to pH. The TCLP leaching procedure utilizes two leaching fluids, Leaching Fluid (LF)#1, and LF#2. Both leaching fluids are comprised of organic acids, however, LF#2 is considered more aggressive than LF#1 because of its lower pH value. The selection of the leaching fluid to be utilized in the analytical procedure is made based on the results of a leaching fluid determination step in the EPA 1311 method. This step is performed by heating an aliquot of the soil in the presence of hydrochloric acid for a certain period. After the sample is cooled to room temperature the pH of the acid and soil solution is measured and based on the pH of that mixture either LF#1 or LF#2 is used for the actual leaching step.

Based on information from Test America all of the untreated site soils were evaluated using LF#1. The final leachate pH measurements were made on the leachate material following a tumbling period of approximately 18 hours of the site soil and the leaching fluid. The leaching fluid pH value can be an important tool for potentially estimating the effectiveness of lead leaching reduction treatments. As previously noted, the leachability of lead can be highly

associated with pH. According to the species of lead present lead can be highly amphoteric. The leachability of lead is often at its lowest at either very low pH values or at high pH values. The stabilization of lead when using pH adjustment applications typically targets treatments with resulting high final leachate pH values ranging from around 9 to 11.5 s.u. The results of the final leachate pH testing shown in **Table 2** indicates that all three materials exhibited pH values of approximately 5 s.u..

PRELIMINARY STABILIZATION EVALUATIONS

KEMRON performed preliminary stabilization treatments using three primary reagents including Free Flow 200® (FF-200), Calciment and EnviroBlend® CS. FF-200 is manufactured by Free Flow Technologies, Inc. and is a high pH powder that contains various metallic oxides and may also contain phosphate based material which can turn lead into the low leachable form of lead phosphate. Calciment® (Dolomitic) is manufactured by Mintek Resources, Inc. and is also a high pH powder which is primarily comprised of lime and Portland cement, and EnviroBlend® CS, manufactured by Premier Magnesia, LLC is a pH adjusting powder that KEMRON understands is primarily a metallic oxide based material which may also contain materials such as phosphates that can turn lead into a less leachable form.

A total of 12 treatment designs for each of the materials were prepared utilizing FF-200, Calciment® (Dolomitic) or EnviroBlend® CS. Each mixture design is outlined in **Table 3** and each mixture design sheet is included in **Attachment D**. The mixtures were prepared by adding the dry reagent to the untreated material on a by-weight basis. For example, in a mixture with 2 percent (%) addition of EnviroBlend® CS, two (2) grams of EnviroBlend® CS was added to every 100 grams of untreated soil utilized in the mixture.. The mixtures were then mixed by hand until visually homogenous. After the preparation of each mixture, the treated materials were immediately sampled for TCLP Lead analysis and Paint Filter testing. The TCLP lead samples were forwarded to Eurofins Test America, and Paint Filter testing was performed in KEMRON's Atlanta laboratory.

The results of the TCLP Lead analysis, performed on the treated materials, are summarized in **Table 3**. Completed data reports pertaining to these analyses are included as **Attachment E**. The results of the Paint Filter testing are also summarized in **Table 3** and the data sheet reports are included in **Attachment E**.

Review of results in **Table 3** indicate that all of the treated materials passed the Paint Filter testing. The results also indicate that treatment using a 7 and 9% addition rate of FF-200 reduced the leachability of lead below the TCLP Regulatory Limit in the ECCLSL0301 material. Treatment of the ECCLSL0302 material indicated that only the 9% FF-200 addition rate reduced

the leachability of lead below the TCLP regulatory limit of 5.0 mg/L, and only the 7% FF-200 treatment reduced the lead concentration in the TCLP leachate to below 5.0 mg/L in the ECCLSL0303 material. Analytical testing of the higher 9% addition rate of the FF-200 applied to the ECCLSL0303 soil, indicated that the lead concentration in the TCLP leachate increased to 16.3 mg/L.

Calciment® (Dolomitic) was effective in reducing the leachability of lead in the ECCLSL0301 soil to below the TCLP lead regulatory limit of 5.0 mg/L at all addition rates including 4, 6, 8 and 12%. However, the 4% addition rate was near the regulatory limit at 4.00 mg/L. Addition rates of Calciment® applied to the ECCLSL0302 site material which achieved TCLP lead concentrations below the 5.0 mg/L criteria included 4.0% and 6.0% while addition rates of of 4, 6, and 10% were effective in reducing the lead leachability to below the criteria in the ECCLSL0303 soil.

The results also indicate that EnviroBlend® CS was successful at reducing the leachability of lead below the TCLP Regulatory Limit, in the ECCLSL0301 and ECCLSL0302 materials using addition rates of 4, 6 and 8%. In the ECCLSL0303 material, addition rates of 2, 4, 6 and 8% reduced the leachability of lead below the TCLP regulatory limit.

Based on the results of the preliminary 36 mixtures, Leidos instructed KEMRON to prepare four mixtures utilizing the EnviroBlend® CS for each of the site materials. The mixture designs are outlined below and are also presented in **Table 3**:

Untreated Material	**Addition Rate**
ECCLSL0301	3% of EnviroBlend® CS
ECCLSL0302	3% of EnviroBlend® CS
ECCLSL0303	1% of EnviroBlend® CS
ECCLSL0303	3% of EnviroBlend® CS

The mixtures were prepared following the same protocol as mentioned for the preliminary 36 mixtures. After the mixtures were prepared, the treated materials were sampled for TCLP lead analysis and Paint Filter testing. The TCLP lead samples were forwarded to Eurofins Test America for TCLP lead analysis. The Paint Filter results are summarized in **Table 3** and data sheet reports are included in **Attachment E**. The results of the TCLP lead analysis are also summarized in **Table 3** and the complete analytical report is included in **Attachment E**.

The results of testing performed on the additional four mixtures, summarized in **Table 3**, indicate that all four treated materials passed the Paint Filter testing. The results also indicate an addition rate of 3% of EnviroBlend® CS was effective in reducing the leachability of lead

below the TCLP regulatory limit in all three site materials. An addition rate of 1% of the EnviroBlend® CS did not reduce the leachability of lead in the ECCLSL0303 material.

CONCLUSIONS

KEMRON performed testing for the NASA ECCL Stabilization study to evaluate potential mixture designs capable of reducing the leachability of lead in the untreated materials to below treatment criteria of 5.0 mg/L as determined by TCLP. The treatments utilized various addition rates of FF-200, Calciment® (Dolomitic) and EnviroBlend® CS.

Untreated material characterization testing indicated that the three site materials, ECCLSL0301, ECCLSL0302 and ECCLSL0303, exhibited similar physical properties with the exception that the ECCLSL0303 material was more acidic that the other two materials. Chemical analyses showed that the ECCLSL0303 material exhibited a higher lead concentration on a total basis, but the ECCLSL0301 material had higher concentration of lead present in the TCLP leachate.

KEMRON prepared numerous mixtures for each of the untreated materials by adding the reagents dry to the appropriate untreated soil material and thoroughly blending by hand. The Paint Filter testing results, summarized in **Table 3**, indicate that all of the treated materials passed the Paint Filter test. The TCLP lead analyses performed on the treated materials, and summarized in **Table 3**, indicate a strong correlation between the final leachate pH and lead leachability. The data presented in Table 3 indicates that the following mixtures reduced the leachability of lead to below the anticipated 5.0 mg/L regulatory limit:

TABLE 3 Summary of Potential Candidate Treatments Below 5.0 mg/L TCLP Lead

Mix Number	Untreated Material Type	Reagent Type	Reagent Addition % by Wet Soil wt.	TCLP Lead 1311/6010 (mg/L)			TCLP Final Leachate pH
				Result	Qual.	MDL	S.U.
0724-003	ECCLSL0301	Free Flow 200	7.0	**0.231**		0.00750	6.90
0724-004	ECCLSL0301	Free Flow 200	9.0	**0.0694**		0.00750	9.51
0724-005	ECCLSL0301	Calciment (Dolomitic)	4.0	**4.00**		0.00750	6.68
0724-006	ECCLSL0301	Calciment (Dolomitic)	6.0	**0.0827**		0.00750	8.53
0724-007	ECCLSL0301	Calciment (Dolomitic)	8.0	**0.0311**	**J**	0.00750	9.48

0724-008	ECCLSL0301	Calciment (Dolomitic)	12.0	**0.0121**	**J**	0.00750	10.08
0724-010	ECCLSL0301	Enviroblend CS	4.0	**0.530**		0.00750	7.83
0724-011	ECCLSL0301	Enviroblend CS	6.0	**0.360**		0.00750	8.43
0724-012	ECCLSL0301	Enviroblend CS	8.0	**0.0865**		0.00750	8.92
0724-016	ECCLSL0302	Free Flow 200	9.0	**0.133**		0.00750	7.19
0724-018	ECCLSL0302	Calciment (Dolomitic)	4.0	**3.29**		0.00750	5.80
0724-019	ECCLSL0302	Calciment (Dolomitic)	6.0	**0.0408**	**J**	0.00750	7.52
0724-022	ECCLSL0302	Enviroblend CS	4.0	**0.107**		0.00750	7.64
0724-023	ECCLSL0302	Enviroblend CS	6.0	**0.0445**	**J**	0.00750	8.54
0724-024	ECCLSL0302	Enviroblend CS	8.0	**0.0405**	**J**	0.00750	8.99
0724-027	ECCLSL0303	Free Flow 200	7.0	**0.0282**	**J**	0.00750	6.91
0724-030	ECCLSL0303	Calciment (Dolomitic)	4.0	**2.60**		0.00750	6.50
0724-031	ECCLSL0303	Calciment (Dolomitic)	6.0	**0.0188**	**J**	0.00750	7.89
0724-032	ECCLSL0303	Calciment (Dolomitic)	10.0	ND		0.00750	9.35
0724-033	ECCLSL0303	Enviroblend CS	2.0	**0.831**		0.00750	6.89
0724-034	ECCLSL0303	Enviroblend CS	4.0	**0.125**		0.00750	7.64
0724-035	ECCLSL0303	Enviroblend CS	6.0	**0.0373**	**J**	0.00750	8.77
0724-036	ECCLSL0303	Enviroblend CS	8.0	**0.0126**	**J**	0.00750	9.17
0724-037	ECCLSL0301	Enviroblend CS	3.0	**0.322**		0.00750	7.30
0724-038	ECCLSL0302	Enviroblend CS	3.0	**0.0747**		0.00750	7.59
0724-040	ECCLSL0303	Enviroblend CS	3.0	**0.152**		0.00750	7.19

This data shows that all of the reagents utilized in the study were capable of reducing the leachability of lead as determined by the TCLP. However, the FF-200 treated materials indicate

that higher addition rates of the reagent will likely be required to meet the treatment criteria compared to the Calciment® (Dolomitic) and the EnviroBlend® CS. Specifically, the Calciment® (Dolomitic) reagent at an addition rate of 6% reduced the lead leachability to below 0.05 mg/L in all three untreated materials, and an addition rate of 3% EnviroBlend® CS achieved lead concentrations below 0.5 mg/L in all three of the untreated materials.

The selection of a full-scale treatment application should take into consideration both the physical and chemical performance of the treated mixtures. Data indicates that all three reagents were effective at reducing the leachability of lead below the TCLP regulatory limit at least one of the addition rates evaluated. Therefore, the most cost effective treatment should be reviewed in the selection of a full-scale treatment application.

This report should be reviewed in its entirety including all attachments prior to making decisions concerning a remedial approach. This study is intended to suggest what will occur in the field but does not guarantee the same results.

If you have any questions concerning the data provided in this report, please do not hesitate to contact us at 404-601-6927.

Sincerely,

KEMRON Environmental Services, Inc.

Mark Clark
Senior Technologist

Tomecia Bradley, CHMM
Program Manager

Attachments:
Tables
Attachment A – Material Chain of Custody
Attachment B – Untreated Physical Properties Testing Data Sheets
Attachment C – Untreated Analytical Reports
Attachment D – Mixture Design Sheets
Attachment E – Treated Analytical Reports and Physical Properties Testing Data Sheets

LEIDOS, INC.
NASA ECCL STABILIZATION
PROJECT No. SH0724

Table 1

Stabilization Untreated Physical Properties Testing

TESTING	TEST	UNIT	SAMPLE		
			ECCLSL0301	ECCLSL0302	ECCLSL0303
Material pH	EPA Method 9045	S.U.	6.73	5.09	4.62
Bulk Unit Weight (Density)	ASTM D7263	lb/ft^3	110.3	103.5	118.2
Moisture Content	ASTM D2216				
ASTM Moisture Content		%	23.15	21.18	24.41
Percent Solids		%	81.20	82.53	80.40
Paint Filter	EPA Method 9095		PASS	PASS	PASS

Notes
%= Percent
lb/ft^3 = pounds per cubic foot
S.U. = Standard Units

LEIDOS, INC.
NASA ECCL STABILIZATION
PROJECT No. SH0724

TABLE 2

Untreated Analytical Characterization
TCLP Lead

Parameters	Units	ECCLSL0301			ECCLSL0302			ECCLSL0303		
		Result	Qual.	MDL	Result	Qual.	MDL	Result	Qual.	MDL
Total Lead 6010										
Lead	mg/Kg	**5,230**		0.269	**1,980**		0.280	**6,090**		0.274
TCLP Lead 1311/6010										
Lead	mg/L	**114**		0.0375	**14.7**		0.00750	**75.6**		0.00750
TCLP Final Leachate pH										
pH	S.U.	**5.01**			**5.16**			**4.96**		

Notes:
mg/Kg = milligram per Kilogram
mg/L = milligram per Liter
S.U. = Standard Units
MDL = Method Detection Limit

LEIDOS, INC.
NASA ECCL STABILIZATION
KEMRON PROJECT No. SH0724

Table 3

Preliminary Mixture Evaluations
Mixture Designs, TCLP Lead, and Paint Filter

Mix Number	Untreated Material Type	Reagent Type	Reagent Addition % by Wet Soil wt.	TCLP Lead 1311/6010 mg/L			Leaching Fluid Used	TCLP Final Leachate pH	Paint Filter EPA Method 9095
				Result	Qual.	MDL		S.U.	Pass/Fail
0724-001	ECCLSL0301	Free Flow 200	3.0	**127**		0.0375	LF #1	5.38	PASS
0724-002	ECCLSL0301	Free Flow 200	5.0	**77.2**		0.00750	LF #1	5.78	PASS
0724-003	ECCLSL0301	Free Flow 200	7.0	**0.231**		0.00750	LF #1	6.90	PASS
0724-004	ECCLSL0301	Free Flow 200	9.0	**0.0694**		0.00750	LF #1	9.51	PASS
0724-005	ECCLSL0301	Calciment (Dolomitic)	4.0	**4.00**		0.00750	LF #1	6.68	PASS
0724-006	ECCLSL0301	Calciment (Dolomitic)	6.0	**0.0827**		0.00750	LF #1	8.53	PASS
0724-007	ECCLSL0301	Calciment (Dolomitic)	8.0	**0.0311**	**J**	0.00750	LF #1	9.48	PASS
0724-008	ECCLSL0301	Calciment (Dolomitic)	12.0	**0.0121**	**J**	0.00750	LF #1	10.08	PASS
0724-009	ECCLSL0301	Enviroblend CS	2.0	**9.94**		0.00750	LF #1	6.59	PASS
0724-010	ECCLSL0301	Enviroblend CS	4.0	**0.530**		0.00750	LF #1	7.83	PASS
0724-011	ECCLSL0301	Enviroblend CS	6.0	**0.360**		0.00750	LF #1	8.43	PASS
0724-012	ECCLSL0301	Enviroblend CS	8.0	**0.0865**		0.00750	LF #1	8.92	PASS
0724-013	ECCLSL0302	Free Flow 200	3.0	**58.3**		0.00750	LF #1	5.20	PASS
0724-014	ECCLSL0302	Free Flow 200	5.0	**18.7**		0.00750	LF #1	5.48	PASS
0724-015	ECCLSL0302	Free Flow 200	7.0	**11.2**		0.00750	LF #1	5.47	PASS
0724-016	ECCLSL0302	Free Flow 200	9.0	**0.133**		0.00750	LF #1	7.19	PASS
0724-017	ECCLSL0302	Calciment (Dolomitic)	2.0	**331**		0.0375	LF #1	5.27	PASS
0724-018	ECCLSL0302	Calciment (Dolomitic)	4.0	**3.29**		0.00750	LF #1	5.80	PASS
0724-019	ECCLSL0302	Calciment (Dolomitic)	6.0	**0.0408**	**J**	0.00750	LF #1	7.52	PASS
0724-020	ECCLSL0302	Calciment (Dolomitic)	10.0	**12.5**	**B**	0.00750	LF #1	5.38	PASS
0724-021	ECCLSL0302	Enviroblend CS	2.0	**7.14**		0.00750	LF #1	5.96	PASS
0724-022	ECCLSL0302	Enviroblend CS	4.0	**0.107**		0.00750	LF #1	7.64	PASS
0724-023	ECCLSL0302	Enviroblend CS	6.0	**0.0445**	**J**	0.00750	LF #1	8.54	PASS
0724-024	ECCLSL0302	Enviroblend CS	8.0	**0.0405**	**J**	0.00750	LF #1	8.99	PASS
0724-025	ECCLSL0303	Free Flow 200	3.0	**392**		0.0375	LF #1	5.36	PASS
0724-026	ECCLSL0303	Free Flow 200	5.0	**74.4**		0.00750	LF #1	5.64	PASS
0724-027	ECCLSL0303	Free Flow 200	7.0	**0.0282**	**J**	0.00750	LF #1	6.91	PASS
0724-028	ECCLSL0303	Free Flow 200	9.0	**16.3**		0.00750	LF #1	5.84	PASS
0724-029	ECCLSL0303	Calciment (Dolomitic)	2.0	**179**		0.0375	LF #1	5.58	PASS
0724-030	ECCLSL0303	Calciment (Dolomitic)	4.0	**2.60**		0.00750	LF #1	6.50	PASS
0724-031	ECCLSL0303	Calciment (Dolomitic)	6.0	**0.0188**	**J**	0.00750	LF #1	7.89	PASS
0724-032	ECCLSL0303	Calciment (Dolomitic)	10.0	ND		0.00750	LF #1	9.35	PASS
0724-033	ECCLSL0303	Enviroblend CS	2.0	**0.831**		0.00750	LF #1	6.89	PASS
0724-034	ECCLSL0303	Enviroblend CS	4.0	**0.125**		0.00750	LF #1	7.64	PASS
0724-035	ECCLSL0303	Enviroblend CS	6.0	**0.0373**	**J**	0.00750	LF #1	8.77	PASS
0724-036	ECCLSL0303	Enviroblend CS	8.0	**0.0126**	**J**	0.00750	LF #1	9.17	PASS
0724-037	ECCLSL0301	Enviroblend CS	3.0	**0.322**		0.00750	LF #1	7.30	PASS
0724-038	ECCLSL0302	Enviroblend CS	3.0	**0.0747**		0.00750	LF #1	7.59	PASS
0724-039	ECCLSL0303	Enviroblend CS	1.0	**91.4**		0.00750	LF #1	5.33	PASS
0724-040	ECCLSL0303	Enviroblend CS	3.0	**0.152**		0.00750	LF #1	7.19	PASS

Notes:
% = Percent
Wt= Weight
mg/L = milligram per Liter
MDL = Method Detection Limit
J = Result is less than the Reporting llmit (RL) but greater than or equal to the MDL and the concentration is an approximate value.
B = Compund was found in the blank and sample.
S.U. = Standard Units

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Attachment A:
Material Chain of Custody

Chain of Custody Record

leidos

COC No.: NASA-ECCL-023

Page 1 of 1 Date: 8/8/2019

Name Leidos
Address: 8866 Commons Blvd. Twinsburg, OH 44087
Phone Number: 330 405-5814
Project Manager: Heather Adams
Project Name: NASA ECCL (Bench Tests)
Charge Number: 327923.02.1.109.00 00.00.00001
Sampler (Signature) (Printed Name)
RS Rich Sprinzl

Laboratory Name: KEMRON Environmental Services Inc.
Address: 1359-A Ellsworth Industrial Blvd. Atlanta GA 30318
Phone 404-214-0098
Contact: Tomecia Bradley

Requested Parameters

Laboratory No.	SELECT UP TO 12 Location ID	Sample ID	Type	Depth	Date	Time	Matrix	Bench Test (SEE REVISED ESTIMA									Total Containers	OBSERVATIONS, COMMENTS SPECIAL INSTRUCTIONS
								S		S	S	S	S	S	S	S		
	Bench Test 1	ECCLSL0301			8/8/2019	1100												
	Bench Test 2	ECCLSL0302			8/8/2019	1315												
	Bench Test 3	ECCLSL0303			8/8/2019	1340												

RS 8/8/19

Relinquished by	Date	Received by	Date
RS Signature	8/8/19	Carter Nyles Signature	8/9/2019
Rich Sprinzl Printed Name	Time 1745	Carter Nyles Printed Name	Time 1543
Leidos Company		Kemron Company	
Relinquished by	Date	Received by	Date
Signature		Signature	
Printed Name	Time	Printed Name	Time
Company		Company	

Notes:
A. Cool, 4C
B HNO3, pH<2, Cool, 4C
C HCL, pH<2, Cool, 4C
D 2 DI-NaHSO4/1-MeOH
1 SW-846 8260B
2. SW-846 8270D
3 SW-846 8270D LL FS
4. SW-846 6020A/7471B

Shipment Method: UPS

Temperature Blank
Temp upon receipt @ Lab NA

Leidos
8866 Commons Blvd.
Twinsburg, OH 44087
330 405-5814

Attachment B:
Untreated Physical Properties Testing Data Sheets

MATERIAL pH

EPA METHOD 9045
DATA SHEET

PROJECT:	NASA ECCL Stabilization
PROJECT No.:	SH0724
TESTING DATE:	8/23/2019
TESTED BY:	MTC
TRACKING CODE:	D456

KEMRON SAMPLE No.		MATERIAL pH
1.	ECCLSL0301 A	7.54
2.	ECCLSL0301 B	6.55
3.	ECCLSL0301 C	6.09
4.		
5.		
6.		
7.		
8.		
9.		
10.		
	AVERAGE:	6.73

UNIT WEIGHT DETERMINATION

DATA SHEET
ASTM D7263

PROJECT:	NASA ECCL Stabilization
PROJECT No.:	SH0724
SAMPLE No.:	ECCLSL0301
TESTING DATE:	08/19/19
TESTED BY:	MTC
TRACKING CODE:	D456

UNIT WEIGHT (DENSITY)							
1. SAMPLE NO.	A		B		C		
2. WT OF MOLD (tare weight)	18.21	g	18.21	g	18.20	g	
3. WT OF MOLD + SOIL	383.61	g	379.84	g	383.05	g	
4. WT OF WET SOIL, W	365.40	g	361.63	g	364.85	g	
5. DIAMETER OF SPECIMEN, D	2.00	in	2.00	in	2.00	in	
6. HEIGHT OF SPECIMEN, H	4.00	in	4.00	in	4.00	in	
7. VOLUME OF SPECIMEN	12.57	in^3	12.57	in^3	12.57	in^3	
8. BULK UNIT WEIGHT	110.8	pcf	109.6	pcf	110.6	pcf	
9. BULK SPECIFIC GRAVITY	1.8		1.8		1.8		
10. AVERAGE BULK UNIT WEIGHT	110.3	pcf					
11. AVERAGE BULK SPECIFIC GRAVITY	1.8						

MOISTURE CONTENT DETERMINATION

REPORT FORM
ASTM D 2216

PROJECT:	NASA ECCL Stabilization
PROJECT No.:	SH0724
SAMPLE No.:	ECCLSL0301
TESTING DATE:	08/16/19
TESTED BY:	MTC
TRACKING CODE:	D456

MOISTURE CONTENT (Dry & Wet Basis)						
1. MOISTURE TIN NO.	A		B		C	
2. WT MOISTURE TIN (tare weight)	1.2671	g	1.2738	g	1.2600	g
3. WT WET SOIL + TARE	22.6670	g	25.2264	g	27.1219	g
4. WT DRY SOIL + TARE	18.6564	g	20.7404	g	22.2291	g
5. WT WATER, Ww	4.0106	g	4.4860	g	4.8928	g
6. WT DRY SOIL, Ws	17.3893	g	19.4666	g	20.9691	g
7. ASTM MOISTURE CONTENT	23.06	%	23.04	%	23.33	%
8. PERCENT SOLIDS	81.26	%	81.27	%	81.08	%
9. AVERAGE ASTM MOISTURE CONTENT	23.15	%				
10. AVERAGE PERCENT SOLIDS	81.20	%				

PAINT FILTER TEST

SUMMARY OF RESULTS

PROJECT:	NASA ECCL Stabilization	TESTING DATE:	8/19/2019
PROJECT No.:	SH0724	TESTED BY:	MTC
SAMPLE No.:	ECCLSL0301	TRACKING CODE:	D456
TESTING METHOD:	EPA Method 9095		

TESTING PARAMETER AND RESULTS		
QUANTITY OF MATERIAL	90.17	**g**
LENGTH OF TEST	5.0	**min.**
QUANTITY OF LIQUID	0.00	**g**
RESULTS (PASS / FAIL) *	PASS	

* In accordance with EPA Method 9095, if any liquid from the test material collects after 5 minutes of testing, the material is deemed to contain free liquids, and therefore has failed the paint filter test.

MATERIAL pH

EPA METHOD 9045
DATA SHEET

PROJECT:	NASA ECCL Stabilization
PROJECT No.:	SH0724
TESTING DATE:	8/23/2019
TESTED BY:	MTC
TRACKING CODE:	D457

KEMRON SAMPLE No.		MATERIAL pH
1.	ECCLSL0302 A	5.29
2.	ECCLSL0302 B	5.09
3.	ECCLSL0302 C	4.90
4.		
5.		
6.		
7.		
8.		
9.		
10.		
	AVERAGE:	5.09

UNIT WEIGHT DETERMINATION

DATA SHEET
ASTM D7263

PROJECT:	NASA ECCL Stabilization
PROJECT No.:	SH0724
SAMPLE No.:	ECCLSL0302
TESTING DATE:	08/19/19
TESTED BY:	MTC
TRACKING CODE:	D457

UNIT WEIGHT (DENSITY)							
1. SAMPLE NO.	A		B		C		
2. WT OF MOLD (tare weight)	18.20	g	18.21	g	18.19	g	
3. WT OF MOLD + SOIL	355.92	g	360.48	g	362.75	g	
4. WT OF WET SOIL, W	337.72	g	342.27	g	344.56	g	
5. DIAMETER OF SPECIMEN, D	2.00	in	2.00	in	2.00	in	
6. HEIGHT OF SPECIMEN, H	4.00	in	4.00	in	4.00	in	
7. VOLUME OF SPECIMEN	12.57	in^3	12.57	in^3	12.57	in^3	
8. BULK UNIT WEIGHT	102.4	pcf	103.8	pcf	104.5	pcf	
9. BULK SPECIFIC GRAVITY	1.6		1.7		1.7		
10. AVERAGE BULK UNIT WEIGHT	103.5	pcf					
11. AVERAGE BULK SPECIFIC GRAVITY	1.7						

MOISTURE CONTENT DETERMINATION

REPORT FORM
ASTM D 2216

PROJECT:	NASA ECCL Stabilization
PROJECT No.:	SH0724
SAMPLE No.:	ECCLSL0302
TESTING DATE:	08/16/19
TESTED BY:	MTC
TRACKING CODE:	D457

MOISTURE CONTENT (Dry & Wet Basis)						
1. MOISTURE TIN NO.	A		B		C	
2. WT MOISTURE TIN (tare weight)	1.2662	g	1.3005	g	1.2688	g
3. WT WET SOIL + TARE	19.6158	g	18.0944	g	22.1113	g
4. WT DRY SOIL + TARE	16.6506	g	15.0213	g	18.3708	g
5. WT WATER, Ww	2.9652	g	3.0731	g	3.7405	g
6. WT DRY SOIL, Ws	15.3844	g	13.7208	g	17.1020	g
7. ASTM MOISTURE CONTENT	19.27	%	22.40	%	21.87	%
8. PERCENT SOLIDS	83.84	%	81.70	%	82.05	%
9. AVERAGE ASTM MOISTURE CONTENT	21.18	%				
10. AVERAGE PERCENT SOLIDS	82.53	%				

PAINT FILTER TEST

SUMMARY OF RESULTS

PROJECT:	NASA ECCL Stabilization	TESTING DATE:	8/19/2019
PROJECT No.:	SH0724	TESTED BY:	MTC
SAMPLE No.:	ECCLSL0302	TRACKING CODE:	D457
TESTING METHOD:	EPA Method 9095		

TESTING PARAMETER AND RESULTS		
QUANTITY OF MATERIAL	100.41	**g**
LENGTH OF TEST	5.0	**min.**
QUANTITY OF LIQUID	0.00	**g**
RESULTS (PASS / FAIL) *	PASS	

* In accordance with EPA Method 9095, if any liquid from the test material collects after 5 minutes of testing, the material is deemed to contain free liquids, and therefore has failed the paint filter test.

MATERIAL pH

EPA METHOD 9045
DATA SHEET

PROJECT:	NASA ECCL Stabilization
PROJECT No.:	SH0724
TESTING DATE:	8/23/2019
TESTED BY:	MTC
TRACKING CODE:	D458

KEMRON SAMPLE No.		MATERIAL pH
1.	ECCLSL0303 A	4.97
2.	ECCLSL0303 B	4.56
3.	ECCLSL0303 C	4.34
4.		
5.		
6.		
7.		
8.		
9.		
10.		
	AVERAGE:	4.62

UNIT WEIGHT DETERMINATION

DATA SHEET
ASTM D7263

PROJECT:	NASA ECCL Stabilization
PROJECT No.:	SH0724
SAMPLE No.:	ECCLSL0303
TESTING DATE:	08/19/19
TESTED BY:	MTC
TRACKING CODE:	D458

UNIT WEIGHT (DENSITY)							
1. SAMPLE NO.	A		B		C		
2. WT OF MOLD (tare weight)	18.20	g	18.20	g	18.20	g	
3. WT OF MOLD + SOIL	406.51	g	404.01	g	413.50	g	
4. WT OF WET SOIL, W	388.31	g	385.81	g	395.30	g	
5. DIAMETER OF SPECIMEN, D	2.00	in	2.00	in	2.00	in	
6. HEIGHT OF SPECIMEN, H	4.00	in	4.00	in	4.00	in	
7. VOLUME OF SPECIMEN	12.57	in^3	12.57	in^3	12.57	in^3	
8. BULK UNIT WEIGHT	117.7	pcf	117.0	pcf	119.8	pcf	
9. BULK SPECIFIC GRAVITY	1.9		1.9		1.9		
10. AVERAGE BULK UNIT WEIGHT	118.2	pcf					
11. AVERAGE BULK SPECIFIC GRAVITY	1.9						

MOISTURE CONTENT DETERMINATION

REPORT FORM
ASTM D 2216

PROJECT:	NASA ECCL Stabilization
PROJECT No.:	SH0724
SAMPLE No.:	ECCLSL0303
TESTING DATE:	08/16/19
TESTED BY:	MTC
TRACKING CODE:	D458

MOISTURE CONTENT (Dry & Wet Basis)						
1. MOISTURE TIN NO.	A		B		C	
2. WT MOISTURE TIN (tare weight)	1.2664	g	1.2617	g	1.2641	g
3. WT WET SOIL + TARE	29.5404	g	28.2298	g	28.3250	g
4. WT DRY SOIL + TARE	23.7633	g	22.7070	g	23.4823	g
5. WT WATER, Ww	5.7771	g	5.5228	g	4.8427	g
6. WT DRY SOIL, Ws	22.4969	g	21.4453	g	22.2182	g
7. ASTM MOISTURE CONTENT	25.68	%	25.75	%	21.80	%
8. PERCENT SOLIDS	79.57	%	79.52	%	82.10	%
9. AVERAGE ASTM MOISTURE CONTENT	24.41	%				
10. AVERAGE PERCENT SOLIDS	80.40	%				

PAINT FILTER TEST

SUMMARY OF RESULTS

PROJECT:	NASA ECCL Stabilization	TESTING DATE:	8/19/2019
PROJECT No.:	SH0724	TESTED BY:	MTC
SAMPLE No.:	ECCLSL0303	TRACKING CODE:	D458
TESTING METHOD:	EPA Method 9095		

TESTING PARAMETER AND RESULTS		
QUANTITY OF MATERIAL	105.07	**g**
LENGTH OF TEST	5.0	**min.**
QUANTITY OF LIQUID	0.00	**g**
RESULTS (PASS / FAIL) *	PASS	

* In accordance with EPA Method 9095, if any liquid from the test material collects after 5 minutes of testing, the material is deemed to contain free liquids, and therefore has failed the paint filter test.

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Attachment C:
Untreated Analytical Reports

eurofins | Environment Testing TestAmerica

ANALYTICAL REPORT

Eurofins TestAmerica, Chicago
2417 Bond Street
University Park, IL 60484
Tel: (708)534-5200

Laboratory Job ID: 500-168649-1
Client Project/Site: NASA ECCL

For:
Kemron Environmental Services, Inc.
1359A Ellsworth Industrial Blvd.
Atlanta, Georgia 30318

Attn: Tomecia Bradley

Therese Hargraves

Authorized for release by:
9/5/2019 5:21:54 PM

Therese Hargraves, Project Manager I
(708)793-3461
therese.hargraves@testamericainc.com

LINKS

Review your project results through TotalAccess

Have a Question? Ask The Expert

Visit us at: www.testamericainc.com

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

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

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

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Receipt Checklists 18

Job ID: 500-168649-1

Laboratory: Eurofins TestAmerica, Chicago

Narrative

Job Narrative
500-168649-1

Comments
No additional comments.

Receipt
The samples were received on 8/21/2019 9:05 AM; the samples arrived in good condition, properly preserved and, where required, on ice. The temperature of the cooler at receipt was 3.5º C.

Metals
No analytical or quality issues were noted, other than those described in the Definitions/Glossary page.

Detection Summary

Client: Kemron Environmental Services, Inc.
Project/Site: NASA ECCL

Job ID: 500-168649-1

Client Sample ID: ECCLSL0301 — Lab Sample ID: 500-168649-1

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Lead	114		0.250	0.0375	mg/L	5		6010C	TCLP

Client Sample ID: ECCLSL0302 — Lab Sample ID: 500-168649-2

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Lead	14.7		0.0500	0.00750	mg/L	1		6010C	TCLP

Client Sample ID: ECCLSL0303 — Lab Sample ID: 500-168649-3

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Lead	75.6		0.0500	0.00750	mg/L	1		6010C	TCLP

This Detection Summary does not include radiochemical test results.

Method Summary

Client: Kemron Environmental Services, Inc.
Project/Site: NASA ECCL

Job ID: 500-168649-1

Method	Method Description	Protocol	Laboratory
6010C	Metals (ICP)	SW846	TAL CHI
1311	TCLP Extraction	SW846	TAL CHI
3010A	Preparation, Total Metals	SW846	TAL CHI

Protocol References:

SW846 = "Test Methods For Evaluating Solid Waste, Physical/Chemical Methods", Third Edition, November 1986 And Its Updates.

Laboratory References:

TAL CHI = Eurofins TestAmerica, Chicago, 2417 Bond Street, University Park, IL 60484, TEL (708)534-5200

Sample Summary

Client: Kemron Environmental Services, Inc.
Project/Site: NASA ECCL

Job ID: 500-168649-1

Lab Sample ID	Client Sample ID	Matrix	Collected	Received	Asset ID
500-168649-1	ECCLSL0301	Solid	08/20/19 11:20	08/21/19 09:05	
500-168649-2	ECCLSL0302	Solid	08/20/19 11:22	08/21/19 09:05	
500-168649-3	ECCLSL0303	Solid	08/20/19 11:24	08/21/19 09:05	

Client Sample Results

Client: Kemron Environmental Services, Inc.
Project/Site: NASA ECCL

Job ID: 500-168649-1

Client Sample ID: ECCLSL0301

Date Collected: 08/20/19 11:20
Date Received: 08/21/19 09:05

Lab Sample ID: 500-168649-1

Matrix: Solid

Method: 6010C - Metals (ICP) - TCLP

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Lead	114		0.250	0.0375	mg/L		09/05/19 08:38	09/05/19 13:34	5

Client Sample Results

Client: Kemron Environmental Services, Inc.
Project/Site: NASA ECCL

Job ID: 500-168649-1

Client Sample ID: ECCLSL0302

Date Collected: 08/20/19 11:22
Date Received: 08/21/19 09:05

Lab Sample ID: 500-168649-2

Matrix: Solid

Method: 6010C - Metals (ICP) - TCLP

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Lead	14.7		0.0500	0.00750	mg/L		09/05/19 08:38	09/05/19 12:40	1

Client Sample Results

Client: Kemron Environmental Services, Inc.
Project/Site: NASA ECCL

Job ID: 500-168649-1

Client Sample ID: ECCLSL0303

Date Collected: 08/20/19 11:24
Date Received: 08/21/19 09:05

Lab Sample ID: 500-168649-3

Matrix: Solid

Method: 6010C - Metals (ICP) - TCLP

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Lead	75.6		0.0500	0.00750	mg/L		09/05/19 08:38	09/05/19 12:59	1

Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
¤	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CFL	Contains Free Liquid
CNF	Contains No Free Liquid
DER	Duplicate Error Ratio (normalized absolute difference)
Dil Fac	Dilution Factor
DL	Detection Limit (DoD/DOE)
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision Level Concentration (Radiochemistry)
EDL	Estimated Detection Limit (Dioxin)
LOD	Limit of Detection (DoD/DOE)
LOQ	Limit of Quantitation (DoD/DOE)
MDA	Minimum Detectable Activity (Radiochemistry)
MDC	Minimum Detectable Concentration (Radiochemistry)
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
NC	Not Calculated
ND	Not Detected at the reporting limit (or MDL or EDL if shown)
PQL	Practical Quantitation Limit
QC	Quality Control
RER	Relative Error Ratio (Radiochemistry)
RL	Reporting Limit or Requested Limit (Radiochemistry)
RPD	Relative Percent Difference, a measure of the relative difference between two points
TEF	Toxicity Equivalent Factor (Dioxin)
TEQ	Toxicity Equivalent Quotient (Dioxin)

QC Association Summary

Client: Kemron Environmental Services, Inc.
Project/Site: NASA ECCL

Job ID: 500-168649-1

Metals

Leach Batch: 503138

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
500-168649-1	ECCLSL0301	TCLP	Solid	1311	
500-168649-2	ECCLSL0302	TCLP	Solid	1311	
500-168649-3	ECCLSL0303	TCLP	Solid	1311	
LB 500-503138/1-B	Method Blank	TCLP	Solid	1311	

Prep Batch: 503281

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
500-168649-1	ECCLSL0301	TCLP	Solid	3010A	503138
500-168649-2	ECCLSL0302	TCLP	Solid	3010A	503138
500-168649-3	ECCLSL0303	TCLP	Solid	3010A	503138
LB 500-503138/1-B	Method Blank	TCLP	Solid	3010A	503138
LCS 500-503281/2-A	Lab Control Sample	Total/NA	Solid	3010A	
LCSD 500-503281/3-A	Lab Control Sample Dup	Total/NA	Solid	3010A	

Analysis Batch: 503358

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
500-168649-3	ECCLSL0303	TCLP	Solid	6010C	503281

Analysis Batch: 503368

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
500-168649-1	ECCLSL0301	TCLP	Solid	6010C	503281
500-168649-2	ECCLSL0302	TCLP	Solid	6010C	503281
LB 500-503138/1-B	Method Blank	TCLP	Solid	6010C	503281
LCS 500-503281/2-A	Lab Control Sample	Total/NA	Solid	6010C	503281
LCSD 500-503281/3-A	Lab Control Sample Dup	Total/NA	Solid	6010C	503281

QC Sample Results

Client: Kemron Environmental Services, Inc.
Project/Site: NASA ECCL

Job ID: 500-168649-1

Method: 6010C - Metals (ICP)

Lab Sample ID: LCS 500-503281/2-A
Matrix: Solid
Analysis Batch: 503368

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 503281

Analyte			Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits		
Lead			0.100	0.09861		mg/L		99	80 - 120		

Lab Sample ID: LCSD 500-503281/3-A
Matrix: Solid
Analysis Batch: 503368

Client Sample ID: Lab Control Sample Dup
Prep Type: Total/NA
Prep Batch: 503281

Analyte			Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Lead			0.100	0.1006		mg/L		101	80 - 120	2	20

Lab Sample ID: LB 500-503138/1-B
Matrix: Solid
Analysis Batch: 503368

Client Sample ID: Method Blank
Prep Type: TCLP
Prep Batch: 503281

Analyte	LB Result	LB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Lead	ND		0.0500	0.00750	mg/L		09/05/19 08:38	09/05/19 12:24	1

Lab Chronicle

Client: Kemron Environmental Services, Inc.
Project/Site: NASA ECCL

Job ID: 500-168649-1

Client Sample ID: ECCLSL0301

Lab Sample ID: 500-168649-1
Date Collected: 08/20/19 11:20
Matrix: Solid
Date Received: 08/21/19 09:05

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
TCLP	Leach	1311			503138	09/04/19 14:30	GCA	TAL CHI
TCLP	Prep	3010A			503281	09/05/19 08:38	SAH	TAL CHI
TCLP	Analysis	6010C		5	503368	09/05/19 13:34	JEF	TAL CHI

Client Sample ID: ECCLSL0302

Lab Sample ID: 500-168649-2
Date Collected: 08/20/19 11:22
Matrix: Solid
Date Received: 08/21/19 09:05

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
TCLP	Leach	1311			503138	09/04/19 14:30	GCA	TAL CHI
TCLP	Prep	3010A			503281	09/05/19 08:38	SAH	TAL CHI
TCLP	Analysis	6010C		1	503368	09/05/19 12:40	JEF	TAL CHI

Client Sample ID: ECCLSL0303

Lab Sample ID: 500-168649-3
Date Collected: 08/20/19 11:24
Matrix: Solid
Date Received: 08/21/19 09:05

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
TCLP	Leach	1311			503138	09/04/19 14:30	GCA	TAL CHI
TCLP	Prep	3010A			503281	09/05/19 08:38	SAH	TAL CHI
TCLP	Analysis	6010C		1	503358	09/05/19 12:59	JEF	TAL CHI

Laboratory References:

TAL CHI = Eurofins TestAmerica, Chicago, 2417 Bond Street, University Park, IL 60484, TEL (708)534-5200

Accreditation/Certification Summary

Client: Kemron Environmental Services, Inc.
Project/Site: NASA ECCL

Job ID: 500-168649-1

Laboratory: Eurofins TestAmerica, Chicago

Unless otherwise noted, all analytes for this laboratory were covered under each accreditation/certification below.

Authority	Program	Identification Number	Expiration Date
Georgia	State Program	N/A	04-30-20

The following analytes are included in this report, but the laboratory is not certified by the governing authority. This list may include analytes for which the agency does not offer certification.

Analysis Method	Prep Method	Matrix	Analyte

Eurofins TestAmerica, Chicago
2417 Bond Street

University Park, IL 60484-3101
phone 708.534.5200 fax 708.534.5211

Chain of Custody Record

eurofins Environment Testing TestAmerica

Regulatory Program: ☐ DW ☐ NPDES ☐ RCRA ☐ Other:

TestAmerica Laboratories, Inc. d/b/a Eurofins TestAmerica

Client Contact	**Project Manager: Tomecia Bradley**		COC No:
KEMRON Environmental Services, Inc.	**Email: triley@kemron.com**	**Site Contact:**	**Date: 8-20-19**	___1___ of ___1___ COCs
1359 Ellsworth Industrial Blvd.	**Tel/Fax: 404-214-0098**	**Lab Contact:**	**Carrier:**	TALS Project #:
Atlanta, GA 30318	**Analysis Turnaround Time**			Sampler:
(404) 636-0928 Phone	☐ CALENDAR DAYS ☑ WORKING DAYS			**For Lab Use Only:**
(xxx) xxx-xxxx FAX	TAT if different from Below _____			Walk-in Client:
Project Name: NASA ECCL	☑ 2 weeks			Lab Sampling:
Site:	☐ 1 week			
P O # SH0724	☐ 2 days			Job / SDG No.: 500-168649
	☐ 1 day			

500-168649 COC

	Sample Identification	Sample Date	Sample Time	Sample Type (C=Comp, G=Grab)	Matrix	# of Cont.	Filtered Sample (Y / N)	Perform MS / MSD (Y / N)	TCLP Lead	Sample Specific Notes:
1	ECCLSL0301	8/20/19	1120	G	S	1			X	
2	ECCLSL0302	8/20/19	1122	G	S	1			X	
3	ECCLSL0303	8/20/19	1124	G	S	1			X	

Preservation Used: 1= Ice, 2= HCl; 3= H2SO4; 4=HNO3; 5=NaOH; 6= Other _____

Possible Hazard Identification:
Are any samples from a listed EPA Hazardous Waste? Please List any EPA Waste Codes for the sample in the Comments Section if the lab is to dispose of the sample.

☑ Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☐ Unknown

Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)

☐ Return to Client ☑ Disposal by Lab ☐ Archive for _____ Months

Special Instructions/QC Requirements & Comments:

Custody Seals Intact: ☐ Yes ☐ No | Custody Seal No.: | Cooler Temp. (°C): Obs'd: 3.5 Corr'd: _____ | Therm ID No.: _____

Relinquished by: Tomecia Bradley	Company: Kemron	Date/Time: 8/20/19 1155	Received by: [signature] 8/20/19	Company: GDA	Date/Time: 11:35
Relinquished by: [signature] 8/20/19	Company: ETA	Date/Time: 1610	Received by: [signature]	Company:	Date/Time:
Relinquished by:	Company:	Date/Time:	Received in Laboratory by: Paula Buckley	Company: TACH	Date/Time: 8/21/19 0905

Form No. CA-C-WI-002, Rev. 4.26, dated 7/25/2019

TestAmerica Chicago
TCLP Extraction Logbook

Page Number: _____

Rotator RPM:30 ± 2 RPMs ID#: C2854 Extr. Start Date 9/4/19 Time 1430 Temp: Uncorrected 21.5 Corrected 22 °C Filtration Start Time: 0749
Group Number: 7753 Extr. End Date 9/5/19 Time 0657 Temp: Uncorrected 20.5 Corrected 21 °C Filtration End Time: 0854
LIMS Batch No.: 503138/503139 Min.Temp: Uncorrected/Corrected 20 / 20.5 °C Max.Temp: Uncorrected/Corrected 21.5 / 22.5 °C Filter Paper Lot #: 112167-9016
Sample Size Specifications: <9.5 mm Control Limits: 10 ± 5 PSI; 23 ± 2 °C Thermometer ID: C0038
Sample Type (Circle): TCLV SPLP (TCLP) ASTM

Sample Number	LB	LB2	500-168281-8	500-168649-1	-2
Sample Description	Extraction Fluid #1	Extraction Fluid #2	Solid		
Sample Weight (g)	N/A		50.20	50.18	50.11
Liquid-Solid Separation (Yes/No)	No				
Volume of Mother Liquid (mLs)	N/A				
Solid Extraction Material (g)	N/A		50.20	50.18	50.11
Extraction Fluid Selection pH of Initial Solution: If <5.0 use Extraction Fluid #1	N/A		6.87	6.70	5.96
pH of Acid/Heat Treated Solution: If <5.0, use Extraction Fluid #1 If >5.0, use Extraction Fluid #2	4.88	2.89	1.83	1.64	1.61
Extraction Fluid Type (1 or 2)	1	2	1		
Extraction Vessel Type / Pressure Check	HDPE/T(28)	HDPE			
Extraction Fluid Volume (mLs)	2000		1000		
Extract Filtered (Yes or No)	Yes				
Mother Liquid Added (mLs)	N/A				
Combined Filtrate Volume (mLs)	250				
Final pH Reading	4.89/4.92	3.09	5.43	5.01	5.16
Spike Source ID # / Volume Added (mLs)	N/A				
Filtrate Preserved	Yes				
ZHE: Initial psi / Final psi	N/A				

Comments:
Extraction Vessel Code: T = Teflon Organics/Metals ZHE = Zero Headspace VOA's HDPE = High Density Polyethylene (Lot # 05189010)
Analyst: Date: 9/5/19
Reviewer: Date: 9/5/19

CHI-33-15-003/P-12/15

Extraction Vessel Codes: T = Teflon Organics/Metals VOA's Metals

Analyst: Date: 9/5/19

Date: 9/5/19

TestAmerica Chicago

TCLP Extraction Logbook

Page Number:

Rotator RPM:30 ± 2 RPMs ID#: C2854 Extr. Start Date 9/4/19 Time 1430 Temp: Uncorrected 21.5 Corrected 22 °C Filtration Start Time: 0749

Group Number: T753 Extr. End Date 9/5/19 Time 0657 Temp: Uncorrected 20.5 Corrected 21 °C Filtration End Time: 0854

LIMS Batch No.: 503138/503139 Min.Temp: Uncorrected/Corrected 20/20.5 °C Max.Temp: Uncorrected/Corrected 21.5/22.5 °C Filter Paper Lot #: 112167-9016

Sample Size Specifications: <9.5 mm Control Limits: 10 ± 5 PSI; 23 ± 2 °C Thermometer ID: 00038

Sample Type (Circle): TCLV SPLP TCLP ASTM

Sample Number	500-168649-3	500-168666-1	500-168965-1	500-168721-1	-2
Sample Description	Solid				
Sample Weight (g)	50.25	50.31	50.26	50.20	50.15
Liquid-Solid Separation (Yes/No)	No				
Volume of Mother Liquid (mLs)	N/A				
Solid Extraction Material (g)	50.25	50.31	50.26	50.20	50.15
Extraction Fluid Selection pH of Initial Solution: If <5.0, use Extraction Fluid #1	5.06	7.77	3.99	7.17	8.73
pH of Acid/Heat Treated Solution: If <5.0, use Extraction Fluid #1 If >5.0, use Extraction Fluid #2	1.57	2.03	N/A	4.83	1.81
Extraction Fluid Type (1 or 2)	1				
Extraction Vessel Type / Pressure Check	HDPE	T(17)	HDPE		
Extraction Fluid Volume (mLs)	1000				
Extract Filtered (Yes or No)	Yes				
Mother Liquid Added (mLs)	N/A				
Combined Filtrate Volume (mLs)	250				
Final pH Reading	4.96	6.48	5.45	7.23	5.07
Spike Source ID # / Volume Added (mLs)	N/A				
Filtrate Preserved	Yes m				
ZHE: Initial psi / Final psi	N/A				

Comments:

Extraction Vessel Codes: T = Teflon Organics/Metals ZHE = Zero Headspace VOA's HDPE = High Density Polyethylene (Lot # 051090ID

Analyst: Metals Date: 9/5/19

Reviewer: BMM Date: 9/5/19

CHI-22-15-003/P-12/15

Login Sample Receipt Checklist

Client: Kemron Environmental Services, Inc.

Job Number: 500-168649-1

Login Number: 168649
List Number: 1
Creator: Buckley, Paula M

List Source: Eurofins TestAmerica, Chicago

Question	Answer	Comment
Radioactivity wasn't checked or is </= background as measured by a survey meter.	True	
The cooler's custody seal, if present, is intact.	True	
Sample custody seals, if present, are intact.	True	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	True	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	3.5
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	True	
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time (excluding tests with immediate HTs)	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	True	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	N/A	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

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eurofins | Environment Testing TestAmerica

ANALYTICAL REPORT

Eurofins TestAmerica, Chicago
2417 Bond Street
University Park, IL 60484
Tel: (708)534-5200

Laboratory Job ID: 500-171547-1
Client Project/Site: NASA ECCL

For:
Kemron Environmental Services, Inc.
1359A Ellsworth Industrial Blvd.
Atlanta, Georgia 30318

Attn: Tomecia Bradley

Authorized for release by:
10/22/2019 2:38:42 PM
Eric Lang, Manager of Project Management
(708)534-5200
eric.lang@testamericainc.com

Designee for

Therese Hargraves, Project Manager I
(708)793-3461
therese.hargraves@testamericainc.com

LINKS

Review your project results through TotalAccess

Have a Question? Ask The Expert

Visit us at: www.testamericainc.com

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

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

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

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Job ID: 500-171547-1

Laboratory: Eurofins TestAmerica, Chicago

Narrative

Job Narrative
500-171547-1

Comments
No additional comments.

Receipt
The samples were received on 10/10/2019 8:40 AM; the samples arrived in good condition, properly preserved and, where required, on ice. The temperature of the cooler at receipt was 2.3º C.

Metals
No analytical or quality issues were noted, other than those described in the Definitions/Glossary page.

Detection Summary

Client: Kemron Environmental Services, Inc.
Project/Site: NASA ECCL

Job ID: 500-171547-1

Client Sample ID: ECCLSL0301 — Lab Sample ID: 500-171547-1

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Lead	5230		0.582	0.269	mg/Kg	1	☼	6010C	Total/NA

Client Sample ID: ECCLSL0302 — Lab Sample ID: 500-171547-2

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Lead	1980		0.605	0.280	mg/Kg	1	☼	6010C	Total/NA

Client Sample ID: ECCLSL0303 — Lab Sample ID: 500-171547-3

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Lead	6090		0.594	0.274	mg/Kg	1	☼	6010C	Total/NA

This Detection Summary does not include radiochemical test results.

Method Summary

Client: Kemron Environmental Services, Inc.
Project/Site: NASA ECCL

Job ID: 500-171547-1

Method	Method Description	Protocol	Laboratory
6010C	Metals (ICP)	SW846	TAL CHI
Moisture	Percent Moisture	EPA	TAL CHI
3050B	Preparation, Metals	SW846	TAL CHI

Protocol References:

EPA = US Environmental Protection Agency

SW846 = "Test Methods For Evaluating Solid Waste, Physical/Chemical Methods", Third Edition, November 1986 And Its Updates.

Laboratory References:

TAL CHI = Eurofins TestAmerica, Chicago, 2417 Bond Street, University Park, IL 60484, TEL (708)534-5200

Sample Summary

Client: Kemron Environmental Services, Inc.
Project/Site: NASA ECCL

Job ID: 500-171547-1

Lab Sample ID	Client Sample ID	Matrix	Collected	Received	Asset ID
500-171547-1	ECCLSL0301	Solid	10/09/19 09:00	10/10/19 08:40	
500-171547-2	ECCLSL0302	Solid	10/09/19 09:05	10/10/19 08:40	
500-171547-3	ECCLSL0303	Solid	10/09/19 09:10	10/10/19 08:40	

Client Sample Results

Client: Kemron Environmental Services, Inc.
Project/Site: NASA ECCL

Job ID: 500-171547-1

Client Sample ID: ECCLSL0301

Date Collected: 10/09/19 09:00
Date Received: 10/10/19 08:40

Lab Sample ID: 500-171547-1

Matrix: Solid
Percent Solids: 81.5

Method: 6010C - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Lead	5230		0.582	0.269	mg/Kg	☼	10/21/19 09:47	10/22/19 09:56	1

Client Sample Results

Client: Kemron Environmental Services, Inc.
Project/Site: NASA ECCL

Job ID: 500-171547-1

Client Sample ID: ECCLSL0302

Date Collected: 10/09/19 09:05
Date Received: 10/10/19 08:40

Lab Sample ID: 500-171547-2

Matrix: Solid
Percent Solids: 81.7

Method: 6010C - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Lead	1980		0.605	0.280	mg/Kg	☼	10/21/19 09:47	10/22/19 10:00	1

Client Sample Results

Client: Kemron Environmental Services, Inc.
Project/Site: NASA ECCL

Job ID: 500-171547-1

Client Sample ID: ECCLSL0303

Date Collected: 10/09/19 09:10
Date Received: 10/10/19 08:40

Lab Sample ID: 500-171547-3

Matrix: Solid
Percent Solids: 81.7

Method: 6010C - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Lead	6090		0.594	0.274	mg/Kg	☼	10/21/19 09:47	10/22/19 10:20	1

Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
¤	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CFL	Contains Free Liquid
CNF	Contains No Free Liquid
DER	Duplicate Error Ratio (normalized absolute difference)
Dil Fac	Dilution Factor
DL	Detection Limit (DoD/DOE)
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision Level Concentration (Radiochemistry)
EDL	Estimated Detection Limit (Dioxin)
LOD	Limit of Detection (DoD/DOE)
LOQ	Limit of Quantitation (DoD/DOE)
MDA	Minimum Detectable Activity (Radiochemistry)
MDC	Minimum Detectable Concentration (Radiochemistry)
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
NC	Not Calculated
ND	Not Detected at the reporting limit (or MDL or EDL if shown)
PQL	Practical Quantitation Limit
QC	Quality Control
RER	Relative Error Ratio (Radiochemistry)
RL	Reporting Limit or Requested Limit (Radiochemistry)
RPD	Relative Percent Difference, a measure of the relative difference between two points
TEF	Toxicity Equivalent Factor (Dioxin)
TEQ	Toxicity Equivalent Quotient (Dioxin)

QC Association Summary

Client: Kemron Environmental Services, Inc.
Project/Site: NASA ECCL

Job ID: 500-171547-1

Metals

Prep Batch: 511037

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
500-171547-1	ECCLSL0301	Total/NA	Solid	3050B	
500-171547-2	ECCLSL0302	Total/NA	Solid	3050B	
500-171547-3	ECCLSL0303	Total/NA	Solid	3050B	
MB 500-511037/1-A	Method Blank	Total/NA	Solid	3050B	
LCS 500-511037/2-A	Lab Control Sample	Total/NA	Solid	3050B	

Analysis Batch: 511300

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
500-171547-1	ECCLSL0301	Total/NA	Solid	6010C	511037
500-171547-2	ECCLSL0302	Total/NA	Solid	6010C	511037
MB 500-511037/1-A	Method Blank	Total/NA	Solid	6010C	511037
LCS 500-511037/2-A	Lab Control Sample	Total/NA	Solid	6010C	511037

Analysis Batch: 511333

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
500-171547-3	ECCLSL0303	Total/NA	Solid	6010C	511037

General Chemistry

Analysis Batch: 509672

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
500-171547-1	ECCLSL0301	Total/NA	Solid	Moisture	
500-171547-2	ECCLSL0302	Total/NA	Solid	Moisture	
500-171547-3	ECCLSL0303	Total/NA	Solid	Moisture	

QC Sample Results

Client: Kemron Environmental Services, Inc.
Project/Site: NASA ECCL

Job ID: 500-171547-1

Method: 6010C - Metals (ICP)

Lab Sample ID: MB 500-511037/1-A
Matrix: Solid
Analysis Batch: 511300

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 511037

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Lead	ND		0.500	0.231	mg/Kg		10/21/19 09:47	10/22/19 09:44	1

Lab Sample ID: LCS 500-511037/2-A
Matrix: Solid
Analysis Batch: 511300

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 511037

Analyte			Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits		
Lead			10.0	9.382		mg/Kg		94	80 - 120		

Lab Chronicle

Client: Kemron Environmental Services, Inc.
Project/Site: NASA ECCL

Job ID: 500-171547-1

Client Sample ID: ECCLSL0301
Lab Sample ID: 500-171547-1
Date Collected: 10/09/19 09:00
Matrix: Solid
Date Received: 10/10/19 08:40

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	Moisture		1	509672	10/11/19 15:05	LWN	TAL CHI

Client Sample ID: ECCLSL0301
Lab Sample ID: 500-171547-1
Date Collected: 10/09/19 09:00
Matrix: Solid
Date Received: 10/10/19 08:40
Percent Solids: 81.5

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3050B			511037	10/21/19 09:47	JEK	TAL CHI
Total/NA	Analysis	6010C		1	511300	10/22/19 09:56	JEF	TAL CHI

Client Sample ID: ECCLSL0302
Lab Sample ID: 500-171547-2
Date Collected: 10/09/19 09:05
Matrix: Solid
Date Received: 10/10/19 08:40

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	Moisture		1	509672	10/11/19 15:05	LWN	TAL CHI

Client Sample ID: ECCLSL0302
Lab Sample ID: 500-171547-2
Date Collected: 10/09/19 09:05
Matrix: Solid
Date Received: 10/10/19 08:40
Percent Solids: 81.7

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3050B			511037	10/21/19 09:47	JEK	TAL CHI
Total/NA	Analysis	6010C		1	511300	10/22/19 10:00	JEF	TAL CHI

Client Sample ID: ECCLSL0303
Lab Sample ID: 500-171547-3
Date Collected: 10/09/19 09:10
Matrix: Solid
Date Received: 10/10/19 08:40

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	Moisture		1	509672	10/11/19 15:05	LWN	TAL CHI

Client Sample ID: ECCLSL0303
Lab Sample ID: 500-171547-3
Date Collected: 10/09/19 09:10
Matrix: Solid
Date Received: 10/10/19 08:40
Percent Solids: 81.7

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3050B			511037	10/21/19 09:47	JEK	TAL CHI
Total/NA	Analysis	6010C		1	511333	10/22/19 10:20	EEN	TAL CHI

Laboratory References:

TAL CHI = Eurofins TestAmerica, Chicago, 2417 Bond Street, University Park, IL 60484, TEL (708)534-5200

Accreditation/Certification Summary

Client: Kemron Environmental Services, Inc.
Project/Site: NASA ECCL

Job ID: 500-171547-1

Laboratory: Eurofins TestAmerica, Chicago

Unless otherwise noted, all analytes for this laboratory were covered under each accreditation/certification below.

Authority	Program	Identification Number	Expiration Date
Georgia	State Program	N/A	04-30-20

The following analytes are included in this report, but the laboratory is not certified by the governing authority. This list may include analytes for which the agency does not offer certification.

Analysis Method	Prep Method	Matrix	Analyte
Moisture		Solid	Percent Moisture
Moisture		Solid	Percent Solids

Eurofins TestAmerica, Chicago
2417 Bond Street

681 Atlanta

University Park, IL 60484-3101
phone 708.534.5200 fax 708.534.5211

Chain of Custody Record

eurofins

Regulatory Program: ☐ DW ☐ NPDES ☐ RCRA ☐ Other:

TestAmerica Laboratories, Inc. d/b/a Eurofins TestAmerica

	Project Manager: Tomecia Bradley		COC No:
Client Contact	Email: triley@kemron.com	Site Contact:	Date: 10-9-19	___1___ of __1___ COCs
KEMRON Environmental Services, Inc	Tel/Fax: 404-214-0098	Lab Contact:	Carrier:	TALS Project #:
1359 Ellsworth Industrial Blvd	Analysis Turnaround Time			Sampler:
Atlanta, GA 30318	☐ CALENDAR DAYS ☑ WORKING DAYS			For Lab Use Only:
(404) 636-0928 Phone	TAT if different from Below _____			Walk-in Client:
(xxx) xxx-xxxx FAX	☑ 2 weeks			Lab Sampling:
Project Name: NASA ECCL	☐ 1 week		500-171547 COC	
Site:	☐ 2 days			Job / SDG No.: 500-171547
P O # SH0724	☐ 1 day			

Sample Identification	Sample Date	Sample Time	Sample Type (C=Comp, G=Grab)	Matrix	# of Cont.	Filtered Sample (Y / N)	Perform MS / MSD (Y / N)	Total Lead 6010C	Sample Specific Notes:
1 ECCLSL0301	10/9/19	900	G	S	1			X	
2 ECCLSL0302	10/9/19	905	G	S	1			X	
3 ECCLSL0303	10/9/19	910	G	S	1			X	

Preservation Used: 1= Ice, 2= HCl; 3= H2SO4; 4=HNO3; 5=NaOH; 6= Other _____

Possible Hazard Identification:
Are any samples from a listed EPA Hazardous Waste? Please List any EPA Waste Codes for the sample in the Comments Section if the lab is to dispose of the sample.
☑ Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☐ Unknown

Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)
☐ Return to Client ☑ Disposal by Lab ☐ Archive for _____ Months

Special Instructions/QC Requirements & Comments:

Custody Seals Intact: ☐ Yes ☐ No | Custody Seal No.: | Cooler Temp. (°C): Obs'd: 2.3 Corr'd: 2.3 | Therm ID No.: _____

Relinquished by:	Company:	Date/Time:	Received by:	Company:	Date/Time:
Cheshia McDaniel	Kemron	10/9/19 1326	[signature]	10-9-19	1326
Relinquished by:	Company:	Date/Time:	Received by:	Company:	Date/Time:
[signature]	10-9-19	1414	[signature]	TA	10/10/19 0840
Relinquished by:	Company:	Date/Time:	Received in Laboratory by:	Company:	Date/Time:

Form No. CA-C-WI-002, Rev. 4.26, dated 7/25/2018

10/22/2019

Login Sample Receipt Checklist

Client: Kemron Environmental Services, Inc.

Job Number: 500-171547-1

Login Number: 171547
List Number: 1
Creator: James, Jeff A

List Source: Eurofins TestAmerica, Chicago

Question	Answer	Comment
Radioactivity wasn't checked or is </= background as measured by a survey meter.	True	
The cooler's custody seal, if present, is intact.	True	
Sample custody seals, if present, are intact.	True	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	True	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	2.3
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	True	
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time (excluding tests with immediate HTs)	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	True	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	N/A	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

Attachment D:
Mixture Design Sheets

MIX DEVELOPMENT DATA SHEET

PROJECT:	NASA ECCL Stabilization	MIX No.	
PROJECT No.:	SH0724		0724-001
MIXING DATE:	16-Oct-19	MIXED BY:	MTC

UNTREATED MATERIAL TYPE		**ECCL SL 0301**
WEIGHT OF UNTREATED MATERIAL		**400 g**
REAGENT TYPE AND LOT NUMBER	ADDITION RATE	WEIGHT
Free Flow 200	3.00 %	12.0 g
	%	0.0 g
	%	0.0 g
	%	0.0 g
	%	0.0 g
Water Addition	%	0.0 g

OBSERVATIONS / NOTES

12g of Free Flow 200 was added to the material on a dry basis.

MONITORING ACTIVITIES

MONITORING ACTIVITIES	TIME PERIOD				
MAXIMUM PID (ppm)					
Notes / Observations:					

MIX DEVELOPMENT DATA SHEET

PROJECT:	NASA ECCL Stabilization	MIX No.	
PROJECT No.:	SH0724		0724-002
MIXING DATE:	16-Oct-19	MIXED BY:	MTC

UNTREATED MATERIAL TYPE		**ECCL SL 0301**
WEIGHT OF UNTREATED MATERIAL		**400 g**
REAGENT TYPE AND LOT NUMBER	ADDITION RATE	WEIGHT
Free Flow 200	5.00 %	20.0 g
	%	0.0 g
	%	0.0 g
	%	0.0 g
	%	0.0 g
Water Addition	%	0.0 g

OBSERVATIONS / NOTES

20g of Free Flow 200 was added to the material on a dry basis.

MONITORING ACTIVITIES

MONITORING ACTIVITIES	TIME PERIOD				
MAXIMUM PID (ppm)					
Notes / Observations:					

MIX DEVELOPMENT DATA SHEET

PROJECT:	NASA ECCL Stabilization	MIX No.	
PROJECT No.:	SH0724		0724-003
MIXING DATE:	16-Oct-19	MIXED BY:	MTC

UNTREATED MATERIAL TYPE		**ECCL SL 0301**
WEIGHT OF UNTREATED MATERIAL		**400 g**
REAGENT TYPE AND LOT NUMBER	ADDITION RATE	WEIGHT
Free Flow 200	7.00 %	28.0 g
	%	0.0 g
	%	0.0 g
	%	0.0 g
	%	0.0 g
Water Addition	%	0.0 g

OBSERVATIONS / NOTES

28g of Free Flow 200 was added to the material on a dry basis.

MONITORING ACTIVITIES

MONITORING ACTIVITIES	TIME PERIOD				
MAXIMUM PID (ppm)					
Notes / Observations:					

MIX DEVELOPMENT DATA SHEET

PROJECT:	NASA ECCL Stabilization	MIX No.	
PROJECT No.:	SH0724		0724-004
MIXING DATE:	16-Oct-19	MIXED BY:	MTC

UNTREATED MATERIAL TYPE		**ECCL SL 0301**
WEIGHT OF UNTREATED MATERIAL		**400 g**
REAGENT TYPE AND LOT NUMBER	ADDITION RATE	WEIGHT
Free Flow 200	9.00 %	36.0 g
	%	0.0 g
	%	0.0 g
	%	0.0 g
	%	0.0 g
Water Addition	%	0.0 g

OBSERVATIONS / NOTES

36g of Free Flow 200 was added to the material on a dry basis.

MONITORING ACTIVITIES

MONITORING ACTIVITIES	TIME PERIOD				
MAXIMUM PID (ppm)					
Notes / Observations:					

MIX DEVELOPMENT DATA SHEET

PROJECT:	NASA ECCL Stabilization	MIX No.	
PROJECT No.:	SH0724		0724-005
MIXING DATE:	16-Oct-19	MIXED BY:	MTC

UNTREATED MATERIAL TYPE		**ECCL SL 0301**
WEIGHT OF UNTREATED MATERIAL		**400 g**
REAGENT TYPE AND LOT NUMBER	ADDITION RATE	WEIGHT
Calciment (Dolomitic) #1135	4.00 %	16.0 g
	%	0.0 g
	%	0.0 g
	%	0.0 g
	%	0.0 g
Water Addition	%	0.0 g

OBSERVATIONS / NOTES

16g of Calciment (Dolomitic) was added to the material on a dry basis.

MONITORING ACTIVITIES

MONITORING ACTIVITIES	TIME PERIOD				
MAXIMUM PID (ppm)					
Notes / Observations:					

MIX DEVELOPMENT DATA SHEET

PROJECT:	NASA ECCL Stabilization	MIX No.	
PROJECT No.:	SH0724		0724-006
MIXING DATE:	16-Oct-19	MIXED BY:	MTC

UNTREATED MATERIAL TYPE		**ECCL SL 0301**
WEIGHT OF UNTREATED MATERIAL		**400 g**
REAGENT TYPE AND LOT NUMBER	ADDITION RATE	WEIGHT
Calciment (Dolomitic) #1135	6.00 %	24.0 g
	%	0.0 g
	%	0.0 g
	%	0.0 g
	%	0.0 g
Water Addition	%	0.0 g

OBSERVATIONS / NOTES

24g of Calciment (Dolomitic) was added to the material on a dry basis.

MONITORING ACTIVITIES

MONITORING ACTIVITIES	TIME PERIOD				
MAXIMUM PID (ppm)					
Notes / Observations:					

MIX DEVELOPMENT DATA SHEET

PROJECT:	NASA ECCL Stabilization	MIX No.	
PROJECT No.:	SH0724		0724-007
MIXING DATE:	16-Oct-19	MIXED BY:	MTC

UNTREATED MATERIAL TYPE		**ECCL SL 0301**
WEIGHT OF UNTREATED MATERIAL		**400 g**
REAGENT TYPE AND LOT NUMBER	ADDITION RATE	WEIGHT
Calciment (Dolomitic) #1135	8.00 %	32.0 g
	%	0.0 g
	%	0.0 g
	%	0.0 g
	%	0.0 g
Water Addition	%	0.0 g

OBSERVATIONS / NOTES

32g of Calciment (Dolomitic) was added to the material on a dry basis.

MONITORING ACTIVITIES

MONITORING ACTIVITIES	TIME PERIOD				
MAXIMUM PID (ppm)					
Notes / Observations:					

MIX DEVELOPMENT DATA SHEET

PROJECT:	NASA ECCL Stabilization	MIX No.	
PROJECT No.:	SH0724		0724-008
MIXING DATE:	16-Oct-19	MIXED BY:	MTC

UNTREATED MATERIAL TYPE		**ECCL SL 0301**
WEIGHT OF UNTREATED MATERIAL		**400 g**
REAGENT TYPE AND LOT NUMBER	ADDITION RATE	WEIGHT
Calciment (Dolomitic) #1135	12.00 %	48.0 g
	%	0.0 g
	%	0.0 g
	%	0.0 g
	%	0.0 g
Water Addition	%	0.0 g

OBSERVATIONS / NOTES

48g of Calciment (Dolomitic) was added to the material on a dry basis.

MONITORING ACTIVITIES

MONITORING ACTIVITIES	TIME PERIOD				
MAXIMUM PID (ppm)					
Notes / Observations:					

MIX DEVELOPMENT DATA SHEET

PROJECT:	NASA ECCL Stabilization	MIX No.	
PROJECT No.:	SH0724		0724-009
MIXING DATE:	16-Oct-19	MIXED BY:	MTC

UNTREATED MATERIAL TYPE		**ECCL SL 0301**
WEIGHT OF UNTREATED MATERIAL		**400 g**
REAGENT TYPE AND LOT NUMBER	ADDITION RATE	WEIGHT
Enviroblend CS	2.00 %	8.0 g
	%	0.0 g
	%	0.0 g
	%	0.0 g
	%	0.0 g
Water Addition	%	0.0 g

OBSERVATIONS / NOTES

8g of Enviroblend CS was added to the material on a dry basis.

MONITORING ACTIVITIES

MONITORING ACTIVITIES	TIME PERIOD				
MAXIMUM PID (ppm)					
Notes / Observations:					

MIX DEVELOPMENT DATA SHEET

PROJECT:	NASA ECCL Stabilization	MIX No.	
PROJECT No.:	SH0724		0724-010
MIXING DATE:	16-Oct-19	MIXED BY:	MTC

UNTREATED MATERIAL TYPE		**ECCL SL 0301**
WEIGHT OF UNTREATED MATERIAL		**400 g**
REAGENT TYPE AND LOT NUMBER	ADDITION RATE	WEIGHT
Enviroblend CS	4.00 %	16.0 g
	%	0.0 g
	%	0.0 g
	%	0.0 g
	%	0.0 g
Water Addition	%	0.0 g

OBSERVATIONS / NOTES

16g of Enviroblend CS was added to the material on a dry basis.

MONITORING ACTIVITIES

MONITORING ACTIVITIES	TIME PERIOD				
MAXIMUM PID (ppm)					
Notes / Observations:					

MIX DEVELOPMENT DATA SHEET

PROJECT:	NASA ECCL Stabilization	MIX No.	
PROJECT No.:	SH0724		0724-011
MIXING DATE:	16-Oct-19	MIXED BY:	MTC

UNTREATED MATERIAL TYPE		**ECCL SL 0301**
WEIGHT OF UNTREATED MATERIAL		**400 g**
REAGENT TYPE AND LOT NUMBER	ADDITION RATE	WEIGHT
Enviroblend CS	6.00 %	24.0 g
	%	0.0 g
	%	0.0 g
	%	0.0 g
	%	0.0 g
Water Addition	%	0.0 g

OBSERVATIONS / NOTES

24g of Enviroblend CS was added to the material on a dry basis.

MONITORING ACTIVITIES

MONITORING ACTIVITIES	TIME PERIOD				
MAXIMUM PID (ppm)					
Notes / Observations:					

MIX DEVELOPMENT DATA SHEET

PROJECT:	NASA ECCL Stabilization	MIX No.	
PROJECT No.:	SH0724		0724-012
MIXING DATE:	16-Oct-19	MIXED BY:	MTC

UNTREATED MATERIAL TYPE		**ECCL SL 0301**
WEIGHT OF UNTREATED MATERIAL		**400 g**
REAGENT TYPE AND LOT NUMBER	ADDITION RATE	WEIGHT
Enviroblend CS	8.00 %	32.0 g
	%	0.0 g
	%	0.0 g
	%	0.0 g
	%	0.0 g
Water Addition	%	0.0 g

OBSERVATIONS / NOTES

32g of Enviroblend CS was added to the material on a dry basis.

MONITORING ACTIVITIES

MONITORING ACTIVITIES	TIME PERIOD				
MAXIMUM PID (ppm)					
Notes / Observations:					

MIX DEVELOPMENT DATA SHEET

PROJECT:	NASA ECCL Stabilization	MIX No.	
PROJECT No.:	SH0724		0724-013
MIXING DATE:	16-Oct-19	MIXED BY:	MTC

UNTREATED MATERIAL TYPE		**ECCL SL 0302**
WEIGHT OF UNTREATED MATERIAL		**400 g**
REAGENT TYPE AND LOT NUMBER	ADDITION RATE	WEIGHT
Free Flow 200	3.00 %	12.0 g
	%	0.0 g
	%	0.0 g
	%	0.0 g
	%	0.0 g
Water Addition	%	0.0 g

OBSERVATIONS / NOTES

12g of Free Flow 200 was added to the material on a dry basis.

MONITORING ACTIVITIES

MONITORING ACTIVITIES	TIME PERIOD				
MAXIMUM PID (ppm)					
Notes / Observations:					

MIX DEVELOPMENT DATA SHEET

PROJECT:	NASA ECCL Stabilization	MIX No.	
PROJECT No.:	SH0724		0724-014
MIXING DATE:	16-Oct-19	MIXED BY:	MTC

UNTREATED MATERIAL TYPE		**ECCL SL 0302**
WEIGHT OF UNTREATED MATERIAL		**400 g**
REAGENT TYPE AND LOT NUMBER	ADDITION RATE	WEIGHT
Free Flow 200	5.00 %	20.0 g
	%	0.0 g
	%	0.0 g
	%	0.0 g
	%	0.0 g
Water Addition	%	0.0 g

OBSERVATIONS / NOTES

20g of Free Flow 200 was added to the material on a dry basis.

MONITORING ACTIVITIES

MONITORING ACTIVITIES	TIME PERIOD				
MAXIMUM PID (ppm)					
Notes / Observations:					

MIX DEVELOPMENT DATA SHEET

PROJECT:	NASA ECCL Stabilization	MIX No.	
PROJECT No.:	SH0724		0724-015
MIXING DATE:	16-Oct-19	MIXED BY:	MTC

UNTREATED MATERIAL TYPE		**ECCL SL 0302**
WEIGHT OF UNTREATED MATERIAL		**400 g**
REAGENT TYPE AND LOT NUMBER	ADDITION RATE	WEIGHT
Free Flow 200	7.00 %	28.0 g
	%	0.0 g
	%	0.0 g
	%	0.0 g
	%	0.0 g
Water Addition	%	0.0 g

OBSERVATIONS / NOTES

28g of Free Flow 200 was added to the material on a dry basis.

MONITORING ACTIVITIES

MONITORING ACTIVITIES	TIME PERIOD				
MAXIMUM PID (ppm)					
Notes / Observations:					

MIX DEVELOPMENT DATA SHEET

PROJECT:	NASA ECCL Stabilization	MIX No.	
PROJECT No.:	SH0724		0724-016
MIXING DATE:	16-Oct-19	MIXED BY:	MTC

UNTREATED MATERIAL TYPE		**ECCL SL 0302**
WEIGHT OF UNTREATED MATERIAL		**400 g**
REAGENT TYPE AND LOT NUMBER	ADDITION RATE	WEIGHT
Free Flow 200	9.00 %	36.0 g
	%	0.0 g
	%	0.0 g
	%	0.0 g
	%	0.0 g
Water Addition	%	0.0 g

OBSERVATIONS / NOTES

36g of Free Flow 200 was added to the material on a dry basis.

MONITORING ACTIVITIES

MONITORING ACTIVITIES	TIME PERIOD				
MAXIMUM PID (ppm)					
Notes / Observations:					

MIX DEVELOPMENT DATA SHEET

PROJECT:	NASA ECCL Stabilization	MIX No.	
PROJECT No.:	SH0724		0724-017
MIXING DATE:	16-Oct-19	MIXED BY:	MTC

UNTREATED MATERIAL TYPE		**ECCL SL 0302**
WEIGHT OF UNTREATED MATERIAL		**400 g**
REAGENT TYPE AND LOT NUMBER	ADDITION RATE	WEIGHT
Calciment (Dolomitic) #1135	2.00 %	8.0 g
	%	0.0 g
	%	0.0 g
	%	0.0 g
	%	0.0 g
Water Addition	%	0.0 g

OBSERVATIONS / NOTES

8g of Calciment (Dolomitic) was added to the material on a dry basis.

MONITORING ACTIVITIES

MONITORING ACTIVITIES	TIME PERIOD				
MAXIMUM PID (ppm)					
Notes / Observations:					

MIX DEVELOPMENT DATA SHEET

PROJECT:	NASA ECCL Stabilization	MIX No.	
PROJECT No.:	SH0724		0724-018
MIXING DATE:	16-Oct-19	MIXED BY:	MTC

UNTREATED MATERIAL TYPE		**ECCL SL 0302**
WEIGHT OF UNTREATED MATERIAL		**400 g**
REAGENT TYPE AND LOT NUMBER	ADDITION RATE	WEIGHT
Calciment (Dolomitic) #1135	4.00 %	16.0 g
	%	0.0 g
	%	0.0 g
	%	0.0 g
	%	0.0 g
Water Addition	%	0.0 g

OBSERVATIONS / NOTES

16g of Calciment (Dolomitic) was added to the material on a dry basis.

MONITORING ACTIVITIES

MONITORING ACTIVITIES	TIME PERIOD				
MAXIMUM PID (ppm)					
Notes / Observations:					

MIX DEVELOPMENT DATA SHEET

PROJECT:	NASA ECCL Stabilization	MIX No.	
PROJECT No.:	SH0724		0724-019
MIXING DATE:	16-Oct-19	MIXED BY:	MTC

UNTREATED MATERIAL TYPE		**ECCL SL 0302**
WEIGHT OF UNTREATED MATERIAL		**400 g**
REAGENT TYPE AND LOT NUMBER	ADDITION RATE	WEIGHT
Calciment (Dolomitic) #1135	6.00 %	24.0 g
	%	0.0 g
	%	0.0 g
	%	0.0 g
	%	0.0 g
Water Addition	%	0.0 g

OBSERVATIONS / NOTES

24g of Calciment (Dolomitic) was added to the material on a dry basis.

MONITORING ACTIVITIES

MONITORING ACTIVITIES	TIME PERIOD				
MAXIMUM PID (ppm)					
Notes / Observations:					

MIX DEVELOPMENT DATA SHEET

PROJECT:	NASA ECCL Stabilization	MIX No.	
PROJECT No.:	SH0724		0724-020
MIXING DATE:	16-Oct-19	MIXED BY:	MTC

UNTREATED MATERIAL TYPE		**ECCL SL 0302**
WEIGHT OF UNTREATED MATERIAL		**400 g**
REAGENT TYPE AND LOT NUMBER	ADDITION RATE	WEIGHT
Calciment (Dolomitic) #1135	10.00 %	40.0 g
	%	0.0 g
	%	0.0 g
	%	0.0 g
	%	0.0 g
Water Addition	%	0.0 g

OBSERVATIONS / NOTES

40g of Calciment (Dolomitic) was added to the material on a dry basis.

MONITORING ACTIVITIES

MONITORING ACTIVITIES	TIME PERIOD				
MAXIMUM PID (ppm)					
Notes / Observations:					

MIX DEVELOPMENT DATA SHEET

PROJECT:	NASA ECCL Stabilization	MIX No.	
PROJECT No.:	SH0724		0724-021
MIXING DATE:	16-Oct-19	MIXED BY:	MTC

UNTREATED MATERIAL TYPE		**ECCL SL 0302**
WEIGHT OF UNTREATED MATERIAL		**400 g**
REAGENT TYPE AND LOT NUMBER	ADDITION RATE	WEIGHT
Enviroblend CS	2.00 %	8.0 g
	%	0.0 g
	%	0.0 g
	%	0.0 g
	%	0.0 g
Water Addition	%	0.0 g

OBSERVATIONS / NOTES

8g of Enviroblend CS was added to the material on a dry basis.

MONITORING ACTIVITIES

MONITORING ACTIVITIES	TIME PERIOD				
MAXIMUM PID (ppm)					
Notes / Observations:					

MIX DEVELOPMENT DATA SHEET

PROJECT:	NASA ECCL Stabilization	MIX No.	
PROJECT No.:	SH0724		0724-022
MIXING DATE:	16-Oct-19	MIXED BY:	MTC

UNTREATED MATERIAL TYPE		**ECCL SL 0302**
WEIGHT OF UNTREATED MATERIAL		**400 g**
REAGENT TYPE AND LOT NUMBER	ADDITION RATE	WEIGHT
Enviroblend CS	4.00 %	16.0 g
	%	0.0 g
	%	0.0 g
	%	0.0 g
	%	0.0 g
Water Addition	%	0.0 g

OBSERVATIONS / NOTES

16g of Enviroblend CS was added to the material on a dry basis.

MONITORING ACTIVITIES

MONITORING ACTIVITIES	TIME PERIOD				
MAXIMUM PID (ppm)					
Notes / Observations:					

MIX DEVELOPMENT DATA SHEET

PROJECT:	NASA ECCL Stabilization	MIX No.	
PROJECT No.:	SH0724		0724-023
MIXING DATE:	16-Oct-19	MIXED BY:	MTC

UNTREATED MATERIAL TYPE		**ECCL SL 0302**
WEIGHT OF UNTREATED MATERIAL		**400 g**
REAGENT TYPE AND LOT NUMBER	ADDITION RATE	WEIGHT
Enviroblend CS	6.00 %	24.0 g
	%	0.0 g
	%	0.0 g
	%	0.0 g
	%	0.0 g
Water Addition	%	0.0 g

OBSERVATIONS / NOTES

24g of Enviroblend CS was added to the material on a dry basis.

MONITORING ACTIVITIES

MONITORING ACTIVITIES	TIME PERIOD				
MAXIMUM PID (ppm)					
Notes / Observations:					

MIX DEVELOPMENT DATA SHEET

PROJECT:	NASA ECCL Stabilization	MIX No.	
PROJECT No.:	SH0724		0724-024
MIXING DATE:	16-Oct-19	MIXED BY:	MTC

UNTREATED MATERIAL TYPE		**ECCL SL 0302**
WEIGHT OF UNTREATED MATERIAL		**400 g**
REAGENT TYPE AND LOT NUMBER	ADDITION RATE	WEIGHT
Enviroblend CS	8.00 %	32.0 g
	%	0.0 g
	%	0.0 g
	%	0.0 g
	%	0.0 g
Water Addition	%	0.0 g

OBSERVATIONS / NOTES

32g of Enviroblend CS was added to the material on a dry basis.

MONITORING ACTIVITIES

MONITORING ACTIVITIES	TIME PERIOD				
MAXIMUM PID (ppm)					
Notes / Observations:					

MIX DEVELOPMENT DATA SHEET

PROJECT:	NASA ECCL Stabilization	MIX No.	
PROJECT No.:	SH0724		0724-025
MIXING DATE:	16-Oct-19	MIXED BY:	MTC

UNTREATED MATERIAL TYPE		**ECCL SL 0303**
WEIGHT OF UNTREATED MATERIAL		**400 g**
REAGENT TYPE AND LOT NUMBER	ADDITION RATE	WEIGHT
Free Flow 200	3.00 %	12.0 g
	%	0.0 g
	%	0.0 g
	%	0.0 g
	%	0.0 g
Water Addition	%	0.0 g

OBSERVATIONS / NOTES

12g of Free Flow 200 was added to the material on a dry basis.

MONITORING ACTIVITIES

MONITORING ACTIVITIES	TIME PERIOD				
MAXIMUM PID (ppm)					
Notes / Observations:					

MIX DEVELOPMENT DATA SHEET

PROJECT:	NASA ECCL Stabilization	MIX No.	
PROJECT No.:	SH0724		0724-026
MIXING DATE:	16-Oct-19	MIXED BY:	MTC

UNTREATED MATERIAL TYPE		**ECCL SL 0303**
WEIGHT OF UNTREATED MATERIAL		**400 g**
REAGENT TYPE AND LOT NUMBER	ADDITION RATE	WEIGHT
Free Flow 200	5.00 %	20.0 g
	%	0.0 g
	%	0.0 g
	%	0.0 g
	%	0.0 g
Water Addition	%	0.0 g

OBSERVATIONS / NOTES

20g of Free Flow 200 was added to the material on a dry basis.

MONITORING ACTIVITIES

MONITORING ACTIVITIES	TIME PERIOD				
MAXIMUM PID (ppm)					
Notes / Observations:					

MIX DEVELOPMENT DATA SHEET

PROJECT:	NASA ECCL Stabilization	MIX No.	
PROJECT No.:	SH0724		0724-027
MIXING DATE:	16-Oct-19	MIXED BY:	MTC

UNTREATED MATERIAL TYPE		**ECCL SL 0303**
WEIGHT OF UNTREATED MATERIAL		**400 g**
REAGENT TYPE AND LOT NUMBER	ADDITION RATE	WEIGHT
Free Flow 200	7.00 %	28.0 g
	%	0.0 g
	%	0.0 g
	%	0.0 g
	%	0.0 g
Water Addition	%	0.0 g

OBSERVATIONS / NOTES

28g of Free Flow 200 was added to the material on a dry basis.

MONITORING ACTIVITIES

MONITORING ACTIVITIES	TIME PERIOD				
MAXIMUM PID (ppm)					
Notes / Observations:					

MIX DEVELOPMENT DATA SHEET

PROJECT:	NASA ECCL Stabilization	MIX No.	
PROJECT No.:	SH0724		0724-028
MIXING DATE:	16-Oct-19	MIXED BY:	MTC

UNTREATED MATERIAL TYPE		**ECCL SL 0303**
WEIGHT OF UNTREATED MATERIAL		**400 g**
REAGENT TYPE AND LOT NUMBER	ADDITION RATE	WEIGHT
Free Flow 200	9.00 %	36.0 g
	%	0.0 g
	%	0.0 g
	%	0.0 g
	%	0.0 g
Water Addition	%	0.0 g

OBSERVATIONS / NOTES

36g of Free Flow 200 was added to the material on a dry basis.

MONITORING ACTIVITIES

MONITORING ACTIVITIES	TIME PERIOD				
MAXIMUM PID (ppm)					
Notes / Observations:					

MIX DEVELOPMENT DATA SHEET

PROJECT:	NASA ECCL Stabilization	MIX No.	
PROJECT No.:	SH0724		0724-029
MIXING DATE:	16-Oct-19	MIXED BY:	MTC

UNTREATED MATERIAL TYPE		**ECCL SL 0303**
WEIGHT OF UNTREATED MATERIAL		**400 g**
REAGENT TYPE AND LOT NUMBER	ADDITION RATE	WEIGHT
Calciment (Dolomitic) #1135	2.00 %	8.0 g
	%	0.0 g
	%	0.0 g
	%	0.0 g
	%	0.0 g
Water Addition	%	0.0 g

OBSERVATIONS / NOTES

8g of Calciment (Dolomitic) was added to the material on a dry basis.

MONITORING ACTIVITIES

MONITORING ACTIVITIES	TIME PERIOD				
MAXIMUM PID (ppm)					
Notes / Observations:					

MIX DEVELOPMENT DATA SHEET

PROJECT:	NASA ECCL Stabilization	MIX No.	
PROJECT No.:	SH0724		0724-030
MIXING DATE:	16-Oct-19	MIXED BY:	MTC

UNTREATED MATERIAL TYPE		**ECCL SL 0303**
WEIGHT OF UNTREATED MATERIAL		**400 g**
REAGENT TYPE AND LOT NUMBER	ADDITION RATE	WEIGHT
Calciment (Dolomitic) #1135	4.00 %	16.0 g
	%	0.0 g
	%	0.0 g
	%	0.0 g
	%	0.0 g
Water Addition	%	0.0 g

OBSERVATIONS / NOTES

16g of Calciment (Dolomitic) was added to the material on a dry basis.

MONITORING ACTIVITIES

MONITORING ACTIVITIES	TIME PERIOD				
MAXIMUM PID (ppm)					
Notes / Observations:					

MIX DEVELOPMENT DATA SHEET

PROJECT:	NASA ECCL Stabilization	MIX No.	
PROJECT No.:	SH0724		0724-031
MIXING DATE:	16-Oct-19	MIXED BY:	MTC

UNTREATED MATERIAL TYPE		**ECCL SL 0303**
WEIGHT OF UNTREATED MATERIAL		**400 g**
REAGENT TYPE AND LOT NUMBER	ADDITION RATE	WEIGHT
Calciment (Dolomitic) #1135	6.00 %	24.0 g
	%	0.0 g
	%	0.0 g
	%	0.0 g
	%	0.0 g
Water Addition	%	0.0 g

OBSERVATIONS / NOTES

24g of Calciment (Dolomitic) was added to the material on a dry basis.

MONITORING ACTIVITIES

MONITORING ACTIVITIES	TIME PERIOD				
MAXIMUM PID (ppm)					
Notes / Observations:					

MIX DEVELOPMENT DATA SHEET

PROJECT:	NASA ECCL Stabilization	MIX No.	
PROJECT No.:	SH0724		0724-032
MIXING DATE:	16-Oct-19	MIXED BY:	MTC

UNTREATED MATERIAL TYPE		**ECCL SL 0303**
WEIGHT OF UNTREATED MATERIAL		**400 g**
REAGENT TYPE AND LOT NUMBER	ADDITION RATE	WEIGHT
Calciment (Dolomitic) #1135	10.00 %	40.0 g
	%	0.0 g
	%	0.0 g
	%	0.0 g
	%	0.0 g
Water Addition	%	0.0 g

OBSERVATIONS / NOTES

40g of Calciment (Dolomitic) was added to the material on a dry basis.

MONITORING ACTIVITIES

MONITORING ACTIVITIES	TIME PERIOD				
MAXIMUM PID (ppm)					
Notes / Observations:					

MIX DEVELOPMENT DATA SHEET

PROJECT:	NASA ECCL Stabilization	MIX No.	
PROJECT No.:	SH0724		0724-033
MIXING DATE:	16-Oct-19	MIXED BY:	MTC

UNTREATED MATERIAL TYPE		**ECCL SL 0303**
WEIGHT OF UNTREATED MATERIAL		**400 g**
REAGENT TYPE AND LOT NUMBER	ADDITION RATE	WEIGHT
Enviroblend CS	2.00 %	8.0 g
	%	0.0 g
	%	0.0 g
	%	0.0 g
	%	0.0 g
Water Addition	%	0.0 g

OBSERVATIONS / NOTES

8g of Enviroblend CS was added to the material on a dry basis.

MONITORING ACTIVITIES

MONITORING ACTIVITIES	TIME PERIOD				
MAXIMUM PID (ppm)					
Notes / Observations:					

MIX DEVELOPMENT DATA SHEET

PROJECT:	NASA ECCL Stabilization	MIX No.	
PROJECT No.:	SH0724		0724-034
MIXING DATE:	16-Oct-19	MIXED BY:	MTC

UNTREATED MATERIAL TYPE		**ECCL SL 0303**
WEIGHT OF UNTREATED MATERIAL		**400 g**
REAGENT TYPE AND LOT NUMBER	ADDITION RATE	WEIGHT
Enviroblend CS	4.00 %	16.0 g
	%	0.0 g
	%	0.0 g
	%	0.0 g
	%	0.0 g
Water Addition	%	0.0 g

OBSERVATIONS / NOTES

16g of Enviroblend CS was added to the material on a dry basis.

MONITORING ACTIVITIES

MONITORING ACTIVITIES	TIME PERIOD				
MAXIMUM PID (ppm)					
Notes / Observations:					

MIX DEVELOPMENT DATA SHEET

PROJECT:	NASA ECCL Stabilization	MIX No.	
PROJECT No.:	SH0724		0724-035
MIXING DATE:	16-Oct-19	MIXED BY:	MTC

UNTREATED MATERIAL TYPE		**ECCL SL 0303**
WEIGHT OF UNTREATED MATERIAL		**400 g**
REAGENT TYPE AND LOT NUMBER	ADDITION RATE	WEIGHT
Enviroblend CS	6.00 %	24.0 g
	%	0.0 g
	%	0.0 g
	%	0.0 g
	%	0.0 g
Water Addition	%	0.0 g

OBSERVATIONS / NOTES

24g of Enviroblend CS was added to the material on a dry basis.

MONITORING ACTIVITIES

MONITORING ACTIVITIES	TIME PERIOD				
MAXIMUM PID (ppm)					
Notes / Observations:					

MIX DEVELOPMENT DATA SHEET

PROJECT:	NASA ECCL Stabilization	MIX No.	
PROJECT No.:	SH0724		0724-036
MIXING DATE:	16-Oct-19	MIXED BY:	MTC

UNTREATED MATERIAL TYPE		**ECCL SL 0303**
WEIGHT OF UNTREATED MATERIAL		**400 g**
REAGENT TYPE AND LOT NUMBER	ADDITION RATE	WEIGHT
Enviroblend CS	8.00 %	32.0 g
	%	0.0 g
	%	0.0 g
	%	0.0 g
	%	0.0 g
Water Addition	%	0.0 g

OBSERVATIONS / NOTES

32g of Enviroblend CS was added to the material on a dry basis.

MONITORING ACTIVITIES

MONITORING ACTIVITIES	TIME PERIOD				
MAXIMUM PID (ppm)					
Notes / Observations:					

MIX DEVELOPMENT DATA SHEET

PROJECT:	NASA ECCL Stabilization	MIX No.	
PROJECT No.:	SH0724		0724-037
MIXING DATE:		MIXED BY:	MTC

UNTREATED MATERIAL TYPE		**ECCL SL 0301**
WEIGHT OF UNTREATED MATERIAL		**400 g**
REAGENT TYPE AND LOT NUMBER	ADDITION RATE	WEIGHT
Enviroblend CS	3.00 %	12.0 g
	%	0.0 g
	%	0.0 g
	%	0.0 g
	%	0.0 g
Water Addition	%	0.0 g

OBSERVATIONS / NOTES

12g of Enviroblend CS was added to the material on a dry basis.

MONITORING ACTIVITIES

MONITORING ACTIVITIES	TIME PERIOD				
MAXIMUM PID (ppm)					
Notes / Observations:					

MIX DEVELOPMENT DATA SHEET

PROJECT:	NASA ECCL Stabilization	MIX No.	
PROJECT No.:	SH0724		0724-038
MIXING DATE:		MIXED BY:	MTC

UNTREATED MATERIAL TYPE		**ECCL SL 0302**
WEIGHT OF UNTREATED MATERIAL		**400 g**
REAGENT TYPE AND LOT NUMBER	ADDITION RATE	WEIGHT
Enviroblend CS	3.00 %	12.0 g
	%	0.0 g
	%	0.0 g
	%	0.0 g
	%	0.0 g
Water Addition	%	0.0 g

OBSERVATIONS / NOTES

12g of Enviroblend CS was added to the material on a dry basis.

MONITORING ACTIVITIES

MONITORING ACTIVITIES	TIME PERIOD				
MAXIMUM PID (ppm)					
Notes / Observations:					

MIX DEVELOPMENT DATA SHEET

PROJECT:	NASA ECCL Stabilization	MIX No.	
PROJECT No.:	SH0724		0724-039
MIXING DATE:		MIXED BY:	MTC

UNTREATED MATERIAL TYPE		**ECCL SL 0303**
WEIGHT OF UNTREATED MATERIAL		**400 g**
REAGENT TYPE AND LOT NUMBER	ADDITION RATE	WEIGHT
Enviroblend CS	1.00 %	4.0 g
	%	0.0 g
	%	0.0 g
	%	0.0 g
	%	0.0 g
Water Addition	%	0.0 g

OBSERVATIONS / NOTES

4g of Enviroblend CS was added to the material on a dry basis.

MONITORING ACTIVITIES

MONITORING ACTIVITIES	TIME PERIOD				
MAXIMUM PID (ppm)					
Notes / Observations:					

MIX DEVELOPMENT DATA SHEET

PROJECT:	NASA ECCL Stabilization	MIX No.	
PROJECT No.:	SH0724		0724-040
MIXING DATE:		MIXED BY:	MTC

UNTREATED MATERIAL TYPE		**ECCL SL 0303**
WEIGHT OF UNTREATED MATERIAL		**400 g**
REAGENT TYPE AND LOT NUMBER	ADDITION RATE	WEIGHT
Enviroblend CS	3.00 %	12.0 g
	%	0.0 g
	%	0.0 g
	%	0.0 g
	%	0.0 g
Water Addition	%	0.0 g

OBSERVATIONS / NOTES

12g of Enviroblend CS was added to the material on a dry basis.

MONITORING ACTIVITIES

MONITORING ACTIVITIES	TIME PERIOD				
MAXIMUM PID (ppm)					
Notes / Observations:					

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Attachment E:
Treated Analytical Reports and Physical Properties Testing Data Sheets

eurofins | Environment Testing TestAmerica

ANALYTICAL REPORT

Eurofins TestAmerica, Chicago
2417 Bond Street
University Park, IL 60484
Tel: (708)534-5200

Laboratory Job ID: 500-171906-1
Client Project/Site: NASA ECCL Stabilization

For:
Kemron Environmental Services, Inc.
1359A Ellsworth Industrial Blvd.
Atlanta, Georgia 30318

Attn: Tomecia Bradley

Therese Hargraves

Authorized for release by:
10/31/2019 3:45:29 PM

Therese Hargraves, Project Manager I
(708)793-3461
therese.hargraves@testamericainc.com

LINKS

Review your project results through TotalAccess

Have a Question? Ask The Expert

Visit us at: www.testamericainc.com

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

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

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

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Job ID: 500-171906-1

Laboratory: Eurofins TestAmerica, Chicago

Narrative

Job Narrative
500-171906-1

Comments
No additional comments.

Receipt
The samples were received on 10/17/2019 8:40 AM; the samples arrived in good condition, properly preserved and, where required, on ice. The temperatures of the 2 coolers at receipt time were 1.6º C and 1.8º C.

Metals
No analytical or quality issues were noted, other than those described in the Definitions/Glossary page.

Detection Summary

Client: Kemron Environmental Services, Inc.
Project/Site: NASA ECCL Stabilization

Job ID: 500-171906-1

Client Sample ID: 0724-001 — Lab Sample ID: 500-171906-1

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Lead	127		0.250	0.0375	mg/L	5		6010C	TCLP

Client Sample ID: 0724-002 — Lab Sample ID: 500-171906-2

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Lead	77.2		0.0500	0.00750	mg/L	1		6010C	TCLP

Client Sample ID: 0724-003 — Lab Sample ID: 500-171906-3

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Lead	0.231		0.0500	0.00750	mg/L	1		6010C	TCLP

Client Sample ID: 0724-004 — Lab Sample ID: 500-171906-4

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Lead	0.0694		0.0500	0.00750	mg/L	1		6010C	TCLP

Client Sample ID: 0724-005 — Lab Sample ID: 500-171906-5

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Lead	4.00		0.0500	0.00750	mg/L	1		6010C	TCLP

Client Sample ID: 0724-006 — Lab Sample ID: 500-171906-6

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Lead	0.0827		0.0500	0.00750	mg/L	1		6010C	TCLP

Client Sample ID: 0724-007 — Lab Sample ID: 500-171906-7

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Lead	0.0311	J	0.0500	0.00750	mg/L	1		6010C	TCLP

Client Sample ID: 0724-008 — Lab Sample ID: 500-171906-8

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Lead	0.0121	J	0.0500	0.00750	mg/L	1		6010C	TCLP

Client Sample ID: 0724-009 — Lab Sample ID: 500-171906-9

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Lead	9.94		0.0500	0.00750	mg/L	1		6010C	TCLP

Client Sample ID: 0724-010 — Lab Sample ID: 500-171906-10

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Lead	0.530		0.0500	0.00750	mg/L	1		6010C	TCLP

Client Sample ID: 0724-011 — Lab Sample ID: 500-171906-11

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Lead	0.360		0.0500	0.00750	mg/L	1		6010C	TCLP

Client Sample ID: 0724-012 — Lab Sample ID: 500-171906-12

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Lead	0.0865		0.0500	0.00750	mg/L	1		6010C	TCLP

This Detection Summary does not include radiochemical test results.

Detection Summary

Client: Kemron Environmental Services, Inc.
Project/Site: NASA ECCL Stabilization

Job ID: 500-171906-1

Client Sample ID: 0724-013 — Lab Sample ID: 500-171906-13

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Lead	58.3		0.0500	0.00750	mg/L	1		6010C	TCLP

Client Sample ID: 0724-014 — Lab Sample ID: 500-171906-14

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Lead	18.7		0.0500	0.00750	mg/L	1		6010C	TCLP

Client Sample ID: 0724-015 — Lab Sample ID: 500-171906-15

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Lead	11.2		0.0500	0.00750	mg/L	1		6010C	TCLP

Client Sample ID: 0724-016 — Lab Sample ID: 500-171906-16

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Lead	0.133		0.0500	0.00750	mg/L	1		6010C	TCLP

Client Sample ID: 0724-017 — Lab Sample ID: 500-171906-17

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Lead	331		0.250	0.0375	mg/L	5		6010C	TCLP

Client Sample ID: 0724-018 — Lab Sample ID: 500-171906-18

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Lead	3.29		0.0500	0.00750	mg/L	1		6010C	TCLP

Client Sample ID: 0724-019 — Lab Sample ID: 500-171906-19

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Lead	0.0408	J	0.0500	0.00750	mg/L	1		6010C	TCLP

Client Sample ID: 0724-020 — Lab Sample ID: 500-171906-20

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Lead	12.5	B	0.0500	0.00750	mg/L	1		6010C	TCLP

Client Sample ID: 0724-021 — Lab Sample ID: 500-171906-21

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Lead	7.14		0.0500	0.00750	mg/L	1		6010C	TCLP

Client Sample ID: 0724-022 — Lab Sample ID: 500-171906-22

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Lead	0.107		0.0500	0.00750	mg/L	1		6010C	TCLP

Client Sample ID: 0724-023 — Lab Sample ID: 500-171906-23

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Lead	0.0445	J	0.0500	0.00750	mg/L	1		6010C	TCLP

Client Sample ID: 0724-024 — Lab Sample ID: 500-171906-24

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Lead	0.0405	J	0.0500	0.00750	mg/L	1		6010C	TCLP

This Detection Summary does not include radiochemical test results.

Detection Summary

Client: Kemron Environmental Services, Inc.
Project/Site: NASA ECCL Stabilization

Job ID: 500-171906-1

Client Sample ID: 0724-025 — Lab Sample ID: 500-171906-25

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Lead	392		0.250	0.0375	mg/L	5		6010C	TCLP

Client Sample ID: 0724-026 — Lab Sample ID: 500-171906-26

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Lead	74.4		0.0500	0.00750	mg/L	1		6010C	TCLP

Client Sample ID: 0724-027 — Lab Sample ID: 500-171906-27

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Lead	0.0282	J	0.0500	0.00750	mg/L	1		6010C	TCLP

Client Sample ID: 0724-028 — Lab Sample ID: 500-171906-28

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Lead	16.3		0.0500	0.00750	mg/L	1		6010C	TCLP

Client Sample ID: 0724-029 — Lab Sample ID: 500-171906-29

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Lead	179		0.250	0.0375	mg/L	5		6010C	TCLP

Client Sample ID: 0724-030 — Lab Sample ID: 500-171906-30

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Lead	2.60		0.0500	0.00750	mg/L	1		6010C	TCLP

Client Sample ID: 0724-031 — Lab Sample ID: 500-171906-31

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Lead	0.0188	J	0.0500	0.00750	mg/L	1		6010C	TCLP

Client Sample ID: 0724-032 — Lab Sample ID: 500-171906-32

No Detections.

Client Sample ID: 0724-033 — Lab Sample ID: 500-171906-33

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Lead	0.831		0.0500	0.00750	mg/L	1		6010C	TCLP

Client Sample ID: 0724-034 — Lab Sample ID: 500-171906-34

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Lead	0.125		0.0500	0.00750	mg/L	1		6010C	TCLP

Client Sample ID: 0724-035 — Lab Sample ID: 500-171906-35

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Lead	0.0373	J	0.0500	0.00750	mg/L	1		6010C	TCLP

Client Sample ID: 0724-036 — Lab Sample ID: 500-171906-36

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Lead	0.0126	J	0.0500	0.00750	mg/L	1		6010C	TCLP

This Detection Summary does not include radiochemical test results.

Method Summary

Client: Kemron Environmental Services, Inc.
Project/Site: NASA ECCL Stabilization

Job ID: 500-171906-1

Method	Method Description	Protocol	Laboratory
6010C	Metals (ICP)	SW846	TAL CHI
1311	TCLP Extraction	SW846	TAL CHI
3010A	Preparation, Total Metals	SW846	TAL CHI

Protocol References:

SW846 = "Test Methods For Evaluating Solid Waste, Physical/Chemical Methods", Third Edition, November 1986 And Its Updates.

Laboratory References:

TAL CHI = Eurofins TestAmerica, Chicago, 2417 Bond Street, University Park, IL 60484, TEL (708)534-5200

Sample Summary

Client: Kemron Environmental Services, Inc.
Project/Site: NASA ECCL Stabilization

Job ID: 500-171906-1

Lab Sample ID	Client Sample ID	Matrix	Collected	Received	Asset ID
500-171906-1	0724-001	Solid	10/16/19 09:00	10/17/19 08:40	
500-171906-2	0724-002	Solid	10/16/19 09:05	10/17/19 08:40	
500-171906-3	0724-003	Solid	10/16/19 09:10	10/17/19 08:40	
500-171906-4	0724-004	Solid	10/16/19 09:15	10/17/19 08:40	
500-171906-5	0724-005	Solid	10/16/19 09:20	10/17/19 08:40	
500-171906-6	0724-006	Solid	10/16/19 09:25	10/17/19 08:40	
500-171906-7	0724-007	Solid	10/16/19 09:30	10/17/19 08:40	
500-171906-8	0724-008	Solid	10/16/19 09:35	10/17/19 08:40	
500-171906-9	0724-009	Solid	10/16/19 09:40	10/17/19 08:40	
500-171906-10	0724-010	Solid	10/16/19 09:45	10/17/19 08:40	
500-171906-11	0724-011	Solid	10/16/19 09:50	10/17/19 08:40	
500-171906-12	0724-012	Solid	10/16/19 09:55	10/17/19 08:40	
500-171906-13	0724-013	Solid	10/16/19 10:00	10/17/19 08:40	
500-171906-14	0724-014	Solid	10/16/19 10:05	10/17/19 08:40	
500-171906-15	0724-015	Solid	10/16/19 10:10	10/17/19 08:40	
500-171906-16	0724-016	Solid	10/16/19 10:15	10/17/19 08:40	
500-171906-17	0724-017	Solid	10/16/19 10:20	10/17/19 08:40	
500-171906-18	0724-018	Solid	10/16/19 10:25	10/17/19 08:40	
500-171906-19	0724-019	Solid	10/16/19 10:30	10/17/19 08:40	
500-171906-20	0724-020	Solid	10/16/19 10:35	10/17/19 08:40	
500-171906-21	0724-021	Solid	10/16/19 10:40	10/17/19 08:40	
500-171906-22	0724-022	Solid	10/16/19 10:45	10/17/19 08:40	
500-171906-23	0724-023	Solid	10/16/19 10:50	10/17/19 08:40	
500-171906-24	0724-024	Solid	10/16/19 10:55	10/17/19 08:40	
500-171906-25	0724-025	Solid	10/16/19 11:00	10/17/19 08:40	
500-171906-26	0724-026	Solid	10/16/19 11:05	10/17/19 08:40	
500-171906-27	0724-027	Solid	10/16/19 11:10	10/17/19 08:40	
500-171906-28	0724-028	Solid	10/16/19 11:15	10/17/19 08:40	
500-171906-29	0724-029	Solid	10/16/19 11:20	10/17/19 08:40	
500-171906-30	0724-030	Solid	10/16/19 11:25	10/17/19 08:40	
500-171906-31	0724-031	Solid	10/16/19 11:30	10/17/19 08:40	
500-171906-32	0724-032	Solid	10/16/19 11:35	10/17/19 08:40	
500-171906-33	0724-033	Solid	10/16/19 11:40	10/17/19 08:40	
500-171906-34	0724-034	Solid	10/16/19 11:45	10/17/19 08:40	
500-171906-35	0724-035	Solid	10/16/19 11:50	10/17/19 08:40	
500-171906-36	0724-036	Solid	10/16/19 11:55	10/17/19 08:40	

Client Sample Results

Client: Kemron Environmental Services, Inc.
Project/Site: NASA ECCL Stabilization

Job ID: 500-171906-1

Client Sample ID: 0724-001

Date Collected: 10/16/19 09:00
Date Received: 10/17/19 08:40

Lab Sample ID: 500-171906-1

Matrix: Solid

Method: 6010C - Metals (ICP) - TCLP

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Lead	127		0.250	0.0375	mg/L		10/29/19 14:55	10/31/19 12:16	5

Client Sample Results

Client: Kemron Environmental Services, Inc.
Project/Site: NASA ECCL Stabilization

Job ID: 500-171906-1

Client Sample ID: 0724-002

Date Collected: 10/16/19 09:05
Date Received: 10/17/19 08:40

Lab Sample ID: 500-171906-2

Matrix: Solid

Method: 6010C - Metals (ICP) - TCLP

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Lead	77.2		0.0500	0.00750	mg/L		10/29/19 14:55	10/31/19 12:20	1

Client Sample Results

Client: Kemron Environmental Services, Inc.
Project/Site: NASA ECCL Stabilization

Job ID: 500-171906-1

Client Sample ID: 0724-003

Date Collected: 10/16/19 09:10
Date Received: 10/17/19 08:40

Lab Sample ID: 500-171906-3

Matrix: Solid

Method: 6010C - Metals (ICP) - TCLP

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Lead	0.231		0.0500	0.00750	mg/L		10/29/19 14:55	10/31/19 12:24	1

Client Sample Results

Client: Kemron Environmental Services, Inc.
Project/Site: NASA ECCL Stabilization

Job ID: 500-171906-1

Client Sample ID: 0724-004

Date Collected: 10/16/19 09:15
Date Received: 10/17/19 08:40

Lab Sample ID: 500-171906-4

Matrix: Solid

Method: 6010C - Metals (ICP) - TCLP

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Lead	0.0694		0.0500	0.00750	mg/L		10/29/19 14:55	10/31/19 12:29	1

Client Sample Results

Client: Kemron Environmental Services, Inc.
Project/Site: NASA ECCL Stabilization

Job ID: 500-171906-1

Client Sample ID: 0724-005

Date Collected: 10/16/19 09:20
Date Received: 10/17/19 08:40

Lab Sample ID: 500-171906-5

Matrix: Solid

Method: 6010C - Metals (ICP) - TCLP

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Lead	4.00		0.0500	0.00750	mg/L		10/29/19 14:55	10/31/19 00:29	1

Client Sample Results

Client: Kemron Environmental Services, Inc.
Project/Site: NASA ECCL Stabilization

Job ID: 500-171906-1

Client Sample ID: 0724-006

Date Collected: 10/16/19 09:25
Date Received: 10/17/19 08:40

Lab Sample ID: 500-171906-6

Matrix: Solid

Method: 6010C - Metals (ICP) - TCLP

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Lead	0.0827		0.0500	0.00750	mg/L		10/29/19 14:55	10/31/19 00:33	1

Client Sample Results

Client: Kemron Environmental Services, Inc.
Project/Site: NASA ECCL Stabilization

Job ID: 500-171906-1

Client Sample ID: 0724-007

Date Collected: 10/16/19 09:30
Date Received: 10/17/19 08:40

Lab Sample ID: 500-171906-7

Matrix: Solid

Method: 6010C - Metals (ICP) - TCLP

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Lead	0.0311	J	0.0500	0.00750	mg/L		10/29/19 14:55	10/31/19 00:37	1

Client Sample Results

Client: Kemron Environmental Services, Inc.
Project/Site: NASA ECCL Stabilization

Job ID: 500-171906-1

Client Sample ID: 0724-008

Date Collected: 10/16/19 09:35
Date Received: 10/17/19 08:40

Lab Sample ID: 500-171906-8

Matrix: Solid

Method: 6010C - Metals (ICP) - TCLP

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Lead	0.0121	J	0.0500	0.00750	mg/L		10/29/19 14:55	10/31/19 00:42	1

Client Sample Results

Client: Kemron Environmental Services, Inc.
Project/Site: NASA ECCL Stabilization

Job ID: 500-171906-1

Client Sample ID: 0724-009

Date Collected: 10/16/19 09:40
Date Received: 10/17/19 08:40

Lab Sample ID: 500-171906-9

Matrix: Solid

Method: 6010C - Metals (ICP) - TCLP

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Lead	9.94		0.0500	0.00750	mg/L		10/29/19 14:55	10/31/19 00:54	1

Client Sample Results

Client: Kemron Environmental Services, Inc.
Project/Site: NASA ECCL Stabilization

Job ID: 500-171906-1

Client Sample ID: 0724-010

Date Collected: 10/16/19 09:45
Date Received: 10/17/19 08:40

Lab Sample ID: 500-171906-10

Matrix: Solid

Method: 6010C - Metals (ICP) - TCLP

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Lead	0.530		0.0500	0.00750	mg/L		10/29/19 14:55	10/31/19 00:58	1

Client Sample Results

Client: Kemron Environmental Services, Inc.
Project/Site: NASA ECCL Stabilization

Job ID: 500-171906-1

Client Sample ID: 0724-011

Date Collected: 10/16/19 09:50
Date Received: 10/17/19 08:40

Lab Sample ID: 500-171906-11

Matrix: Solid

Method: 6010C - Metals (ICP) - TCLP

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Lead	0.360		0.0500	0.00750	mg/L		10/29/19 14:55	10/31/19 01:03	1

Client Sample Results

Client: Kemron Environmental Services, Inc.
Project/Site: NASA ECCL Stabilization

Job ID: 500-171906-1

Client Sample ID: 0724-012

Date Collected: 10/16/19 09:55
Date Received: 10/17/19 08:40

Lab Sample ID: 500-171906-12

Matrix: Solid

Method: 6010C - Metals (ICP) - TCLP

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Lead	0.0865		0.0500	0.00750	mg/L		10/29/19 14:55	10/31/19 01:07	1

Client Sample Results

Client: Kemron Environmental Services, Inc.
Project/Site: NASA ECCL Stabilization

Job ID: 500-171906-1

Client Sample ID: 0724-013

Date Collected: 10/16/19 10:00
Date Received: 10/17/19 08:40

Lab Sample ID: 500-171906-13

Matrix: Solid

Method: 6010C - Metals (ICP) - TCLP

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Lead	58.3		0.0500	0.00750	mg/L		10/29/19 14:55	10/31/19 01:11	1

Client Sample Results

Client: Kemron Environmental Services, Inc.
Project/Site: NASA ECCL Stabilization

Job ID: 500-171906-1

Client Sample ID: 0724-014

Date Collected: 10/16/19 10:05
Date Received: 10/17/19 08:40

Lab Sample ID: 500-171906-14

Matrix: Solid

Method: 6010C - Metals (ICP) - TCLP

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Lead	18.7		0.0500	0.00750	mg/L		10/29/19 14:55	10/31/19 01:15	1

Client Sample Results

Client: Kemron Environmental Services, Inc.
Project/Site: NASA ECCL Stabilization

Job ID: 500-171906-1

Client Sample ID: 0724-015

Date Collected: 10/16/19 10:10
Date Received: 10/17/19 08:40

Lab Sample ID: 500-171906-15

Matrix: Solid

Method: 6010C - Metals (ICP) - TCLP

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Lead	11.2		0.0500	0.00750	mg/L		10/29/19 14:55	10/31/19 01:20	1

Client Sample Results

Client: Kemron Environmental Services, Inc.
Project/Site: NASA ECCL Stabilization

Job ID: 500-171906-1

Client Sample ID: 0724-016

Date Collected: 10/16/19 10:15
Date Received: 10/17/19 08:40

Lab Sample ID: 500-171906-16

Matrix: Solid

Method: 6010C - Metals (ICP) - TCLP

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Lead	0.133		0.0500	0.00750	mg/L		10/29/19 14:55	10/31/19 12:49	1

Client Sample Results

Client: Kemron Environmental Services, Inc.
Project/Site: NASA ECCL Stabilization

Job ID: 500-171906-1

Client Sample ID: 0724-017

Date Collected: 10/16/19 10:20
Date Received: 10/17/19 08:40

Lab Sample ID: 500-171906-17

Matrix: Solid

Method: 6010C - Metals (ICP) - TCLP

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Lead	331		0.250	0.0375	mg/L		10/29/19 14:55	10/31/19 13:21	5

Client Sample Results

Client: Kemron Environmental Services, Inc.
Project/Site: NASA ECCL Stabilization

Job ID: 500-171906-1

Client Sample ID: 0724-018

Date Collected: 10/16/19 10:25
Date Received: 10/17/19 08:40

Lab Sample ID: 500-171906-18

Matrix: Solid

Method: 6010C - Metals (ICP) - TCLP

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Lead	3.29		0.0500	0.00750	mg/L		10/29/19 14:55	10/31/19 01:33	1

Client Sample Results

Client: Kemron Environmental Services, Inc.
Project/Site: NASA ECCL Stabilization

Job ID: 500-171906-1

Client Sample ID: 0724-019

Date Collected: 10/16/19 10:30
Date Received: 10/17/19 08:40

Lab Sample ID: 500-171906-19

Matrix: Solid

Method: 6010C - Metals (ICP) - TCLP

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Lead	0.0408	J	0.0500	0.00750	mg/L		10/29/19 14:55	10/31/19 01:45	1

Client Sample Results

Client: Kemron Environmental Services, Inc.
Project/Site: NASA ECCL Stabilization

Job ID: 500-171906-1

Client Sample ID: 0724-020

Date Collected: 10/16/19 10:35
Date Received: 10/17/19 08:40

Lab Sample ID: 500-171906-20

Matrix: Solid

Method: 6010C - Metals (ICP) - TCLP

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Lead	12.5	B	0.0500	0.00750	mg/L		10/29/19 14:55	10/31/19 13:05	1

Client Sample Results

Client: Kemron Environmental Services, Inc.
Project/Site: NASA ECCL Stabilization

Job ID: 500-171906-1

Client Sample ID: 0724-021

Date Collected: 10/16/19 10:40
Date Received: 10/17/19 08:40

Lab Sample ID: 500-171906-21

Matrix: Solid

Method: 6010C - Metals (ICP) - TCLP

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Lead	7.14		0.0500	0.00750	mg/L		10/29/19 15:59	10/31/19 03:02	1

Client Sample Results

Client: Kemron Environmental Services, Inc.
Project/Site: NASA ECCL Stabilization

Job ID: 500-171906-1

Client Sample ID: 0724-022

Date Collected: 10/16/19 10:45
Date Received: 10/17/19 08:40

Lab Sample ID: 500-171906-22

Matrix: Solid

Method: 6010C - Metals (ICP) - TCLP

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Lead	0.107		0.0500	0.00750	mg/L		10/29/19 15:59	10/31/19 03:15	1

Client Sample Results

Client: Kemron Environmental Services, Inc.
Project/Site: NASA ECCL Stabilization

Job ID: 500-171906-1

Client Sample ID: 0724-023

Date Collected: 10/16/19 10:50
Date Received: 10/17/19 08:40

Lab Sample ID: 500-171906-23

Matrix: Solid

Method: 6010C - Metals (ICP) - TCLP

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Lead	0.0445	J	0.0500	0.00750	mg/L		10/29/19 15:59	10/31/19 03:19	1

Client Sample Results

Client: Kemron Environmental Services, Inc.
Project/Site: NASA ECCL Stabilization

Job ID: 500-171906-1

Client Sample ID: 0724-024

Date Collected: 10/16/19 10:55
Date Received: 10/17/19 08:40

Lab Sample ID: 500-171906-24

Matrix: Solid

Method: 6010C - Metals (ICP) - TCLP

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Lead	0.0405	J	0.0500	0.00750	mg/L		10/29/19 15:59	10/31/19 03:23	1

Client Sample Results

Client: Kemron Environmental Services, Inc.
Project/Site: NASA ECCL Stabilization

Job ID: 500-171906-1

Client Sample ID: 0724-025

Date Collected: 10/16/19 11:00
Date Received: 10/17/19 08:40

Lab Sample ID: 500-171906-25

Matrix: Solid

Method: 6010C - Metals (ICP) - TCLP

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Lead	392		0.250	0.0375	mg/L		10/29/19 15:59	10/31/19 13:09	5

Client Sample Results

Client: Kemron Environmental Services, Inc.
Project/Site: NASA ECCL Stabilization

Job ID: 500-171906-1

Client Sample ID: 0724-026

Date Collected: 10/16/19 11:05
Date Received: 10/17/19 08:40

Lab Sample ID: 500-171906-26

Matrix: Solid

Method: 6010C - Metals (ICP) - TCLP

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Lead	74.4		0.0500	0.00750	mg/L		10/29/19 15:59	10/31/19 03:31	1

Client Sample Results

Client: Kemron Environmental Services, Inc.
Project/Site: NASA ECCL Stabilization

Job ID: 500-171906-1

Client Sample ID: 0724-027

Date Collected: 10/16/19 11:10
Date Received: 10/17/19 08:40

Lab Sample ID: 500-171906-27

Matrix: Solid

Method: 6010C - Metals (ICP) - TCLP

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Lead	0.0282	J	0.0500	0.00750	mg/L		10/29/19 15:59	10/31/19 03:35	1

Client Sample Results

Client: Kemron Environmental Services, Inc.
Project/Site: NASA ECCL Stabilization

Job ID: 500-171906-1

Client Sample ID: 0724-028

Date Collected: 10/16/19 11:15
Date Received: 10/17/19 08:40

Lab Sample ID: 500-171906-28

Matrix: Solid

Method: 6010C - Metals (ICP) - TCLP

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Lead	16.3		0.0500	0.00750	mg/L		10/29/19 15:59	10/31/19 03:40	1

Client Sample Results

Client: Kemron Environmental Services, Inc.
Project/Site: NASA ECCL Stabilization

Job ID: 500-171906-1

Client Sample ID: 0724-029

Date Collected: 10/16/19 11:20
Date Received: 10/17/19 08:40

Lab Sample ID: 500-171906-29

Matrix: Solid

Method: 6010C - Metals (ICP) - TCLP

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Lead	179		0.250	0.0375	mg/L		10/29/19 15:59	10/31/19 13:14	5

Client Sample Results

Client: Kemron Environmental Services, Inc.
Project/Site: NASA ECCL Stabilization

Job ID: 500-171906-1

Client Sample ID: 0724-030

Date Collected: 10/16/19 11:25
Date Received: 10/17/19 08:40

Lab Sample ID: 500-171906-30

Matrix: Solid

Method: 6010C - Metals (ICP) - TCLP

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Lead	2.60		0.0500	0.00750	mg/L		10/29/19 15:59	10/31/19 03:48	1

Client Sample Results

Client: Kemron Environmental Services, Inc.
Project/Site: NASA ECCL Stabilization

Job ID: 500-171906-1

Client Sample ID: 0724-031

Date Collected: 10/16/19 11:30
Date Received: 10/17/19 08:40

Lab Sample ID: 500-171906-31

Matrix: Solid

Method: 6010C - Metals (ICP) - TCLP

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Lead	0.0188	J	0.0500	0.00750	mg/L		10/29/19 15:59	10/31/19 03:52	1

Client Sample Results

Client: Kemron Environmental Services, Inc.
Project/Site: NASA ECCL Stabilization

Job ID: 500-171906-1

Client Sample ID: 0724-032

Date Collected: 10/16/19 11:35
Date Received: 10/17/19 08:40

Lab Sample ID: 500-171906-32

Matrix: Solid

Method: 6010C - Metals (ICP) - TCLP

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Lead	ND		0.0500	0.00750	mg/L		10/29/19 15:59	10/31/19 04:04	1

Client Sample Results

Client: Kemron Environmental Services, Inc.
Project/Site: NASA ECCL Stabilization

Job ID: 500-171906-1

Client Sample ID: 0724-033

Date Collected: 10/16/19 11:40
Date Received: 10/17/19 08:40

Lab Sample ID: 500-171906-33

Matrix: Solid

Method: 6010C - Metals (ICP) - TCLP

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Lead	0.831		0.0500	0.00750	mg/L		10/29/19 15:59	10/31/19 04:09	1

Client Sample Results

Client: Kemron Environmental Services, Inc.
Project/Site: NASA ECCL Stabilization

Job ID: 500-171906-1

Client Sample ID: 0724-034

Date Collected: 10/16/19 11:45
Date Received: 10/17/19 08:40

Lab Sample ID: 500-171906-34

Matrix: Solid

Method: 6010C - Metals (ICP) - TCLP

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Lead	0.125		0.0500	0.00750	mg/L		10/29/19 15:59	10/31/19 04:13	1

Client Sample Results

Client: Kemron Environmental Services, Inc.
Project/Site: NASA ECCL Stabilization

Job ID: 500-171906-1

Client Sample ID: 0724-035

Date Collected: 10/16/19 11:50
Date Received: 10/17/19 08:40

Lab Sample ID: 500-171906-35

Matrix: Solid

Method: 6010C - Metals (ICP) - TCLP

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Lead	0.0373	J	0.0500	0.00750	mg/L		10/29/19 15:59	10/31/19 04:17	1

Client Sample Results

Client: Kemron Environmental Services, Inc.
Project/Site: NASA ECCL Stabilization

Job ID: 500-171906-1

Client Sample ID: 0724-036

Date Collected: 10/16/19 11:55
Date Received: 10/17/19 08:40

Lab Sample ID: 500-171906-36

Matrix: Solid

Method: 6010C - Metals (ICP) - TCLP

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Lead	0.0126	J	0.0500	0.00750	mg/L		10/29/19 15:59	10/31/19 04:21	1

Definitions/Glossary

Client: Kemron Environmental Services, Inc.
Project/Site: NASA ECCL Stabilization

Job ID: 500-171906-1

Qualifiers

Metals

Qualifier	Qualifier Description
B	Compound was found in the blank and sample.
F5	Duplicate RPD exceeds limit, and one or both sample results are less than 5 times RL. The data are considered valid because the absolute difference is less than the RL.
J	Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value.

Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
¤	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CFL	Contains Free Liquid
CNF	Contains No Free Liquid
DER	Duplicate Error Ratio (normalized absolute difference)
Dil Fac	Dilution Factor
DL	Detection Limit (DoD/DOE)
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision Level Concentration (Radiochemistry)
EDL	Estimated Detection Limit (Dioxin)
LOD	Limit of Detection (DoD/DOE)
LOQ	Limit of Quantitation (DoD/DOE)
MDA	Minimum Detectable Activity (Radiochemistry)
MDC	Minimum Detectable Concentration (Radiochemistry)
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
NC	Not Calculated
ND	Not Detected at the reporting limit (or MDL or EDL if shown)
PQL	Practical Quantitation Limit
QC	Quality Control
RER	Relative Error Ratio (Radiochemistry)
RL	Reporting Limit or Requested Limit (Radiochemistry)
RPD	Relative Percent Difference, a measure of the relative difference between two points
TEF	Toxicity Equivalent Factor (Dioxin)
TEQ	Toxicity Equivalent Quotient (Dioxin)

QC Association Summary

Client: Kemron Environmental Services, Inc.
Project/Site: NASA ECCL Stabilization

Job ID: 500-171906-1

Metals

Leach Batch: 512263

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
500-171906-1	0724-001	TCLP	Solid	1311	
500-171906-2	0724-002	TCLP	Solid	1311	
500-171906-3	0724-003	TCLP	Solid	1311	
500-171906-4	0724-004	TCLP	Solid	1311	
500-171906-5	0724-005	TCLP	Solid	1311	
500-171906-6	0724-006	TCLP	Solid	1311	
500-171906-7	0724-007	TCLP	Solid	1311	
500-171906-8	0724-008	TCLP	Solid	1311	
500-171906-9	0724-009	TCLP	Solid	1311	
500-171906-10	0724-010	TCLP	Solid	1311	
500-171906-11	0724-011	TCLP	Solid	1311	
500-171906-12	0724-012	TCLP	Solid	1311	
500-171906-13	0724-013	TCLP	Solid	1311	
500-171906-14	0724-014	TCLP	Solid	1311	
500-171906-15	0724-015	TCLP	Solid	1311	
500-171906-16	0724-016	TCLP	Solid	1311	
500-171906-17	0724-017	TCLP	Solid	1311	
500-171906-18	0724-018	TCLP	Solid	1311	
500-171906-19	0724-019	TCLP	Solid	1311	
LB 500-512263/1-B	Method Blank	TCLP	Solid	1311	
500-171906-19 MS	0724-019	TCLP	Solid	1311	
500-171906-19 DU	0724-019	TCLP	Solid	1311	

Leach Batch: 512264

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
500-171906-20	0724-020	TCLP	Solid	1311	
LB2 500-512264/1-B	Method Blank	TCLP	Solid	1311	

Leach Batch: 512265

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
500-171906-21	0724-021	TCLP	Solid	1311	
500-171906-22	0724-022	TCLP	Solid	1311	
500-171906-23	0724-023	TCLP	Solid	1311	
500-171906-24	0724-024	TCLP	Solid	1311	
500-171906-25	0724-025	TCLP	Solid	1311	
500-171906-26	0724-026	TCLP	Solid	1311	
500-171906-27	0724-027	TCLP	Solid	1311	
500-171906-28	0724-028	TCLP	Solid	1311	
500-171906-29	0724-029	TCLP	Solid	1311	
500-171906-30	0724-030	TCLP	Solid	1311	
500-171906-31	0724-031	TCLP	Solid	1311	
500-171906-32	0724-032	TCLP	Solid	1311	
500-171906-33	0724-033	TCLP	Solid	1311	
500-171906-34	0724-034	TCLP	Solid	1311	
500-171906-35	0724-035	TCLP	Solid	1311	
500-171906-36	0724-036	TCLP	Solid	1311	
LB 500-512265/1-B	Method Blank	TCLP	Solid	1311	
500-171906-36 MS	0724-036	TCLP	Solid	1311	
500-171906-36 DU	0724-036	TCLP	Solid	1311	

QC Association Summary

Client: Kemron Environmental Services, Inc.
Project/Site: NASA ECCL Stabilization

Job ID: 500-171906-1

Metals

Prep Batch: 512522

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
500-171906-1	0724-001	TCLP	Solid	3010A	512263
500-171906-2	0724-002	TCLP	Solid	3010A	512263
500-171906-3	0724-003	TCLP	Solid	3010A	512263
500-171906-4	0724-004	TCLP	Solid	3010A	512263
500-171906-5	0724-005	TCLP	Solid	3010A	512263
500-171906-6	0724-006	TCLP	Solid	3010A	512263
500-171906-7	0724-007	TCLP	Solid	3010A	512263
500-171906-8	0724-008	TCLP	Solid	3010A	512263
500-171906-9	0724-009	TCLP	Solid	3010A	512263
500-171906-10	0724-010	TCLP	Solid	3010A	512263
500-171906-11	0724-011	TCLP	Solid	3010A	512263
500-171906-12	0724-012	TCLP	Solid	3010A	512263
500-171906-13	0724-013	TCLP	Solid	3010A	512263
500-171906-14	0724-014	TCLP	Solid	3010A	512263
500-171906-15	0724-015	TCLP	Solid	3010A	512263
500-171906-16	0724-016	TCLP	Solid	3010A	512263
500-171906-17	0724-017	TCLP	Solid	3010A	512263
500-171906-18	0724-018	TCLP	Solid	3010A	512263
500-171906-19	0724-019	TCLP	Solid	3010A	512263
500-171906-20	0724-020	TCLP	Solid	3010A	512264
LB 500-512263/1-B	Method Blank	TCLP	Solid	3010A	512263
LB2 500-512264/1-B	Method Blank	TCLP	Solid	3010A	512264
LCS 500-512522/2-A	Lab Control Sample	Total/NA	Solid	3010A	
500-171906-19 MS	0724-019	TCLP	Solid	3010A	512263
500-171906-19 DU	0724-019	TCLP	Solid	3010A	512263

Prep Batch: 512534

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
500-171906-21	0724-021	TCLP	Solid	3010A	512265
500-171906-22	0724-022	TCLP	Solid	3010A	512265
500-171906-23	0724-023	TCLP	Solid	3010A	512265
500-171906-24	0724-024	TCLP	Solid	3010A	512265
500-171906-25	0724-025	TCLP	Solid	3010A	512265
500-171906-26	0724-026	TCLP	Solid	3010A	512265
500-171906-27	0724-027	TCLP	Solid	3010A	512265
500-171906-28	0724-028	TCLP	Solid	3010A	512265
500-171906-29	0724-029	TCLP	Solid	3010A	512265
500-171906-30	0724-030	TCLP	Solid	3010A	512265
500-171906-31	0724-031	TCLP	Solid	3010A	512265
500-171906-32	0724-032	TCLP	Solid	3010A	512265
500-171906-33	0724-033	TCLP	Solid	3010A	512265
500-171906-34	0724-034	TCLP	Solid	3010A	512265
500-171906-35	0724-035	TCLP	Solid	3010A	512265
500-171906-36	0724-036	TCLP	Solid	3010A	512265
LB 500-512265/1-B	Method Blank	TCLP	Solid	3010A	512265
LCS 500-512534/2-A	Lab Control Sample	Total/NA	Solid	3010A	
500-171906-36 MS	0724-036	TCLP	Solid	3010A	512265
500-171906-36 DU	0724-036	TCLP	Solid	3010A	512265

QC Association Summary

Client: Kemron Environmental Services, Inc.
Project/Site: NASA ECCL Stabilization

Job ID: 500-171906-1

Metals

Analysis Batch: 512844

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
500-171906-5	0724-005	TCLP	Solid	6010C	512522
500-171906-6	0724-006	TCLP	Solid	6010C	512522
500-171906-7	0724-007	TCLP	Solid	6010C	512522
500-171906-8	0724-008	TCLP	Solid	6010C	512522
500-171906-9	0724-009	TCLP	Solid	6010C	512522
500-171906-10	0724-010	TCLP	Solid	6010C	512522
500-171906-11	0724-011	TCLP	Solid	6010C	512522
500-171906-12	0724-012	TCLP	Solid	6010C	512522
500-171906-13	0724-013	TCLP	Solid	6010C	512522
500-171906-14	0724-014	TCLP	Solid	6010C	512522
500-171906-15	0724-015	TCLP	Solid	6010C	512522
500-171906-18	0724-018	TCLP	Solid	6010C	512522
500-171906-19	0724-019	TCLP	Solid	6010C	512522
LB 500-512263/1-B	Method Blank	TCLP	Solid	6010C	512522
LB2 500-512264/1-B	Method Blank	TCLP	Solid	6010C	512522
LCS 500-512522/2-A	Lab Control Sample	Total/NA	Solid	6010C	512522
500-171906-19 MS	0724-019	TCLP	Solid	6010C	512522
500-171906-19 DU	0724-019	TCLP	Solid	6010C	512522

Analysis Batch: 512850

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
500-171906-21	0724-021	TCLP	Solid	6010C	512534
500-171906-22	0724-022	TCLP	Solid	6010C	512534
500-171906-23	0724-023	TCLP	Solid	6010C	512534
500-171906-24	0724-024	TCLP	Solid	6010C	512534
500-171906-26	0724-026	TCLP	Solid	6010C	512534
500-171906-27	0724-027	TCLP	Solid	6010C	512534
500-171906-28	0724-028	TCLP	Solid	6010C	512534
500-171906-30	0724-030	TCLP	Solid	6010C	512534
500-171906-31	0724-031	TCLP	Solid	6010C	512534
500-171906-32	0724-032	TCLP	Solid	6010C	512534
500-171906-33	0724-033	TCLP	Solid	6010C	512534
500-171906-34	0724-034	TCLP	Solid	6010C	512534
500-171906-35	0724-035	TCLP	Solid	6010C	512534
500-171906-36	0724-036	TCLP	Solid	6010C	512534
LB 500-512265/1-B	Method Blank	TCLP	Solid	6010C	512534
LCS 500-512534/2-A	Lab Control Sample	Total/NA	Solid	6010C	512534
500-171906-36 MS	0724-036	TCLP	Solid	6010C	512534
500-171906-36 DU	0724-036	TCLP	Solid	6010C	512534

Analysis Batch: 512965

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
500-171906-17	0724-017	TCLP	Solid	6010C	512522

Analysis Batch: 512977

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
500-171906-1	0724-001	TCLP	Solid	6010C	512522
500-171906-2	0724-002	TCLP	Solid	6010C	512522
500-171906-3	0724-003	TCLP	Solid	6010C	512522
500-171906-4	0724-004	TCLP	Solid	6010C	512522
500-171906-16	0724-016	TCLP	Solid	6010C	512522

Metals (Continued)

Analysis Batch: 512977 (Continued)

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
500-171906-20	0724-020	TCLP	Solid	6010C	512522
500-171906-25	0724-025	TCLP	Solid	6010C	512534
500-171906-29	0724-029	TCLP	Solid	6010C	512534

Method: 6010C - Metals (ICP)

Lab Sample ID: LCS 500-512522/2-A — **Client Sample ID: Lab Control Sample**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 512844 — **Prep Batch: 512522**

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Lead	0.100	0.1003		mg/L		100	80 - 120

Lab Sample ID: LCS 500-512534/2-A — **Client Sample ID: Lab Control Sample**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 512850 — **Prep Batch: 512534**

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Lead	0.100	0.1001		mg/L		100	80 - 120

Lab Sample ID: LB 500-512263/1-B — **Client Sample ID: Method Blank**
Matrix: Solid — **Prep Type: TCLP**
Analysis Batch: 512844 — **Prep Batch: 512522**

Analyte	LB Result	LB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Lead	ND		0.0500	0.00750	mg/L		10/29/19 14:55	10/31/19 00:03	1

Lab Sample ID: LB2 500-512264/1-B — **Client Sample ID: Method Blank**
Matrix: Solid — **Prep Type: TCLP**
Analysis Batch: 512844 — **Prep Batch: 512522**

Analyte	LB2 Result	LB2 Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Lead	0.008015	J	0.0500	0.00750	mg/L		10/29/19 14:55	10/31/19 02:02	1

Lab Sample ID: 500-171906-19 MS — **Client Sample ID: 0724-019**
Matrix: Solid — **Prep Type: TCLP**
Analysis Batch: 512844 — **Prep Batch: 512522**

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
Lead	0.0408	J	0.100	0.1259		mg/L		85	75 - 125

Lab Sample ID: 500-171906-19 DU — **Client Sample ID: 0724-019**
Matrix: Solid — **Prep Type: TCLP**
Analysis Batch: 512844 — **Prep Batch: 512522**

Analyte	Sample Result	Sample Qualifier	DU Result	DU Qualifier	Unit	D	RPD	RPD Limit
Lead	0.0408	J	0.03831	J	mg/L		6	20

Lab Sample ID: LB 500-512265/1-B — **Client Sample ID: Method Blank**
Matrix: Solid — **Prep Type: TCLP**
Analysis Batch: 512850 — **Prep Batch: 512534**

Analyte	LB Result	LB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Lead	ND		0.0500	0.00750	mg/L		10/29/19 15:59	10/31/19 02:54	1

Lab Sample ID: 500-171906-36 MS — **Client Sample ID: 0724-036**
Matrix: Solid — **Prep Type: TCLP**
Analysis Batch: 512850 — **Prep Batch: 512534**

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
Lead	0.0126	J	0.100	0.1269		mg/L		114	75 - 125

QC Sample Results

Client: Kemron Environmental Services, Inc.
Project/Site: NASA ECCL Stabilization

Job ID: 500-171906-1

Method: 6010C - Metals (ICP)

Lab Sample ID: 500-171906-36 DU
Matrix: Solid
Analysis Batch: 512850

Client Sample ID: 0724-036
Prep Type: TCLP
Prep Batch: 512534

Analyte	Sample Result	Sample Qualifier		DU Result	DU Qualifier	Unit	D			RPD	RPD Limit
Lead	0.0126	J		0.01736	J F5	mg/L				32	20

Lab Chronicle

Client: Kemron Environmental Services, Inc.
Project/Site: NASA ECCL Stabilization

Job ID: 500-171906-1

Client Sample ID: 0724-001 — Lab Sample ID: 500-171906-1

Date Collected: 10/16/19 09:00 — **Matrix: Solid**
Date Received: 10/17/19 08:40

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
TCLP	Leach	1311			512263	10/28/19 11:45	GCA	TAL CHI
TCLP	Prep	3010A			512522	10/29/19 14:55	BDE	TAL CHI
TCLP	Analysis	6010C		5	512977	10/31/19 12:16	EEN	TAL CHI

Client Sample ID: 0724-002 — Lab Sample ID: 500-171906-2

Date Collected: 10/16/19 09:05 — **Matrix: Solid**
Date Received: 10/17/19 08:40

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
TCLP	Leach	1311			512263	10/28/19 11:45	GCA	TAL CHI
TCLP	Prep	3010A			512522	10/29/19 14:55	BDE	TAL CHI
TCLP	Analysis	6010C		1	512977	10/31/19 12:20	EEN	TAL CHI

Client Sample ID: 0724-003 — Lab Sample ID: 500-171906-3

Date Collected: 10/16/19 09:10 — **Matrix: Solid**
Date Received: 10/17/19 08:40

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
TCLP	Leach	1311			512263	10/28/19 11:45	GCA	TAL CHI
TCLP	Prep	3010A			512522	10/29/19 14:55	BDE	TAL CHI
TCLP	Analysis	6010C		1	512977	10/31/19 12:24	EEN	TAL CHI

Client Sample ID: 0724-004 — Lab Sample ID: 500-171906-4

Date Collected: 10/16/19 09:15 — **Matrix: Solid**
Date Received: 10/17/19 08:40

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
TCLP	Leach	1311			512263	10/28/19 11:45	GCA	TAL CHI
TCLP	Prep	3010A			512522	10/29/19 14:55	BDE	TAL CHI
TCLP	Analysis	6010C		1	512977	10/31/19 12:29	EEN	TAL CHI

Client Sample ID: 0724-005 — Lab Sample ID: 500-171906-5

Date Collected: 10/16/19 09:20 — **Matrix: Solid**
Date Received: 10/17/19 08:40

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
TCLP	Leach	1311			512263	10/28/19 11:45	GCA	TAL CHI
TCLP	Prep	3010A			512522	10/29/19 14:55	BDE	TAL CHI
TCLP	Analysis	6010C		1	512844	10/31/19 00:29	EEN	TAL CHI

Lab Chronicle

Client: Kemron Environmental Services, Inc.
Project/Site: NASA ECCL Stabilization

Job ID: 500-171906-1

Client Sample ID: 0724-006
Date Collected: 10/16/19 09:25
Date Received: 10/17/19 08:40

Lab Sample ID: 500-171906-6
Matrix: Solid

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
TCLP	Leach	1311			512263	10/28/19 11:45	GCA	TAL CHI
TCLP	Prep	3010A			512522	10/29/19 14:55	BDE	TAL CHI
TCLP	Analysis	6010C		1	512844	10/31/19 00:33	EEN	TAL CHI

Client Sample ID: 0724-007
Date Collected: 10/16/19 09:30
Date Received: 10/17/19 08:40

Lab Sample ID: 500-171906-7
Matrix: Solid

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
TCLP	Leach	1311			512263	10/28/19 11:45	GCA	TAL CHI
TCLP	Prep	3010A			512522	10/29/19 14:55	BDE	TAL CHI
TCLP	Analysis	6010C		1	512844	10/31/19 00:37	EEN	TAL CHI

Client Sample ID: 0724-008
Date Collected: 10/16/19 09:35
Date Received: 10/17/19 08:40

Lab Sample ID: 500-171906-8
Matrix: Solid

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
TCLP	Leach	1311			512263	10/28/19 11:45	GCA	TAL CHI
TCLP	Prep	3010A			512522	10/29/19 14:55	BDE	TAL CHI
TCLP	Analysis	6010C		1	512844	10/31/19 00:42	EEN	TAL CHI

Client Sample ID: 0724-009
Date Collected: 10/16/19 09:40
Date Received: 10/17/19 08:40

Lab Sample ID: 500-171906-9
Matrix: Solid

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
TCLP	Leach	1311			512263	10/28/19 11:45	GCA	TAL CHI
TCLP	Prep	3010A			512522	10/29/19 14:55	BDE	TAL CHI
TCLP	Analysis	6010C		1	512844	10/31/19 00:54	EEN	TAL CHI

Client Sample ID: 0724-010
Date Collected: 10/16/19 09:45
Date Received: 10/17/19 08:40

Lab Sample ID: 500-171906-10
Matrix: Solid

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
TCLP	Leach	1311			512263	10/28/19 11:45	GCA	TAL CHI
TCLP	Prep	3010A			512522	10/29/19 14:55	BDE	TAL CHI
TCLP	Analysis	6010C		1	512844	10/31/19 00:58	EEN	TAL CHI

Lab Chronicle

Client: Kemron Environmental Services, Inc.
Project/Site: NASA ECCL Stabilization

Job ID: 500-171906-1

Client Sample ID: 0724-011
Date Collected: 10/16/19 09:50
Date Received: 10/17/19 08:40

Lab Sample ID: 500-171906-11
Matrix: Solid

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
TCLP	Leach	1311			512263	10/28/19 11:45	GCA	TAL CHI
TCLP	Prep	3010A			512522	10/29/19 14:55	BDE	TAL CHI
TCLP	Analysis	6010C		1	512844	10/31/19 01:03	EEN	TAL CHI

Client Sample ID: 0724-012
Date Collected: 10/16/19 09:55
Date Received: 10/17/19 08:40

Lab Sample ID: 500-171906-12
Matrix: Solid

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
TCLP	Leach	1311			512263	10/28/19 11:45	GCA	TAL CHI
TCLP	Prep	3010A			512522	10/29/19 14:55	BDE	TAL CHI
TCLP	Analysis	6010C		1	512844	10/31/19 01:07	EEN	TAL CHI

Client Sample ID: 0724-013
Date Collected: 10/16/19 10:00
Date Received: 10/17/19 08:40

Lab Sample ID: 500-171906-13
Matrix: Solid

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
TCLP	Leach	1311			512263	10/28/19 11:45	GCA	TAL CHI
TCLP	Prep	3010A			512522	10/29/19 14:55	BDE	TAL CHI
TCLP	Analysis	6010C		1	512844	10/31/19 01:11	EEN	TAL CHI

Client Sample ID: 0724-014
Date Collected: 10/16/19 10:05
Date Received: 10/17/19 08:40

Lab Sample ID: 500-171906-14
Matrix: Solid

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
TCLP	Leach	1311			512263	10/28/19 11:45	GCA	TAL CHI
TCLP	Prep	3010A			512522	10/29/19 14:55	BDE	TAL CHI
TCLP	Analysis	6010C		1	512844	10/31/19 01:15	EEN	TAL CHI

Client Sample ID: 0724-015
Date Collected: 10/16/19 10:10
Date Received: 10/17/19 08:40

Lab Sample ID: 500-171906-15
Matrix: Solid

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
TCLP	Leach	1311			512263	10/28/19 11:45	GCA	TAL CHI
TCLP	Prep	3010A			512522	10/29/19 14:55	BDE	TAL CHI
TCLP	Analysis	6010C		1	512844	10/31/19 01:20	EEN	TAL CHI

Lab Chronicle

Client: Kemron Environmental Services, Inc.
Project/Site: NASA ECCL Stabilization

Job ID: 500-171906-1

Client Sample ID: 0724-016
Date Collected: 10/16/19 10:15
Date Received: 10/17/19 08:40

Lab Sample ID: 500-171906-16
Matrix: Solid

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
TCLP	Leach	1311			512263	10/28/19 11:45	GCA	TAL CHI
TCLP	Prep	3010A			512522	10/29/19 14:55	BDE	TAL CHI
TCLP	Analysis	6010C		1	512977	10/31/19 12:49	EEN	TAL CHI

Client Sample ID: 0724-017
Date Collected: 10/16/19 10:20
Date Received: 10/17/19 08:40

Lab Sample ID: 500-171906-17
Matrix: Solid

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
TCLP	Leach	1311			512263	10/28/19 11:45	GCA	TAL CHI
TCLP	Prep	3010A			512522	10/29/19 14:55	BDE	TAL CHI
TCLP	Analysis	6010C		5	512965	10/31/19 13:21	EEN	TAL CHI

Client Sample ID: 0724-018
Date Collected: 10/16/19 10:25
Date Received: 10/17/19 08:40

Lab Sample ID: 500-171906-18
Matrix: Solid

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
TCLP	Leach	1311			512263	10/28/19 11:45	GCA	TAL CHI
TCLP	Prep	3010A			512522	10/29/19 14:55	BDE	TAL CHI
TCLP	Analysis	6010C		1	512844	10/31/19 01:33	EEN	TAL CHI

Client Sample ID: 0724-019
Date Collected: 10/16/19 10:30
Date Received: 10/17/19 08:40

Lab Sample ID: 500-171906-19
Matrix: Solid

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
TCLP	Leach	1311			512263	10/28/19 11:45	GCA	TAL CHI
TCLP	Prep	3010A			512522	10/29/19 14:55	BDE	TAL CHI
TCLP	Analysis	6010C		1	512844	10/31/19 01:45	EEN	TAL CHI

Client Sample ID: 0724-020
Date Collected: 10/16/19 10:35
Date Received: 10/17/19 08:40

Lab Sample ID: 500-171906-20
Matrix: Solid

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
TCLP	Leach	1311			512264	10/28/19 11:45	GCA	TAL CHI
TCLP	Prep	3010A			512522	10/29/19 14:55	BDE	TAL CHI
TCLP	Analysis	6010C		1	512977	10/31/19 13:05	EEN	TAL CHI

Lab Chronicle

Client: Kemron Environmental Services, Inc.
Project/Site: NASA ECCL Stabilization

Job ID: 500-171906-1

Client Sample ID: 0724-021
Date Collected: 10/16/19 10:40
Date Received: 10/17/19 08:40

Lab Sample ID: 500-171906-21
Matrix: Solid

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
TCLP	Leach	1311			512265	10/28/19 11:45	GCA	TAL CHI
TCLP	Prep	3010A			512534	10/29/19 15:59	BDE	TAL CHI
TCLP	Analysis	6010C		1	512850	10/31/19 03:02	EEN	TAL CHI

Client Sample ID: 0724-022
Date Collected: 10/16/19 10:45
Date Received: 10/17/19 08:40

Lab Sample ID: 500-171906-22
Matrix: Solid

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
TCLP	Leach	1311			512265	10/28/19 11:45	GCA	TAL CHI
TCLP	Prep	3010A			512534	10/29/19 15:59	BDE	TAL CHI
TCLP	Analysis	6010C		1	512850	10/31/19 03:15	EEN	TAL CHI

Client Sample ID: 0724-023
Date Collected: 10/16/19 10:50
Date Received: 10/17/19 08:40

Lab Sample ID: 500-171906-23
Matrix: Solid

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
TCLP	Leach	1311			512265	10/28/19 11:45	GCA	TAL CHI
TCLP	Prep	3010A			512534	10/29/19 15:59	BDE	TAL CHI
TCLP	Analysis	6010C		1	512850	10/31/19 03:19	EEN	TAL CHI

Client Sample ID: 0724-024
Date Collected: 10/16/19 10:55
Date Received: 10/17/19 08:40

Lab Sample ID: 500-171906-24
Matrix: Solid

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
TCLP	Leach	1311			512265	10/28/19 11:45	GCA	TAL CHI
TCLP	Prep	3010A			512534	10/29/19 15:59	BDE	TAL CHI
TCLP	Analysis	6010C		1	512850	10/31/19 03:23	EEN	TAL CHI

Client Sample ID: 0724-025
Date Collected: 10/16/19 11:00
Date Received: 10/17/19 08:40

Lab Sample ID: 500-171906-25
Matrix: Solid

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
TCLP	Leach	1311			512265	10/28/19 11:45	GCA	TAL CHI
TCLP	Prep	3010A			512534	10/29/19 15:59	BDE	TAL CHI
TCLP	Analysis	6010C		5	512977	10/31/19 13:09	EEN	TAL CHI

Lab Chronicle

Client: Kemron Environmental Services, Inc.
Project/Site: NASA ECCL Stabilization

Job ID: 500-171906-1

Client Sample ID: 0724-026
Date Collected: 10/16/19 11:05
Date Received: 10/17/19 08:40

Lab Sample ID: 500-171906-26
Matrix: Solid

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
TCLP	Leach	1311			512265	10/28/19 11:45	GCA	TAL CHI
TCLP	Prep	3010A			512534	10/29/19 15:59	BDE	TAL CHI
TCLP	Analysis	6010C		1	512850	10/31/19 03:31	EEN	TAL CHI

Client Sample ID: 0724-027
Date Collected: 10/16/19 11:10
Date Received: 10/17/19 08:40

Lab Sample ID: 500-171906-27
Matrix: Solid

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
TCLP	Leach	1311			512265	10/28/19 11:45	GCA	TAL CHI
TCLP	Prep	3010A			512534	10/29/19 15:59	BDE	TAL CHI
TCLP	Analysis	6010C		1	512850	10/31/19 03:35	EEN	TAL CHI

Client Sample ID: 0724-028
Date Collected: 10/16/19 11:15
Date Received: 10/17/19 08:40

Lab Sample ID: 500-171906-28
Matrix: Solid

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
TCLP	Leach	1311			512265	10/28/19 11:45	GCA	TAL CHI
TCLP	Prep	3010A			512534	10/29/19 15:59	BDE	TAL CHI
TCLP	Analysis	6010C		1	512850	10/31/19 03:40	EEN	TAL CHI

Client Sample ID: 0724-029
Date Collected: 10/16/19 11:20
Date Received: 10/17/19 08:40

Lab Sample ID: 500-171906-29
Matrix: Solid

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
TCLP	Leach	1311			512265	10/28/19 11:45	GCA	TAL CHI
TCLP	Prep	3010A			512534	10/29/19 15:59	BDE	TAL CHI
TCLP	Analysis	6010C		5	512977	10/31/19 13:14	EEN	TAL CHI

Client Sample ID: 0724-030
Date Collected: 10/16/19 11:25
Date Received: 10/17/19 08:40

Lab Sample ID: 500-171906-30
Matrix: Solid

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
TCLP	Leach	1311			512265	10/28/19 11:45	GCA	TAL CHI
TCLP	Prep	3010A			512534	10/29/19 15:59	BDE	TAL CHI
TCLP	Analysis	6010C		1	512850	10/31/19 03:48	EEN	TAL CHI

Lab Chronicle

Client: Kemron Environmental Services, Inc.
Project/Site: NASA ECCL Stabilization

Job ID: 500-171906-1

Client Sample ID: 0724-031
Date Collected: 10/16/19 11:30
Date Received: 10/17/19 08:40

Lab Sample ID: 500-171906-31
Matrix: Solid

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
TCLP	Leach	1311			512265	10/28/19 11:45	GCA	TAL CHI
TCLP	Prep	3010A			512534	10/29/19 15:59	BDE	TAL CHI
TCLP	Analysis	6010C		1	512850	10/31/19 03:52	EEN	TAL CHI

Client Sample ID: 0724-032
Date Collected: 10/16/19 11:35
Date Received: 10/17/19 08:40

Lab Sample ID: 500-171906-32
Matrix: Solid

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
TCLP	Leach	1311			512265	10/28/19 11:45	GCA	TAL CHI
TCLP	Prep	3010A			512534	10/29/19 15:59	BDE	TAL CHI
TCLP	Analysis	6010C		1	512850	10/31/19 04:04	EEN	TAL CHI

Client Sample ID: 0724-033
Date Collected: 10/16/19 11:40
Date Received: 10/17/19 08:40

Lab Sample ID: 500-171906-33
Matrix: Solid

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
TCLP	Leach	1311			512265	10/28/19 11:45	GCA	TAL CHI
TCLP	Prep	3010A			512534	10/29/19 15:59	BDE	TAL CHI
TCLP	Analysis	6010C		1	512850	10/31/19 04:09	EEN	TAL CHI

Client Sample ID: 0724-034
Date Collected: 10/16/19 11:45
Date Received: 10/17/19 08:40

Lab Sample ID: 500-171906-34
Matrix: Solid

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
TCLP	Leach	1311			512265	10/28/19 11:45	GCA	TAL CHI
TCLP	Prep	3010A			512534	10/29/19 15:59	BDE	TAL CHI
TCLP	Analysis	6010C		1	512850	10/31/19 04:13	EEN	TAL CHI

Client Sample ID: 0724-035
Date Collected: 10/16/19 11:50
Date Received: 10/17/19 08:40

Lab Sample ID: 500-171906-35
Matrix: Solid

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
TCLP	Leach	1311			512265	10/28/19 11:45	GCA	TAL CHI
TCLP	Prep	3010A			512534	10/29/19 15:59	BDE	TAL CHI
TCLP	Analysis	6010C		1	512850	10/31/19 04:17	EEN	TAL CHI

Lab Chronicle

Client: Kemron Environmental Services, Inc.
Project/Site: NASA ECCL Stabilization

Job ID: 500-171906-1

Client Sample ID: 0724-036

Date Collected: 10/16/19 11:55
Date Received: 10/17/19 08:40

Lab Sample ID: 500-171906-36

Matrix: Solid

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
TCLP	Leach	1311			512265	10/28/19 11:45	GCA	TAL CHI
TCLP	Prep	3010A			512534	10/29/19 15:59	BDE	TAL CHI
TCLP	Analysis	6010C		1	512850	10/31/19 04:21	EEN	TAL CHI

Laboratory References:

TAL CHI = Eurofins TestAmerica, Chicago, 2417 Bond Street, University Park, IL 60484, TEL (708)534-5200

Accreditation/Certification Summary

Client: Kemron Environmental Services, Inc.
Project/Site: NASA ECCL Stabilization

Job ID: 500-171906-1

Laboratory: Eurofins TestAmerica, Chicago

Unless otherwise noted, all analytes for this laboratory were covered under each accreditation/certification below.

Authority	Program	Identification Number	Expiration Date
Georgia	State Program	N/A	04-30-20

The following analytes are included in this report, but the laboratory is not certified by the governing authority. This list may include analytes for which the agency does not offer certification.

Analysis Method	Prep Method	Matrix	Analyte

Eurofins TestAmerica, Chicago
2417 Bind Street

University Park, IL 60464-3101
phone 708.534.5200 fax 708.534.5211

Chain of Custody Record

eurofins

Regulatory Program: ☐ DW ☐ NPDES ☐ RCRA ☐ Other:

TestAmerica Laboratories, Inc. d/b/a Eurofins TestAmerica

Client Contact	**Project Manager:** T. Bradley		COC No:
	Email: triley@kemron.com	**Site Contact:**	**Date:** 10-16-19	___1___ of ___3___ COCs
KEMRON Environmental Services, Inc.	**Tel/Fax:** 404-636-0928	**Lab Contact:**	**Carrier:**	TALS Project #:
1359 Ellsworth Industrial Blvd	**Analysis Turnaround Time**			Sampler:
Atlanta, GA 30318	☐ CALENDAR DAYS ☑ WORKING DAYS			**For Lab Use Only:**
(404) 636-0928 Phor	TAT if different from Below _____			Walk-in Client:
(xxx) xxx-xxxx FAX	☑ 2 weeks			Lab Sampling:
Project Name:	☐ 1 week			
Site: 500-171906 COC	☐ 2 days			Job / SDG No.:
P O #	☐ 1 day			500-171906

	Sample Identification	Sample Date	Sample Time	Sample Type (C=Comp, G=Grab)	Matrix	# of Cont.	Filtered Sample (Y / N)	Perform MS / MSD (Y / N)	TCLP Lead	Sample Specific Notes:
1	0724-001	10/16/19	900	G	S	1			X	
2	0724-002	10/16/19	905	G	S	1			X	
3	0724-003	10/16/19	910	G	S	1			X	
4	0724-004	10/16/19	915	G	S	1			X	
5	0724-005	10/16/19	920	G	S	1			X	
6	0724-006	10/16/19	925	G	S	1			X	
7	0724-007	10/16/19	930	G	S	1			X	
8	0724-008	10/16/19	935	G	S	1			X	
9	0724-009	10/16/19	940	G	S	1			X	
10	0724-010	10/16/19	945	G	S	1			X	
11	0724-011	10/16/19	950	G	S	1			X	
12	0724-012	10/16/19	955	G	S	1			X	

Preservation Used: 1= Ice, 2= HCl; 3= H2SO4; 4=HNO3; 5=NaOH; 6= Other _____

Possible Hazard Identification:
Are any samples from a listed EPA Hazardous Waste? Please List any EPA Waste Codes for the sample in the Comments Section if the lab is to dispose of the sample.

☐ Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☐ Unknown

Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)

☐ Return to Client ☐ Disposal by Lab ☐ Archive for_____ Months

Special Instructions/QC Requirements & Comments: **Please include ph logs**

118/16

Custody Seals Intact: ☐ Yes ☐ No | Custody Seal No.: | Cooler Temp. (°C): Obs'd:_____ Corr'd:_____ | Therm ID No.:_____

Relinquished by:	Company:	Date/Time:	Received by:	Company:	Date/Time:
[signature]	10-16-19	1351	[signature]	10-16-19	1351
Relinquished by:	Company:	Date/Time:	Received by:	Company:	Date/Time:
[signature]	10-16-19	1435			
Relinquished by:	Company:	Date/Time:	Received in Laboratory by:	Company:	Date/Time:
			[signature]	TA-CHI	10/17/19 0840

Eurofins TestAmerica, Chicago
2417 Bind Street

University Park, IL 60464-3101
phone 708.534.5200 fax 708.534.5211

Chain of Custody Record

eurofins

Regulatory Program: ☐ DW ☐ NPDES ☐ RCRA ☐ Other:

TestAmerica Laboratories, Inc. d/b/a Eurofins TestAmerica

Client Contact	**Project Manager: T. Bradley**		COC No:
KEMRON Environmental Services, Inc.	**Email: triley@kemron.com**	**Site Contact:**	**Date: 10-16-19**	___2___ of ___3___ COCs
1359 Ellsworth Industrial Blvd	**Tel/Fax: 404-636-0928**	**Lab Contact:**	**Carrier:**	TALS Project #:
Atlanta, GA 30318	**Analysis Turnaround Time**			Sampler:
(404) 636-0928 Phone	☐ CALENDAR DAYS ☑ WORKING DAYS			**For Lab Use Only:**
(xxx) xxx-xxxx FAX	TAT if different from Below _____			Walk-in Client:
Project Name:	☑ 2 weeks			Lab Sampling:
Site:	☐ 1 week			
P O #	☐ 2 days			Job / SDG No.: 500-171906
	☐ 1 day			

	Sample Identification	Sample Date	Sample Time	Sample Type (C=Comp, G=Grab)	Matrix	# of Cont.	Filtered Sample (Y / N)	Perform MS / MSD (Y / N)	TCLP Lead	Sample Specific Notes:
13	0724-013	10/16/19	1000	G	S	1			X	
14	0724-014	10/16/19	1005	G	S	1			X	
15	0724-015	10/16/19	1010	G	S	1			X	
16	0724-016	10/16/19	1015	G	S	1			X	
17	0724-017	10/16/19	1020	G	S	1			X	
18	0724-018	10/16/19	1025	G	S	1			X	
19	0724-019	10/16/19	1030	G	S	1			X	
20	0724-020	10/16/19	1035	G	S	1			X	
21	0724-021	10/16/19	1040	G	S	1			X	
22	0724-022	10/16/19	1045	G	S	1			X	
23	0724-023	10/16/19	1050	G	S	1			X	
24	0724-024	10/16/19	1055	G	S	1			X	

Preservation Used: 1= Ice, 2= HCl; 3= H2SO4; 4=HNO3; 5=NaOH; 6= Other _____

Possible Hazard Identification:
Are any samples from a listed EPA Hazardous Waste? Please List any EPA Waste Codes for the sample in the Comments Section if the lab is to dispose of the sample.

☐ Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☐ Unknown

Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)

☐ Return to Client ☐ Disposal by Lab ☐ Archive for_____ Months

Special Instructions/QC Requirements & Comments: **Please include pH logs**

Custody Seals Intact: ☐ Yes ☐ No | Custody Seal No.: | Cooler Temp. (°C): Obs'd:_____ Corr'd:_____ | Therm ID No.:_____

Relinquished by:	Company:	Date/Time:	Received by:	Company:	Date/Time:
[signature]	Kemron	10/16/19 16	[signature]	10-16-19	1351
Relinquished by: [signature]	Company: 10-16-19	Date/Time: 1433	Received by:	Company:	Date/Time:
Relinquished by:	Company:	Date/Time:	Received in Laboratory by: [signature]	Company: TA-CHI	Date/Time: 10/17/19 0840

Form No. CA-C-WI-002, Rev. 4.26, dated 7/25/2019

Eurofins TestAmerica, Chicago
2417 Bind Street

University Park, IL 60464-3101
phone 708.534.5200 fax 708.534.5211

Chain of Custody Record

eurofins

Regulatory Program: ☐ DW ☐ NPDES ☐ RCRA ☐ Other:

TestAmerica Laboratories, Inc. d/b/a Eurofins TestAmerica

Client Contact	**Project Manager: T. Bradley**		COC No:
KEMRON Environmental Services, Inc.	**Email: triley@kemron.com**	**Site Contact:**	**Date: 10-16-19**	___3___ of ___3___ COCs
1359 Ellsworth Industrial Blvd	**Tel/Fax: 404-636-0928**	**Lab Contact:**	**Carrier:**	TALS Project #:
Atlanta, GA 30318	**Analysis Turnaround Time**			Sampler:
(404) 636-0928 Phone	☐ CALENDAR DAYS ☑ WORKING DAYS			**For Lab Use Only:**
(xxx) xxx-xxxx FAX	TAT if different from Below _____			Walk-in Client:
Project Name:	☑ 2 weeks			Lab Sampling:
Site:	☐ 1 week			
P O #	☐ 2 days			Job / SDG No.:
	☐ 1 day			500-171906

	Sample Identification	Sample Date	Sample Time	Sample Type (C=Comp, G=Grab)	Matrix	# of Cont.	Filtered Sample (Y / N)	Perform MS / MSD (Y / N)	TCLP Lead	Sample Specific Notes:
25	0724-025	10/16/19	1100	G	S	1			X	
26	0724-026	10/16/19	1105	G	S	1			X	
27	0724-027	10/16/19	1110	G	S	1			X	
28	0724-028	10/16/19	1115	G	S	1			X	
29	0724-029	10/16/19	1120	G	S	1			X	
30	0724-030	10/16/19	1125	G	S	1			X	
31	0724-031	10/16/19	1130	G	S	1			X	
32	0724-032	10/16/19	1135	G	S	1			X	
33	0724-033	10/16/19	1140	G	S	1			X	
34	0724-034	10/16/19	1145	G	S	1			X	
35	0724-035	10/16/19	1150	G	S	1			X	
36	0724-036	10/16/19	1155	G	S	1			X	

Preservation Used: 1= Ice, 2= HCl; 3= H2SO4; 4=HNO3; 5=NaOH; 6= Other _____

Possible Hazard Identification:
Are any samples from a listed EPA Hazardous Waste? Please List any EPA Waste Codes for the sample in the Comments Section if the lab is to dispose of the sample.

☑ Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☐ Unknown

Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)

☐ Return to Client ☑ Disposal by Lab ☐ Archive for_____ Months

Special Instructions/QC Requirements & Comments: **Please include pH logs**

Custody Seals Intact: ☐ Yes ☐ No | Custody Seal No.: | Cooler Temp. (°C): Obs'd:_____ Corr'd:_____ | Therm ID No.:_____

Relinquished by:	Company:	Date/Time:	Received by:	Company:	Date/Time:
[signature]	Kemron	1159 10/16/19	[signature]	10-16-19	1351
[signature]	10-16-19	1733	Received by:	Company:	Date/Time:
Relinquished by:	Company:	Date/Time:	Received in Laboratory by: [signature]	Company: TA Chi	Date/Time: 10/17/19 0840

Form No. CA-C-WI-002, Rev. 4.26, dated 7/25/2019

Analyst: [illegible]
Reviewer:

VOA's

Metals
Date: 10/28/19
Date:

Testamerica Chicago
TCLP Extraction Logbook

Page Number:

Rotator RPM:30 ± 2 RPMs ID#: C2393 Extr. Start Date 10/28/19 Time 1145 Temp: Uncorrected 20.5 Corrected 20.5 °C Filtration Start Time: 1120
Group Number: T986 Extr. End Date 10/29/19 Time 0345 Temp: Uncorrected 20.5 Corrected 20.5 °C Filtration End Time: 1245
LIMS Batch No.: 512263/512264 Min.Temp: Uncorrected/Corrected 19.5 / 19.5 °C Max.Temp: Uncorrected/Corrected 20.5 / 21 °C Filter Paper Lot #: 112167-9259
Sample Size Specifications: <9.5 mm Control Limits: 10 ± 5 PSI; 23 ± 2 °C Thermometer ID: L0042
Sample Type (Circle): TCLV SPLP (TCLP) ASTM

Sample Number	LB	LB2	500-171906-1	-2	-3
Sample Description	Extraction fluid #1	Extraction fluid #2	Solid	→	→
Sample Weight (g)	N/A	→	50.48	50.18	50.43
Liquid-Solid Separation (Yes/No)	No	→	→	→	→
Volume of Mother Liquid (mLs)	N/A	→	→	→	→
Solid Extraction Material (g)	N/A	→	50.48	50.18	50.43
Extraction Fluid Selection pH of Initial Solution: If <5.0, use Extraction Fluid #1	N/A	→	10.28	10.85	11.02
pH of Acid/Heat Treated Solution: If <5.0, use Extraction Fluid #1 If >5.0, use Extraction Fluid #2	4.92	2.85	1.83	1.76	1.83
Extraction Fluid Type (1 or 2)	1	2	1	→	→
Extraction Vessel Type / Pressure Check	HDPE	→	→	→	→
Extraction Fluid Volume (mLs)	2000	→	1000	→	→
Extract Filtered (Yes or No)	Yes	→	→	→	→
Mother Liquid Added (mLs)	N/A	→	→	→	→
Combined Filtrate Volume (mLs)	250	→	→	→	→
Final pH Reading	4.85	3.35	5.38	5.78	6.90
Spike Source ID # / Volume Added (mLs)	N/A	→	→	→	→
Filtrate Preserved	Yes/M	→	→	→	→
ZHE: Initial psi / Final psi	N/A	→	→	→	→

Comments:
Extraction Vessel Codes: T = Teflon Organics/Metals ZHE = Zero Headspace VOA's HDPE = High Density Polyethylene (Lot # 05109012)

Analyst: [signature]
Reviewer: [signature]

Metals
Date: 10/28/19
Date: 10/31/19

CHI-22-15-003/P-12/15

TestAmerica Chicago
TCLP Extraction Logbook

Page Number:

Rotator RPM:30 ± 2 RPMs ID#: 12393 Extr. Start Date 10/28/19 Time 1145 Temp: Uncorrected 20.5 Corrected 20.5 °C Filtration Start Time: 1120
Group Number: T986 Extr. End Date 10/29/19 Time 0545 Temp: Uncorrected 20.5 Corrected 20.5 °C Filtration End Time: 1245
LIMS Batch No.: 54863/512264 Min.Temp: Uncorrected/Corrected 19.4 / 19.5 °C Max.Temp: Uncorrected/Corrected 20.5 / 21 °C Filter Paper Lot #: 112167-9259
Sample Size Specifications: <9.5 mm Control Limits: 10 ± 5 PSI; 23 ± 2 °C Thermometer ID: C0042
Sample Type (Circle): TCLV SPLP TCLP ASTM HA 10/29/19

Sample Number	500-171906-4	-5	-6	-7	-8
Sample Description	solid				
Sample Weight (g)	50.31	50.06	50.40	50.50	50.43
Liquid-Solid Separation (Yes/No)	No				
Volume of Mother Liquid (mLs)	N/A				
Solid Extraction Material (g)	50.31	50.06	50.40	50.50	50.43
Extraction Fluid Selection pH of Initial Solution: If <5.0, use Extraction Fluid #1	11.04	10.14	10.29	10.70	11.06
pH of Acid/Heat Treated Solution: If <5.0, use Extraction Fluid #1 If >5.0, use Extraction Fluid #2	2.06	1.83	2.10	2.39	3.79
Extraction Fluid Type (1 or 2)	1				
Extraction Vessel Type / Pressure Check	HDPE				
Extraction Fluid Volume (mLs)	1000				
Extract Filtered (Yes or No)	Yes				
Mother Liquid Added (mLs)	N/A				
Combined Filtrate Volume (mLs)	250				
Final pH Reading	9.51	6.68	8.53	9.48	10.08
Spike Source ID # / Volume Added (mLs)	N/A				
Filtrate Preserved	Yes/N				
ZHE: Initial psi / Final psi	N/A				

Comments:
Extraction Vessel Codes: T = Teflon Organics/Metals ZHE = Zero Headspace VOA's HDPE = High Density Polyethylene (Lot # 051090113) Metals
Analyst: Date: 10/28/19
Reviewer: Date: 10/30/19

CHI-22-15-003/P-12/16

Organics/Metals

ZHE = Zero Headspace VOA's

HDPE = High Density Polyethylene (Lot # 051090JP) Metals

Analyst: [signature] Date: 10/28/19

Reviewer: [signature] Date: 10/31/19

CHI-22-15-003/P-12/15

Page Number:

TCLP Extraction Logbook

Rotator RPM:30 ± 2 RPMs ID#: C2593 Extr. Start Date 10/28/19 Time 1145 Temp: Uncorrected 20.5 Corrected 20.5 °C Filtration Start Time: 1120

Group Number: T986 Extr. End Date 10/29/19 Time 0545 Temp: Uncorrected 20.5 Corrected 20.5 °C Filtration End Time: 1245

LIMS Batch No.: 512263/512264 Min.Temp: Uncorrected/Corrected 19.5 / 19.5 °C Max.Temp: Uncorrected/Corrected 20.5 / 21 °C Filter Paper Lot #: 112167-9259

Sample Size Specifications: <9.5 mm Control Limits: 10 ± 5 PSI; 23 ± 2 °C Thermometer ID: C0042

Sample Type (Circle): TCLV SPLP TCLP ASTM

Sample Number	500-171906-9	-10	-11	-12	-13
Sample Description	solid	→	→	→	→
Sample Weight (g)	50.26	50.45	50.37	50.24	50.39
Liquid-Solid Separation (Yes/No)	NO	→	→	→	→
Volume of Mother Liquid (mLs)	N/A	→	→	→	→
Solid Extraction Material (g)	50.26	50.45	50.37	50.24	50.39
Extraction Fluid Selection pH of Initial Solution: If <5.0, use Extraction Fluid #1	9.38	9.74	10.02	10.12	10.55
pH of Acid/Heat Treated Solution: If <5.0, use Extraction Fluid #1; If >5.0, use Extraction Fluid #2	1.72	1.86	2.01	2.27	1.70
Extraction Fluid Type (1 or 2)	1	→	→	→	→
Extraction Vessel Type / Pressure Check	HDPE	→	→	→	→
Extraction Fluid Volume (mLs)	1000	→	→	→	→
Extract Filtered (Yes or No)	Yes	→	→	→	→
Mother Liquid Added (mLs)	N/A	→	→	→	→
Combined Filtrate Volume (mLs)	250	→	→	→	→
Final pH Reading	6.59	7.83	8.43	8.92	5.20
Spike Source ID # / Volume Added (mLs)	N/A	→	→	→	→
Filtrate Preserved	Yes/M	→	→	→	→
ZHE: Initial psi / Final psi	N/A	→	→	→	→

Comments:

Extraction Vessel Codes: T = Teflon

ZHE = Zero Headspace VOA's

HDPE = High Density Polyethylene (Lot # 051090JP) Metals

Analyst: [signature] Date: 10/28/19

Reviewer: [signature] Date: 10/31/19

CHI-22-15-003/P-12/15

TestAmerica Chicago
TCLP Extraction Logbook

Page Number:

Rotator RPM:30 ± 2 RPMs ID#: C2393 Extr. Start Date 10/28/19 Time 1145 Temp: Uncorrected 20.5 Corrected 20.5 °C Filtration Start Time: 1120
Group Number: T986 Extr. End Date 10/29/19 Time 0845 Temp: Uncorrected 20.5 Corrected 20.5 °C Filtration End Time: 1245
LIMS Batch No.: 512263/512264 Min.Temp: Uncorrected/Corrected 19.5/19.5 °C Max.Temp: Uncorrected/Corrected 20.5/21 °C Filter Paper Lot #: 112167-9259
Sample Size Specifications: <9.5 mm Control Limits: 10 ± 5 PSI; 23 ± 2 °C Thermometer ID: C0042
Sample Type (Circle): TCLV SPLP (TCLP) ASTM

Sample Number	500-171906-14	-15	-16	-17	-18
Sample Description	Solid				
Sample Weight (g)	50.35	50.21	50.48	50.22	50.35
Liquid-Solid Separation (Yes/No)	NO				
Volume of Mother Liquid (mLs)	N/A				
Solid Extraction Material (g)	50.35	50.21	50.48	50.22	50.35
Extraction Fluid Selection pH of Initial Solution: If <5.0, use Extraction Fluid #1	10.99	11.04	11.45	9.50	10.28
pH of Acid/Heat Treated Solution: If <5.0, use Extraction Fluid #1; If >5.0, use Extraction Fluid #2	1.92	1.85	2.06	1.81	1.98
Extraction Fluid Type (1 or 2)	1				
Extraction Vessel Type / Pressure Check	HDPE				
Extraction Fluid Volume (mLs)	1000				
Extract Filtered (Yes or No)	Yes				
Mother Liquid Added (mLs)	N/A				
Combined Filtrate Volume (mLs)	250				
Final pH Reading	5.48	5.47	7.19	5.27	5.80
Spike Source ID # / Volume Added (mLs)	N/A				
Filtrate Preserved	Yes M				
ZHE: Initial psi / Final psi	N/A				

Comments:
Extraction Vessel Codes: T = Teflon Organics/Metals ZHE = Zero Headspace VOA's HDPE = High Density Polyethylene (Lot # 05104010 Metals)
Analyst: Date: 10/28/19
Reviewer: Date: 10/31/19

CHI-22-15-003/P-12/16

TestAmerica Chicago
TCLP Extraction Logbook
Page Number: 299
Rotator RPM:30 ± 2 RPMs ID#: C2393 Extr. Start Date 10/28/19 Time 1145 Temp: Uncorrected 20.5 Corrected 20.5 °C Filtration Start Time: 1120

Analyst: [signature] Date: 10/28/19
Reviewer: [signature] Date: 10/31/19

CHI-22-15-003/P-12/15

Pace Analytical Chicago
TCLP Extraction Logbook

Page Number:

Rotator RPM:30 ± 2 RPMs ID#: C2313 Extr. Start Date 10/28/19 Time 1145 Temp: Uncorrected 20.5 Corrected 20.5 °C Filtration Start Time: 1120
Group Number: T986 Extr. End Date 10/29/19 Time 1545 Temp: Uncorrected 20.5 Corrected 20.5 °C Filtration End Time: 1245
LIMS Batch No.: 512263/512264 Min.Temp: Uncorrected/Corrected ~~20.5~~ 19.5 / ~~20.5~~ 19.5 °C Max.Temp: Uncorrected/Corrected ~~19.5~~ 20.5 / ~~19.5~~ 20.5 °C Filter Paper Lot #: 112167-9259
Sample Size Specifications: <9.5 mm Control Limits: 10 ± 5 PSI; 23 ± 2 °C Thermometer ID: C0042
Sample Type (Circle): TCLV SPLP TCLP ASTM HA 10/29/19 AA 10/29/19

Sample Number	500-179166-19	-20			
Sample Description	Solid				
Sample Weight (g)	50.23	50.48			
Liquid-Solid Separation (Yes/No)	NO				
Volume of Mother Liquid (mLs)	NA				
Solid Extraction Material (g)	50.23	50.48			
Extraction Fluid Selection pH of Initial Solution: If <5.0, use Extraction Fluid #1	10.75	11.09			
pH of Acid/Heat Treated Solution: If <5.0, use Extraction Fluid #1 If >5.0, use Extraction Fluid #2	2.26	5.90			HA 10/28/19
Extraction Fluid Type (1 or 2)	1	2			
Extraction Vessel Type / Pressure Check	HDPE				
Extraction Fluid Volume (mLs)	1000				
Extract Filtered (Yes or No)	Yes				
Mother Liquid Added (mLs)	NA				
Combined Filtrate Volume (mLs)	250				
Final pH Reading	7.52	5.38			
Spike Source ID # / Volume Added (mLs)	NA				
Filtrate Preserved	~~Yes~~ NA				
ZHE: Initial psi / Final psi	NA				

Comments:
Extraction Vessel Codes: T = Teflon Organics/Metals ZHE = Zero Headspace VOA's HDPE = High Density Polyethylene (Lot # 051090115) Metals
Analyst: [signature] Date: 10/28/19
Reviewer: [signature] Date: 10/31/19

CHI-22-15-003/P-12/15

TestAmerica Chicago
TCLP Extraction Logbook

Page Number: _____

Rotator RPM:30 ± 2 RPMs ID#: C2854 Extr. Start Date 10/28/19 Time 1145 Temp: Uncorrected 20.5 Corrected ~~20.5~~ 20.7 HA 10/28/19 °C Filtration Start Time: 1335

Group Number: T487 Extr. End Date 10/29/19 Time 0545 Temp: Uncorrected 20.5 Corrected 20.7 °C Filtration End Time: 1525

LIMS Batch No.: 512265 Min.Temp: Uncorrected/Corrected 20 / 20.2 °C Max.Temp: Uncorrected/Corrected 21.5 / 22.2 °C Filter Paper Lot #: 112167-4259

Sample Size Specifications: <9.5 mm Control Limits: 10 ± 5 PSI; 23 ± 2 °C Thermometer ID: C3024

Sample Type (Circle): TCLV SPLP (TCLP) ASTM

Sample Number	LB	500-171906-21	-22	-23	-24
Sample Description	Extraction fluid #1	Solid	HA 10/28/19		
Sample Weight (g)	N/A	50.43	~~50.43~~ 50.36	~~50.36~~ 50.21	~~50.21~~ 50.43
Liquid-Solid Separation (Yes/No)	No				
Volume of Mother Liquid (mLs)	N/A				
Solid Extraction Material (g)	N/A	50.43	50.3	50.21	50.43
Extraction Fluid Selection pH of Initial Solution: If <5.0, use Extraction Fluid #1	N/A	8.89	9.75	10.06	10.09
pH of Acid/Heat Treated Solution: If <5.0, use Extraction Fluid #1 If >5.0, use Extraction Fluid #2	4.92	1.62	1.70	2.04	2.00
Extraction Fluid Type (1 or 2)	1				
Extraction Vessel Type / Pressure Check	HDPE				
Extraction Fluid Volume (mLs)	1000				
Extract Filtered (Yes or No)	Yes				
Mother Liquid Added (mLs)	N/A				
Combined Filtrate Volume (mLs)	250				
Final pH Reading	4.85	5.96	7.64	8.54	8.99
Spike Source ID # / Volume Added (mLs)	N/A				
Filtrate Preserved	Yes/N				
ZHE: Initial psi / Final psi	N/A				

Comments:

Extraction Vessel Codes: T = Teflon Organics/Metals ZHE = Zero Headspace VOA's HDPE = High Density Polyethylene (Lot # 051090ID) Metals

Analyst: [signature] Date: 10/28/19

Reviewer: [signature] Date: 10/31/19

CHI-22-15-003/P-12/15

TCLP Extraction Logbook Page Number: _____

Extraction Vessel Codes: T = Teflon Organics/Metals; ZHE = Zero Headspace VOA's; HDPE = High Density Polyethylene (Lot # 05109011) Metals

Analyst: [signature] Date: 10/28/19

Reviewer: [signature] Date: 10/31/19

CHI-22-15-003/P-12/15

TCLP Extraction Logbook

Page Number:

Rotator RPM:30 ± 2 RPMs ID#: C2854 Extr. Start Date 10/28/19 Time 1145 Temp: Uncorrected 20.5 Corrected 20.7 °C Filtration Start Time: 1335

Group Number: T987 Extr. End Date 10/29/19 Time 0545 Temp: Uncorrected 20.5 Corrected 20.7 °C Filtration End Time: 1525

LIMS Batch No.: 512265 Min.Temp: Uncorrected/Corrected 20 / 20.2 °C Max.Temp: Uncorrected/Corrected 21.5 / 22.2 °C Filter Paper Lot #: N2167-9259

Sample Size Specifications: <9.5 mm Control Limits: 10 ± 5 PSI; 23 ± 2 °C Thermometer ID: C3024

Sample Type (Circle): TCLV SPLP (TCLP) ASTM

Sample Number	500-171906-25	-26	-27	-28	-29
Sample Description	Solid	→	→	→	→
Sample Weight (g)	50.28	50.05	50.24	50.24	50.42
Liquid-Solid Separation (Yes/No)	NO	→	→	→	→
Volume of Mother Liquid (mLs)	NA	→	→	→	→
Solid Extraction Material (g)	50.28	50.05	50.24	50.24	50.42
Extraction Fluid Selection pH of Initial Solution: If <5.0, use Extraction Fluid #1	10.14	10.48	11.04	11.11	9.42
pH of Acid/Heat Treated Solution: If <5.0, use Extraction Fluid #1; If >5.0, use Extraction Fluid #2	1.59	1.61	1.77	1.76	1.63
Extraction Fluid Type (1 or 2)	1	→	→	→	→
Extraction Vessel Type / Pressure Check	HDPE	→	→	→	→
Extraction Fluid Volume (mLs)	1000	→	→	→	→
Extract Filtered (Yes or No)	Yes	→	→	→	→
Mother Liquid Added (mLs)	N/A	→	→	→	→
Combined Filtrate Volume (mLs)	250	→	→	→	→
Final pH Reading	5.36	5.64	6.91	5.84	5.58
Spike Source ID # / Volume Added (mLs)	N/A	→	→	→	→
Filtrate Preserved	Yes/M	→	→	→	→
ZHE: Initial psi / Final psi	N/A	→	→	→	→

Comments:

Extraction Vessel Codes: T = Teflon Organics/Metals; ZHE = Zero Headspace VOA's; HDPE = High Density Polyethylene (Lot # 05109011) Metals

Analyst: [signature] Date: 10/28/19

Reviewer: [signature] Date: 10/31/19

CHI-22-15-003/P-12/15

TestAmerica Chicago
TCLP Extraction Logbook

302

Page Number: 11-A 10/29/19

Rotator RPM:30 ± 2 RPMs ID#: C2854 Extr. Start Date 10/28/19 Time 1145 Temp: Uncorrected 20.5 Corrected 20.7 °C Filtration Start Time: ~~1530~~ 1335

Group Number: T987 Extr. End Date 10/29/19 Time 0545 Temp: Uncorrected 20.5 Corrected 20.7 °C Filtration End Time: 1525

LIMS Batch No.: 512265 Min.Temp: Uncorrected/Corrected 20 20.2 °C Max.Temp: Uncorrected/Corrected 21.5 22.2 °C Filter Paper Lot #: 112167-9251

Sample Size Specifications: <9.5 mm Control Limits: 10 ± 5 PSI; 23 ± 2 °C Thermometer ID: C3024

Sample Type (Circle): TCLV SPLP TCLP ASTM

Sample Number	500-171906-30	-31	-32	-33	-34
Sample Description	solid				
Sample Weight (g)	50.21	50.30	50.48	50.21	50.48
Liquid-Solid Separation (Yes/No)	No				
Volume of Mother Liquid (mLs)	N/A				
Solid Extraction Material (g)	50.21	50.30	50.48	50.21	50.48
Extraction Fluid Selection pH of Initial Solution: If <5.0, use Extraction Fluid #1	9.52	10.19	10.83	9.31	9.67
pH of Acid/Heat Treated Solution: If <5.0, use Extraction Fluid #1 If >5.0, use Extraction Fluid #2	1.83	1.83	3.49	1.64	1.92
Extraction Fluid Type (1 or 2)	1				
Extraction Vessel Type / Pressure Check	HDPE				
Extraction Fluid Volume (mLs)	1000				
Extract Filtered (Yes or No)	Yes				
Mother Liquid Added (mLs)	N/A				
Combined Filtrate Volume (mLs)	250				
Final pH Reading	6.50	7.89	9.35	6.89	7.64
Spike Source ID # / Volume Added (mLs)	N/A				
Filtrate Preserved	Yes N				
ZHE: Initial psi / Final psi	N/A				

Comments:

Extraction Vessel Codes: T = Teflon Organics/Metals ZHE = Zero Headspace VOA's HDPE = High Density Polyethylene (Lot # 05170901) Metals

Analyst: Date: 10/28/19

Reviewer: Date: 10/31/19

CHI-22-15-003/P-12/15

Analyst: [illegible] Organics/Metals VOA's Metals Date: 10/28/19
Reviewer: [illegible] Date: 10/31/19

CHI-22-15-003/P-12/15

TestAmerica Chicago
TCLP Extraction Logbook

Page Number:

Rotator RPM:30 ± 2 RPMs ID#: C2859 Extr. Start Date 10/28/19 Time 1145 Temp: Uncorrected 20.5 Corrected 20.7 °C Filtration Start Time: 1355
Group Number: T987 Extr. End Date 10/29/19 Time 0545 Temp: Uncorrected 20.5 Corrected 20.7 °C Filtration End Time: 1525
LIMS Batch No.: 512265 Min.Temp: Uncorrected/Corrected 20 / 20.2 °C Max.Temp: Uncorrected/Corrected 21.5 / 22.2 °C Filter Paper Lot #: 112167-9259
Sample Size Specifications: <9.5 mm Control Limits: 10 ± 5 PSI; 23 ± 2 °C Thermometer ID: C3024
Sample Type (Circle): TCLV SPLP (TCLP) ASTM

Sample Number	500-171906-35	-36			
Sample Description	Solid →				
Sample Weight (g)	50.14	50.33			
Liquid-Solid Separation (Yes/No)	No →				
Volume of Mother Liquid (mLs)	N/A →				
Solid Extraction Material (g)	50.14	50.33			
Extraction Fluid Selection pH of Initial Solution: If <5.0, use Extraction Fluid #1	9.89	9.94			
pH of Acid/Heat Treated Solution: If <5.0, use Extraction Fluid #1 If >5.0, use Extraction Fluid #2	1.84	1.85			HA 10/28/19
Extraction Fluid Type (1 or 2)	1 →				
Extraction Vessel Type / Pressure Check	HDPE →				
Extraction Fluid Volume (mLs)	1000 →				
Extract Filtered (Yes or No)	Yes →				
Mother Liquid Added (mLs)	N/A →				
Combined Filtrate Volume (mLs)	250 →				
Final pH Reading	8.77	9.17			
Spike Source ID # / Volume Added (mLs)	N/A →				
Filtrate Preserved	Yes M →				
ZHE: Initial psi / Final psi	N/A →				

Comments:
Extraction Vessel Codes: T = Teflon ZHE = Zero Headspace HDPE = High Density Polyethylene (Lot # 05D7015)
Analyst: [illegible] Organics/Metals VOA's Metals Date: 10/28/19
Reviewer: [illegible] Date: 10/31/19

CHI-22-15-003/P-12/15

Login Sample Receipt Checklist

Client: Kemron Environmental Services, Inc.

Job Number: 500-171906-1

Login Number: 171906
List Number: 1
Creator: Scott, Sherri L

List Source: Eurofins TestAmerica, Chicago

Question	Answer	Comment
Radioactivity wasn't checked or is </= background as measured by a survey meter.	True	
The cooler's custody seal, if present, is intact.	True	
Sample custody seals, if present, are intact.	True	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	True	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	1.8,1.6
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	True	
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time (excluding tests with immediate HTs)	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	True	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	N/A	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

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ANALYTICAL REPORT

Eurofins TestAmerica, Chicago
2417 Bond Street
University Park, IL 60484
Tel: (708)534-5200

Laboratory Job ID: 500-173080-1
Client Project/Site: NASA ECCL Stabilization
Revision: 1

For:
Kemron Environmental Services, Inc.
1359A Ellsworth Industrial Blvd.
Atlanta, Georgia 30318

Attn: Tomecia Bradley

Therese Hargraves

Authorized for release by:
11/19/2019 2:53:31 PM

Therese Hargraves, Project Manager I
(708)793-3461
therese.hargraves@testamericainc.com

LINKS

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

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

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

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Job ID: 500-173080-1

Laboratory: Eurofins TestAmerica, Chicago

Narrative

Job Narrative
500-173080-1

Comments
No additional comments.

Receipt
The samples were received on 11/7/2019 8:09 PM; the samples arrived in good condition, properly preserved and, where required, on ice. The temperature of the cooler at receipt was 1.2º C.

Revised Report
TCLP Extraction Logs added to report.

Metals
No analytical or quality issues were noted, other than those described in the Definitions/Glossary page.

Detection Summary

Client: Kemron Environmental Services, Inc.
Project/Site: NASA ECCL Stabilization

Job ID: 500-173080-1

Client Sample ID: 0724-037 — Lab Sample ID: 500-173080-1

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Lead	0.322		0.0500	0.00750	mg/L	1		6010C	TCLP

Client Sample ID: 0724-038 — Lab Sample ID: 500-173080-2

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Lead	0.0747		0.0500	0.00750	mg/L	1		6010C	TCLP

Client Sample ID: 0724-039 — Lab Sample ID: 500-173080-3

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Lead	91.4		0.0500	0.00750	mg/L	1		6010C	TCLP

Client Sample ID: 0724-040 — Lab Sample ID: 500-173080-4

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Lead	0.152		0.0500	0.00750	mg/L	1		6010C	TCLP

This Detection Summary does not include radiochemical test results.

Method Summary

Client: Kemron Environmental Services, Inc.
Project/Site: NASA ECCL Stabilization

Job ID: 500-173080-1

Method	Method Description	Protocol	Laboratory
6010C	Metals (ICP)	SW846	TAL CHI
1311	TCLP Extraction	SW846	TAL CHI
3010A	Preparation, Total Metals	SW846	TAL CHI

Protocol References:

SW846 = "Test Methods For Evaluating Solid Waste, Physical/Chemical Methods", Third Edition, November 1986 And Its Updates.

Laboratory References:

TAL CHI = Eurofins TestAmerica, Chicago, 2417 Bond Street, University Park, IL 60484, TEL (708)534-5200

Sample Summary

Client: Kemron Environmental Services, Inc.
Project/Site: NASA ECCL Stabilization

Job ID: 500-173080-1

Lab Sample ID	Client Sample ID	Matrix	Collected	Received	Asset ID
500-173080-1	0724-037	Solid	11/06/19 10:00	11/07/19 20:09	
500-173080-2	0724-038	Solid	11/06/19 10:05	11/07/19 20:09	
500-173080-3	0724-039	Solid	11/06/19 10:10	11/07/19 20:09	
500-173080-4	0724-040	Solid	11/06/19 10:15	11/07/19 20:09	

Client Sample Results

Client: Kemron Environmental Services, Inc.
Project/Site: NASA ECCL Stabilization

Job ID: 500-173080-1

Client Sample ID: 0724-037

Date Collected: 11/06/19 10:00
Date Received: 11/07/19 20:09

Lab Sample ID: 500-173080-1

Matrix: Solid

Method: 6010C - Metals (ICP) - TCLP

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Lead	0.322		0.0500	0.00750	mg/L		11/15/19 15:16	11/18/19 16:45	1

Client Sample Results

Client: Kemron Environmental Services, Inc.
Project/Site: NASA ECCL Stabilization

Job ID: 500-173080-1

Client Sample ID: 0724-038

Date Collected: 11/06/19 10:05
Date Received: 11/07/19 20:09

Lab Sample ID: 500-173080-2

Matrix: Solid

Method: 6010C - Metals (ICP) - TCLP

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Lead	0.0747		0.0500	0.00750	mg/L		11/15/19 15:16	11/18/19 16:50	1

Client Sample Results

Client: Kemron Environmental Services, Inc.
Project/Site: NASA ECCL Stabilization

Job ID: 500-173080-1

Client Sample ID: 0724-039

Date Collected: 11/06/19 10:10
Date Received: 11/07/19 20:09

Lab Sample ID: 500-173080-3

Matrix: Solid

Method: 6010C - Metals (ICP) - TCLP

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Lead	91.4		0.0500	0.00750	mg/L		11/15/19 15:16	11/18/19 16:54	1

Client Sample Results

Client: Kemron Environmental Services, Inc.
Project/Site: NASA ECCL Stabilization

Job ID: 500-173080-1

Client Sample ID: 0724-040

Date Collected: 11/06/19 10:15
Date Received: 11/07/19 20:09

Lab Sample ID: 500-173080-4

Matrix: Solid

Method: 6010C - Metals (ICP) - TCLP

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Lead	0.152		0.0500	0.00750	mg/L		11/15/19 15:16	11/18/19 16:58	1

Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
¤	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CFL	Contains Free Liquid
CNF	Contains No Free Liquid
DER	Duplicate Error Ratio (normalized absolute difference)
Dil Fac	Dilution Factor
DL	Detection Limit (DoD/DOE)
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision Level Concentration (Radiochemistry)
EDL	Estimated Detection Limit (Dioxin)
LOD	Limit of Detection (DoD/DOE)
LOQ	Limit of Quantitation (DoD/DOE)
MDA	Minimum Detectable Activity (Radiochemistry)
MDC	Minimum Detectable Concentration (Radiochemistry)
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
NC	Not Calculated
ND	Not Detected at the reporting limit (or MDL or EDL if shown)
PQL	Practical Quantitation Limit
QC	Quality Control
RER	Relative Error Ratio (Radiochemistry)
RL	Reporting Limit or Requested Limit (Radiochemistry)
RPD	Relative Percent Difference, a measure of the relative difference between two points
TEF	Toxicity Equivalent Factor (Dioxin)
TEQ	Toxicity Equivalent Quotient (Dioxin)

QC Association Summary

Client: Kemron Environmental Services, Inc.
Project/Site: NASA ECCL Stabilization

Job ID: 500-173080-1

Metals

Leach Batch: 515389

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
500-173080-1	0724-037	TCLP	Solid	1311	
500-173080-2	0724-038	TCLP	Solid	1311	
500-173080-3	0724-039	TCLP	Solid	1311	
500-173080-4	0724-040	TCLP	Solid	1311	
LB 500-515389/1-B	Method Blank	TCLP	Solid	1311	

Prep Batch: 515643

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
500-173080-1	0724-037	TCLP	Solid	3010A	515389
500-173080-2	0724-038	TCLP	Solid	3010A	515389
500-173080-3	0724-039	TCLP	Solid	3010A	515389
500-173080-4	0724-040	TCLP	Solid	3010A	515389
LB 500-515389/1-B	Method Blank	TCLP	Solid	3010A	515389
LCS 500-515643/2-A	Lab Control Sample	Total/NA	Solid	3010A	

Analysis Batch: 516075

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
500-173080-1	0724-037	TCLP	Solid	6010C	515643
500-173080-2	0724-038	TCLP	Solid	6010C	515643
500-173080-3	0724-039	TCLP	Solid	6010C	515643
500-173080-4	0724-040	TCLP	Solid	6010C	515643
LB 500-515389/1-B	Method Blank	TCLP	Solid	6010C	515643
LCS 500-515643/2-A	Lab Control Sample	Total/NA	Solid	6010C	515643

QC Sample Results

Client: Kemron Environmental Services, Inc.
Project/Site: NASA ECCL Stabilization

Job ID: 500-173080-1

Method: 6010C - Metals (ICP)

Lab Sample ID: LCS 500-515643/2-A
Matrix: Solid
Analysis Batch: 516075

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 515643

Analyte			Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits		
Lead			0.100	0.1004		mg/L		100	80 - 120		

Lab Sample ID: LB 500-515389/1-B
Matrix: Solid
Analysis Batch: 516075

Client Sample ID: Method Blank
Prep Type: TCLP
Prep Batch: 515643

Analyte	LB Result	LB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Lead	ND		0.0500	0.00750	mg/L		11/15/19 15:16	11/18/19 16:28	1

Lab Chronicle

Client: Kemron Environmental Services, Inc.
Project/Site: NASA ECCL Stabilization

Job ID: 500-173080-1

Client Sample ID: 0724-037 — Lab Sample ID: 500-173080-1

Date Collected: 11/06/19 10:00
Date Received: 11/07/19 20:09
Matrix: Solid

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
TCLP	Leach	1311			515389	11/14/19 13:43	GCA	TAL CHI
TCLP	Prep	3010A			515643	11/15/19 15:16	BDE	TAL CHI
TCLP	Analysis	6010C		1	516075	11/18/19 16:45	EEN	TAL CHI

Client Sample ID: 0724-038 — Lab Sample ID: 500-173080-2

Date Collected: 11/06/19 10:05
Date Received: 11/07/19 20:09
Matrix: Solid

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
TCLP	Leach	1311			515389	11/14/19 13:43	GCA	TAL CHI
TCLP	Prep	3010A			515643	11/15/19 15:16	BDE	TAL CHI
TCLP	Analysis	6010C		1	516075	11/18/19 16:50	EEN	TAL CHI

Client Sample ID: 0724-039 — Lab Sample ID: 500-173080-3

Date Collected: 11/06/19 10:10
Date Received: 11/07/19 20:09
Matrix: Solid

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
TCLP	Leach	1311			515389	11/14/19 13:43	GCA	TAL CHI
TCLP	Prep	3010A			515643	11/15/19 15:16	BDE	TAL CHI
TCLP	Analysis	6010C		1	516075	11/18/19 16:54	EEN	TAL CHI

Client Sample ID: 0724-040 — Lab Sample ID: 500-173080-4

Date Collected: 11/06/19 10:15
Date Received: 11/07/19 20:09
Matrix: Solid

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
TCLP	Leach	1311			515389	11/14/19 13:43	GCA	TAL CHI
TCLP	Prep	3010A			515643	11/15/19 15:16	BDE	TAL CHI
TCLP	Analysis	6010C		1	516075	11/18/19 16:58	EEN	TAL CHI

Laboratory References:

TAL CHI = Eurofins TestAmerica, Chicago, 2417 Bond Street, University Park, IL 60484, TEL (708)534-5200

Accreditation/Certification Summary

Client: Kemron Environmental Services, Inc.
Project/Site: NASA ECCL Stabilization

Job ID: 500-173080-1

Laboratory: Eurofins TestAmerica, Chicago

Unless otherwise noted, all analytes for this laboratory were covered under each accreditation/certification below.

Authority	Program	Identification Number	Expiration Date
Georgia	State Program	N/A	04-30-20

The following analytes are included in this report, but the laboratory is not certified by the governing authority. This list may include analytes for which the agency does not offer certification.

Analysis Method	Prep Method	Matrix	Analyte

Eurofins TestAmerica, Chicago
2417 Bond Street

University Park, IL 60484-3101
phone 708.534.5200 fax 708.534.5211

Chain of Custody Record

eurofins Environment Testing TestAmerica

Regulatory Program: ☐ DW ☐ NPDES ☐ RCRA ☐ Other:

TestAmerica Laboratories, Inc. d/b/a Eurofins TestAmerica

Client Contact	
KEMRON Environmental Services, Inc.	
1359 Ellsworth Industrial Blvd.	
Atlanta, GA 30318	
(xxx) xxx-xxxx	Phone
(xxx) xxx-xxxx	FAX
Project Name: NASA ECCL Stabilization	
Site:	
P O # SH0724	

Project Manager: T. Bradley
Email: triley119@gmail.com
Tel/Fax: 404-636-0928

Analysis Turnaround Time
☐ CALENDAR DAYS ☑ WORKING DAYS
TAT if different from Below _____
☑ 2 weeks
☐ 1 week
☐ 2 days
☐ 1 day

Site Contact:
Lab Contact:
Date: 10-16-19
Carrier:

500-173080 COC

COC No: 1 of 1 COCs
TALS Project #:
Sampler:
For Lab Use Only:
Walk-in Client:
Lab Sampling:
Job / SDG No.: 500-173080

	Sample Identification	Sample Date	Sample Time	Sample Type (C=Comp, G=Grab)	Matrix	# of Cont.	Filtered Sample (Y / N)	Perform MS / MSD (Y / N)	TCLP Lead	Sample Specific Notes:
1	0724-037	11/6/19	1000	G	S	1			X	
2	0724-038	11/6/19	1005	G	S	1			X	
3	0724-039	11/6/19	1010	G	S	1			X	
4	0724-040	11/6/19	1015	G	S	1			X	

Preservation Used: 1= Ice, 2= HCl; 3= H2SO4; 4=HNO3; 5=NaOH; 6= Other _____

Possible Hazard Identification:
Are any samples from a listed EPA Hazardous Waste? Please List any EPA Waste Codes for the sample in the Comments Section if the lab is to dispose of the sample.
☑ Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☐ Unknown

Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)
☐ Return to Client ☑ Disposal by Lab ☐ Archive for _____ Months

Special Instructions/QC Requirements & Comments:

Custody Seals Intact: ☐ Yes ☐ No | Custody Seal No.: | Cooler Temp. (°C): Obs'd: 1.2 Corr'd: _____ | Therm ID No.: _____

Relinquished by: Jomecia Bradly	Company: KEMRON	Date/Time: 10:50	Received by:	Company: ETA	Date/Time: 10:50 11/6/19
Relinquished by:	Company: ETA 16:00	Date/Time: 11/6/19	Received by:	Company:	Date/Time:
Relinquished by:	Company:	Date/Time:	Received in Laboratory by: Donna Bulley	Company: TA	Date/Time: 11/7/19 0900

Form No. CA-C-WI-002, Rev. 4.27, dated 01/22/2019 (Rev. 1)

Analyst: [illegible] Date: _____

Instrumental Chemistry 99

TCLP Extraction Logbook Page Number: _____

Rotator RPM:30 ± 2 RPMs ID#: C2854 Extr. Start Date 11/14/19 Time 1343 Temp: Uncorrected 20.5 Corrected 20.7 °C Filtration Start Time: 1195

Group Number: T064 Extr. End Date 11/15/19 Time 0743 Temp: Uncorrected 20.5 Corrected 20.7 °C Filtration End Time: 1235

LIMS Batch No.: 515389/515391 Min.Temp: Uncorrected/Corrected 19.5/19.7 °C Max.Temp: Uncorrected/Corrected 21/21.7 °C Filter Paper Lot #: 112167-9301

Sample Size Specifications: ____<9.5 mm___ Control Limits: 10 ± 5 PSI; 23 ± 2 °C Thermometer ID: C3024

Sample Type (Circle): TCLV SPLP (TCLP) ASTM

Sample Number	LB	LB2	500-173080-1	-2	-3
Sample Description	Extraction Fluid #1	Extraction Fluid #2	Solid	→	→
Sample Weight (g)	N/A	→	50.35	50.25	50.31
Liquid-Solid Separation (Yes/No)	No	→	→	→	→
Volume of Mother Liquid (mLs)	N/A	→	→	→	→
Solid Extraction Material (g)	N/A	→	50.35	50.25	50.31
Extraction Fluid Selection pH of Initial Solution: If <5.0, use Extraction Fluid #1	N/A	→	9.46	9.38	8.43
pH of Acid/Heat Treated Solution: If <5.0, use Extraction Fluid #1 If >5.0, use Extraction Fluid #2	4.92	2.89	1.56	1.58	1.43
Extraction Fluid Type (1 or 2)	1	2	1	→	→
Extraction Vessel Type / Pressure Check	HDPE	→	→	→	→
Extraction Fluid Volume (mLs)	2000	→	1000	→	→
Extract Filtered (Yes or No)	Yes	→	→	→	→
Mother Liquid Added (mLs)	N/A	→	→	→	→
Combined Filtrate Volume (mLs)	250	→	→	→	→
Final pH Reading	4.82	2.88	7.30	7.59	5.33
Spike Source ID # / Volume Added (mLs)	N/A	→	→	→	→
Filtrate Preserved	Yes	→	→	→	→
ZHE: Initial psi / Final psi	N/A	→	→	→	→

Comments: _____

Extraction Vessel Codes: T = Teflon Organics/Metals ZHE = Zero Headspace VOA's HDPE = High Density Polyethylene Metals (Lot # 0510901D)

Analyst: [signature] Date: 11/14/19

Reviewer: [signature] Date: 11/19/19

CHI-22-15-003/P-12/15

TestAmerica Chicago
TCLP Extraction Logbook

Page Number: _____

Rotator RPM:30 ± 2 RPMs ID#: C2854 Extr. Start Date 11/14/19 Time 1343 Temp: Uncorrected 20.5 Corrected 20.7 °C Filtration Start Time: 1105
Group Number: T064 Extr. End Date 11/15/19 Time 0743 Temp: Uncorrected 20.5 Corrected 20.7 °C Filtration End Time: 1235
LIMS Batch No.: 515389/515391 Min.Temp: Uncorrected/Corrected 19.5/19.7 °C Max.Temp: Uncorrected/Corrected 21/21.7 °C Filter Paper Lot #: 112167-9301
Sample Size Specifications: <9.5 mm Control Limits: 10 ± 5 PSI; 23 ± 2 °C Thermometer ID: C3024
Sample Type (Circle): TCLV SPLP (TCLP) ASTM

Sample Number	500-173080-4	500-173292-1	500-173308-1	-2	-3
Sample Description	Solid				
Sample Weight (g)	50.30	50.10	25.10	10.09	10.38
Liquid-Solid Separation (Yes/No)	No				
Volume of Mother Liquid (mLs)	N/A				
Solid Extraction Material (g)	50.30	50.10	25.10	10.09	10.38
Extraction Fluid Selection pH of Initial Solution: If <5.0, use Extraction Fluid #1	9.28	10.70	9.45	11.94	11.71
pH of Acid/Heat Treated Solution: If <5.0, use Extraction Fluid #1; If >5.0, use Extraction Fluid #2	1.49	1.66	1.65	11.35	5.62
Extraction Fluid Type (1 or 2)	1			2	
Extraction Vessel Type / Pressure Check	HDPE				
Extraction Fluid Volume (mLs)	1000		500	200	
Extract Filtered (Yes or No)	Yes				
Mother Liquid Added (mLs)	N/A				
Combined Filtrate Volume (mLs)	250			150	
Final pH Reading	7.19	10.58	5.06	5.52	4.65
Spike Source ID # / Volume Added (mLs)	N/A				
Filtrate Preserved	Yes m				
ZHE; Initial psi / Final psi	N/A				

Comments:
Extraction Vessel Codes: T = Teflon Organics/Metals ZHE = Zero Headspace VOA's HDPE = High Density Polyethylene (Lot # 05090ID) Metals
Analyst: [signature] Date: 11/14/19
Reviewer: Date: 11/15/19

TestAmerica Chicago
TCLP Extraction Logbook
Page Number:
Rotator RPM:30 + 2 RPMs ID#: C2854 Extr. Start Date 11/14/19 Time 1343 Temp: Uncorrected 20.5 Corrected 20.7 °C Filtration Start Time: 1105

Analyst: [illegible] Date: 11/19/19

Page Number: 101

TCLP Extraction Logbook

Rotator RPM: 30 ± 2 RPMs ID#: 62854 Extr. Start Date 11/19/19 Time 1343 Temp: Uncorrected 20.5 Corrected 20.7 °C Filtration Start Time: 1105

Group Number: T064 Extr. End Date 11/19/19 Time 0745 Temp: Uncorrected 20.5 Corrected 20.7 °C Filtration End Time: 1235

LIMS Batch No.: 515389/515391 Min.Temp: Uncorrected/Corrected 19.5 / 19.7 °C Max.Temp: Uncorrected/Corrected 21 / 21.7 °C Filter Paper Lot #: 112167-930)

Sample Size Specifications: <9.5 mm Control Limits: 10 ± 5 PSI; 23 ± 2 °C Thermometer ID: C3024

Sample Type (Circle): TCLV SPLP (TCLP) ASTM

Sample Number	500-173308-4	500-173337-1	-2	-3	310-169780-1
Sample Description	Solid				
Sample Weight (g)	15.34	50.26	50.37	50.03	50.07
Liquid-Solid Separation (Yes/No)	No				
Volume of Mother Liquid (mLs)	N/A				
Solid Extraction Material (g)	15.34	50.26	25.37	50.03	50.07
Extraction Fluid Selection pH of Initial Solution: If <5.0, use Extraction Fluid #1	11.80	11.72	9.60	9.41	6.87
pH of Acid/Heat Treated Solution: If <5.0, use Extraction Fluid #1 If >5.0, use Extraction Fluid #2	2.20	2.01	1.63	1.66	6.87
Extraction Fluid Type (1 or 2)	1				
Extraction Vessel Type / Pressure Check	HDPE				
Extraction Fluid Volume (mLs)	300	1000			
Extract Filtered (Yes or No)	Yes				
Mother Liquid Added (mLs)	N/A				
Combined Filtrate Volume (mLs)	250				
Final pH Reading	7.93	8.04	6.42	5.88	5.02
Spike Source ID # / Volume Added (mLs)	N/A				
Filtrate Preserved	Yes m				
ZHE: Initial psi / Final psi	N/A				

Comments:

Extraction Vessel Codes: T = Teflon Organics/Metals ZHE = Zero Headspace VOA's HDPE = High Density Polyethylene (Lot # 05109010) Metals

Analyst: [signature] Date: 11/14/19

Reviewer: [signature] Date: 11/19/19

CHI-22-15-003/P-12/15

TestAmerica Chicago
TCLP Extraction Logbook

Page Number:

Rotator RPM:30 ± 2 RPMs ID#: C2854 Extr. Start Date 11/14/19 Time 1343 Temp: Uncorrected 20.5 Corrected 20.7 °C Filtration Start Time: 1105
Group Number: T064 Extr. End Date 11/15/19 Time 0743 Temp: Uncorrected 20.5 Corrected 20.7 °C Filtration End Time: 1235
LIMS Batch No.: 515389/515391 Min.Temp: Uncorrected/Corrected 19.5/19.7 °C Max.Temp: Uncorrected/Corrected 21/21.7 °C Filter Paper Lot #: 112167-9301
Sample Size Specifications: <9.5 mm Control Limits: 10 ± 5 PSI; 23 ± 2 °C Thermometer ID: C3024
Sample Type (Circle): TCLV SPLP (TCLP) ASTM

Sample Number	500-173164-1	-2	-3		
Sample Description	Solid				
Sample Weight (g)	50.12	50.29	50.35		
Liquid-Solid Separation (Yes/No)	No				
Volume of Mother Liquid (mLs)	N/A				
Solid Extraction Material (g)	50.12	50.29	50.35		
Extraction Fluid Selection pH of Initial Solution: If <5.0, use Extraction Fluid #1	5.78	5.56	5.84		
pH of Acid/Heat Treated Solution: If <5.0, use Extraction Fluid #1 If >5.0, use Extraction Fluid #2	1.37	1.34	1.35		
Extraction Fluid Type (1 or 2)	1				
Extraction Vessel Type / Pressure Check	HDPE				BC 11/14/19
Extraction Fluid Volume (mLs)	1000				
Extract Filtered (Yes or No)	Yes				
Mother Liquid Added (mLs)	N/A				
Combined Filtrate Volume (mLs)	250				
Final pH Reading	500	4.98	4.97		
Spike Source ID # / Volume Added (mLs)	N/A				
Filtrate Preserved	Yes m				
ZHE: Initial psi / Final psi	N/A				

Comments:
Extraction Vessel Codes: T = Teflon Organics/Metals ZHE = Zero Headspace VOA's HDPE = High Density Polyethylene (Lot # 051090ID) Metals
Analyst: Date: 11/14/19
Reviewer: Date:

TCLP Extraction Logbook Rev. Number
Rotator RPM:30 ± 2 RPMs ID#: C2854 Extr. Start Date 11/14/19 Time 1343 Temp: Uncorrected 20.5 Corrected 20.7 °C Filtration Start Time: 1105
Min.Temp: Uncorrected/Corrected 19.5/19.7 °C Max.Temp: Uncorrected/Corrected 21/21.7 °C Filtration End Time: 1235

Login Sample Receipt Checklist

Client: Kemron Environmental Services, Inc.

Job Number: 500-173080-1

Login Number: 173080
List Number: 1
Creator: Buckley, Paula M

List Source: Eurofins TestAmerica, Chicago

Question	Answer	Comment
Radioactivity wasn't checked or is </= background as measured by a survey meter.	True	
The cooler's custody seal, if present, is intact.	True	
Sample custody seals, if present, are intact.	True	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	True	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	1.2
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	True	
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time (excluding tests with immediate HTs)	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	True	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	N/A	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

PAINT FILTER TEST

SUMMARY OF RESULTS

PROJECT:	NASA ECCL Stabilization	TESTING DATE:	10/16/2019
PROJECT No.:	SH0724	TESTED BY:	MTC
SAMPLE No.:	0724-001	TRACKING CODE:	D586
TESTING METHOD:	EPA Method 9095		

TESTING PARAMETER AND RESULTS		
QUANTITY OF MATERIAL	100.00	**g**
LENGTH OF TEST	5.0	**min.**
QUANTITY OF LIQUID	0.00	**g**
RESULTS (PASS / FAIL) *	PASS	

* In accordance with EPA Method 9095, if any liquid from the test material collects after 5 minutes of testing, the material is deemed to contain free liquids, and therefore has failed the paint filter test.

PAINT FILTER TEST

SUMMARY OF RESULTS

PROJECT:	NASA ECCL Stabilization	TESTING DATE:	10/16/2019
PROJECT No.:	SH0724	TESTED BY:	MTC
SAMPLE No.:	0724-002	TRACKING CODE:	D587
TESTING METHOD:	EPA Method 9095		

TESTING PARAMETER AND RESULTS		
QUANTITY OF MATERIAL	100.00	**g**
LENGTH OF TEST	5.0	**min.**
QUANTITY OF LIQUID	0.00	**g**
RESULTS (PASS / FAIL) *	PASS	

* In accordance with EPA Method 9095, if any liquid from the test material collects after 5 minutes of testing, the material is deemed to contain free liquids, and therefore has failed the paint filter test.

PAINT FILTER TEST

SUMMARY OF RESULTS

PROJECT:	NASA ECCL Stabilization	TESTING DATE:	10/16/2019
PROJECT No.:	SH0724	TESTED BY:	MTC
SAMPLE No.:	0724-003	TRACKING CODE:	D588
TESTING METHOD:	EPA Method 9095		

TESTING PARAMETER AND RESULTS		
QUANTITY OF MATERIAL	100.00	**g**
LENGTH OF TEST	5.0	**min.**
QUANTITY OF LIQUID	0.00	**g**
RESULTS (PASS / FAIL) *	PASS	

* In accordance with EPA Method 9095, if any liquid from the test material collects after 5 minutes of testing, the material is deemed to contain free liquids, and therefore has failed the paint filter test.

PAINT FILTER TEST

SUMMARY OF RESULTS

PROJECT:	NASA ECCL Stabilization	TESTING DATE:	10/16/2019
PROJECT No.:	SH0724	TESTED BY:	MTC
SAMPLE No.:	0724-004	TRACKING CODE:	D589
TESTING METHOD:	EPA Method 9095		

TESTING PARAMETER AND RESULTS		
QUANTITY OF MATERIAL	100.00	**g**
LENGTH OF TEST	5.0	**min.**
QUANTITY OF LIQUID	0.00	**g**
RESULTS (PASS / FAIL) *	PASS	

* In accordance with EPA Method 9095, if any liquid from the test material collects after 5 minutes of testing, the material is deemed to contain free liquids, and therefore has failed the paint filter test.

PAINT FILTER TEST

SUMMARY OF RESULTS

PROJECT:	NASA ECCL Stabilization	TESTING DATE:	10/16/2019
PROJECT No.:	SH0724	TESTED BY:	MTC
SAMPLE No.:	0724-005	TRACKING CODE:	D590
TESTING METHOD:	EPA Method 9095		

TESTING PARAMETER AND RESULTS		
QUANTITY OF MATERIAL	100.00	**g**
LENGTH OF TEST	5.0	**min.**
QUANTITY OF LIQUID	0.00	**g**
RESULTS (PASS / FAIL) *	PASS	

* In accordance with EPA Method 9095, if any liquid from the test material collects after 5 minutes of testing, the material is deemed to contain free liquids, and therefore has failed the paint filter test.

PAINT FILTER TEST

SUMMARY OF RESULTS

PROJECT:	NASA ECCL Stabilization	TESTING DATE:	10/16/2019
PROJECT No.:	SH0724	TESTED BY:	MTC
SAMPLE No.:	0724-006	TRACKING CODE:	D591
TESTING METHOD:	EPA Method 9095		

TESTING PARAMETER AND RESULTS		
QUANTITY OF MATERIAL	100.00	**g**
LENGTH OF TEST	5.0	**min.**
QUANTITY OF LIQUID	0.00	**g**
RESULTS (PASS / FAIL) *	PASS	

* In accordance with EPA Method 9095, if any liquid from the test material collects after 5 minutes of testing, the material is deemed to contain free liquids, and therefore has failed the paint filter test.

PAINT FILTER TEST

SUMMARY OF RESULTS

PROJECT:	NASA ECCL Stabilization	TESTING DATE:	10/16/2019
PROJECT No.:	SH0724	TESTED BY:	MTC
SAMPLE No.:	0724-007	TRACKING CODE:	D592
TESTING METHOD:	EPA Method 9095		

TESTING PARAMETER AND RESULTS		
QUANTITY OF MATERIAL	100.00	**g**
LENGTH OF TEST	5.0	**min.**
QUANTITY OF LIQUID	0.00	**g**
RESULTS (PASS / FAIL) *	PASS	

* In accordance with EPA Method 9095, if any liquid from the test material collects after 5 minutes of testing, the material is deemed to contain free liquids, and therefore has failed the paint filter test.

PAINT FILTER TEST

SUMMARY OF RESULTS

PROJECT:	NASA ECCL Stabilization	TESTING DATE:	10/16/2019
PROJECT No.:	SH0724	TESTED BY:	MTC
SAMPLE No.:	0724-008	TRACKING CODE:	D593
TESTING METHOD:	EPA Method 9095		

TESTING PARAMETER AND RESULTS		
QUANTITY OF MATERIAL	100.00	**g**
LENGTH OF TEST	5.0	**min.**
QUANTITY OF LIQUID	0.00	**g**
RESULTS (PASS / FAIL) *	PASS	

* In accordance with EPA Method 9095, if any liquid from the test material collects after 5 minutes of testing, the material is deemed to contain free liquids, and therefore has failed the paint filter test.

PAINT FILTER TEST

SUMMARY OF RESULTS

PROJECT:	NASA ECCL Stabilization	TESTING DATE:	10/16/2019
PROJECT No.:	SH0724	TESTED BY:	MTC
SAMPLE No.:	0724-009	TRACKING CODE:	D594
TESTING METHOD:	EPA Method 9095		

TESTING PARAMETER AND RESULTS		
QUANTITY OF MATERIAL	100.00	**g**
LENGTH OF TEST	5.0	**min.**
QUANTITY OF LIQUID	0.00	**g**
RESULTS (PASS / FAIL) *	PASS	

* In accordance with EPA Method 9095, if any liquid from the test material collects after 5 minutes of testing, the material is deemed to contain free liquids, and therefore has failed the paint filter test.

PAINT FILTER TEST

SUMMARY OF RESULTS

PROJECT:	NASA ECCL Stabilization	TESTING DATE:	10/16/2019
PROJECT No.:	SH0724	TESTED BY:	MTC
SAMPLE No.:	0724-010	TRACKING CODE:	D595
TESTING METHOD:	EPA Method 9095		

TESTING PARAMETER AND RESULTS		
QUANTITY OF MATERIAL	100.00	**g**
LENGTH OF TEST	5.0	**min.**
QUANTITY OF LIQUID	0.00	**g**
RESULTS (PASS / FAIL) *	PASS	

* In accordance with EPA Method 9095, if any liquid from the test material collects after 5 minutes of testing, the material is deemed to contain free liquids, and therefore has failed the paint filter test.

PAINT FILTER TEST

SUMMARY OF RESULTS

PROJECT:	NASA ECCL Stabilization	TESTING DATE:	10/16/2019
PROJECT No.:	SH0724	TESTED BY:	MTC
SAMPLE No.:	0724-011	TRACKING CODE:	D596
TESTING METHOD:	EPA Method 9095		

TESTING PARAMETER AND RESULTS		
QUANTITY OF MATERIAL	100.00	**g**
LENGTH OF TEST	5.0	**min.**
QUANTITY OF LIQUID	0.00	**g**
RESULTS (PASS / FAIL) *	PASS	

* In accordance with EPA Method 9095, if any liquid from the test material collects after 5 minutes of testing, the material is deemed to contain free liquids, and therefore has failed the paint filter test.

PAINT FILTER TEST

SUMMARY OF RESULTS

PROJECT:	NASA ECCL Stabilization	TESTING DATE:	10/16/2019
PROJECT No.:	SH0724	TESTED BY:	MTC
SAMPLE No.:	0724-012	TRACKING CODE:	D597
TESTING METHOD:	EPA Method 9095		

TESTING PARAMETER AND RESULTS		
QUANTITY OF MATERIAL	100.00	**g**
LENGTH OF TEST	5.0	**min.**
QUANTITY OF LIQUID	0.00	**g**
RESULTS (PASS / FAIL) *	PASS	

* In accordance with EPA Method 9095, if any liquid from the test material collects after 5 minutes of testing, the material is deemed to contain free liquids, and therefore has failed the paint filter test.

PAINT FILTER TEST

SUMMARY OF RESULTS

PROJECT:	NASA ECCL Stabilization	TESTING DATE:	10/16/2019
PROJECT No.:	SH0724	TESTED BY:	MTC
SAMPLE No.:	0724-013	TRACKING CODE:	D598
TESTING METHOD:	EPA Method 9095		

TESTING PARAMETER AND RESULTS		
QUANTITY OF MATERIAL	100.00	**g**
LENGTH OF TEST	5.0	**min.**
QUANTITY OF LIQUID	0.00	**g**
RESULTS (PASS / FAIL) *	PASS	

* In accordance with EPA Method 9095, if any liquid from the test material collects after 5 minutes of testing, the material is deemed to contain free liquids, and therefore has failed the paint filter test.

PAINT FILTER TEST

SUMMARY OF RESULTS

PROJECT:	NASA ECCL Stabilization	TESTING DATE:	10/16/2019
PROJECT No.:	SH0724	TESTED BY:	MTC
SAMPLE No.:	0724-014	TRACKING CODE:	D599
TESTING METHOD:	EPA Method 9095		

TESTING PARAMETER AND RESULTS		
QUANTITY OF MATERIAL	100.00	**g**
LENGTH OF TEST	5.0	**min.**
QUANTITY OF LIQUID	0.00	**g**
RESULTS (PASS / FAIL) *	PASS	

* In accordance with EPA Method 9095, if any liquid from the test material collects after 5 minutes of testing, the material is deemed to contain free liquids, and therefore has failed the paint filter test.

PAINT FILTER TEST

SUMMARY OF RESULTS

PROJECT:	NASA ECCL Stabilization	TESTING DATE:	10/16/2019
PROJECT No.:	SH0724	TESTED BY:	MTC
SAMPLE No.:	0724-015	TRACKING CODE:	D600
TESTING METHOD:	EPA Method 9095		

TESTING PARAMETER AND RESULTS		
QUANTITY OF MATERIAL	100.00	**g**
LENGTH OF TEST	5.0	**min.**
QUANTITY OF LIQUID	0.00	**g**
RESULTS (PASS / FAIL) *	PASS	

* In accordance with EPA Method 9095, if any liquid from the test material collects after 5 minutes of testing, the material is deemed to contain free liquids, and therefore has failed the paint filter test.

PAINT FILTER TEST

SUMMARY OF RESULTS

PROJECT:	NASA ECCL Stabilization	TESTING DATE:	10/16/2019
PROJECT No.:	SH0724	TESTED BY:	MTC
SAMPLE No.:	0724-016	TRACKING CODE:	D601
TESTING METHOD:	EPA Method 9095		

TESTING PARAMETER AND RESULTS		
QUANTITY OF MATERIAL	100.00	**g**
LENGTH OF TEST	5.0	**min.**
QUANTITY OF LIQUID	0.00	**g**
RESULTS (PASS / FAIL) *	PASS	

* In accordance with EPA Method 9095, if any liquid from the test material collects after 5 minutes of testing, the material is deemed to contain free liquids, and therefore has failed the paint filter test.

PAINT FILTER TEST

SUMMARY OF RESULTS

PROJECT:	NASA ECCL Stabilization	TESTING DATE:	10/16/2019
PROJECT No.:	SH0724	TESTED BY:	MTC
SAMPLE No.:	0724-017	TRACKING CODE:	D602
TESTING METHOD:	EPA Method 9095		

TESTING PARAMETER AND RESULTS		
QUANTITY OF MATERIAL	100.00	**g**
LENGTH OF TEST	5.0	**min.**
QUANTITY OF LIQUID	0.00	**g**
RESULTS (PASS / FAIL) *	PASS	

* In accordance with EPA Method 9095, if any liquid from the test material collects after 5 minutes of testing, the material is deemed to contain free liquids, and therefore has failed the paint filter test.

PAINT FILTER TEST

SUMMARY OF RESULTS

PROJECT:	NASA ECCL Stabilization	TESTING DATE:	10/16/2019
PROJECT No.:	SH0724	TESTED BY:	MTC
SAMPLE No.:	0724-018	TRACKING CODE:	D603
TESTING METHOD:	EPA Method 9095		

TESTING PARAMETER AND RESULTS		
QUANTITY OF MATERIAL	100.00	**g**
LENGTH OF TEST	5.0	**min.**
QUANTITY OF LIQUID	0.00	**g**
RESULTS (PASS / FAIL) *	PASS	

* In accordance with EPA Method 9095, if any liquid from the test material collects after 5 minutes of testing, the material is deemed to contain free liquids, and therefore has failed the paint filter test.

PAINT FILTER TEST

SUMMARY OF RESULTS

PROJECT:	NASA ECCL Stabilization	TESTING DATE:	10/16/2019
PROJECT No.:	SH0724	TESTED BY:	MTC
SAMPLE No.:	0724-019	TRACKING CODE:	D604
TESTING METHOD:	EPA Method 9095		

TESTING PARAMETER AND RESULTS		
QUANTITY OF MATERIAL	100.00	**g**
LENGTH OF TEST	5.0	**min.**
QUANTITY OF LIQUID	0.00	**g**
RESULTS (PASS / FAIL) *	PASS	

* In accordance with EPA Method 9095, if any liquid from the test material collects after 5 minutes of testing, the material is deemed to contain free liquids, and therefore has failed the paint filter test.

PAINT FILTER TEST

SUMMARY OF RESULTS

PROJECT:	NASA ECCL Stabilization	TESTING DATE:	10/16/2019
PROJECT No.:	SH0724	TESTED BY:	MTC
SAMPLE No.:	0724-020	TRACKING CODE:	D605
TESTING METHOD:	EPA Method 9095		

TESTING PARAMETER AND RESULTS		
QUANTITY OF MATERIAL	100.00	**g**
LENGTH OF TEST	5.0	**min.**
QUANTITY OF LIQUID	0.00	**g**
RESULTS (PASS / FAIL) *	PASS	

* In accordance with EPA Method 9095, if any liquid from the test material collects after 5 minutes of testing, the material is deemed to contain free liquids, and therefore has failed the paint filter test.

PAINT FILTER TEST

SUMMARY OF RESULTS

PROJECT:	NASA ECCL Stabilization	TESTING DATE:	10/16/2019
PROJECT No.:	SH0724	TESTED BY:	MTC
SAMPLE No.:	0724-021	TRACKING CODE:	D606
TESTING METHOD:	EPA Method 9095		

TESTING PARAMETER AND RESULTS		
QUANTITY OF MATERIAL	100.00	**g**
LENGTH OF TEST	5.0	**min.**
QUANTITY OF LIQUID	0.00	**g**
RESULTS (PASS / FAIL) *	PASS	

* In accordance with EPA Method 9095, if any liquid from the test material collects after 5 minutes of testing, the material is deemed to contain free liquids, and therefore has failed the paint filter test.

PAINT FILTER TEST

SUMMARY OF RESULTS

PROJECT:	NASA ECCL Stabilization	TESTING DATE:	10/16/2019
PROJECT No.:	SH0724	TESTED BY:	MTC
SAMPLE No.:	0724-022	TRACKING CODE:	D607
TESTING METHOD:	EPA Method 9095		

TESTING PARAMETER AND RESULTS		
QUANTITY OF MATERIAL	100.00	**g**
LENGTH OF TEST	5.0	**min.**
QUANTITY OF LIQUID	0.00	**g**
RESULTS (PASS / FAIL) *	PASS	

* In accordance with EPA Method 9095, if any liquid from the test material collects after 5 minutes of testing, the material is deemed to contain free liquids, and therefore has failed the paint filter test.

PAINT FILTER TEST

SUMMARY OF RESULTS

PROJECT:	NASA ECCL Stabilization	TESTING DATE:	10/16/2019
PROJECT No.:	SH0724	TESTED BY:	MTC
SAMPLE No.:	0724-023	TRACKING CODE:	D608
TESTING METHOD:	EPA Method 9095		

TESTING PARAMETER AND RESULTS		
QUANTITY OF MATERIAL	100.00	**g**
LENGTH OF TEST	5.0	**min.**
QUANTITY OF LIQUID	0.00	**g**
RESULTS (PASS / FAIL) *	PASS	

* In accordance with EPA Method 9095, if any liquid from the test material collects after 5 minutes of testing, the material is deemed to contain free liquids, and therefore has failed the paint filter test.

PAINT FILTER TEST

SUMMARY OF RESULTS

PROJECT:	NASA ECCL Stabilization	TESTING DATE:	10/16/2019
PROJECT No.:	SH0724	TESTED BY:	MTC
SAMPLE No.:	0724-024	TRACKING CODE:	D609
TESTING METHOD:	EPA Method 9095		

TESTING PARAMETER AND RESULTS		
QUANTITY OF MATERIAL	100.00	**g**
LENGTH OF TEST	5.0	**min.**
QUANTITY OF LIQUID	0.00	**g**
RESULTS (PASS / FAIL) *	PASS	

* In accordance with EPA Method 9095, if any liquid from the test material collects after 5 minutes of testing, the material is deemed to contain free liquids, and therefore has failed the paint filter test.

PAINT FILTER TEST

SUMMARY OF RESULTS

PROJECT:	NASA ECCL Stabilization	TESTING DATE:	10/16/2019
PROJECT No.:	SH0724	TESTED BY:	MTC
SAMPLE No.:	0724-025	TRACKING CODE:	D610
TESTING METHOD:	EPA Method 9095		

TESTING PARAMETER AND RESULTS		
QUANTITY OF MATERIAL	100.00	**g**
LENGTH OF TEST	5.0	**min.**
QUANTITY OF LIQUID	0.00	**g**
RESULTS (PASS / FAIL) *	PASS	

* In accordance with EPA Method 9095, if any liquid from the test material collects after 5 minutes of testing, the material is deemed to contain free liquids, and therefore has failed the paint filter test.

PAINT FILTER TEST

SUMMARY OF RESULTS

PROJECT:	NASA ECCL Stabilization	TESTING DATE:	10/16/2019
PROJECT No.:	SH0724	TESTED BY:	MTC
SAMPLE No.:	0724-026	TRACKING CODE:	D611
TESTING METHOD:	EPA Method 9095		

TESTING PARAMETER AND RESULTS		
QUANTITY OF MATERIAL	100.00	**g**
LENGTH OF TEST	5.0	**min.**
QUANTITY OF LIQUID	0.00	**g**
RESULTS (PASS / FAIL) *	PASS	

* In accordance with EPA Method 9095, if any liquid from the test material collects after 5 minutes of testing, the material is deemed to contain free liquids, and therefore has failed the paint filter test.

PAINT FILTER TEST

SUMMARY OF RESULTS

PROJECT:	NASA ECCL Stabilization	TESTING DATE:	10/16/2019
PROJECT No.:	SH0724	TESTED BY:	MTC
SAMPLE No.:	0724-027	TRACKING CODE:	D612
TESTING METHOD:	EPA Method 9095		

TESTING PARAMETER AND RESULTS		
QUANTITY OF MATERIAL	100.00	**g**
LENGTH OF TEST	5.0	**min.**
QUANTITY OF LIQUID	0.00	**g**
RESULTS (PASS / FAIL) *	PASS	

* In accordance with EPA Method 9095, if any liquid from the test material collects after 5 minutes of testing, the material is deemed to contain free liquids, and therefore has failed the paint filter test.

PAINT FILTER TEST

SUMMARY OF RESULTS

PROJECT:	NASA ECCL Stabilization	TESTING DATE:	10/16/2019
PROJECT No.:	SH0724	TESTED BY:	MTC
SAMPLE No.:	0724-028	TRACKING CODE:	D613
TESTING METHOD:	EPA Method 9095		

TESTING PARAMETER AND RESULTS		
QUANTITY OF MATERIAL	100.00	**g**
LENGTH OF TEST	5.0	**min.**
QUANTITY OF LIQUID	0.00	**g**
RESULTS (PASS / FAIL) *	PASS	

* In accordance with EPA Method 9095, if any liquid from the test material collects after 5 minutes of testing, the material is deemed to contain free liquids, and therefore has failed the paint filter test.

PAINT FILTER TEST

SUMMARY OF RESULTS

PROJECT:	NASA ECCL Stabilization	TESTING DATE:	10/16/2019
PROJECT No.:	SH0724	TESTED BY:	MTC
SAMPLE No.:	0724-029	TRACKING CODE:	D614
TESTING METHOD:	EPA Method 9095		

TESTING PARAMETER AND RESULTS		
QUANTITY OF MATERIAL	100.00	**g**
LENGTH OF TEST	5.0	**min.**
QUANTITY OF LIQUID	0.00	**g**
RESULTS (PASS / FAIL) *	PASS	

* In accordance with EPA Method 9095, if any liquid from the test material collects after 5 minutes of testing, the material is deemed to contain free liquids, and therefore has failed the paint filter test.

PAINT FILTER TEST

SUMMARY OF RESULTS

PROJECT:	NASA ECCL Stabilization	TESTING DATE:	10/16/2019
PROJECT No.:	SH0724	TESTED BY:	MTC
SAMPLE No.:	0724-030	TRACKING CODE:	D615
TESTING METHOD:	EPA Method 9095		

TESTING PARAMETER AND RESULTS		
QUANTITY OF MATERIAL	100.00	**g**
LENGTH OF TEST	5.0	**min.**
QUANTITY OF LIQUID	0.00	**g**
RESULTS (PASS / FAIL) *	PASS	

* In accordance with EPA Method 9095, if any liquid from the test material collects after 5 minutes of testing, the material is deemed to contain free liquids, and therefore has failed the paint filter test.

PAINT FILTER TEST

SUMMARY OF RESULTS

PROJECT:	NASA ECCL Stabilization	TESTING DATE:	10/16/2019
PROJECT No.:	SH0724	TESTED BY:	MTC
SAMPLE No.:	0724-031	TRACKING CODE:	D616
TESTING METHOD:	EPA Method 9095		

TESTING PARAMETER AND RESULTS		
QUANTITY OF MATERIAL	100.00	**g**
LENGTH OF TEST	5.0	**min.**
QUANTITY OF LIQUID	0.00	**g**
RESULTS (PASS / FAIL) *	PASS	

* In accordance with EPA Method 9095, if any liquid from the test material collects after 5 minutes of testing, the material is deemed to contain free liquids, and therefore has failed the paint filter test.

PAINT FILTER TEST

SUMMARY OF RESULTS

PROJECT:	NASA ECCL Stabilization	TESTING DATE:	10/16/2019
PROJECT No.:	SH0724	TESTED BY:	MTC
SAMPLE No.:	0724-032	TRACKING CODE:	D617
TESTING METHOD:	EPA Method 9095		

TESTING PARAMETER AND RESULTS		
QUANTITY OF MATERIAL	100.00	**g**
LENGTH OF TEST	5.0	**min.**
QUANTITY OF LIQUID	0.00	**g**
RESULTS (PASS / FAIL) *	PASS	

* In accordance with EPA Method 9095, if any liquid from the test material collects after 5 minutes of testing, the material is deemed to contain free liquids, and therefore has failed the paint filter test.

PAINT FILTER TEST

SUMMARY OF RESULTS

PROJECT:	NASA ECCL Stabilization	TESTING DATE:	10/16/2019
PROJECT No.:	SH0724	TESTED BY:	MTC
SAMPLE No.:	0724-033	TRACKING CODE:	D618
TESTING METHOD:	EPA Method 9095		

TESTING PARAMETER AND RESULTS		
QUANTITY OF MATERIAL	100.00	**g**
LENGTH OF TEST	5.0	**min.**
QUANTITY OF LIQUID	0.00	**g**
RESULTS (PASS / FAIL) *	PASS	

* In accordance with EPA Method 9095, if any liquid from the test material collects after 5 minutes of testing, the material is deemed to contain free liquids, and therefore has failed the paint filter test.

PAINT FILTER TEST

SUMMARY OF RESULTS

PROJECT:	NASA ECCL Stabilization	TESTING DATE:	10/16/2019
PROJECT No.:	SH0724	TESTED BY:	MTC
SAMPLE No.:	0724-034	TRACKING CODE:	D619
TESTING METHOD:	EPA Method 9095		

TESTING PARAMETER AND RESULTS		
QUANTITY OF MATERIAL	100.00	**g**
LENGTH OF TEST	5.0	**min.**
QUANTITY OF LIQUID	0.00	**g**
RESULTS (PASS / FAIL) *	PASS	

* In accordance with EPA Method 9095, if any liquid from the test material collects after 5 minutes of testing, the material is deemed to contain free liquids, and therefore has failed the paint filter test.

PAINT FILTER TEST

SUMMARY OF RESULTS

PROJECT:	NASA ECCL Stabilization	TESTING DATE:	10/16/2019
PROJECT No.:	SH0724	TESTED BY:	MTC
SAMPLE No.:	0724-035	TRACKING CODE:	D620
TESTING METHOD:	EPA Method 9095		

TESTING PARAMETER AND RESULTS		
QUANTITY OF MATERIAL	100.00	**g**
LENGTH OF TEST	5.0	**min.**
QUANTITY OF LIQUID	0.00	**g**
RESULTS (PASS / FAIL) *	PASS	

* In accordance with EPA Method 9095, if any liquid from the test material collects after 5 minutes of testing, the material is deemed to contain free liquids, and therefore has failed the paint filter test.

PAINT FILTER TEST

SUMMARY OF RESULTS

PROJECT:	NASA ECCL Stabilization	TESTING DATE:	10/16/2019
PROJECT No.:	SH0724	TESTED BY:	MTC
SAMPLE No.:	0724-036	TRACKING CODE:	D621
TESTING METHOD:	EPA Method 9095		

TESTING PARAMETER AND RESULTS		
QUANTITY OF MATERIAL	100.00	**g**
LENGTH OF TEST	5.0	**min.**
QUANTITY OF LIQUID	0.00	**g**
RESULTS (PASS / FAIL) *	PASS	

* In accordance with EPA Method 9095, if any liquid from the test material collects after 5 minutes of testing, the material is deemed to contain free liquids, and therefore has failed the paint filter test.

PAINT FILTER TEST

SUMMARY OF RESULTS

PROJECT:	NASA ECCL Stabilization	TESTING DATE:	11/6/2019
PROJECT No.:	SH0724	TESTED BY:	MTC
SAMPLE No.:	0724-037	TRACKING CODE:	D712
TESTING METHOD:	EPA Method 9095		

TESTING PARAMETER AND RESULTS		
QUANTITY OF MATERIAL	100.00	**g**
LENGTH OF TEST	5.0	**min.**
QUANTITY OF LIQUID	0.00	**g**
RESULTS (PASS / FAIL) *	PASS	

* In accordance with EPA Method 9095, if any liquid from the test material collects after 5 minutes of testing, the material is deemed to contain free liquids, and therefore has failed the paint filter test.

PAINT FILTER TEST

SUMMARY OF RESULTS

PROJECT:	NASA ECCL Stabilization	TESTING DATE:	11/6/2019
PROJECT No.:	SH0724	TESTED BY:	MTC
SAMPLE No.:	0724-038	TRACKING CODE:	D713
TESTING METHOD:	EPA Method 9095		

TESTING PARAMETER AND RESULTS		
QUANTITY OF MATERIAL	100.00	**g**
LENGTH OF TEST	5.0	**min.**
QUANTITY OF LIQUID	0.00	**g**
RESULTS (PASS / FAIL) *	PASS	

* In accordance with EPA Method 9095, if any liquid from the test material collects after 5 minutes of testing, the material is deemed to contain free liquids, and therefore has failed the paint filter test.

PAINT FILTER TEST

SUMMARY OF RESULTS

PROJECT:	NASA ECCL Stabilization	TESTING DATE:	11/6/2019
PROJECT No.:	SH0724	TESTED BY:	MTC
SAMPLE No.:	0724-039	TRACKING CODE:	D714
TESTING METHOD:	EPA Method 9095		

TESTING PARAMETER AND RESULTS		
QUANTITY OF MATERIAL	100.00	**g**
LENGTH OF TEST	5.0	**min.**
QUANTITY OF LIQUID	0.00	**g**
RESULTS (PASS / FAIL) *	PASS	

* In accordance with EPA Method 9095, if any liquid from the test material collects after 5 minutes of testing, the material is deemed to contain free liquids, and therefore has failed the paint filter test.

PAINT FILTER TEST

SUMMARY OF RESULTS

PROJECT:	NASA ECCL Stabilization	TESTING DATE:	11/6/2019
PROJECT No.:	SH0724	TESTED BY:	MTC
SAMPLE No.:	0724-040	TRACKING CODE:	D715
TESTING METHOD:	EPA Method 9095		

TESTING PARAMETER AND RESULTS		
QUANTITY OF MATERIAL	100.00	**g**
LENGTH OF TEST	5.0	**min.**
QUANTITY OF LIQUID	0.00	**g**
RESULTS (PASS / FAIL) *	PASS	

* In accordance with EPA Method 9095, if any liquid from the test material collects after 5 minutes of testing, the material is deemed to contain free liquids, and therefore has failed the paint filter test.

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ATTACHMENT B. REGULATORY NOTIFICATIONS

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United States Fish and Wildlife Service – Indiana Bat Tree Guidance

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From: Bressler, Richard Alan. (GRC-FDP0)[Firelake Arrowhead] <richard.bressler@nasa.gov>
Sent: Wednesday, January 15, 2020 4:34 PM
To: Sprinzl, Rich E. [US-US]
Subject: FW: GRC New Tree Clearing Reporting Requirement for USFWS
Attachments: Tree clearing tracking log.xlsx

FYI…

Rick Bressler | Firelake Construction, Inc.
Construction Manager | NASA Facilities Division
office: 419.621.2244 | mobile: 216.409.6698
email: richard.bressler@nasa.gov

From: Staschiak, Christine C. (GRC-FE00)
Sent: Tuesday, December 31, 2019 11:06 AM
To: Bronczek, Michael T. (GRC-FDO0) <michael.t.bronczek@nasa.gov>; Micham, Michael A. (GRC-FDO0) <michael.a.micham@nasa.gov>; Keating, Thomas C. (GRC-H000)[HX5 Sierra] <thomas.c.keating@nasa.gov>; Bressler, Richard Alan. (GRC-FDP0)[Firelake Arrowhead] <richard.bressler@nasa.gov>
Cc: DeGreen, John J. (GRC-FDS0) <john.degreen@nasa.gov>; Evanina, Ransook C. (GRC-FE00) <ransook.c.evanina@nasa.gov>; Myers, Christie J. (GRC-FE00) <christie.myers@nasa.gov>; Walker, Aaron M. (GRC-FE00) <aaron.m.walker@nasa.gov>; Doglio, James A. (GRC-FDP0) <james.a.doglio@nasa.gov>
Subject: GRC New Tree Clearing Reporting Requirement for USFWS

Good afternoon,

I wanted to reach out and provide a few details regarding the annual tree removal consultation I completed with USFWS for FY20. This consultation is completed for both LF and PBS indicating trees ≥3 inches dbh are only removed between October 1 and March 31 (excluding the specific clearance alongside the LF hill). A few new requirements (**) have been provided by USFWS which I have broken down below. Please let me know if you have any questions regarding the information.

LF:

- Clearing outside of the timeframe of October 1 – March 31 must await consultation with USFWS (exempting the 123 acres following the 2019 survey expiring 3.31.2024)
    - Requirements provided earlier this year for the exempted area still apply
- USFWS will provide guidance of whether an emergence survey or mist net survey is required
- **Any trees cut during the unrestricted timeframe must be reported to me in order to conduct an annual consultation summary. This includes date of removal, location, number/acreage of trees removed and the reason for removal

PBS:

- Clearing outside of the timeframe of October 1 – March 31 is not allowed due to the positive identification of the federally endangered Indiana bat. Clearance could result in the incidental take, resulting in a violation of the Endangered Species Act (civil & criminal penalties)

- **Any trees cut during the unrestricted timeframe must be reported to me in order to conduct an annual consultation summary. This includes date of removal, location, number/acreage of trees removed and the reason for removal
- **Work that is within 660 feet of an eagle's nest or within direct line-of-site of a nest is restricted from January 15 - July 31 (egg-laying period until the young fledge).
    - Nest located on Ransom Rd and near Magazine 9189 (41°21'52.65"N, 82°39'46.58"W)
    - If this request cannot be met, a take permit for the project may be necessary
- **USFWS recommends no tree clearing within 660 feet of a bald eagle nest or within woodlot supporting a nest tree

As noted above, both sites must report the quantity of trees removed as part of GRC's annual consultation. Without this information I will not be able to renew our consultation, therefore, limiting future tree removal. I have attached a spreadsheet that can be utilized to log this information.

Please filter this email as deemed appropriate.

Thanks in advance and happy holidays!

Christine Staschiak
Environmental Management Office
NASA Glenn Research Center
21000 Brookpark Rd. MS 6-7
Cleveland, OH 44135
Office: 216-433-6662

NASA Plum Brook Station
Tree Clearing Tracking Log

Date	Location	Activity/Project	Acreage	# of trees removed (> 3 abh)	Comments
1.14.20-1.22.20	Map provided	Firing Ranges 3 & 4 Remediation	0.58	14	Mostly Brush
1.21.20-2.21.20	Map provided	ECCL Remediation	20.79	387	Mostly Brush
3.2.20-3.9.20	Map provided	Firing Range 5 & CDP Remediation	1.38	29	Mostly Brush

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From: Staschiak, Christine C. (GRC-FE00) <christine.c.staschiak@nasa.gov>
Sent: Friday, January 17, 2020 2:26 PM
To: Sprinzl, Rich E. [US-US]
Cc: Brodt, John P. (GRC-FE00); Bressler, Richard Alan. (GRC-FDP0)[Firelake Arrowhead]; Dirk Doege; Jeremy Soenen; Adams, Heather R. [US-US]; Lowak, David J. [US-US]
Subject: RE: GRC New Tree Clearing Reporting Requirement for USFWS

Hi Rich,

Yes, all three remediation sites are clear from the two known eagle nests.

Have a great weekend!
Christine

From: Sprinzl, Rich [mailto:RICHARD.E.SPRINZL@leidos.com]
Sent: Friday, January 17, 2020 2:19 PM
To: Staschiak, Christine C. (GRC-FE00) <christine.c.staschiak@nasa.gov>
Cc: Brodt, John P. (GRC-FE00) <john.p.brodt@nasa.gov>; Bressler, Richard Alan. (GRC-FDP0)[Firelake Arrowhead] <richard.bressler@nasa.gov>; Dirk Doege <dirk4work@yahoo.com>; Jeremy Soenen <jsoenen@arrowhead-usa.com>; Adams, Heather R. <HEATHER.R.ADAMS@leidos.com>; Lowak, David J. <DAVID.J.LOWAK@leidos.com>
Subject: [EXTERNAL] RE: GRC New Tree Clearing Reporting Requirement for USFWS

Christine,
Please provide confirmation that Firing Range 3&4, Firing Range 5/CDP, and ECCL Firing Range (see attached site map) are clear from known eagle nests.

-nest near Magazine 9189 appears to be >1 mile away.
-Nearest Ransom Road intersection is >1 mile from Firing Range 3&4.

Field crews will be made aware to notify NASA (you) if any eagles or suspect nests are observed during clearing or soil removal.

Thank you,
Rich Sprinzl, P.E. | Leidos
Environmental Engineer | Environmental Planning and Restoration Portfolio
phone: 330.405.5808
mobile: 330.348.1378
richard.e.sprinzl@leidos.com | leidos.com/civil

From: Staschiak, Christine C. (GRC-FE00)
Sent: Tuesday, December 31, 2019 11:06 AM
To: Bronczek, Michael T. (GRC-FDO0) <michael.t.bronczek@nasa.gov>; Micham, Michael A. (GRC-FDO0) <michael.a.micham@nasa.gov>; Keating, Thomas C. (GRC-H000)[HX5 Sierra] <thomas.c.keating@nasa.gov>; Bressler, Richard Alan. (GRC-FDP0)[Firelake Arrowhead] <richard.bressler@nasa.gov>

Cc: DeGreen, John J. (GRC-FDS0) <john.degreen@nasa.gov>; Evanina, Ransook C. (GRC-FE00) <ransook.c.evanina@nasa.gov>; Myers, Christie J. (GRC-FE00) <christie.myers@nasa.gov>; Walker, Aaron M. (GRC-FE00) <aaron.m.walker@nasa.gov>; Doglio, James A. (GRC-FDP0) <james.a.doglio@nasa.gov>
Subject: GRC New Tree Clearing Reporting Requirement for USFWS

Good afternoon,

I wanted to reach out and provide a few details regarding the annual tree removal consultation I completed with USFWS for FY20. This consultation is completed for both LF and PBS indicating trees ≥3 inches dbh are only removed between October 1 and March 31 (excluding the specific clearance alongside the LF hill). A few new requirements (**) have been provided by USFWS which I have broken down below. Please let me know if you have any questions regarding the information.

LF:

- Clearing outside of the timeframe of October 1 – March 31 must await consultation with USFWS (exempting the 123 acres following the 2019 survey expiring 3.31.2024)
    - Requirements provided earlier this year for the exempted area still apply
- USFWS will provide guidance of whether an emergence survey or mist net survey is required
- **Any trees cut during the unrestricted timeframe must be reported to me in order to conduct an annual consultation summary. This includes date of removal, location, number/acreage of trees removed and the reason for removal

PBS:

- Clearing outside of the timeframe of October 1 – March 31 is not allowed due to the positive identification of the federally endangered Indiana bat. Clearance could result in the incidental take, resulting in a violation of the Endangered Species Act (civil & criminal penalties)
- **Any trees cut during the unrestricted timeframe must be reported to me in order to conduct an annual consultation summary. This includes date of removal, location, number/acreage of trees removed and the reason for removal
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As noted above, both sites must report the quantity of trees removed as part of GRC's annual consultation. Without this information I will not be able to renew our consultation, therefore, limiting future tree removal. I have attached a spreadsheet that can be utilized to log this information.

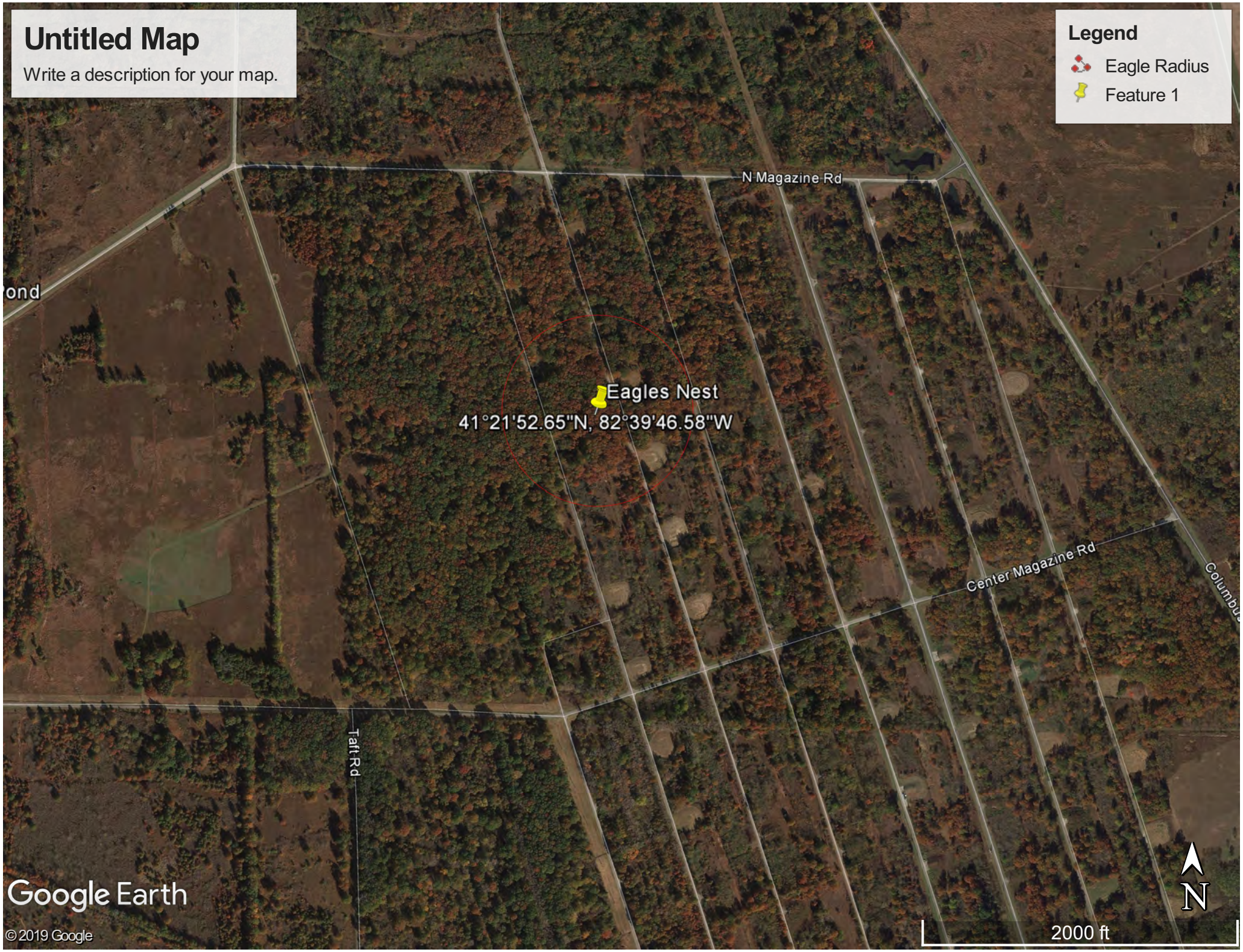
Please filter this email as deemed appropriate.

Thanks in advance and happy holidays!

Christine Staschiak
Environmental Management Office
NASA Glenn Research Center
21000 Brookpark Rd. MS 6-7
Cleveland, OH 44135
Office: 216-433-6662

Untitled Map

Write a description for your map.



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ATTACHMENT C. DESIGN DRAWINGS

List of Design Drawings:

- Drawing C-1. Title Sheet
- Drawing C-2. General Notes
- Drawing C-3. Extent of Impacted Soils Removal
- Drawing C-4. Site Preparation Plan & Construction Site Plan
- Drawing C-5. Soil Stabilization and Removal Plan;
- Drawing C-6. Verification and Confirmation Sampling Plan
- Drawing C-7. Restoration Plan
- Drawing C-8. Details
- Drawing C-9. Traffic Management Plan

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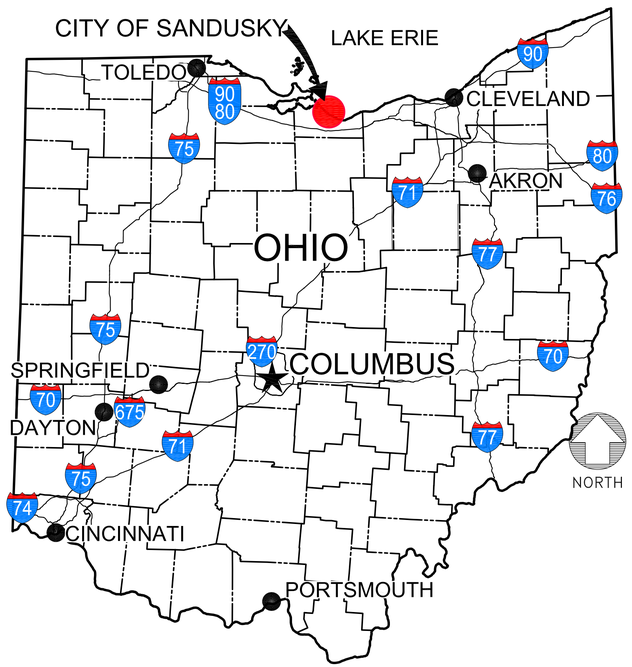
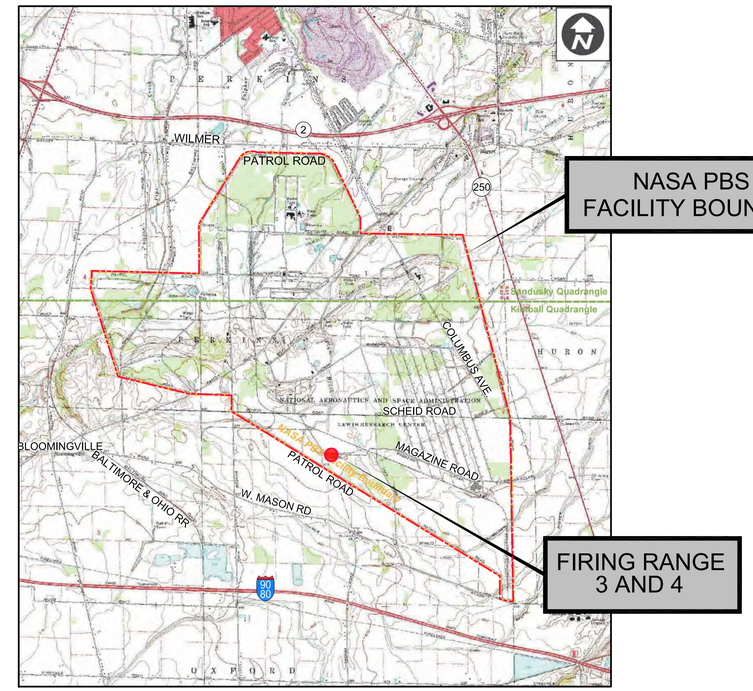
PLUM BROOK STATION FIRING RANGE 3 AND 4
REMOVAL ACTION WORK PLAN
SANDUSKY, OHIO



LOCATION MAP
NOT TO SCALE



VICINITY MAP
NOT TO SCALE

THIS DESIGN PACKAGE ADDRESSES TREATMENT, EXCAVATION, AND OFF-SITE DISPOSAL OF APROXIMATELY 675 TONS (502 CUBIC YARDS) OF IMPACTED SOILS (IN SITU) AS STATED IN THE SELECTED ALTERNATIVE IN THE FINAL RANGES 3 AND 4 REMOVAL SITE EVALUATION REPORT, NASA PLUM BROOK STATION, SANDUSKY, OHIO (DATED DECEMBER 13, 2019, AND SET FORTH IN THE FINAL ACTION MEMORANDUM.

SCOPE OF WORK

National Aeronautics and Space Administration
Plum Brook Station
Sandusky, Ohio

DATE:	1/21/20
DRAWING NO.	C:\18013\DWGS T17-PBS-FR34-C-1
DRAWN BY:	P. HOLM
DESIGNED BY:	R. SPRINZL
CHECKED BY:	
APPROVED BY:	
REV.	
DATE	
DESCRIPTIONS	
DRAWN BY	
CHECKED BY	

PROJECT: FIRING RANGES 3 & 4 REMOVAL ACTION WORK PLAN

DRAWING TITLE: TITLE SHEET

CLIENT: NATIONAL AERONAUTICS AND SPACE ADMINISTRATION PLUM BROOK STATION

C-1

DRAWING NUMBER

GENERAL NOTES

1. HEREINAFTER, THE TERM "CONTRACTOR" IN THESE DESIGN DRAWINGS SHALL REFER TO THE ENTITIES (I.E., THE CONTRACTOR AND/OR ITS SUBCONTRACTOR[S]) IMPLEMENTING THE FIRING RANGE 3 & 4 REMOVAL ACTION DESIGN UNLESS OTHERWISE NOTED.
2. THE CONTRACTOR SHALL COMPLETE ALL ACTIVITIES ASSOCIATED WITH THE PROJECT IN COMPLIANCE WITH APPLICABLE LOCAL, STATE, AND FEDERAL REGULATIONS AND REQUIREMENTS.
3. THE CONTRACTOR SHALL EXECUTE ALL REMEDIAL ACTIVITIES IN ACCORDANCE WITH THE FIRING RANGE 3 & 4 REMOVAL ACTION WORK PLAN, DRAWINGS, AND ATTACHMENTS.
4. THE CONTRACTOR SHALL PARTICIPATE IN WEEKLY PROJECT STATUS MEETINGS WITH THE NASA TECHNICAL MONITOR (TM).
5. THE CONTRACTOR SHALL SUPPLY ALL EQUIPMENT, MATERIALS, AND LABOR TO PERFORM THE CONTRACT REQUIREMENTS INCLUDING ALL WORKER SAFETY EQUIPMENT.
6. THE CONTRACTOR SHALL COMPLY WITH NASA GRC SITE ACCESS PROTOCOLS.
7. ACCESS TO NASA GRC SHALL BE THROUGH THE MAIN GATE LOCATED OFF SCHEID ROAD/ROUTE 250 . THIS GATE IS GUARDED AND SHALL REQUIRE ADDITIONAL TIME TO GAIN ACCESS. THE CONTRACTOR SHALL BE REQUIRED TO ALLOW FOR DELAYS WITHOUT ADDITIONAL CHARGES TO NASA GRC.
8. TOPOGRAPHIC MAPPING DATA IS BASED ON NASA GRC'S UNDERGROUND RECORD DRAWINGS CONSISTENT WITH NASA GRC'S LOCAL GRID COORDINATE SYSTEM. MINOR DISCREPANCIES BETWEEN DRAWINGS AND ACTUAL FIELD CONDITIONS SHALL NOT BE CAUSE FOR ADDITIONAL PAYMENT. IT IS THE CONTRACTOR'S RESPONSIBILITY TO VERIFY EXISTING CONDITIONS, ELEVATIONS, AND DIMENSIONS PRIOR TO THE START OF CONSTRUCTION AND NOTIFY NASA GRC IF THERE IS A CONFLICT.
9. ALL EXISTING GRADE DIMENSIONS AND EVALUATIONS ARE IN FEET AND ARE APPROXIMATE.
10. THE CONTRACTOR SHALL INSTALL CONSTRUCTION SIGNS AT THE LOCATIONS INDICATED ON DRAWING C-8 PRIOR TO INITIATION OF SITE PREPARATION ACTIVITIES.
11. THE CONTRACTOR SHALL CONTACT THE NASA TM AT LEAST 14 DAYS PRIOR TO CONSTRUCTION ACTIVITIES TO COORDINATE UTILITY SURVEY AND CLEARANCES. THE IDENTIFICATION AND LOCATION OF UTILITIES ON THESE DRAWINGS IS BASED ON BEST AVAILABLE INFORMATION AT TIME OF PREPARATION.
12. EROSION CONTROL MEASURES SHALL BE INSTALLED PRIOR TO INITIATION OF ANY CONSTRUCTION ACTIVITY THAT MAY CAUSE EROSION OR SEDIMENTATION. EROSION CONTROL MEASURES SHALL BE MAINTAINED AND REINSTALLED AS NECESSARY THROUGHOUT THE DURATION OF CONSTRUCTION AND RESTORATION ACTIVITIES.
13. AT A MINIMUM THE CONTRACTOR SHALL PLACE EROSION CONTROLS WHERE INDICATED ON THE DRAWINGS. ADDITIONAL CONTROLS MAY BE REQUIRED, DEPENDING ON SITE CONDITIONS. EROSION CONTROL MEASURES SHALL MEET ALL FEDERAL AND STATE REQUIREMENTS.
14. THE CONTRACTOR SHALL OBTAIN POTABLE WATER FOR CONSTRUCTION PURPOSES FROM EXISTING NASA GRC FACILITIES. ANY HOSE CONNECTED TO A FIXED POTABLE WATER SUPPLY MUST BE EQUIPPED WITH BACKFLOW PREVENTION IN ACCORDANCE WITH NASA GRC REQUIREMENTS. COORDINATION WITH THE NASA TM SHALL BE INITIATED DURING MOBILIZATION IN ORDER TO PROVIDE SUFFICIENT TIME TO OBTAIN ACCESS TO THE IDENTIFIED POTABLE WATER SUPPLY.
15. IF UNEXPECTED MATERIALS ARE DISCOVERED DURING REMEDIAL ACTIVITIES, THE CONTRACTOR SHALL STOP WORK IMMEDIATELY AND NOTIFY THE NASA TM. THE CONTRACTOR SHALL NOT RESUME WORK UNTIL APPROVAL IS GRANTED BY THE NASA TM AND SITE SAFETY AND HEALTH OFFICER.
16. SHOULD THE CONTRACTOR DISCOVER UTILITIES NOT SHOWN ON THE DRAWINGS, EXCAVATION ACTIVITIES SHALL STOP IMMEDIATELY AND THE CONTRACTOR SHALL NOTIFY THE NASA TM. NASA GRC PERSONNEL SHALL DETERMINE THE DISPOSITION OF THE DISCOVERED UTILITY. THE CONTRACTOR SHALL NOT RESUME WORK UNTIL APPROVAL IS GRANTED BY THE NASA TM.
17. NO WORK SHALL TAKE PLACE DURING INCLEMENT WEATHER TO MINIMIZE THE POTENTIAL FOR EROSION AND SEDIMENT RUNOFF. THE CONTRACTOR SHALL BE REQUIRED TO ALLOW FOR DELAYS WITHOUT ADDITIONAL CHARGES TO NASA GRC.
18. DURING INSTANCES OF HIGH WINDS, WHICH RESULT IN EXCESSIVE DUST, NASA GRC RESERVES THE RIGHT TO REQUIRE ADDITIONAL DUST CONTROL OR TO STOP WORK. THE CONTRACTOR SHALL BE REQUIRED TO ALLOW FOR DELAYS WITHOUT ADDITIONAL CHARGES TO NASA GRC.
19. ALL ON-ROAD HAUL TRUCKS WILL ADHERE TO ODOT TRANSPORTATION GUIDELINES. THE CONTRACTOR IS RESPONSIBLE FOR ENSURING AND VERIFYING TRUCKS DO NOT LEAVE THE PROJECT SITE IN EXCESS OF 80,000 LBS GROSS WEIGHT. ALL TRUCKS WILL BE WEIGHED EMPTY ANF FULL USING NASA PBS TRUCK SCALE NEAR MAIN GATE. PORTABLE SCALE WILL BE PROVIDED BY THE CONTRACTOR IF NECESSARY.
20. THE CONTRACTOR SHALL NOT ALLOW HAUL TRUCKS TO TRACK SOIL/MUD ONTO NASA GRC OR PUBLIC ROADWAYS. THE CONTRACTOR SHALL INSPECT ALL HAUL TRUCKS WITHIN THE INSPECTION AREA BEFORE RELEASE TO PUBLIC ROADS. SOIL REMOVED FROM HAUL TRUCKS SHALL BE COLLECTED AND DISPOSED WITH EXCAVATED SOILS.
21. THE CONTRACTOR IS RESPONSIBLE FOR IMMEDIATELY REMOVING ANY MATERIAL INCIDENTALLY SPILLED ON ROADWAYS OR TRACKED DURING IMPLEMENTATION OF THIS SOIL REMOVAL DESIGN RELATED EQUIPMENT AND TRUCKS.
22. THE CONTRACTOR SHALL COORDINATE ALL WASTE MANAGEMENT ACTIVITIES WITH THE NASA TM AND THE NASA WASTE MANAGEMENT TEAM. WASTE HANDLING AND DISPOSAL ACTIVITIES SHALL BE CONDUCTED IN ACCORDANCE WITH APPLICABLE STATE AND FEDERAL REGULATIONS FOR WASTE MATERIALS.
23. ALL SOIL WASTE SHALL BE DISPOSED AT A LANDFILL APPROVED BY NASA GRC.
24. ALL HAUL TRUCKS TRAVELING ON PUBLIC ROADS SHALL HAVE A BILL OF LADING OR MANIFEST SIGNED BY THE APPROPRIATE NASA GRC PERSONNEL.
25. THE CONTRACTOR RESPONSIBLE FOR IMPLEMENTING CONSTRUCTION ACTIVITIES IS REQUIRED TO PREPARE AN ADDENDUM TO THE SITE SPECIFIC HEALTH AND SAFETY PLAN IN ACCORDANCE WITH NASA GRC TEMPLATE AND OSHA GUIDELINES. THE ADDENDUM SHOULD BE SUBMITTED FOR REVIEW AT LEAST 10 DAYS PRIOR TO INITIATION OF ANY REMEDIAL ACTION ACTIVITIES. THE ADDENDUM SHALL BE REVIEWED AND APPROVED BY NASA GRC PRIOR TO INITIATION OF ANY REMEDIAL ACTION ACTIVITIES.
26. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ALL FEDERAL, STATE, AND LOCAL SAFETY REQUIREMENTS FOR THE PROTECTION OF ALL PERSONS (INCLUDING EMPLOYEES) AND PROPERTY. IT IS ALSO THE CONTRACTOR'S RESPONSIBILITY TO INITIATE, MAINTAIN, AND SUPERVISE ALL SAFETY REQUIREMENTS, PRECAUTIONS AND PROGRAMS IN CONNECTION WITH THE WORK AND IN ACCORDANCE WITH THE FIRING RANGE 3 & 4 REMOVAL ACTION DESIGN HEALTH AND SAFETY PLAN (HASP).
27. ALL CONTRACTOR EMPLOYEES WORKING ON-SITE MUST ATTEND DAILY HEALTH AND SAFETY TAILGATE MEETINGS PRIOR TO THE START OF THE DAY'S CONSTRUCTION ACTIVITIES.
28. IF THE CONTRACTOR STORES FUEL ON SITE, THAT FUEL SHALL BE STORED WITHIN A DOUBLE CONTAINMENT VESSEL MANUFACTURED FOR FUEL STORAGE. PLASTIC LINED STRUCTURES ARE NOT ACCEPTABLE FOR THE DOUBLE CONTAINMENT. FUEL STORAGE SHALL COMPLY WITH CHAPTER 22 OF THE NASA GRC ENVIRONMENTAL PROGRAMS MANUAL AND NASA GRC TECHNICAL STANDARD 8719.11.
29. CONTAINERS WILL BE DOUBLE LEAK-PROOF WITH A REGULATORY STANDARD AMOUNT OF FREE-BOARD. ALL FUEL CONTAINERS AND/OR TANKS WILL BE PROPERLY PLACARDED AND SECURED ACCORDING TO OSHA AND DOT REGULATIONS AND ADEQUATE SPILL CLEANUP EQUIPMENT AND MATERIALS WILL BE MAINTAINED AT THE FUEL-STORAGE SITE.
30. THE CONTRACTOR WILL PROVIDE ALL NECESSARY ON-SITE SPILL EQUIPMENT (E.G., ABSORBENT BLANKETS, PPE, SHOVELS, CONTAINERS). ALL CONTRACTOR EMPLOYEES ON-SITE SHALL BE TRAINED ON PROPER USE OF SPILL EQUIPMENT AND CLEAN-UP OF MATERIAL IMPACTED BY A SPILL.
31. A SPILL KIT AND FIRST AID KIT SHALL BE MAINTAINED ON-SITE BY THE CONTRACTOR DURING CONSTRUCTION ACTIVITIES. THE CONTRACTOR IS RESPONSIBLE FOR KEEPING THE SPILL KIT AND FIRST AID KIT SUPPLIED.
32. THE CONTRACTOR IS TO ENSURE THIS REMEDIAL DESIGN AND HEALTH AND SAFETY PLAN IS PRESENT AT ALL TIMES ON-SITE DURING CONSTRUCTION ACTIVITIES.
33. THE CONTRACTOR WILL USE A PBS APPROVED SEED MIXTURE FOR PERMANENT COVER OF PROJECT SITE DISTURBED DURING REMOVAL ACTION ACTIVITIES. PBS APPROVED SEED MIXTURES PRESENT THE SEED MIXTURE AND APPLICATION SPECIFICATIONS.

MATERIAL NOTES

1. BACKFILL

BACKFILL MATERIAL WILL MEET NASA GRC ENVIRONMENTAL PROGRAMS MANUAL CHAPTER 20 (HANDLING, REUSE, AND DISPOSAL OF SOIL) AND GRC SPECIFICATION 31 00 00 (EARTHWORK).

2. BACKFILLING

BACKFILLING SHALL BE COMPLETED AS NOTED IN SECTION 7 OF THIS FIRING RANGE RA WORK PLAN AND ON DRAWING C-7. BACKFILL SCREENING CRITERIA AGAINST WHICH THE ANALYTICAL RESULTS WILL BE EVALUATED, INCLUDES BACKGROUND SCREENING LEVELS AND USEPA REGIONAL SCREENING LEVELS CORRESPONDING TO A TARGET RISK OF 1E-06 AND A TARGET HAZARD QUOTIENT OF 0.1.

3. EROSION AND SEDIMENTATION CONTROL MEASURES ON DRAWINGS C-4 & C-7.

PLACEMENT AND ANCHORING OF EROSION AND SEDIMENTATION CONTROL STRUCTURES SHALL BE COMPLETED IN ACCORDANCE WITH THE MANUFACTURERS RECOMMENDATIONS AND DRAWINGS C-4.

4. STABILIZATION AGENT

SELECTED AGENT SHALL BE DEMONSTRATED TO BE EFFECTIVE IN REDUCING LEAD TOXICITY, ENABLING FIRING RANGE SOILS TO BE MANAGED AS SOLID NONHAZARDOUS WASTE.

PBS APPROVED SEED MIXTURES

SEED TYPE	MIXTURE %	SEED RATE (lbs/acre)	lbs/1000 ft^2)
INDIANGRASS	50	25 - 50	1 - 1-1/4
DOMESTIC ANNUAL RYEGRASS	50	25 - 50	1 - 1-1/4

SPECIFICATIONS:

1. ADD 20 LBS/ACRE OF ANNUAL RYEGRASS (LOLIUM MULTIFLORUM) TO THE BROADCAST MIX.
2. MULCH WITH A MINIMUM OF 3 BALES OF STRAW PER 1,000 SF. OR ALTERNATE METHOD CAN BE HYDROMULCH.

BACKFILL AND MISCELLANEOUS MATERIALS

TOTAL BACKFILL MATERIAL (yd^3)		CLEAN FILL (yd^3)	TOP SOIL (6")(yd^3)
BLASTWALL FOOTPRINT	56	28 (6")	28
HOTSPOTS (FR4)	49	36.5	12.5
HOTSPOTS (FR3)	4	2	2

NO. 2 GRANULAR FILL	CUBIC YARDS (yd^3)
TRUCK TURN AROUND (12")	12
SILT FENCE	LINEAR FEET 600
SAFETY FENCE	302.5
SOIL AMENDMENT	
CALCIMENT (6% DOSAGE RATE)	20 TONS
ENVIROBLEND (3% DOSAGE RATE, ALTERNATE	10 TONS

LEGEND

- ROADWAY
- GRAVEL ROAD
- ABANDONED RAIL ROAD
- CULVERT
- WETLAND AREA
- DRAINAGE DITCH
- SOIL BORING WHERE EXCEEDED RSL
- SOIL PILE
- P-1 PHOTOGRAPH WITH VIEW DIRECTION
- 1 COORDINATE LOCATION WITH POINT NO.
- HOTSPOT SOIL REMOVAL AREA
- BLAST WALL REMOVAL
- SF SILT FENCE
- SAFETY FENCE
- CONSTRUCTION LAYDOWN AREA
- 1 / C-8 DETAIL WITH DRAWING SHEET NUMBER

DRAWING INDEX

DRAWING NO.	DRAWING TITLE
C-1	TITLE SHEET
C-2	GENERAL NOTES
C-3	EXTENT OF IMPACTED SOILS REMOVAL
C-4	SITE PREPARATION PLAN & CONSTRUCTION SITE PLAN
C-5	SOIL STABILIZATION AND REMOVAL PLAN
C-6	VERIFICATION AND CONFIRMATION SAMPLING PLAN
C-7	RESTORATION PLAN
C-8	DETAILS
C-9	TRAFFIC MANAGEMENT PLAN

SOIL REMOVAL - VOLUME ESTIMATES

BLAST WALL REMOVAL	Height (ft)	Width (ft)	Length (ft)	Area (SF)	Volume (CF)	Volume (CY)	Tons*	COCs
Blast Wall - Outer Wooden Barricade	20	0.75	320	240	4,800	178	89	Lead
Blast Wall - Soil Inside Barricade (FR3-West Side)	10	10	75	750	7,500	278	375	Lead/PAHs
Blast Wall - Soil inside Barricade (FR4-East Side)	5	10	75	750	3,750	139	187	
						Subtotal	651	

HOT SPOT SOIL REMOVAL	Depth bgs (ft)	Width (ft)	Length (ft)	Area (SF)	Volume (CF)	Volume (CY)	Tons*	COCs
Soil excavated below Barricade	1	10	150	1500	1,500	56	75	Lead/PAHs
Soil hotspot excavation (F4T-SB007)	1	10	15	150	150	6	8	Lead/PAHs
Soil hotspot excavation (F4T-SB002)	1	10	10	100	100	4	5	PAHs
Soil hotspot excavation (F4T-SB001, -SB008)	2	10	10	100	200	7	10	Lead
Soil hotspot excavation (F4T-SB006)	1	10	10	100	100	4	5	PAHs
Soil hotspot excavation (F4S-SS031)	1	10	10	100	100	4	5	Lead
Soil hotspot excavation (F3S-SS006)	1	10	10	100	100	4	5	Lead
						Subtotal	113	

* ASSUMES 1.35 TONS/CUBIC YARDS SOIL DENSITY AND DENSITY OF WOOD AT 0.5 TONS/CUBIC YARDS

DESIGNED BY: R. SPRINZL
DRAWN BY: P. HOLM
APPROVED BY:
CHECKED BY:
DATE: 4/29/20
DRAWING NO. C:\18013\DWGS T17-PBS-FR34-C-2

REV.	DATE	DESCRIPTIONS	DRAWN BY	CHECKED BY

FIRING RANGES 3 & 4
REMOVAL ACTION WORK PLAN

DRAWING TITLE: GENERAL NOTES

CLIENT: NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
PROJECT: PLUM BROOK STATION

leidos

C-2
DRAWING NUMBER

LEGEND:

- ROADWAY
- GRAVEL ROAD
- ABANDONED RAIL ROAD
- CULVERT
- WETLAND AREA
- DRAINAGE DITCH
- SOIL BORING WHERE EXCEEDED RSL
- SOIL PILE
- P-1 PHOTOGRAPH WITH VIEW DIRECTION
- 1 COORDINATE LOCATION WITH POINT NO.

SOIL REMOVAL AREA

- HOTSPOT SOIL REMOVAL AREA
- BLAST WALL - SOIL BELOW BARRICADE
- BLAST WALL - OUTER WOODEN BARRICADE

* DEFINE EACH AREA AS NONHAZARDOUS, HAZARDOUS (TO BE TREATED), OR HAZARDOUS (REFER TO DATA SUMMARY TABLE).

NOTE:

LIMITS OF EXCAVATION ARE BASED ON MODELED EXTENTS OF CONTAMINATION AS SHOWN IN FIGURE 4 OF THIS FIRING RANGE REMOVAL ACTION WORK PLAN. THE EXCAVATION LIMITS HAVE BEEN MODIFIED FOR CONSTRUCTABILITY.

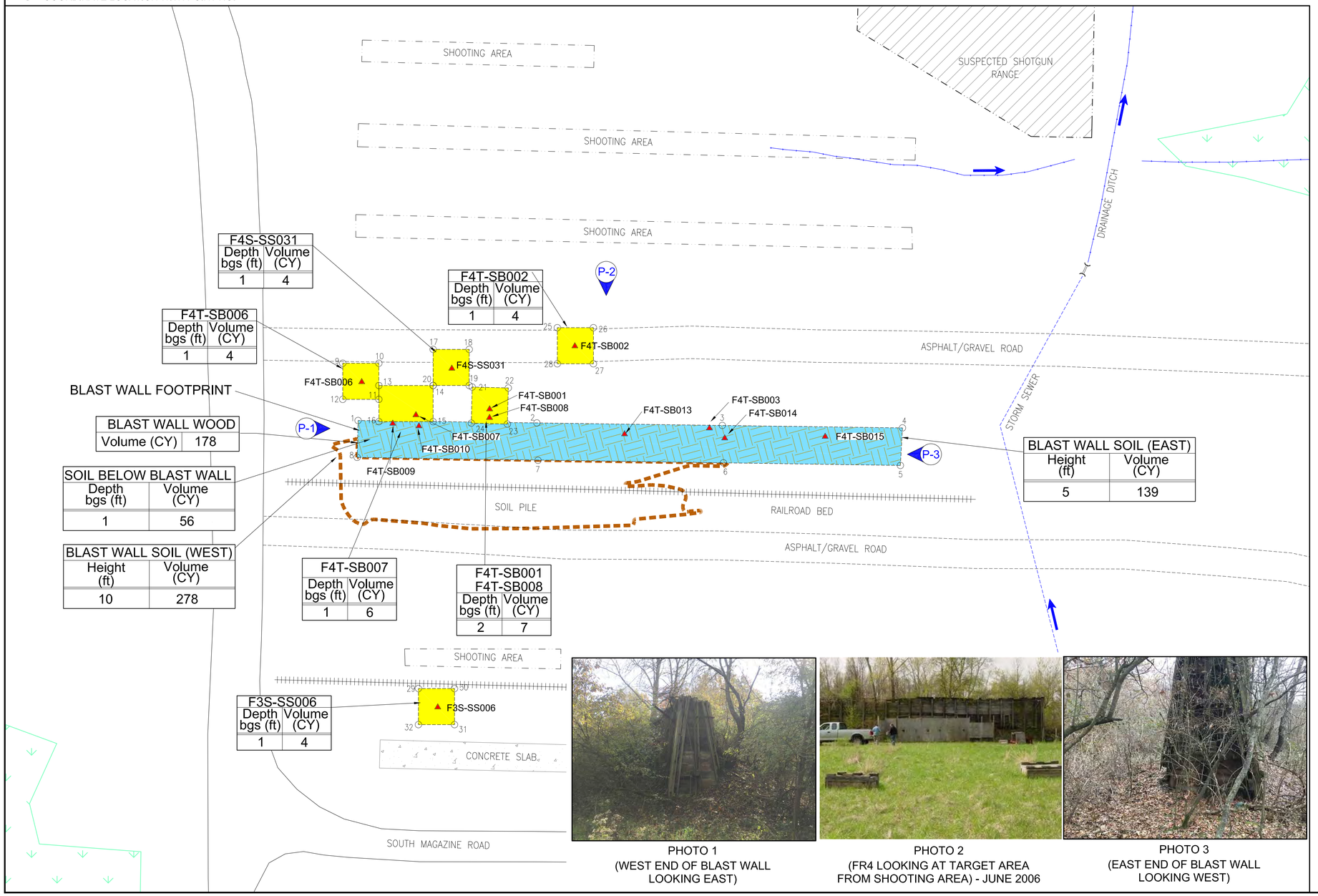


PHOTO 1
(WEST END OF BLAST WALL LOOKING EAST)

PHOTO 2
(FR4 LOOKING AT TARGET AREA FROM SHOOTING AREA) - JUNE 2006

PHOTO 3
(EAST END OF BLAST WALL LOOKING WEST)

AREA DESCRIPTION	POINT NO.	EASTING	NORTHING
BLAST WALL	1	1919609.49	614928.99
	2	1919658.96	614928.32
	3	1919710.27	614927.62
	4	1919760.13	614926.94
	5	1919759.55	614916.55
	6	1919710.58	614917.28
	7	1919659.27	614917.98
	8	1919609.24	614918.79
F4T-SB006	9	1919605.24	614944.83
	10	1919615.24	614944.83
	11	1919615.24	614934.83
	12	1919605.24	614934.83
F4T-SB007	13	1919615.25	614938.67
	14	1919630.25	614938.67
	15	1919630.25	614928.67
	16	1919615.25	614928.67
F4S-SS031	17	1919630.25	614948.67
	18	1919640.25	614948.67
	19	1919640.25	614938.67
	20	1919630.25	614938.67
F4T-SB001, -SB008	21	1919641.07	614938.25
	22	1919651.06	614938.00
	23	1919650.81	614928.00
	24	1919640.82	614928.25
F4T-SB002	25	1919664.61	614954.67
	26	1919674.61	614954.67
	27	1919674.61	614944.67
	28	1919664.61	614944.67
F3S-SS006	29	1919626.18	614854.85
	30	1919636.18	614854.85
	31	1919636.18	614844.85
	32	1919626.18	614844.85

COORDINATES ARE IN OHIO STATE PLANE, NAD 83 NORTH FEET.

SCALE: 1" = 15'

DESIGNED BY: R. SPRINZL
DRAWN BY: P. HOLM
APPROVED BY:
CHECKED BY:
DATE: 4/1/20
DRAWING NO. C:\18013\DWGS T17-PBS-FR34-C-3

REV.	DATE	DESCRIPTIONS	DRAWN BY	CHECKED BY

PROJECT: FIRING RANGES 3 & 4 REMOVAL ACTION WORK PLAN

DRAWING TITLE: EXTENT OF IMPACTED SOILS REMOVAL

CLIENT: NATIONAL AERONAUTICS AND SPACE ADMINISTRATION PLUM BROOK STATION

leidos

C-3

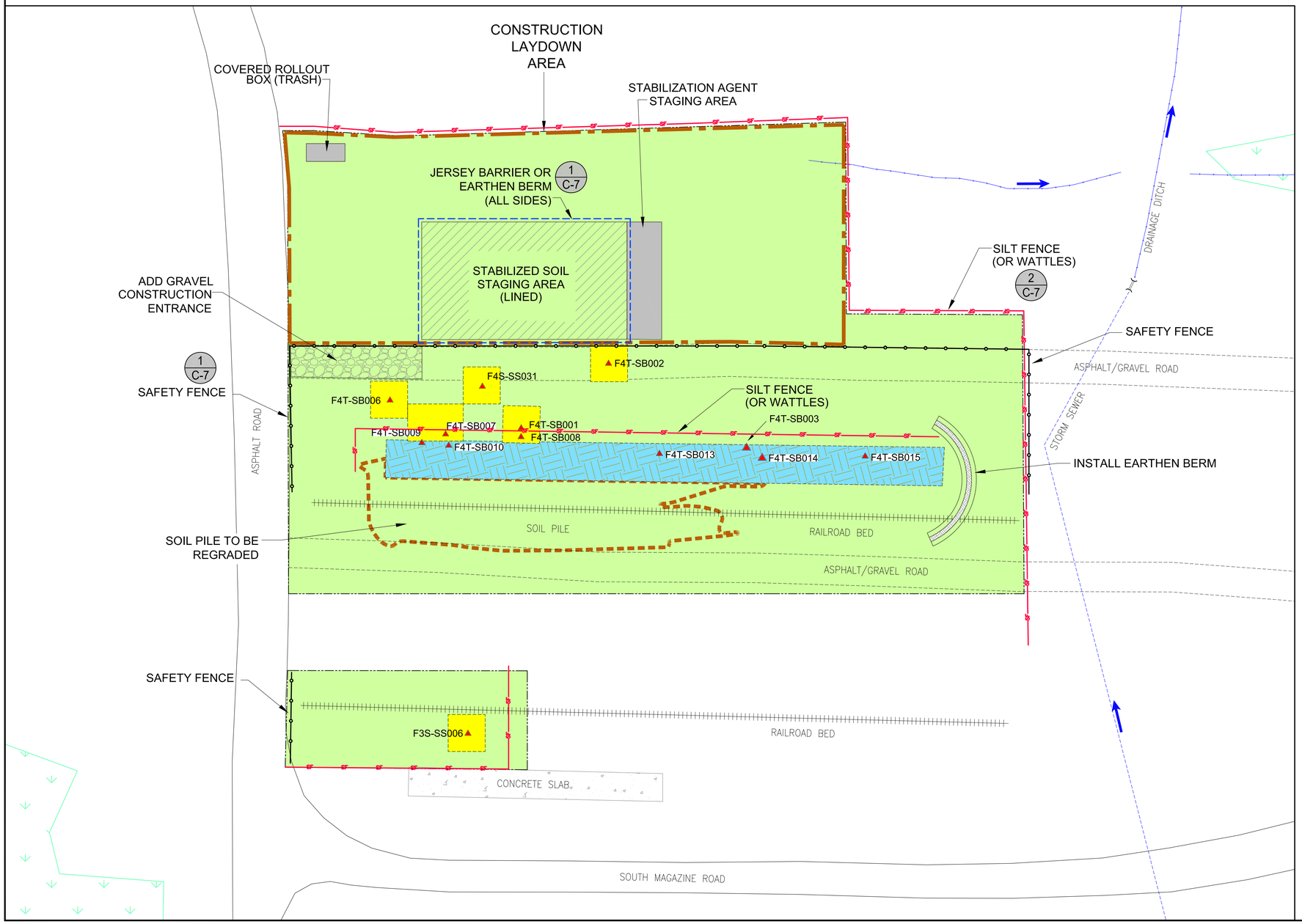
DRAWING NUMBER

LEGEND:

- ROADWAY
- GRAVEL ROAD
- ABANDONED RAIL ROAD
- CULVERT
- WETLAND AREA
- DRAINAGE DITCH
- SOIL BORING WHERE EXCEEDED RSL
- SOIL PILE
- CLEARING EXTENT
- CONSTRUCTION LAY DOWN AREA
- JERSEY BARRIER
- SILT FENCE
- SAFETY FENCE
- 1 / C-7 — DETAIL IDENTIFICATION & DRAWING NO.

SOIL REMOVAL AREA

- HOTSPOT SOIL REMOVAL AREA
- BLAST WALL - SOIL BELOW BARRICADE
- BLAST WALL - OUTER WOODEN BARRICADE



SITE PREPARATION

1. THE CONTRACTOR SHALL SET CONSTRUCTION SUPPORT FACILITIES AT APPROXIMATE LOCATIONS WITHIN THE CONSTRUCTION LAY DOWN AREA.
2. THE CONTRACTOR SHALL INSTALL SILT FENCE (OR WATTLES) AT LOCATIONS INDICATED ON THIS DRAWING IN ACCORDANCE WITH THE SPECIFICATIONS ON DRAWING C-7.
3. THE CONTRACTOR SHALL CLEAR AND GRUB TREES (INCLUDING FELLED TREES) IN AREAS NOTED ON THIS DRAWING. STUMPS MAY BE LEFT IN AREAS OUTSIDE OF ACCESS ROAD AND EXCAVATION AREAS.
4. TREE ROOTS WITHIN THE EXCAVATION AREA SHALL BE REMOVED DURING EXCAVATION ACTIVITIES AS DESCRIBED IN DRAWING C-7.
5. TREES AND VEGETATION MATERIALS SHALL BE MANAGED IN ACCORDANCE WITH SECTION 3.2.3 OF THIS FIRING RANGE 3 & 4 RA WORK PLAN.
6. THE CONTRACTOR SHALL CONTROL SITE ACCESS AT INGRESS/EGRESS.
7. WHEREVER POSSIBLE, THE CONTRACTOR SHALL NOT DISTURB EXISTING VEGETATION.
8. TOPSOIL OVERBURDEN MAY BE USED TO CONSTRUCT EARTHEN BERMS.
9. STABILIZED SOIL STAGING AREA SHALL BE GRADED A MINIMUM OF 1% SLOPE TOWARDS THE NORTHWEST CORNER OF THE STAGING AREA TO MANAGE SURFACE WATER. SURFACE WATER SHALL BE COLLECTED WITH A DEWATERING PUMP AND STORED IN TANK(S). DEWATERING HOSE AND STORMWATER CONTROLS SHALL BE INSPECTED DAILY AND REPAIRED/REPLACED AS NEEDED.
10. THE CONTRACTOR SHALL HAVE TANK ON STANDBY FOR DELIVERY AND SETUP, IF NEEDED, FOR MANAGING EXCAVATION WATER.
11. AN EXCLUSION ZONE SHALL BE ESTABLISHED TO SURROUND OPEN AND ACTIVE EXCAVATION AREAS. PERSONNEL AND EQUIPMENT ACCESS TO THE EXCLUSION ZONE SHALL BE LIMITED TO AUTHORIZED INDIVIDUALS/EQUIPMENT TO MINIMIZE DIRECT CONTACT WITH CONTAMINATED SOILS. CONTAMINATION REDUCTION AND SUPPORT ZONES SHALL BE ESTABLISHED WITHIN THE LIMITS OF CONSTRUCTION. TRUCK/EQUIPMENT EXITING THE CONTAMINATION REDUCTION ZONE SHALL BE INSPECTED AND CLEANED AT THE ESTABLISHED INSPECTION ZONE.
12. CONTRACTOR SHALL USE CAUTION DURING VEGETATION CLEARING TO AVOID ABANDONED ELECTRICAL AND FENCE POSTS. CAUTION TAPE OR SAFETY FENCE WILL BE PLACED AROUND POSTS.

SEQUENCE OF CONSTRUCTION:

1. SET UP CONSTRUCTION SUPPORT FACILITIES (E.G. EQUIPMENT TRAILER, SANITARY FACILITIES, ETC.)
2. INSTALL STORMWATER CONTROLS AS INDICATED ON DRAWING.
3. CLEAR AND GRUB AREAS AS INDICATED ON DRAWING.
4. A LAND SURVEY OF THE EXCAVATION AREAS INDICATED ON DRAWING C-3 SHALL BE PERFORMED. THE SURVEYED EXCAVATION AREAS SHALL BE STAKED, FLAGGED, AND ROPED OFF TO PREVENT CONSTRUCTION ACTIVITIES IN THESE AREAS.
5. IF NECESSARY, ESTABLISH THE STABILIZATION AGENT STAGING AREAS ACCORDING TO SECTION 4.23 OF THE FIRING RANGE 3 & 4 RA WORK PLAN.
6. THE CONTRACTOR SHALL CONSTRUCT THE STABILIZED SOIL STAGING AREA IF NECESSARY, WITH CONCRETE JERSEY BARRIERS AND EARTHEN BERMS INDICATED ON DRAWING.
7. THE CONTRACTOR SHALL CONSTRUCT CONSTRUCTION ENTRANCE AS INDICATED ON DRAWING.
8. THE CONTRACTOR SHALL INSTALL SAFETY FENCE BETWEEN LAYDOWN AREA AND ROAD.

N

0 5 10 15 30
SCALE: 1" = 15'

REV.	DATE	DESCRIPTIONS	DRAWN BY	CHECKED BY

DRAWN BY: P. HOLM
DESIGNED BY: R. SPRINZL
CHECKED BY:
APPROVED BY:
DATE: 4/29/20
DRAWING NO. C:\18013\DWGS T17-PBS-FR34-C-4

PROJECT: FIRING RANGES 3 & 4 REMOVAL ACTION WORK PLAN

DRAWING TITLE: SITE PREPARATION PLAN AND CONSTRUCTION SITE PLAN

CLIENT: NATIONAL AERONAUTICS AND SPACE ADMINISTRATION PLUM BROOK STATION

leidos

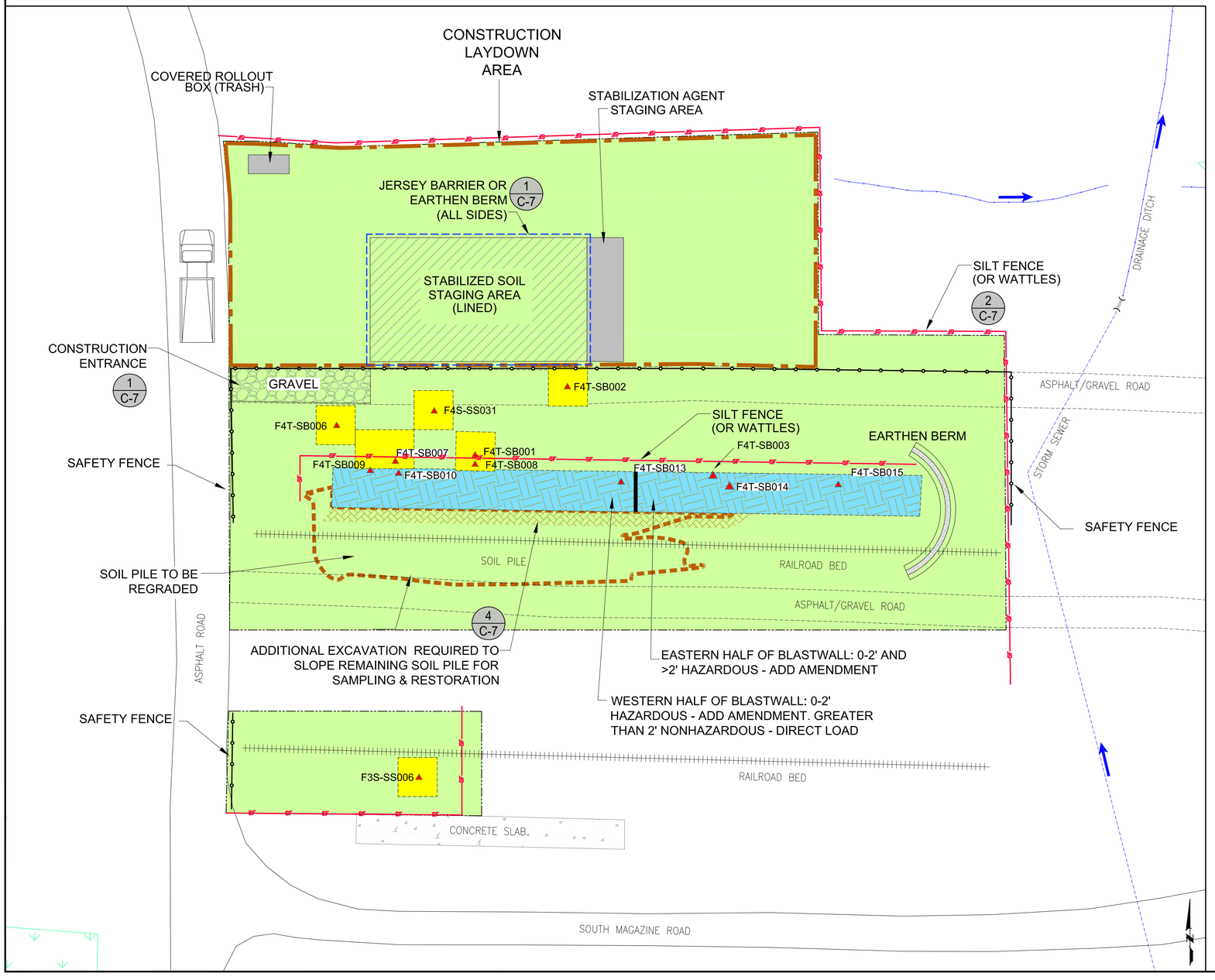
C-4
DRAWING NUMBER

LEGEND:

- ROADWAY
- GRAVEL ROAD
- ABANDONED RAIL ROAD
- CULVERT
- WETLAND AREA
- DRAINAGE DITCH
- SOIL BORING WHERE EXCEEDED RSL
- SOIL PILE
- CLEARING EXTENT
- CONSTRUCTION LAY DOWN AREA
- JERSEY BARRIER
- SILT FENCE (S F)
- SAFETY FENCE
- 1 / C-7 — DETAIL IDENTIFICATION & DRAWING NO.

SOIL REMOVAL AREA

- HOTSPOT SOIL REMOVAL AREA
- BLAST WALL - SOIL BELOW BARRICADE
- BLAST WALL - OUTER WOODEN BARRICADE
- ADDITIONAL EXCAVATION TO SLOPE SOIL PILE



REMOVAL PLAN:

1. THE WOODEN BARRICADE OF BLAST WALL WILL BE REMOVED FIRST AND DISPOSED OFF SITE IN ONROAD HAUL TRUCKS AT APPROVED HAZARDOUS WASTE FACILITY (ENVIROSAFE OF OREGON, OH.
2. SOIL REMOVAL AT THE BLAST WALL SHALL BE PEFORMED PRIOR TO REMEDIATING THE HOT SPOT EXCAVATIONS.
3. TO REMEDIATE THE BLASTWALL (IF NECESSARY), THE CONTRACTOR SHALL USE ONE OF THE APPROVED SOIL STABILIZATION AGENTS SPECIFIED IN SECTION 4.2 OF THIS FIRING RANGE 3 & 4 RA WORK PLAN OR EQUIVALENT. THE CONTRACTOR MAY USE AN EQUIVALENT PRODUCT PROVIDED THE CONTRACTOR CAN DEMONSTRATE THE PRODUCT IS AS EFFECTIVE AS THE APPROVED STABILIZATION AGENT. THE TECHNICAL SPECIFICATIONS AND TREATABILITY RESULTS FOR THE PROPOSED ALTERNATIVE AGENT MUST BE PROVIDED TO NASA GRC FOR APPROVAL AT LEAST 30 DAYS PRIOR TO INITIATING CONSTRUCTION ACTIVITIES.
4. MISTING WILL BE EMPLOYED TO MINIMIZE DUST GENERATION, IF DUST ACTION LIMITS IN HASP EXCEEDED USING REAL-TIME DUST MONITOR. SOILS SHALL BE PROPERLY DISPOSED IN ACCORDANCE WITH FEDERAL, STATE, AND LOCAL LAWS AND REGULATIONS.
5. EARTHMOVING EQUIPMENT, SUCH AS AN EXCAVATOR, SHALL BE USED TO EXCAVATE THE SOILS AT THE BLAST WALL AND HOT SPOTS. EXCAVATED SOILS SHALL BE MIXED ON SITE, AND MOVED TO STOCKPILE. EXCAVATOR SHALL ADD STABILIZATION AGENT AT RECOMMENDED DOSAGES (SECTION 4.2 OF THIS FIRING RANGE RA WORK PLAN). MIXING SHALL BE CONTINUED UNTIL AGENT IS THOROUGHLY INCORPORATED INTO SOIL PER MANUFACTURER SPECIFICATIONS AND RECOMMENDATIONS.
6. EQUIPMENT TRACKS AND/OR TIRES SHALL NOT CONTACT IMPACTED SOILS WITHIN THE EXCAVATION. BOARD ROADS SHALL THEN BE PLACED OVER THE HOT SPOT EXCAVATIONS WITHIN THE GRAVEL ROAD TO ALLOW THE EXCAVATOR TO WORK WITHOUT CONTACTING INPACTED SOILS.
7. STABILIZED SOILS SHALL BE SEGREGATED INTO SUBAREAS TO FACILITATE STABILIZATION CONFIRMATION SAMPLING (DRAWING NUMBER C-6 AND SECTION 5.1 OF THIS FIRING RANGE 3 & 4 RA WORK PLAN).
8. TREE ROOT BALLS SHALL BE REMOVED BY THE EXCAVATOR AND PLACED IN A ROLL OFF BOX OR SOIL TRUCKS SEGREGATED FROM SOILS.
9. AN ADDITIONAL 6 INCHES OF SOIL SHALL BE REMOVED FROM THE STABILIZED SOIL STAGING AREA AND VERIFICATION SAMPLING CONDUCTED (DRAWING C-6 AND SECTION 5.2 OF THIS RA WORK PLAN. THE EXCAVATED SOILS SHALL BE DIRECT LOADED INTO ON-ROAD HAUL TRUCKS.
10. LIMITS OF SOIL REMOVAL ARE REFERENCED ON DRAWING NUMBER C-3.
11. OPEN EXCAVATIONS AND STABILIZED SOILS SHALL BE COVERED AT THE END OF EACH WORK DAY AND DURING INCLEMENT WEATHER.

SEQUENCE OF CONSTRUCTION

1. ESTABLISH LIMITS OF EXCAVATION AS INDICATED ON DRAWING C-3.
2. CONSTRUCT STORMWATER CONTROLS (EARTHEN BERMS, ETC.) AS INDICATED ON DRAWING C-4.
3. SOIL STABILIZATION (IF NECESSARY) AND EXCAVATION SHALL OCCUR AT BLAST WALL PRIOR TO STABILIZATION AND EXCAVATION ACTIVITIES AT THE HOT SPOT EXCAVATION.
4. EXCAVATE AND STABILIZE SOILS FROM THE BLAST WALL FOOTPRINT AS INDICATED ON DRAWING.
5. OBTAIN VERIFICATION SAMPLES WITHIN BLAST WALL IN ACCORDANCE WITH DRAWING C-6 AND SECTION 5.2 OF THIS FIRING RANGE 3 & 4 RA WORK PLAN.
6. OBTAIN STABILIZATION CONFIRMATION SAMPLES IN ACCORDANCE WITH DRAWING C-6 AND SECTION 5.1 OF THIS FIRING RANGE 3 & 4 RA WORK PLAN PRIOR TO LOADOUT OF STABILIZED SOILS. ADDITIONAL SOIL STABILIZATION SHALL BE DETERMINED BY STABILIZATION CONFIRMATION RESULTS. DECONTAMINATE EXCAVATOR BUCKET OVER SOIL STABILIZATION AREA IN ACCORDANCE WITH SECTION 4.4 OF THIS FIRING RANGE RA WORK PLAN.
7. LOADOUT STABILIZED SOILS FROM SOIL STAGING AREA INTO ON-ROAD HAUL TRUCKS FOR TRANSPORTATION TO APPROVED DISPOSAL FACILITY.

NOTE: HOT SPOT EXCAVATIONS SHALL FOLLOW THE SAME SEQUENCE OF CONSTRUCTION AS THE BLAST WALL.

0 5 10 15 30
SCALE: 1" = 15'

DESIGNED BY: R. SPRINZL
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APPROVED BY:
DATE: 4/29/20
DRAWING NO: C:\18013\OWCS T17-PBS-FR34-C-5

REV.	DATE	DESCRIPTIONS	DRAWN BY	CHECKED BY

PROJECT: FIRING RANGES 3 & 4 REMOVAL ACTION WORK PLAN

DRAWING TITLE: SOIL STABILIZATION AND REMOVAL PLAN

CLIENT: NATIONAL AERONAUTICS AND SPACE ADMINISTRATION PLUM BROOK STATION

leidos

C-5

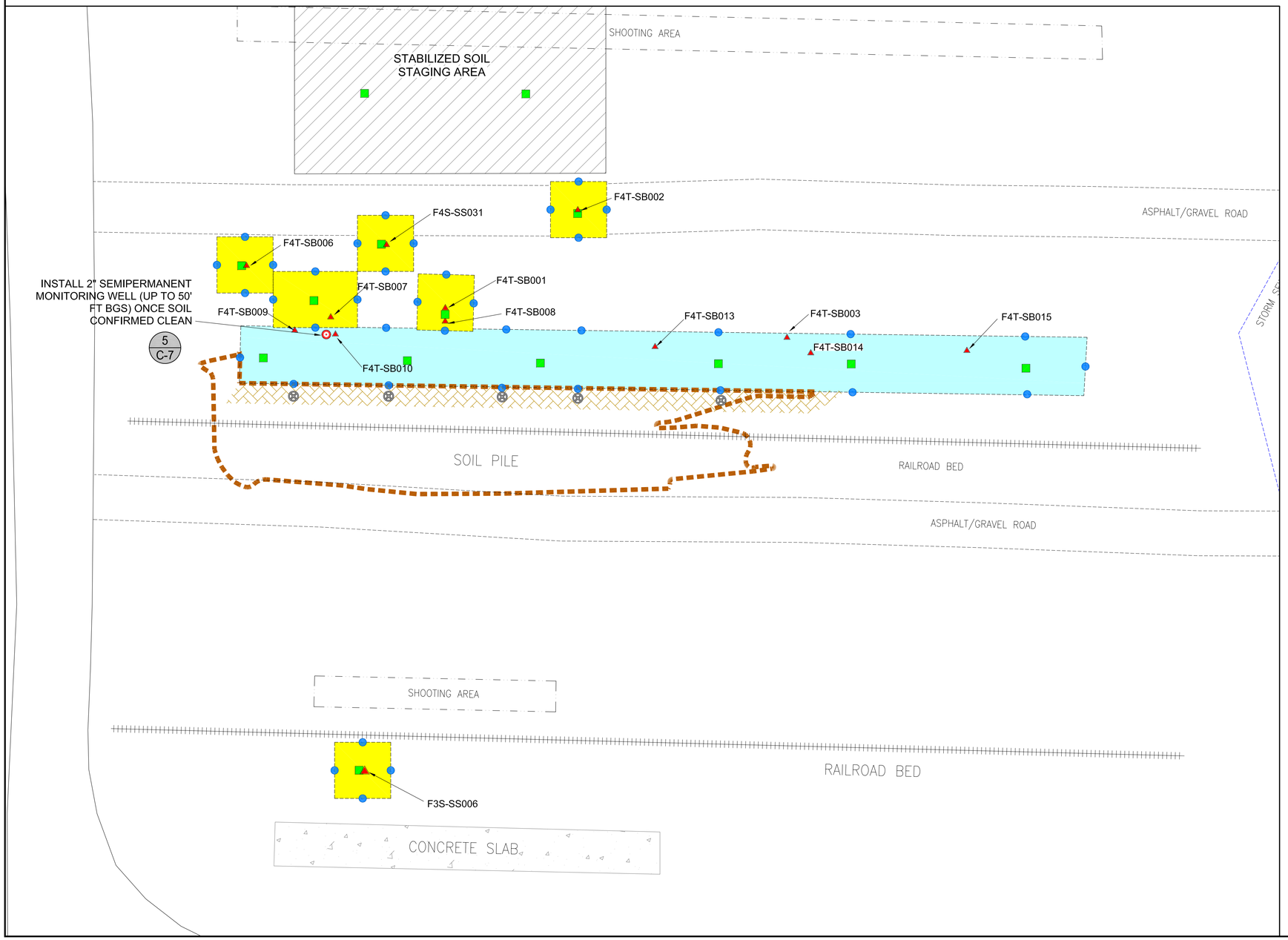
DRAWING NUMBER

LEGEND:

- ROADWAY
- GRAVEL ROAD
- ABANDONED RAIL ROAD
- CULVERT
- DRAINAGE DITCH
- EXISTING SOIL BORING
- PROPOSED FLOOR SAMPLE (INCLUDES XRF FOR LEAD AREAS
- PROPOSED WALL SAMPLE (1 OR MORE INTERVALS) (INCLUDES XRF FOR LEAD AREAS
- PROPOSED SOIL PILE WALL XRF SAMPLE
- SEMIPERMANENT MONITORING WELL
- 1 / C-7 DETAIL IDENTIFICATION & DRAWING NO.

SOIL REMOVAL AREA

- HOTSPOT SOIL REMOVAL AREA
- BLAST WALL - OUTER WOODEN BARRICADE
- ADDITIONAL EXCAVATION TO SLOPE SOIL PILE



CONFIRMATION SAMPLING:

1. CONFIRMATION SAMPLING SHALL BE CONDUCTED TO CONFIRM SOILS ARE ADEQUATELY TREATED IN ACCORDANCE WITH SECTION 5.1 OF THIS FIRING RANGE 3 & 4 RA WORK PLAN.
2. SOIL STABILIZATION AREAS SHALL BE DIVIDED INTO SUBAREAS.
3. BLAST WALL SOILS SHALL BE SEGREGATED INTO SEPARATE SUBAREAS TO ENSURE ADEQUATE STABILIZATION OCCURS.
4. WHEN LOAD-OUT OF A SUBAREA IS WARRANTED, ONE COMPOSITE SAMPLE SHALL BE OBTAINED FROM THE APPROXIMATE CENTER OF THE SUBAREA.
5. THE SAMPLE SHALL BE ANALYZED FOR THE DISPOSAL FACILITIES WASTE ACCEPTANCE CRITERIA.
6. ANY SUBAREA FAILING WASTE ACCEPTANCE CRITERIA FOR LEAD, ANTIMONY OR ARSENIC (EITHER LDR OR TCLP AS REQUIRED BY DISPOSAL FACILITY) SHALL BE FURTHER STABILIZED AND RESAMPLED.

EXCAVATION VERIFICATION SAMPLING:

1. EXCAVATION VERIFICATION SAMPLING SHALL BE CONDUCTED TO CONFIRM ALL IMPACTED SOILS ARE REMOVED IN ACCORDANCE WITH SECTION 5.2 OF THIS FIRING RANGE RA WORK PLAN.
3. VERIFICATION SAMPLES SHALL BE OBTAINED AT THE APPROXIMATE LOCATIONS INDICATED ON THE DRAWING.
4. VERIFICATION SAMPLES SHALL BE ANALYZED FOR LEAD USING XRF TECHNOLOGY OR AT AN APPROVED LABORATORY AS INDICATED ON DRAWING.
5. XRF SAMPLES WILL ALSO BE COLLECTED FROM THE REMAINING SOIL PILE ALONG THE EXCAVATED SLOPE AND SAMPLES WILL BE ANALYZED BY LABORATORY TO CONFIRM.
6. FOLLOWING SCRAPING UP TO 0.5 BGS IN THE STABILIZED SOIL STAGING AREA, VERIFICATION SAMPLES WILL BE COLLECTED FROM FLOOR. (0-0.5 FT DEPTH).

GROUNDWATER CONFIRMATION SAMPLING

1. ONCE THE BLASTWALL FOOTPRINT IS CONFIRMED CLEAN AND BACKFILLED, THE CONTRACTOR WILL INSTALL A SEMI-PERMANENT BEDROCK MONITORING WELL (2" PCV UP TO ESTIMATED 50 FT BGS) CO-LOCATED WITH F4T-SB010 (MAXIMUM LEAD CONCENTRATION IN SOIL) INSTALLATION AND DEVELOPMENT IN ACCORDANCE WITH SECTION 5.3 OF RA WORKPLAN.
2. GROUNDWATER SAMPLE WILL BE COLLECTED AT LEAST 48 HOURS FOLLOWING PROPER DEVELOPMENT.
3. MONITOR WELL WILL BE ABANDONED IF NO GROUNDWATER CONCENTRATION IS PRESENT IN ACCORDANCE WITH SECTION 5.3 OF RA WORKPLAN.

0 2 4 6 8 10 20
SCALE: 1" = 10'

DESIGNED BY: R. SPRINZL
DRAWN BY: P. HOLM
APPROVED BY:
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DATE: 1/21/20
DRAWING NO: C:\18013\DWGS T17-PBS-FR34-C-6

REV.	DATE	DESCRIPTIONS	DRAWN BY	CHECKED BY

PROJECT: FIRING RANGES 3 & 4 REMOVAL ACTION WORK PLAN

DRAWING TITLE: VERIFICATION AND CONFIRMATION SAMPLING PLAN

CLIENT: NATIONAL AERONAUTICS AND SPACE ADMINISTRATION PLUM BROOK STATION

leidos

C-6

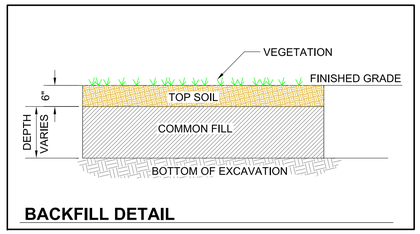
DRAWING NUMBER

LEGEND:

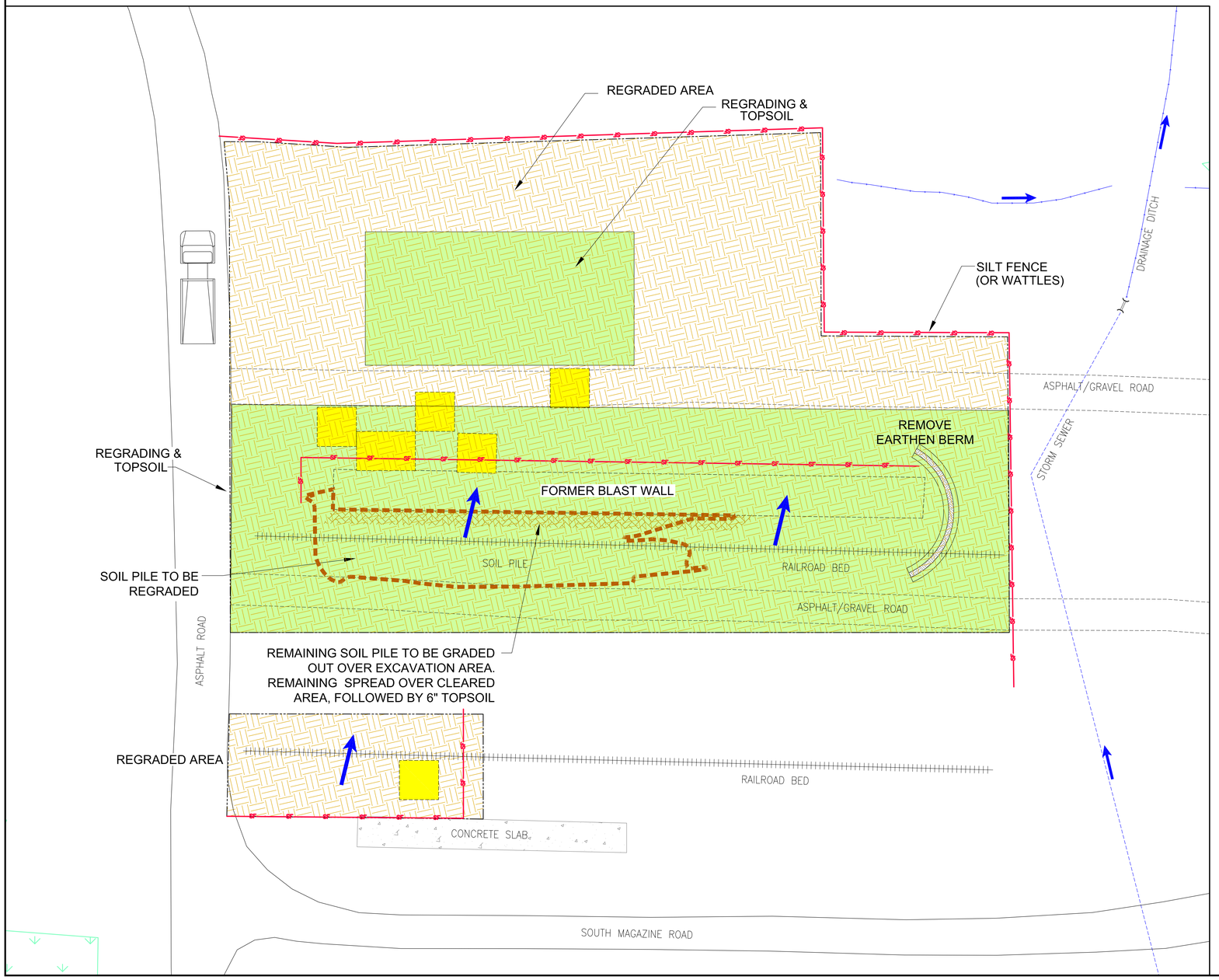
- ROADWAY
- GRAVEL ROAD
- ABANDONED RAIL ROAD
- CULVERT
- WETLAND AREA
- DRAINAGE DITCH
- SOIL PILE
- STORMWATER FLOW DIRECTION
- JERSEY BARRIER
- S F — SILT FENCE

BACK FILL AREAS:

- REGRADED AREA
- TOPSOIL
- HOTSPOT SOIL REMOVAL AREA



BACKFILL DETAIL

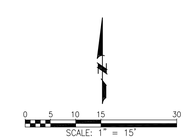


FINAL GRADING AND RESTORATION:

1. EARTHEN BERMS SHALL BE USED AS BACKFILL MATERIALS, IF NOT IMPACTED.
2. SOIL STAGING AREA SHALL BE GRADED TO APPROXIMATE PRE-CONSTRUCTION ELEVATIONS.
3. EXCAVATIONS AND REMAINING SOIL PILE SHALL BE GRADED TO EXISTING UNDISTURBED GROUND ELEVATIONS OR BACKFILLED WITH CLEAN SOILS IN ACCORDANCE WITH NASA GRC ENVIRONMENTAL PROGRAM MANUAL, CHAPTER 20-HANDLING, REUSE, AND DISPOSAL OF SOIL AND ALL APPLICABLE REGULATIONS AND GUIDANCE. BACKFILL SCREENING CRITERIA AGAINST WHICH THE ANALYTICAL RESULTS WILL BE EVALUATED, INCLUDES BACKGROUND SCREENING LEVELS AND USEPA REGIONAL SCREENING LEVELS CORRESPONDING TO A TARGET RISK OF 1E-06 AND A TARGET HAZARD QUOTIENT OF 0.1.

SEQUENCE OF RESTORATION:

1. REMOVE ALL EQUIPMENT FROM AREAS TO BE REVEGETATED PRIOR TO RESTORATION ACTIVITIES.
2. BACKFILL AND GRADE ALL EXCAVATIONS AND RESTORATION AREAS. UPPER 6" WILL BE TOPSOIL.
3. CONDUCT TOPOGRAPHIC LAND SURVEY OF BACKFILLED AND GRADED AREAS AFTER GRADING IS ACCEPTED BY NASA TM OR DESIGNEE.
4. REVEGETATE (HYDROSEED OR SEED/MULCH).
5. HYDROSEED STABILIZED SOIL STAGING AREA AND LAYDOWN AREAS.
6. SILT FENCING OR WATTLES SHALL BE REMOVED BY SUBCONTRACTOR AFTER SEED HAS TAKEN ROOT AND THE NASA TM APPROVES REMOVAL OF SILT FENCE. AREAS WHERE SEED DID NOT PROVIDE ADEQUATE COVERAGE (AT LEAST 70%) SHALL BE RESEEDED. SILT FENCE REMOVAL SHALL BE DETERMINED BY THE NASA TM. SILT FENCING REMOVAL AND RESEEDING ACTIVITIES SHALL NOT NEGATIVELY IMPACT FINAL GRADING. FINAL GRADING SHALL BE REPAIRED AT NO COST IF NEGATIVE IMPACT OCCURS.



DESIGNED BY: R. SPRINZL
DRAWN BY: P. HOLM
APPROVED BY:
CHECKED BY:
DATE: 4/29/20
DRAWING NO. C:\18013\DWGS T17-PBS-FR34-C-7

REV.	DATE	DESCRIPTIONS	DRAWN BY	CHECKED BY

PROJECT: FIRING RANGES 3 & 4 REMOVAL ACTION WORK PLAN

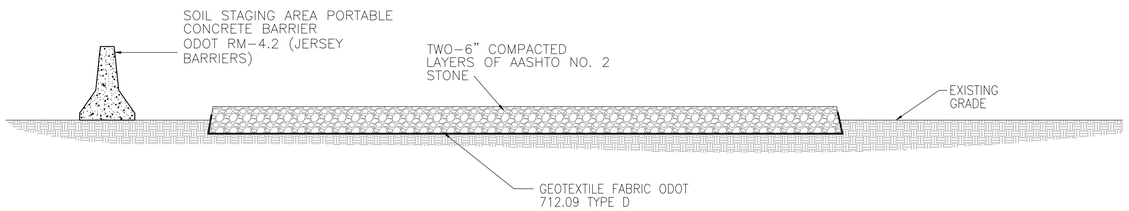
DRAWING TITLE: RESTORATION PLAN

CLIENT: NATIONAL AERONAUTICS AND SPACE ADMINISTRATION PLUM BROOK STATION

leidos

C-7

DRAWING NUMBER



1 C-4 CONSTRUCTION ENTRANCE DETAIL
NOT TO SCALE

CONSTRUCTION ENTRANCE:

1. THE CONTRACTOR SHALL CONSTRUCT A CONSTRUCTION ENTRANCE TO FACILITATE LOADOUT OF STABILIZED SOILS INTO HIGHWAY HAUL TRUCKS.

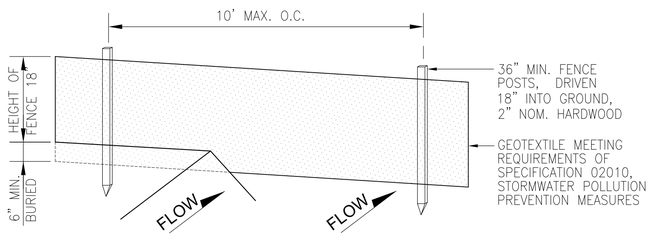
2. THE CONTRACTOR SHALL USE COMPACTED GRANULAR MATERIAL (AASHTO SIZE NO. 2 OR SIMILAR).

3. THE CONTRACTOR SHALL LEAVE CONSTRUCTION ENTRANCE AND RESTORE THE AREA TO PRE-CONSTRUCTION CONDITIONS IN ACCORDANCE WITH DRAWING C-5 AND AS NOTED IN SECTION 7 OF THIS FIRING RANGE 3 & 4 RA WORK PLAN.

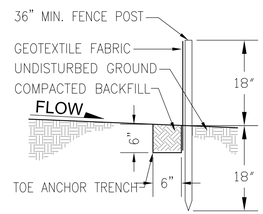
NOTES:

1. THE CONTRACTOR SHALL PROVIDE SILT FENCES OR WATTLES (SEE DETAIL) AS A TEMPORARY STRUCTURE TO MINIMIZE EROSION AND SEDIMENT RUNOFF. SILT FENCES SHALL BE PROPERLY INSTALLED TO EFFECTIVELY RETAIN SEDIMENT. SILT FENCES SHALL BE INSTALLED AT THE LOCATIONS SHOWN ON DRAWING C-4 CONSTRUCTION SITE PLAN.

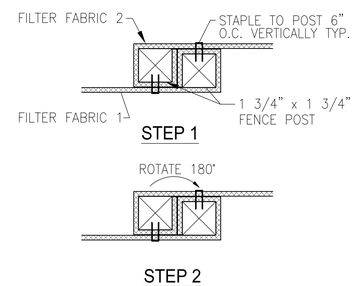
2. THE CONTRACTOR SHALL INSPECT ALL EROSION CONTROL MEASURES WEEKLY AND WITHIN 24 HOURS OF A STORM EVENT (GREATER THAN 0.5"). ANY REQUIRED REPAIRS SHALL BE MADE IMMEDIATELY.



SILT FENCE PERSPECTIVE VIEW



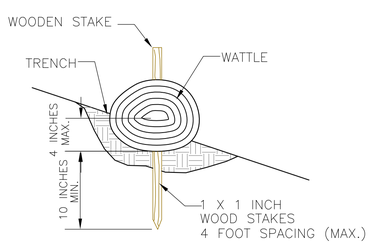
FENCE SECTION



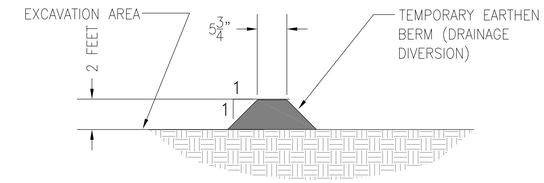
① ROTATE BOTH POST WITH FABRIC CLOCKWISE AT LEAST 180°
② EMBED BOTH POST INTO GROUND PER APPLICABLE FILTER FENCE SPECIFICATIONS

SILT FENCE CONNECTION POINT

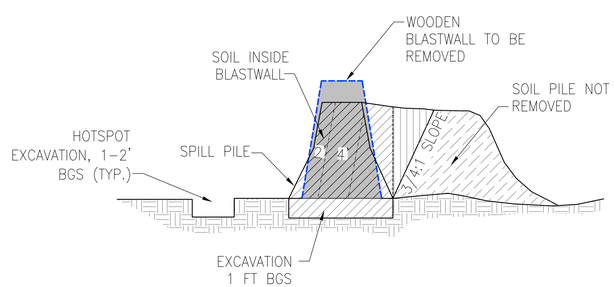
2 C-3 SILT FENCE AND WATTLE DETAILS
NOT TO SCALE



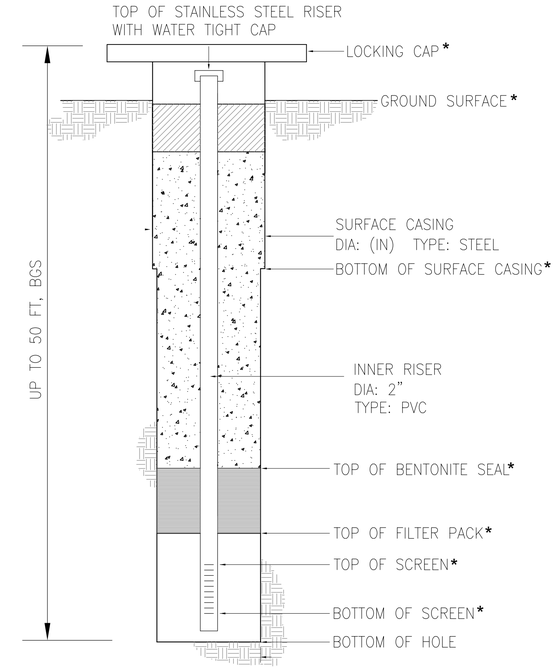
WATTLE DETAIL
STRAW OR WOOD



3 C-4 TEMPORARY EARTHEN BERM DETAIL
NOT TO SCALE



4 C-5 SECTION - SOIL PILE WEST END VIEW
NOT TO SCALE



* THESE DISTANCES WILL BE DETERMINED BY THE FIELD GEOLOGIST BASED ON FIELD CONDITIONS. WELL WILL BE INSTALLED FOLLOWING OHIO TGM.

5 C-6 SEMIPERMANENT MONITORING WELL
NOT TO SCALE

DESIGNED BY: R. SPRINZL
DRAWN BY: P. HOLM
APPROVED BY:
CHECKED BY:
DATE: 4/29/20
DRAWING NO. C:\18013\OWCS T17-PBS-FR34-C-8

REV.	DATE	DESCRIPTIONS	DRAWN BY	CHECKED BY

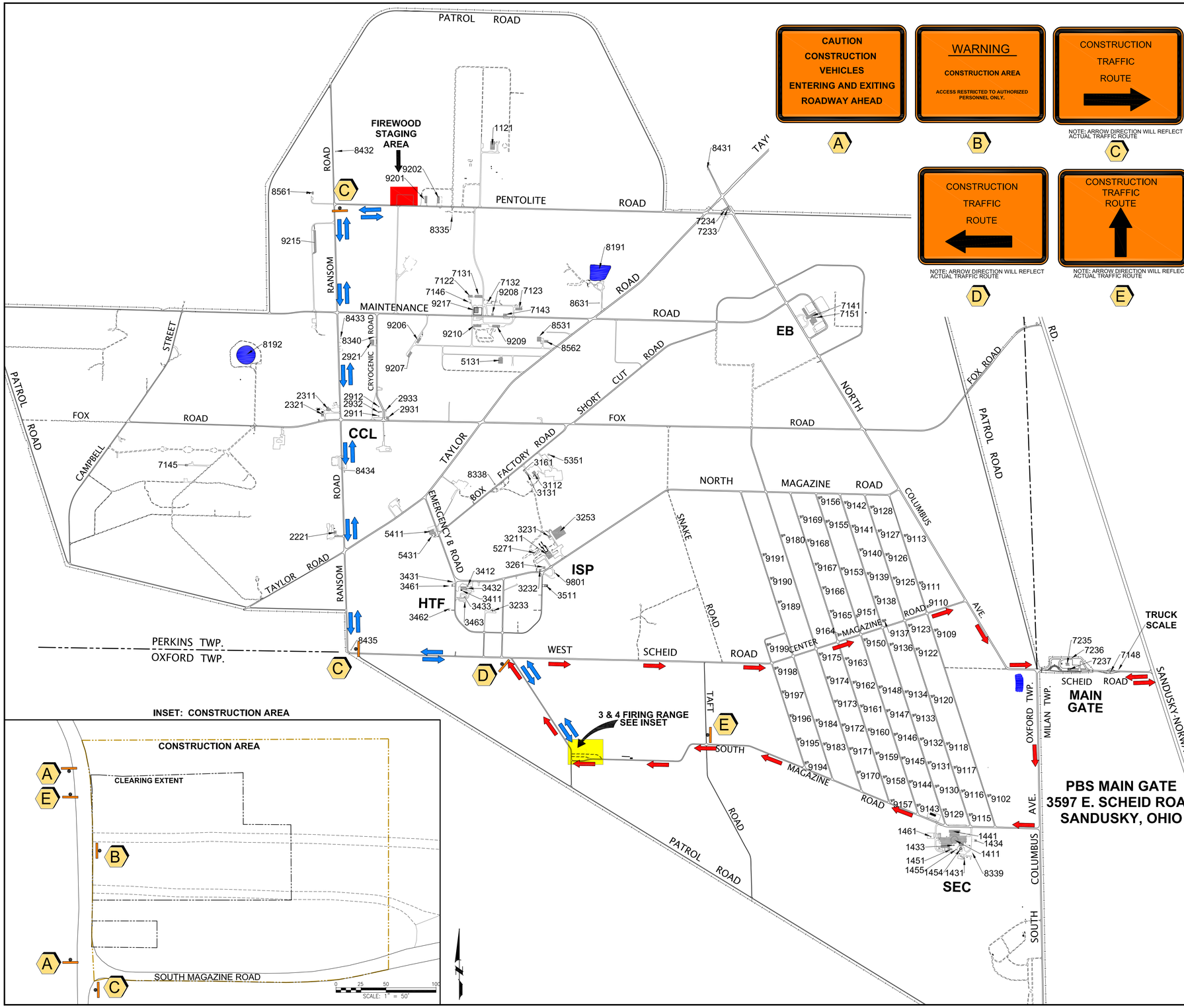
FIRING RANGES 3 & 4
REMOVAL ACTION WORK PLAN

DRAWING TITLE: DETAILS

CLIENT: NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
PROJECT: PLUM BROOK STATION

leidos

C-8
DRAWING NUMBER



LEGEND:

- FENCE
- ROADWAY
- PROJECT SITE
- SOIL TRUCK TRAFFIC ARROW
- FIREWOOD TRUCK TRAFFIC ARROW
- TRAFFIC SIGN
- E — TRAFFIC SIGN TYPE

NOTES:

1. ALL VEHICLES MUST ENTER NASA PLUM BROOK STATION (PBS) THROUGH THE MAIN GATE (3597 E. SCHIED ROAD, SANDUSKY, OHIO).
2. ALL VEHICLES AND CONTENTS ARE SUBJECT TO SEARCH AND INSPECTION.
3. NO WEAPONS, LIGHTERS OR SIMILAR FIRE STARTERS, OR ALCOHOL ARE PROHIBITED ONSITE. PROHIBITED ITEMS MAY BE LEFT WITH SECURITY WHILE ONSITE. SECURITY WILL CONFISCATE ANY PROHIBITED ITEMS DISCOVERED DURING INSPECTIONS.
4. ALL PERSONNEL ENTERING PBS MUST COMPLETE THE PBS SECURITY ACCESS FORM AND SUBMIT IT TO NASA TM FOR ACCESS TO THE FACILITY. NASA TM WILL COORDINATE WITH THE PBS SECURITY WHO WILL APPROVE ALL ACCESS TO THE FACILITY. ACCESS MUST BE COORDINATED AT LEAST 48 HOURS IN ADVANCE. ALL WEEKEND AND HOLIDAY WORK MUST BE PREAPPROVED BY PBS SECURITY.
5. ALL ON-ROAD HAUL TRUCKS WILL ADHERE TO ODOT TRANSPORTATION GUIDELINES. THE CONTRACTOR IS RESPONSIBLE FOR ENSURING AND VERIFYING TRUCKS DO NOT EXCEED 80,000 LBS. GROSS WEIGHT, USING PBS TRUCK SCALE, IF NECESSARY PORTABLE SCALE WILL BE PROVIDED BY THE CONTRACTOR.
6. ALL HAUL TRUCKS WILL HAVE OPERATIONAL LOAD COVERS IN GOOD CONDITION (I.E., FREE OF HOLES, TEARS). LOADS WILL BE COVERED PRIOR TO DEPARTING THE PROJECT AREAS AND WILL STAY IN PLACE UNTIL UNLOADING AT THE APPROVED DISPOSAL SITE.
7. ON-ROAD HAUL TRUCKS HAULING HAZARDOUS WASTE SHALL BE LINED IN ACCORDANCE WITH THE APPROVED DISPOSAL FACILITY REQUIREMENTS.
8. ROADS SHALL NOT BE BLOCKED. PBS TRAFFIC SHALL BE MAINTAINED ON AT LEAST ONE HALF OF THE ROADWAY WIDTH AT ALL TIMES.
9. CONTRACTOR SHALL CONFIRM NO OVERHEAD HAZARDS (I.E., POWER LINES), MANHOLES, AND WATER VALVES WILL IMPEDE REMEDIAL ACTIVITIES.
10. SIGN LETTERING SHALL BE BLACK ON A FLUORESCENT ORANGE BACKGROUND WITH A BAKED ENAMEL FINISH. LETTERING SHALL NOT BE LESS THAN 2 INCHES HIGH. SIGNS WILL BE CONSTRUCTED AS AN A-FRAME STYLE SUCH THAT THEY CAN BE EASILY PLACED AND REMOVED BY THE CONTRACTOR.
11. SIGNS WILL BE PLACED ALONG ROADWAYS DURING CONSTRUCTION MOBILIZATION. SIGNS WILL BE WEIGHED DOWN TO ENSURE THE SIGNS DO NOT MOVE DURING HIGH WIND EVENTS, DURING EXTENDED TIME AWAY FROM THE PROJECT SITE (E.G. DURING CONFIRMATION SAMPLE ANALYSIS). THE SIGNS WILL BE REMOVED FROM THE ROADWAY AND PLACED IN STORAGE.
12. THE CONTRACTOR SHALL BE RESPONSIBLE TO REPAIR ANY DAMAGES TO PBS ROADS AS A RESULT OF HIS OR HER CONTRACTORS ACTIONS.

REV.	DATE	DESCRIPTIONS	DRAWN BY	CHECKED BY

DESIGNED BY: R. SPRINZL
DRAWN BY: P. HOLM
APPROVED BY:
CHECKED BY:
DATE: 1/27/20
DRAWING NO: C:\18013\DWGS T17-PBS-FR34-C-9

FIRING RANGES 3 & 4
REMOVAL ACTION WORK PLAN

DRAWING TITLE:
TRAFFIC MANAGEMENT PLAN

CLIENT: PROJECT:
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION PLUM BROOK STATION

leidos

C-9
DRAWING NUMBER

ATTACHMENT D. NASA GRC SPECIFICATIONS

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-- End of Project Table of Contents --

SECTION 01 33 00

SUBMITTAL PROCEDURES
03/15

PART 1 GENERAL

1.1 SUMMARY

Requirements of this Section apply to, and are a component part of, each section of the specifications for projects completed at Glenn Research Center (GRC) and Plum Brook Station (PBS).

1.2 SUBMITTALS

A standard contractor developed transmittal form shall be used to transmit each submittal.

Submittal Description (SD): Drawings, diagrams, layouts, schematics, descriptive literature, illustrations, schedules, performance and test data, and similar materials to be furnished by the Contractor explaining in detail specific portions of the work required by the contract.

The following items, SD-01 through SD-11, are descriptions of data to be submitted for the project. The requirements to actually furnish the applicable items will be called out in each specification.

However, as a minimum, provide test reports, installation, operation and maintenance submittals and manuals. Equipment actually installed will be clearly marked.

Submittals may be provided in an electronic format such as PDF's on some NASA projects. The Contractor will receive additional information on processing electronic submittals at the preconstruction conference.

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only.

SD-01 Preconstruction Submittals

Submittals which are required prior to a notice to proceed on a new contract. Submittals required prior to the start of the next major phase of the construction on a multi-phase contract. Schedules or tabular list of data or tabular list including location, features, or other pertinent information regarding products, materials, equipment, or components to be used in the work, submitted prior to contract notice to proceed or next major phase of construction.

SD-03 Product Data

Data composed of catalog cuts, brochures, circulars, specifications and product data, and printed information in sufficient detail and scope to verify compliance with requirements of the contract documents. Upon approval by the Government, this data shall be provided in an electronic pdf file format on compact disc(s).

SD-06 Test Reports

Written reports of a manufacturer's findings of his product during field inspections, attesting that the products are installed in accordance with the manufacturer's installation instructions, shop drawings, or other manufacturer's requirements. Written reports by a general contractor or his subcontractors including daily logs reporting on the progress of daily activities or attesting that the work has been installed in accordance with the contract plans and specifications.

SD-07 Certificates

A document, required of the Contractor, or through the Contractor by way of a supplier, installer, manufacturer, or other Lower Tier Contractor, the purpose of which is to further the quality or orderly progression of a portion of the work by documenting procedures, acceptability of methods or personnel, qualifications, or other verification of quality.

Statements signed by responsible officials of a manufacturer of a product, system, or material attesting that the product, system or material meet specified requirements. Statements must be dated after the award of this contract, name the project, and list the specific requirements which it is intended to address.

SD-08 Manufacturer's Instructions

Preprinted material describing installation of a product, system, or material, including special notices and material safety data sheets, if any concerning impedances, hazards, and safety precautions. These materials shall be provided in an electronic pdf file format on compact disc(s).

SD-11 Closeout Submittals

Special requirements necessary to properly close out a construction contract. For example, as-built record drawings, manufacturer's help and product lines necessary to maintain and install equipment. Also, submittal requirements necessary to properly close out a major phase of construction on a multi-phase contract.

1.3 PREPARATION

1.3.1 Marking

Prepare, review and stamp with Contractor's approval all specified submittals.

Permanently mark each submittal to identify it by contract number; NASA Project I.D. number; transmittal date; Contractor's, Subcontractor's, and supplier's name, address(es) and telephone number(s); submittal name; specification or drawing reference; and similar information to distinguish it from other submittals. Submittal identification shall include space to receive the review action by the Contracting Officer.

1.3.2 Drawing Format

Drawing submittals shall be prepared on NASA GRC AutoCAD electronic standard title block frame not less than 11 by 17 inches nor larger than 24 by 36 inches in size. Drawings shall be prepared to accurate size,

with scale indicated, unless other form is required.

Copies of each drawing shall have the following information clearly marked thereon:

a. Job name, which shall be the general title of the contract drawings.

b. Date of the drawings and revisions.

c. Name of Contractor.

d. Name of Subcontractor.

e. Name of the item, material, or equipment detailed thereon.

f. Submittal number (e.g., first submittal to last submittal) in a uniform location adjacent to the title block.

g. Specification section to which submittal applies.

h. Government contract number shall appear in the margin, immediately below the title block.

Drawings shall be numbered in accordance with NASA GRC standards. Each drawing shall bear the number of the submittal in a uniform location adjacent to the title block. Government contract number shall appear in the margin, immediately below the title block, for each drawing.

A blank space, no smaller than 2 inches shall be reserved on the right hand side of each sheet for the Government disposition stamp.

1.3.3 Data Format

Required data submittals for each specific material, product, unit of work, or system shall be collected into a single submittal and marked for choices, options, and portions applicable to the submittal. Marking of each copy of product data submitted shall be identical. Partial submittals will [not] be accepted for expedition of construction effort.

1.3.4 Samples

Samples shall be physically identical with the proposed material or product to be incorporated in the work, fully fabricated and finished in the specified manner, and full scale. Where variations in color, finish, pattern, or texture are inherent in the material or product represented by the sample, multiple units of the sample, showing the near-limits of the variations and the "average" of the whole range (not less than 3 units), shall be submitted. Each unit shall be marked to describe its relation to the range of the variation. Where samples are specified for selection of color, finish, pattern, or texture, the full set of available choices shall be submitted for the material or product specified. Sizes and quantities of samples shall represent their respective standard unit.

1.4 SUBMISSION REQUIREMENTS

1.4.1 Schedules

[Within 30 calendar days of notice to proceed] [Within 15 calendar days of

notice to proceed] [At the Preconstruction conference], provide, for approval by the Contracting Officer, the following schedule of submittals:

a. A schedule of shop drawings and technical submittals required by the specifications and drawings. Indicate the specification or drawing reference requiring the submittal; the material, item, or process for which the submittal is required; the "SD" number and identifying title of the submittal; the Contractor's anticipated submission date and the approval need date.

b. A separate schedule of other submittals required under the contract but not listed in the specifications or drawings. Schedule will indicate the contract requirement reference; the type or title of the submittal; the Contractor's anticipated submission date and the approved need date (if approval is required).

c. Submittals called for by the contract documents will be listed on one of the above schedules. If a submittal is called for but does not pertain to the contract work, the Contractor shall include the submittal in the applicable schedule and annotate it "N/A" with a brief explanation. Approval of the schedules by the Contracting Officer does not relieve the Contractor of supplying submittals required by the contract documents but which have been omitted from the schedules or marked "N/A".

d. Re-submit copies of both schedules and annotate monthly by the Contractor with actual submission and approval dates. When all items on a schedule have been fully approved, no further re-submittal of the schedule is required.

e. Provide one (1) hard copy and one (1) CD with planned submittals filed in a PDF format. CD shall contain a text file indicating list of planned submittals.

1.4.2 Drawings Submittals

Submit six (6) full size copy(s) of each drawing. [_____] prints, marked with review notations by the Contracting Officer, will be returned to the Contractor. All required installation, fabrication and connection drawings shall be submitted and approved prior to the start of work detailed on these drawings.

Upon project completion, Contractor shall submit two (2) sets of the final drawings along with two (2) CD's containing PDF files of all approved drawings submitted.

1.4.3 Data Submittals

Submit six (6) complete sets of indexed and bound product data. Three sets, marked with review notations by the Contracting Officer, will be returned to the Contractor.

At the completion of the project the Contractor shall submit 2 sets of bound data along with two (2) electronic CDs containing PDF files of all data submitted.

1.4.4 Samples

Submit two (2) sets of identified samples. A copy of the transmittal form, marked with review notations including selections by the Contracting Officer, will be returned to the Contractor.

Samples that are intended or permitted to be returned and actually incorporated in the work are so indicated in the individual technical sections. These samples will be returned to the Contractor, at his expense, to be clearly labeled, with installation location recorded. Samples shall be in undamaged condition at the time of installation.

Where mockups and similar large samples are required by individual technical sections, it is recognized that these are a special type of sample which cannot be readily "transmitted" as specified for submittal of samples. Otherwise, and except as indicated in the individual technical sections, the requirements for samples shall be complied with and a transmittal form shall be processed for each mockup, to provide a record of the activity.

1.5 GOVERNMENT'S REVIEW

1.5.1 Review Notations

Contracting Officer will review submittals and provide pertinent notation within ten (10) calendar days after date of submission. Submittals will be returned to the Contractor with the following notations:

a. Submittals marked "approved", "previously approved", or "received for information" authorize the Contractor to proceed with the work covered.

b. Submittals marked "approved as noted" authorize the Contractor to proceed with the work covered provided he takes no exception to the corrections. Notes shall be incorporated prior to submission of the final submittal.

c. Submittals marked "return for additional information" require the Contractor to make the necessary corrections and revisions and to re-submit them for approval in the same routine as before, prior to proceeding with any of the work depicted by the submittal.

d. Submittals marked "not approved" indicate noncompliance with the contract requirements and shall be re-submitted with appropriate changes. No item of work requiring a submittal shall be accomplished until the submittals are approved or approved as noted.

e. Contractor shall make corrections required by the Contracting Officer. If the Contractor considers any correction or notation on the returned submittals to constitute a change to the contract drawings or specifications; notice as required under the clause entitled, "Changes" shall be given to the Contracting Officer. Approval of the submittals by the Contracting Officer shall not be construed as a complete check, but will indicate only that the general method of construction and detailing is satisfactory. Contractor shall be responsible for the dimensions and design of connection details and construction of work. Failure to point out deviations may result in the Government requiring rejection and

removal of such work at the Contractor's expense.

f. If changes are necessary to approved submittals, the Contractor shall make such revisions and submission of the submittals in accordance with the procedures above. No item of work requiring a submittal change shall be accomplished until the changed submittals are approved.

1.5.2 Sample Approval

Furnish, for the approval of the Contracting Officer, samples required by the specifications or by the Contracting Officer. Shipping charges shall be paid by the Contractor. Materials or equipment requiring sample approval shall not be delivered to the site or used in the work until approved in writing by the Contracting Officer.

Each sample shall have a label indicating:

a. Name of project

b. Name of Contractor

c. Material or equipment

d. Place of origin

e. Name of producer and brand

f. Specification section to which samples applies

g. Samples of furnished material shall have additional markings that will identify them under the finished schedules.

Contractor shall submit to the Contracting Officer two samples of materials where samples are requested. Transmit to the Contracting Officer with each sample a transmittal form, original and four (4) copies, containing the above information.

Approval of a sample shall be only for the characteristics or use named in such approval and shall not be construed to change or modify any contract requirements. Before submitting samples, the Contractor shall assure that the materials or equipment will be available in quantities required in the project. No change or substitution will be permitted after a sample has been approved.

Materials and equipment incorporated in the work shall match the approved samples. If requested, approved samples, including those which may be damaged in testing, will be returned to the Contractor, at his expense, upon completion of the contract. Samples not approved will also be returned to the Contractor at its expense, if so requested.

Failure of any materials to pass the specified tests will be sufficient cause for refusal to consider, under this contract, any further samples of the same brand or make of that material. Government reserves the right to disapproved any material or equipment which previously has proved unsatisfactory in service.

Variations from contract requirements shall be specifically pointed out in transmittal letters. Failure to point out deviations may result in the

Government requiring rejection and removal of such work at no additional cost to the Government.

Samples of various materials or equipment delivered on the site or in place may be taken by the Contracting Officer for testing. Samples failing to meet contract requirements will automatically void previous approvals. Contractor shall replace such materials or equipment to meet contract requirements.

Approval of the Contractor's samples by the Contracting Officer shall not relieve the Contractor of his responsibilities under the contract.

1.6 PROGRESS SCHEDULE

1.6.1 Bar Chart

a. Submit four (4) copies of the progress chart, for approval by the Contracting Officer, at the Preconstruction Conference.

b. Prepare the progress chart in the form of a bar chart utilizing form "Construction Progress Chart" or comparable format acceptable to the Contracting Officer.

c. Include no less than the following information on the progress chart:

(1) Break out by major headings for primary work activity.

(2) A line item break out under each major heading sufficient to track the progress of the work.

(3) A line item showing contract finalization task which includes punch list, clean-up and demolition, and final construction drawings.

(4) A materials bar and a separate labor bar for each line item. Both bars will show the scheduled percentage complete for any given date within the contract performance period. Labor bar will also show the number of men (man-load) expected to be working on any given date within the contract performance period.

(5) The estimated cost and percentage weight of total contract cost for each materials and labor bar on the chart.

(6) Separate line items for mobilization and drawing submittal and approval. (These items are to show no associated costs.)

d. Update the progress schedule every 30 calendar days throughout the contract performance period.

1.7 STATUS REPORT ON MATERIALS ORDERS

Within 14 calendar days after notice to proceed, submit, for approval by the Contracting Officer, an initial material status report on all materials orders. This report will be updated and re-submitted every 14 calendar days as the status on material orders changes.

Report shall list, in chronological order by need date, materials orders necessary for completion of the contract. The following information will

be required for each material order listed:

a. Material name, supplier, and invoice number.

b. Bar chart line item or CPM activity number affected by the order.

c. Delivery date needed to allow directly and indirectly related work to be completed within the contract performance period.

d. Current delivery date agreed on by supplier.

e. When item d exceeds item c, the effect that delayed delivery date will have on contract completion date.

f. When item d exceeds item c, a summary of efforts made by the Contractor to expedite the delayed delivery date to bring it in line with the needed delivery date, including efforts made to place the order (or subcontract) with other suppliers.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

Not Used

-- End of Section --

SECTION 01 35 26.98

GENERAL SAFETY REQUIREMENTS
03/18

PART 1 GENERAL

1.1 SUMMARY

The requirements of this Section apply to, and are a component part of, each section of the specifications.

1.2 REFERENCES

The documents listed below are incorporated by reference into this contract as if fully rewritten herein.

U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

10 CFR 20	Standards for Protection Against Radiation
29 CFR 1910	Occupational Safety and Health Standards
29 CFR 1926	Safety and Health Regulations for Construction

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION (NASA)

NASA NPR 8621.1	(2006b; Change 7) NASA Procedural Requirements for Mishap and Close Call Reporting, Investigating, and Recordkeeping
NASA NPR 8715.3	(2008c; Change 9) NASA General Safety Program Requirements
GLM-QS-1700.1	Glenn Research Center, Safety Manual
GLM-QS-1800.1	Glenn Research Center, Occupational Health Programs Manual

1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-06 Test Reports

Records shall be submitted in accordance with paragraph entitled, " Gas Protection," of this section.

SD-07 Certificates

Statements shall be submitted for the following items in accordance with paragraphs entitled, "Safety Plan" and "Protection Plan," of this section.

Site Specific Health and Safety Plan; G

Protection Plan; G
Construction Project Training Summary Report; G

Construction Project Training Summary Report; G

Training certifications for fall protection competent person.

Steel Erection Plan; G

1.3.1 Site Specific Health and Safety Plan

Contractor shall submit a site specific safety plan to the Contracting Officer for approval within 10 working days after award of contract and it shall be approved prior to notice to proceed. Compliance to the safety plan is mandatory. A copy of this approved plan shall be maintained on the construction site.

The Site Specific Health and Safety plan shall include, as a minimum, the following:

a. Health and Safety program objectives.

b. Description of work.

c. Methods to attain safety objectives.

d. Responsibility of key personnel for the Contractor.

e. List of subcontractors and their competent persons.

f. Safety meetings, surveys, inspections, and reports.

g. Identification of safety hazards and mitigation plan to allow for safe conduct of work. If the hazard cannot be mitigated, include specific PPE that shall be worn. When selecting hazard control methods and personal protective equipment (PPE) to limit workers exposures the most restrictive occupational exposure limits (OELs) shall be used. The most restrictive OELs of the following shall be used: OSHA permissible exposure limit (PEL), ACGIH threshold limit value (TLV), and American Industrial Hygiene Association (AIHA) workplace environmental exposure limits (WEELs)

h. Emergency plan including emergency number and muster locations.

i. Lists of key personnel to be contacted in times of emergency.

j. Program to show compliance with Federal OSHA Safety and Health Standards 29 CFR 1910 and 29 CFR 1926 and various safety requirements of NASA NPR 8715.3. This shall include an overall site Fall Protection Plan that demonstrates that the requirements and criteria for fall protection in construction workplaces covered under 29 CFR part 1926 will be met for every activity taking place during the project.

k. Methods to comply with the requirement for immediate reporting of mishaps to the Contracting Officer in accordance with NASA NPR 8621.1. This document is available at: http://nodis3.gsfc.nasa.gov/displayDir.cfm?Internal_ID=N_PR_8621_001B_&page_na

l. Procedures for emergency actions to be taken to secure dangerous conditions, to protect personnel, and secure work areas in the event of accident or an act of nature.

m. Procedures for securing the mishap site so that the area remains secure until arrival of a safety investigator. Mishap site will remain secured until released by the Contracting Officer.

n. Provide MSDS sheets for all chemicals which will be used. Methods for handling and storage shall be identified.

o. Identify the competent person and the competent person for specific activities as required by 29 CFR 1926.

p. The Health and Safety plan shall be reviewed and signed by all site personnel.

q. Daily documented site safety inspections shall be performed and documented.

r. A C-979 Fall Prevention Plan form shall be completed if the workers are working at a height of 6 feet or greater.

s. If the prime contractor is writing the HASP for a subcontractor, then the subcontractor shall submit documentation on company letterhead indicating that they concur with the HASP and are able to comply with all controls and personal protective equipment requirements as specified by the prime contractor.

1.3.2 Protection Plan

Structures, utilities, sidewalks, pavements, and other facilities immediately adjacent shall be protected against damage.

1.3.3 Construction Project Training Summary Report

The contractor shall provide a submittal of an up-to-date Construction Project Training Summary Report containing worker's names, employers, assigned tasks, qualifying training, certifications, and dates of training for a prime and subcontractor workers to be on site. The submittal shall include a statement from the prime contractor stating that the construction workers have undergone a qualifications review and verified as being qualified for assigned tasks while at the GRC construction site. The Construction Project Training Summary Report shall be updated and submitted monthly. The Construction Project Training Summary Report shall be reviewed and accepted by the Project Team through the Contracting Officer's Representative (COR) and then to the Contracting Officer (CO). The status of the Construction Project Training Summary Report shall be incorporated into the project meeting minutes and shall document any Project Team comments.

1.3.4 Steel Erection

Provide a steel erection plan per 29 CFR 1926.752 prior to the beginning of any steel erection operation.

1.4 SAFETY SUPERVISION

Contractor's Safety Supervisor shall ensure that:

a. NASA fall protection requirements are included in work instructions where NASA employees and/or contractors will be working in situations that require fall protection.

b. Ensure that anyone who is identified as a qualified person (per ANSI/ASSE Z359.0–2007, paragraph 2.109) to serve as a subject matter expert in fall protection has an engineering degree or access to a person with an engineering degree to identify and to evaluate unique situations and nonstandard equipment and has been trained by an industry-recognized trainer, NASA-recognized trainer/training center, or NASA-developed training program equivalent to ANSI- and OSHA-compliant training (Ref: ANSI/ASSE Z359.2 -2007 Section C.5).

c. For each situation that requires fall protection, ensure that there is a competent person (per ANSI/ASSE Z359.0-2007, paragraph 2.27) assigned responsibility for the immediate application of fall protection work where fall protection is required whose education and training has been administered by an industry-recognized trainer, NASA-recognized trainer/training center, or NASA-developed training program equivalent to ANSI and OSHA compliant training. Fall protection competent person shall be on site 100% of the time active fall protection is being used.

d. Construction personnel are performing work in compliance with the approved site specific health and safety plan.

1.5 GENERAL SAFETY PROVISIONS

The GRC Safety Manual, GLM-QS-1700.1, is available online at http://smad-ext.grc.nasa.gov/shed/pub/gsm/gsm-manual.pdf.

The GRC Occupational Health Programs Manual, GLM-QS-1800.1, is available on-line at http://smad-ext.grc.nasa.gov/shed/pub/ohpm/ohpm-manual.pdf

These documents are incorporated by reference into this contract as if fully rewritten herein.

The Contractor and all subcontractors are subject to applicable federal, state, and local laws, regulations, ordinances, codes, and orders relating to safety and health in effect on the date of this Contract.

During the performance of work under this Contract, the Contractor shall comply with procedures prescribed for control and safety of persons visiting the project site. Contractor is responsible for his personnel and for familiarizing each of his subcontractors with safety requirements. Contractor shall advise the Contracting Officer of any special safety restriction he has established so that Government personnel can be notified of these restrictions.

All contractor and subcontractor employees shall sign the HASP to document that they understand and will comply with the contents.

Contractor shall comply with the requirements of NASA NPR 8715.3. This document is available at http://nodis3.gsfc.nasa.gov/displayDir.cfm?Internal_ID=N_PR_8715_003C_&page_

name=main
The contractor shall protect workers who may be exposed to a fall of six feet or greater to a lower level for construction activities. This requirement is more stringent in some cases than that required by 29 CFR 1926, such as for steel erection.

1.6 SAFETY LOCKOUT/TAGOUT PROCEDURES

Contractor shall ensure that each employee is familiar with and complies with these procedures as listed in Chapter 9 Lockout/Tagout of the Glenn Safety Manual, GLM -QS -1700.1,and 29 CFR 1910.147.

Contracting Officer or designee shall, at the Contractor's request, have proper isolation of sources of hazardous energy performed by on-site personnel because of the experience and knowledge necessary to make the particular equipment safe to work on. The contractor shall then perform the required lockout/tagout using red bodied locks and, GRC furnished, GRC946A Danger Do Not Operate tags, at all final points of isolation.

No person, regardless of position or authority, shall operate any switch, valve, or equipment that has an official lockout/tagout red lock and tag attached to it, nor shall such locks and/or tags be removed except by the employee that attached them (Except in an emergency situation, see Chapter 9 Lockout/Tagout of the Glenn Safety Manual, GLM -QS -1700.1).

No person shall work on any equipment that requires a lockout/tagout red lock and tag unless he/she has placed their personal, red bodied, lock at the final point of isolation.

Any individual, regardless of position or authority, who is required to be protected by lockout/tagout shall place their personal, red bodied, lock at the final point of isolation.

Identification markings on building light and power distribution circuits shall not be relied on for established safe work conditions. An established safe work condition exists when (1) sources have been isolated, (2) lockout/tagout has been performed, (3) verification using the hot-dead hot method has been accomplished, and (4) grounding (if required) has been completed.

Before clearance will be given on any equipment, the apparatus, valves, electrical circuits, or systems shall be secured in a passive condition with the appropriate vents, pins, and/or locks.

Pressurized or vacuum systems shall be vented to relieve differential pressure completely.

Vent valves shall be tagged and locked open during the course of the work.

Where dangerous gas or fluid systems are involved, or in areas where the environment may be oxygen deficient, system or areas shall be purged, ventilated, or otherwise made safe prior to entry.

1.7 ACCIDENT TREATMENT AND RECORDS

Contractor shall post emergency first aid and ambulance information at project site.

Emergency response shall require the Contractor to call 911 on a NASA phone or 216 433-8888 (LF) or 419-621-3222 (PBS)on an outside line.

1.8 FIRE PREVENTION AND PROTECTION

Open-flame heating devices will not be permitted except by approval in writing from the Authority Having Jurisdiction (AHJ) at GRC. Approval for the use of open fires and open-flame heating devices will not relieve the Contractor from the responsibility for any damage incurred because of fires.

Burning trash, brush, or wood on the project site shall not be permitted.

All hot work operations shall comply with NASA GRC Safety Manual, Chapter 28, Hot Work Authorization. Prior to hot work, a C-7a Hot Work Authorization Permit shall be issued by the Safety, Health and Environmental Division. Immediately prior to hot work operations, a C-7b form and associated inspection shall be completed by the responsible person.

Contractor shall discontinue burning, welding, or cutting operations 1 hour prior to the end of the normal work day. A workman shall remain at the site for 1 hour after discontinuing these operations to make thorough inspection of the area for possible sources of latent combustion. The Contractor shall be equipped with the appropriate fire extinguishers and shall be trained in the proper use of fire extinguishers. Any unsafe conditions shall be reported to SHED. (Telephone: (216) 433-2088)

1.9 ELECTRICAL

Contractor shall appoint an individual responsible for the electrical safety of each work team to restrict entry to dangerous locations to those authorized by him jointly with the Government.

1.10 UNDERGROUND UTILITIES

A Confined Space Entry Permit, NASA C-199, as per Chapter 16 of the Glenn Safety Manual is required before any Contractor personnel enters a manhole. Contractor shall contact the Contracting Officer for support services by calling (216) 433-8888 at least 72 hours in advance.

Contractor shall be responsible for removing water and debris before commencement and during execution of work in manholes.

1.11 RADIATION SAFETY REQUIREMENTS

License Certificates for radioactive materials (RAM)and equipment shall be submitted for all specialized material and equipment per Chapter 8 of the Glenn Occupational Programs Manual. As a Federal facility, GRC falls under the jurisdiction of the NRC. Radiography companies shall possess an NRC license or NRC reciprocity for their state license. Individuals performing source radiography shall have a radiography license issued by the NRC to perform such work at GRC, a Federal reservation. Alternatively, a state license with a reciprocity agreement from the NRC shall be acceptable. Portable nuclear moisture/density gauge users shall have a RAM license issued by the NRC, or alternatively, by a comparable state agency with an NRC reciprocity agreement.

Operations performed by the Contractor which utilize nuclear density

gauges and/or source radiography shall be included in the HASP. The NASA GRC Radiation Safety Officer shall review and approve aspects of the contractor's HASP or "radiation safety plan" related to using RAM.

Workers shall be protected from radiation exposure in accordance with 10 CFR 20. Standards for Protection Against Radiation

Loss of radioactive material shall be reported immediately to the Contracting Officer.

Actual exposure of the radiographic film or unshielding the source shall not be initiated until after 5 p.m. on weekdays.

In instances where radiography is scheduled near or adjacent to buildings or areas having limited access or one-way doors, no assumptions shall be made as to building occupancy. Where necessary, the Contracting Officer will direct the Contractor to conduct an actual building entry, search, and alert. Where removal of personnel from such a building cannot be accomplished and it is otherwise safe to proceed with the radiography, a fully instructed employee shall be positioned inside such building or area to prevent exiting while external radiographic operations are in process.

1.12 FACILITY OCCUPANCY CLOSURE

Streets, walks, and other facilities occupied and used by the Government shall not be closed or obstructed without written permission from the Contracting Officer. Any closure of a road, sidewalk or parking spots requires submittal of a Barricade Request Form.

1.13 DIGGING, TRENCHING, AND/OR EXCAVATION

Prior to performing any excavation work or any surface penetrations on any ground surface, the Contractor shall obtain from the Facilities Division an Excavation Permit (C 927). The Contractor shall comply with GRC Safety Manual, Chapter 35, Digging, Trenching, & Excavating Procedure and Requirements.

Contractors must obtain a C927 Excavation Permit for any penetration into surface at GRC. Each permit is limited to a 400 linear foot section or approximately 1 acre as determined by the COR and NASA Civil Systems Manager. The permit will only be valid for 3 months or after work is complete within the permit defined area, whatever comes first. The government shall be responsible to fill out part A. The Prime Contractor and Excavation Contractor shall be responsible to fill out portions B-C of permit when required by COR.

The contractor shall be required to acquire a Professional Ohio Surveyor to stake out all proposed infrastructure work. The contractor shall also be required to mark excavation with white temporary marking paint prior to receiving approved Excavation C927 Permit.

Permit portion B1 is the Utility Verification and Marking log. The contractor is required to track utility markings and request them every two weeks or sooner if necessary. See GRC Excavation Manual for further information.

Permit Portion B2 is the Potholing log. The contractor is required to verify (pothole) all utilities as identified on the Underground Record Drawing (URD) prior to completing infrastructure excavation. This log

verifies all utilities are properly identified and protected. See GRC Excavation Manual and GRC Safety Manual for further information on Potholing requirements.

Permit portion C is Daily Field Tag Up Meetings. The contractor is required to hold daily coordination meetings with excavation personnel to coordinate work activities for the day witnessed by NASA Construction Manager and/or Inspector. During these meetings the area of work shall be addressed. The contractor will be limited to this area as discussed during the day. See GRC Excavation Manual for further information.

The Requestor is a member of GRC organization or support service contractor which will monitor the excavation activities. The requestor shall:

Initiate a NASA Form filling out Part A step 1 of the GRC927, Digging, Trenching, and Excavating on Permit, and submitting it electronically using the GRC927 submit button function.

Ensure the Contractor Competent Person designated for this activity has the NASA GRC Excavation Manual and has read the manual thoroughly and verify the competent person has the knowledge and training required by the GRC Excavation Manual.

Ensure the Contractor Excavator operator has NASA GRC Excavation Quick Reference card and understands all utility markings.

Ensure that all personnel working at the jobsite are trained and aware of the hazards of digging, trenching, excavating and ground penetration. Ensure that all items outlined in the permit are properly defined and resolved prior to operations involving digging, trenching, excavating activities to avoid damage to utilities and structures identified on the construction drawings.

Notify the Emergency Dispatch and their supervisor (if a civil servant) or their COR (if a contractor) if an unexpected underground utility or structure is found during the activity or if an underground utility or structure is hit or broken during the activity (The requestor shall notify the emergency dispatch at 911 if using a NASA internal telephone or if using a cell phone dial 216-433-8888 at Lewis Field or 419-621-3222 at Plum Brook Station.) It is the Supervisor's or COR's responsibility to notify SHeD.

Comply with all the requirements of the above listed reference documents and other regulations in regard to safe performance of the job.

Coordinate their work with the lab utilities to assure that related activities such as utility shutdown are addressed

Attends daily tag up meetings held by contractor competent person, and contractors excavation personnel to ensure all aspects of excavation work are discussed and coordinated all portions of C927 and filled out properly;

Ensure all work ceases if problems are found until such time as the excavation is made safe again for entry

The Contractor performing the excavation and/or utility work shall ensure a competent person to oversee each permitted excavation (GRC927). This person shall be at the physical excavation site 100% of the time comparing construction documents to the Underground Record Drawings (URD), auditing the excavation process, evaluating utility markings, evaluating symbols versus details and ensuring the permit process is followed. The contractor shall submit an official document stating the compliance and qualifications of competent persons. The excavation competent person period will expire at the end of each contract and/or every three years, whatever is more stringent. The following are minimum requirements:

Excavation Competent Person Mandatory Qualifications:

a. Has a working knowledge of trenching, excavation, horizontal directional drilling, underground construction, shoring, and soil types as appropriate to the assigned task.

b. Has the ability to assure that all underground utilities are located, field verified, and clearly marked prior to excavation.

c. Is knowledgeable in applicable excavation regulations to include OSHA 29CFR1926. Have knowledge of trench collapse prevention, ventilation and air monitoring requirements (where applicable), ground water control, personal protective equipment, and emergency procedures as they pertain to underground construction and utility work. A minimum 5 years excavating experience is required.

d. Has the ability to notify the prime contractor or Government (as applicable) of any nonconformance issues and document them; and to provide any corrective actions to mitigate hazards or nonconformance issues.

e. Successful completion of GRC Excavation 101 Course GRC-012-15.

Utility Competent Person Mandatory Qualifications:

a. Has a working knowledge of trenching, excavation, horizontal directional drilling, underground construction, shoring, and soil types as appropriate to the assigned task.

b. Has the ability to assure that all underground utilities are located, field verified, and clearly marked prior to excavation for proposed infrastructure or infrastructure repair.

c. Is knowledgeable in applicable excavation regulations to include OSHA 29CFR1926. Have knowledge of trench collapse prevention, ventilation and air monitoring requirements (where applicable), ground water control, personal protective equipment, and emergency procedures as they pertain to underground construction and utility work. A minimum 5 years excavating experience is required.

d. Has the ability to notify the prime contractor or Government (as applicable) of any nonconformance issues and document them; and to provide any corrective actions to mitigate hazards or nonconformance issues.

e. Has the ability to review, understand, and interpret Underground Record Drawings, contract drawings, and specifications.

f. Successful completion of GRC Excavation 101 Course GRC-012-15.

g. Has the ability to oversee and witness underground construction and utility work to ensure that established processes are followed. A minimum of 5 years utility installation experience is required.

h. Has working knowledge of hydro-testing and pigging, as well as welding and fusion procedures, as appropriate to the assigned task.

i. Is knowledgeable in applicable rules and regulations to include 29CFR1926 and installation of utilities such as domestic water (i.e. fire hydrants, thrust blocks, testing, cleaning and chlorination), sewers, duct banks, natural gas, and other pressure pipes, as appropriate to the assigned task.

j. Is capable of identifying existing and predictable hazards in the surroundings of underground utility construction and understanding the corrective measures to eliminate them.

Excavations greater than 4 ft in depth may be considered to be confined spaces. As such, these shall be evaluated by SHED with regard to existing and potential hazards to determine if the excavation shall be considered a permit-required confined space. Further regulations regarding confined spaces follow:

Below 4 and 20 ft, SHED shall evaluate and determine if an excavation is to be considered a permit-required confined space based upon the known and potential hazards.

Below 20 ft in depth, all excavations shall be considered to be permit-required confined spaces and the requirements of the Glenn Safety Manual, Chapter 16, Confined Space Entry, shall be in effect.

Confined Space Entry Training shall be required if an excavation has been determined to be a Permit-Required Confined Space. Employees who work in or around excavations must be provided training according to their work activities.

GRC adheres to ORC 3781.30, in addition GRC has established a tolerance zone surrounding all underground utilities. The tolerance zone is the total width of the underground utility plus 18 inches on each side. The vertical tolerance zone extends from the elevation shown on the utility profile and/or underground record drawing to 24 inches above the tope edge and 24 inches below the bottom edge of the utility.

Methods of excavation within the tolerances zones are hand digging, vacuum excavation, and hydro excavation. Potholing of all utilities for verification is required prior to infrastructure excavation. The GRC Civil Systems Manager may grant a waiver for potholing however the contractor is still required to excavate in accordance with the tolerance zone requirements. See NASA GRC Excavation manual for further information.

NASA Civil System Manager, NASA COR, and the NASA Health and Safety Office will strictly monitor digging, excavation, trenching and ground penetration activities to ensure compliance with the Excavation permit. Significant discrepancies shall be documented in the SHETrak System.

All permits and associated documentation issued for the purpose of controlling digging, trenching, excavating and ground penetration activities shall be considered part of the construction and/or task documentation. Records retention requirements shall be governed by those of the construction and/or task documents or contract.

Completed Excavation Permits shall be submitted in accordance with Section 01 33 00, SUBMITTAL PROCEDURES, in sufficient detail to show full compliance with the specification. Contractor is responsible to submit the permit in its entirety as a submittal to the Government once the permit is expired and/or terminated along with all associated subsurface infrastructure as-built information installed and obtained as part of this permit. Permit and as-built submittal is required 10 business days after permit expiration or termination.

The contractor shall submit the utility as-builts for newly installed utilities and surface features along with any existing utility information collected as part of the excavation permit process. The applicable as-builts shall be submitted to the government for approval within 10 days after each completion of the excavation permit (GRC 927). A complete set of as builts will be required at completion of project. The As-Built redlines must be completed on official construction drawings. Lines, letters, and details shall be sharp, clear, and legible. Additions or corrections to the drawings shall be drawn to the scale of the original drawing.

1.14 GAS PROTECTION

Contractor shall have one or more employees properly trained in operation of gas testing equipment and formally qualified as gas inspectors who shall be on duty during times workmen are in confined spaces. Their primary functions shall be to test for gas and operate testing equipment. Unless equipment of constant supervisory type with automatic alarm is employed, gas tests shall be made at least every 2 hours or more often when character of ground or experience indicates gas may be encountered. A gas test shall be made before workmen are permitted to enter the excavation after an idle period exceeding one-half hour.

Readings shall be permanently recorded daily, indicating the concentration of gas, number and location of drilled piers, point of test, date, and time of test.

All gas detection equipment shall be calibrated as per the manufacturer's requirements. Documentation of this calibration shall be made available to the Government upon request.

Special requirements, coordination, and precautions will apply to areas that contain a hazardous atmosphere or, by virtue of their use or physical character, may be oxygen deficient. The contractor shall not enter a confined space that is oxygen deficient or may be immediately dangerous to life and health.

1.15 ROOFING AND COATING

At the beginning of each work day the Contractor shall check with the Contracting Officer before proceeding to work on the roof to ensure safe work conditions.

1.16 HIGH NOISE LEVEL PROTECTION

Operations performed by the Contractor that involve the use of equipment with output of high noise levels (jackhammers, air compressors, and explosive device activated tools) shall be scheduled for after duty working hours. Use of any such equipment shall be approved in writing by the Contracting Officer prior to commencement of work.

1.17 LASER

Operations performed by the Contractor which utilize lasers shall be included in the HASP. Laser operations shall only be performed during daylight hours. For further requirements, see GRC Occupational Health Program Manual Chapter 13, "Laser Safety," at http://smad-ext.grc.nasa.gov/shed/pub/ohpm/ohpm13-laser.pdf .

1.18 SEVERE STORM PLAN

In the event of a severe storm warning, the Contractor shall:

a. Secure outside equipment and materials and place materials possible to damage in protected locations.

b. Check surrounding area, including roof, for loose material, equipment, debris, and other objects that could be blown away or against existing facilities.

c. Ensure that temporary erosion controls are adequate.

1.19 CONFINED SPACE

Comply with the requirements in Chapter 16 of the GRC Safety Manual, 29 CFR 1910.146.

Prior to a permit required confined space entry, a confined space permit C-199 form shall be submitted for approval from SHED. All contractors involved with entry into or working in confined spaces shall have training in confined space entry.

a. Entry Procedures. Prohibit entry into a confined space by personnel for any purpose, including hot work, until the qualified person has conducted appropriate tests to ensure the confined or enclosed space is safe for the work intended and that all potential hazards are controlled or eliminated and documented. (See SHED for entry procedures.) All hazards pertaining to the space shall be reviewed with each employee.

b. Forced air ventilation is required for all confined space entry operations and the minimum air exchange requirements must be maintained.

c. Manholes and excavations require continuous atmosphere monitoring with audible alarm for toxic gas detection and low oxygen levels.

d. Include training information for employees who will be involved as entrant attendants for the work.

e. Entry Permit. Use C-199 , completed by the qualified person.

Post the permit in a conspicuous place close to the confined space entrance.

1.20 MISHAP INVESTIGATIONS

Refer to the Glenn Safety Manual, Chapter 21. If a mishap occurs during the project that requires investigation per Chapter 21, the mishap site, which may include the entire construction work area, may be secured by NASA and not released to the Contractor for up to 75 working days. **Contractor shall not be entitled to additional payment for any expenses incurred as a result of the investigation.** Contractor shall submit a schedule recovery plan once the site is release back to the Contractor showing how the remaining work will be accomplished within the current contract period. If the Contractor determines the schedule cannot be recovered within the current contract period, a contract extension may be negotiated at no cost to the Government.

1.21 FALL PROTECTION

It is NASA's policy to provide fall protection for any walking working surface where a person is exposed to a fall to a lower level. Fall protection programs shall focus on eliminating the fall hazard before an individual is exposed to the hazard.

a. Fall protection programs shall protect workers who may be exposed to a fall six feet or greater to a lower level for all construction activities - including steel erection.

b. For work within 6 feet of an edge, on low-slope roofs, protect personnel from falling by use of personal fall arrest systems, guardrails, or safety nets. A safety monitoring system is not adequate fall protection and it not authorized.

c. "Fall hazards” from any height to lower level shall require protection if the work is over a collateral hazard (e.g. moving machinery, chemicals, electrical hazards, impalement hazards).

Competent person: For each situation that requires fall protection at GRC, there is a competent person (per ANSI/ASSE Z359.0-2007, paragraph 2.27) assigned responsibility for the immediate application of fall protection work where fall protection is required whose education and training has been administered by an industry-recognized trainer.

The fall protection competent person shall be on the construction site 100% of the time that active fall protection is being used.

Written Fall Protection Plan: specific fall protection requirements, including rescue plans, shall be developed and submitted to NASA for approval, using the C-979 Fall Prevention Plan form, as an appendix to the Health and Safety Plan.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

Not Used

-- End of Section --

SECTION 01 35 43.98

ENVIRONMENTAL PROTECTION PROCEDURES
12/14

PART 1 GENERAL

1.1 SUMMARY

The pollution prevention, environmental compliance, and sustainability provisions described in this section apply to all work under this contract.

1.2 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

29 CFR 1910.120	Hazardous Waste Operations and Emergency Response
29 CFR 1910.1200	Hazard Communication
29 CFR 1910	Occupational Safety and Health Standards
40 CFR 82	Protection of Stratospheric Ozone
40 CFR 112	Oil Pollution Prevention
40 CFR 261	Identification and Listing of Hazardous Waste
40 CFR 262	Standards Applicable to Generators of Hazardous Waste
40 CFR 265.16	(2003) Personnel Training
40 CFR 273.2	Standards for Universal Waste Management - Batteries
40 CFR 273.3	Standards for Universal Waste Management - Pesticides
40 CFR 273.4	Standards for Universal Waste Management - Mercury Containing Equipment
40 CFR 273.5	Standards for Universal Waste Management - Lamps
40 CFR 173	(2005) Shippers -- general requirements for shipments and packagings
40 CFR 177	(2005) Carriage by public highway
40 CFR 178	(2005) Specifications for packaging

40 CFR 761	Polychlorinated Biphenyls (PCBs) Manufacturing, Processing, Distribution in Commerce, and Use Prohibitions
49 CFR 100-185	(2002) Transportation
49 CFR 171	General Information, Regulations, and Definitions
50 CFR 17	(2002) Endangered and Threatened Wildlife and Plants

1.3 SUBMITTALS

The following shall be submitted in accordance with Section 01 33 00, SUBMITTAL PROCEDURES, in sufficient detail to show full compliance with the specification:

SD-01 Preconstruction Submittals

Environmental protection plan; G

[Dirt and dust control plan]; [G]

[Request for Wastewater Discharge, at least 7 days before commencement of discharge. The request shall include the estimated discharge volume, discharge rate, source of the wastewater and the duration of discharge. EEMO written approval shall be obtained before commencement of discharge. Analysis of the wastewater might be needed to obtain the discharge approval. EEMO approval may take longer than 7 days when analysis of wastewater and/or coordination with outside agencies is required.]

Hazardous Materials Inventories Statement (HMIS) and Safety Data Sheets (SDS), at project commencement and as necessary to reflect changes in materials stored; G.

A copy of the Hazard Communication Written Program per 29 CFR 1910.1200(e); G.

SDSs of all products before bringing these materials on-site; G.

List of Solid Waste, Hazardous Waste, Construction Debris (CD) and Commercial/Industrial Fill (CIF) Subcontractors four weeks prior to removal from site; G.

[Storm Water Pollution Prevention Plan. See Section 01 57 23.98 TEMPORARY STORM WATER POLLUTION CONTROL].

Treatment, Storage and Disposal Facility List: The Contractor shall submit a list of storage and disposal facilities (TSDF) that perform treatment, storage, or disposal services under this contract. Each facility shall have, as a minimum, EPA RCRA interim status or state approval as a treatment of disposal facility and be in good standing with regulatory community. Recycling facilities shall meet all federal, state and local regulations. The Contractor shall not use a facility other than those initially approved for use under this contract without first

obtaining the written approval of the COR.

SD-06 Test Reports

Site Inspection Checklists, every week for projects handling hazardous materials.

RCRA 90-Day Waste Accumulation Site Inspection Checklists, weekly for all hazardous waste storage areas for the duration of the on-site project work.

Hazardous Waste Profiles, and supporting analytical data four weeks prior to disposal for NASA GRC Waste Management (WM) to review prior to Energy & Environmental Management Office (EEMO) signature.

Laboratory analysis

Disposal Requirements

SD-07 Certificates

TSDF Letter of Acceptance and Hazardous Waste Manifests 3 weeks prior to shipment and for review by WM and signature by NASA GRC EEMO immediately prior to shipment.

Final, signed hazardous waste manifests completed by the contractor and disposal facility in accordance with 40 CFR 261. NASA GRC Waste Management shall receive the final signed manifest directly from the disposal facility. In the event the contractor receives the final signed manifest, it shall be immediately forwarded to NASA Waste Management. For Solid Waste/CD/CIF all documents shall be forwarded to NASA Waste Management.

SD-11 Closeout Submittals

Some of the records listed below are also required as part of other submittals. For the "Records" submittal, maintain on-site a separate three-ring Environmental Records binder and submit at the completion of the project. Make separate parts to the binder corresponding to each of the applicable sub items listed below.

Preconstruction survey

Waste determination documentation

Disposal documentation for solid, hazardous, and regulated waste

Contractor employee training records in compliance with 40 CFR 265.16, 29 CFR 1910.120, 29 CFR 1910.1200 and 40 CFR 82.

Regulatory notification

Erosion and sediment control inspection reports

Solid waste disposal report

Contractor Hazardous Material Inventory Log

Hazardous Waste/Debris Management

Reclamation of Equipment Containing Hazardous Waste Residues: The Contractor shall submit to NASA Waste Management the facility to which equipment containing hazardous material residues are shipped for reclamation, such as electrical wrapped with asbestos and electrical panels containing asbestos. The disclosure shall be documented on the Bill of Lading or by other written means. This process shall be managed by NASA GRC Management.

Disposal of Non-Hazardous Waste Containing Hazardous Material Residue: The Contractor shall submit to the NASA Waste Management the facility to which equipment containing hazardous material residues are shipped for disposal, such as steel coated with lead paint. The disclosure shall be documented on the Bill of Lading or by other written means. Supporting analytical data shall be included to document the equipment is not hazardous waste.

1.4 GENERAL RESPONSIBILITIES

Conduct project activities in a manner that protects surface/ground water and air quality, conserves resources, and minimizes the use of toxic chemicals and hazardous materials.

Minimize environmental pollution and damage that may occur as the result of construction and demolition operations. The environmental resources within the project boundaries and those affected outside the limits of permanent work shall be protected during the entire duration of this contract.

The Contracting Officer will notify the Contractor in writing of any observed noncompliance with Federal, State, or local environmental laws or regulations, permits, GRC Environmental Policy, and Federal Executive Orders. The Contractor shall, after receipt of such notice, inform the Contracting Officer of the proposed corrective action and take such action when approved by the Contracting Officer in consultation with EEMO. The Contracting Officer may issue an order stopping all or part of the work until satisfactory corrective action has been taken. No time extension shall be granted or equitable adjustments allowed to the Contractor for any such suspensions. This is in addition to any other actions the Contracting Officer may take under the contract, or in accordance with the Federal Acquisition Regulation of Federal Law.

The Contractor shall be responsible for payment of all fines/fees for violation or non-compliance with Federal, State, Regional and local environmental laws and regulations.

1.5 CONSTRUCTION AND DEMOLITION DEBRIS (C&DD) MANAGEMENT

Any removed or demolished item that meets the definition of C&DD shall be evaluated for reuse and/or recycling. The Contractor shall reuse or recycle any item that can be segregated from the waste stream and reused or recycled in a cost effective manner. NASA GRC WM manages the Construction Waste Management Program. All reuse, recycling and disposal activities shall be coordinated with the NASA GRC WM. The Contractor shall submit a manifest for any C&DD materials that will be reused off site, recycled or disposed of to the COR, which will then be reviewed and approved by NASA GRC WM for transportation off-site. Materials that will be reused or recycled shall be segregated and manifested individually.

NASA has specifically targeted the following materials for reuse or recycling: Asphalt, Concrete, Gravel/Stone, Commercial/Industrial Fill Soil, Topsoil, Trees/Bushes, Ferrous and Non-Ferrous Metals, Concrete Block, Bricks, Carpeting, and Ceramic Tiles.

1.6 DEFINITIONS

Construction and Demolition Debris - Those materials resulting from the alteration, construction, destruction, rehabilitation, or repair of any manmade physical structure, including, without limitation, houses, buildings, industrial or commercial facilities, or roadways. "Construction and demolition debris" does not include materials identified or listed as solid wastes, infectious wastes, or hazardous wastes pursuant to Chapter 3734 of the Revised Code and rules adopted under it; or materials from mining operations, nontoxic fly ash, spent nontoxic foundry sand, and slag; or reinforced or non-reinforced concrete, asphalt, building or paving brick, or building or paving stone that is stored for a period of less than two years for recycling into a usable construction material. For the purpose of this definition, "materials resulting from the alteration, construction, destruction, rehabilitation, or repair of any manmade physical structure," are those structural and functional materials comprising the structure and surrounding site improvements, such as brick, concrete and other masonry materials, stone, glass, wall coverings, plaster, drywall, framing and finishing lumber, roofing materials, plumbing fixtures, heating equipment, electrical wiring and components containing no hazardous fluids or refrigerants, insulation, affixed carpeting, asphalt substances, metals incidental to any of the above, and weathered railroad ties and utility poles. "Materials resulting from the alteration, construction, destruction, rehabilitation, or repair" do not include materials whose removal has been required prior to demolition, and materials which are otherwise contained within or exist outside the structure such as solid wastes, yard wastes, furniture, and appliances. Also excluded in all cases are liquids including containerized or bulk liquids, fuel tanks, drums and other closed or filled containers, tires, and batteries.

"Clean hard fill" - C&DD which consists only of reinforced or non-reinforced concrete, asphalt concrete, brick, block, tile, and/or stone which can be reutilized as construction material. Brick in clean hard fill includes but is not limited to refractory brick and mortar. Clean hard fill does not include materials contaminated with solid wastes, hazardous wastes, or infectious wastes.

Hazardous Material - Any material that poses a significant present or potential hazard to human health and safety or to the environment if released into the workplace or the environment. Common examples are oil, fuel, caustic and acid cleaners, mineral spirits, petroleum distillate based solvents, oil based paints, aerosol spray paints, coolants and antifreeze, and solvents/cleaners containing chlorinated compounds.

Hazardous Waste - As defined in 40 CFR 261.3.

Non-Hazardous Solid Waste - Includes rubbish, debris, garbage, and other discarded solid materials resulting from industrial, commercial, construction, and agricultural operations, and from community activities. Also includes soil with contaminant levels above Voluntary Action Program (VAP) commercial/industrial fill standards.

Non-Sewerable - Wastewater that contains at least one contaminant above

the allowable discharge limit set by the Publicly Owned Treatment Works (POTWs) for discharge to the sanitary sewer.

Reclamation - A process to recover or regenerate a usable product. Examples are recovery of lead from spent batteries and regeneration of spent solvents.

Recycling - In general, the use of discarded materials and objects in original or changed form rather than disposing of them. Examples include paper, cardboard boxes, empty containers and certain elements of Construction and Demolition Debris, including but not limited to metal building materials, piping, electrical, wiring, concrete, and masonry building materials, gypsum products and various floor coverings.

Solid Waste - As defined in 40 CFR 261.2.

Surface Discharge - implies that the water is discharged with possible sheeting action and subsequent soil erosion may occur. Waters that are surface discharged may terminate in drainage ditches, storm sewers, creeks, and/or "waters of the United States" and may require a permit to discharge water from the State of Ohio.

Universal Waste - Universal Waste means any of the following hazardous wastes that are subject to the universal waste requirements of 40 CFR part 273:

(1) Batteries as described in 40 CFR 273.2
(2) Pesticides as described in 40 CFR 273.3
(3) Thermostats as described in 40 CFR 273.4; and
(4) Lamps as described in 40 CFR 273.5.

1.7 NATURAL AND CULTURAL RESOURCES

The Contractor shall conduct activities in a manner that does not unnecessarily negatively impact fauna or flora, and in accordance with 50 CFR 17. The Contractor shall minimize interference with, disturbance to, and damage to all fish, wildlife, and plants including their habitat. The Contractor shall be responsible for the protection of threatened and endangered animal and plant species including their habitat in accordance with Federal, State, and local laws and regulations.

If during excavation or other construction activities any previously unidentified or unanticipated historical, archaeological, and cultural resources are discovered or found, all activities that may damage or alter such resources shall be temporarily suspended. Resources covered by this paragraph include but are not limited to any human skeletal remains or burials, artifacts, shell, midden (refuse heap), bone, charcoal, or other deposits, rock or coral alignments, pavings, wall, or other constructed features, and any indication of agricultural or other human activities. Upon such discovery or find, the Contractor shall immediately notify the Contracting Officer so that the appropriate authorities may be notified and a determination made as to their significance. The Contractor shall cease all activities that may result in impact to or the destruction of these resources. The Contractor shall secure the area and prevent employees or other persons form trespassing on, removing, or otherwise disturbing such resources. The Contractor may proceed with work in areas devoid of cultural resources.

1.8 WASTEWATER DISCHARGE

The Contractor shall submit a Request for Incidental Sewer Discharge to the Contracting Officer prior to the planned discharge of contaminated groundwater or other wastewater. The Contracting Officer will inform the EEMO of this request and obtain approval for discharge. The request shall include the estimated discharge volume, discharge rate, source of the wastewater and the duration of discharge. Analyses may be needed to obtain discharge approval from EEMO.

With the exception of non-contaminated groundwater from an excavation, wastewater from Contractor operations shall be containerized by the Contractor until the Contractor is notified of discharge approval.

The Contractor shall record and submit information specified in the EEMO approval for discharge issued to the project including, but not limited to, the location of discharge, dates of discharge, quantity of water discharged, source of the wastewater, dates wastewater was sampled and analyzed (if required), and filtering method (if required).

Non-sewerable wastewater that is hazardous waste shall be managed and disposed of properly by the Contractor in coordination with NASA Waste Management. Non-sewerable wastewater that is nonhazardous waste shall be managed and disposed of properly by the Contractor in coordination with NASA Waste Management.

1.9 AIR QUALITY

An Air Permit review from the EEMO is required for activities adding, removing or modifying an air pollution source.

Construction operations and materials used on the project shall be in compliance with federal, state, and local air pollution standards, rules and regulations.

Chlorofluorocarbons (CFCs), Hydrochlorofluorocarbon (HCFC), Other Ozone Depleting Substances (ODS) and their substitutes.

Class I Ozone Depleting Substances shall not be used in the performance of this contract, nor be provided as part of the equipment without prior written permission from the EEMO. This prohibition shall prevail over any other provision, specification, drawing, or referenced documents. A list of Class I ODS may be obtained from US EPA or their web page at http://www.epa.gov/ozone/ods.html.

Class II Ozone Depleting Substances shall not be used in the performance of this contract, nor be provided as part of the equipment without prior written permission from the EEMO. This prohibition shall prevail over any other provision, specification, drawing, or referenced documents. A list of Class II ODS may be obtained from US EPA or their web page at http://www.epa.gov/ozone/ods2.html.

Chemicals used in lieu of ozone depleting substances (Substitutes or alternatives) must conform with US EPA's Significant New Alternatives Policy (SNAP) program. These rules are summarized on the US EPA web page at http://www.epa.gov/ozone/snap/lists/index.html.

Service, maintain, renovate, and demolish ODS and ODS Substitute containing equipment in accordance with 40 CFR 82. The Contractor

shall ensure that ODS refrigerants and their substitutes are handled by a certified technician. The recovery equipment shall meet applicable EPA requirements and be certified with US EPA.

Hazardous Air Pollutants (HAPs).

The list of specific chemicals and compounds defined as HAPs in Section 112b of the 1990 Clean Air Act Amendments is available from Ohio EPA on-line at: http://www.epa.state.oh.us/dapc/general/haplist.html. This listing is subject to change and only the currently listed items require tracking.

The use of HAPs and materials containing HAPs is allowed at GRC however the airborne release of HAPs shall be minimized at all times.

Records of the use of HAPs and materials containing HAPs must be provided to the CO for forwarding to the Environmental Management Branch. At a minimum, this should include Material Safety Data Sheets and quantities of each HAP and materials containing HAPs used.

Product and waste HAPs and materials containing HAPs must be stored in such a way as to prevent their release to the atmosphere.

Prohibition of Air Pollution Nuisances

No air pollution generating activity shall be allowed if it is expected to cause an air pollution nuisance.

No air pollution generating activity shall be allowed to continue if it is found to be an air pollution nuisance.

1.10 HAZARDOUS WASTE LIABILITY

Hazardous Waste Liability - For the purpose of this contract, the Contractor shall be responsible for any release or threatened release of the materials or substances handled under this contract, as well as any liabilities resulting or arising from or related to this contract, and shall bear all costs pertaining to such releases including, but not limited to, responses, remediation, testing, or disposal costs, and further shall defend and indemnify the Government for any costs including, but not limited to, any judgments, penalties, assessments, litigation, or attorney fees.

1.11 HAZARDOUS WASTE TRANSPORTATION

Certified Waste Haulers shall be utilized. Government directed waste shall be transported to the disposal facility or interim storage facility without delay, in accordance with Department of Transportation (DOT) manifest regulations. The Contractor shall notify the Government if 10 days or more have a elapsed during shipment.

1.12 SUSTAINABILITY

The Contractor shall conduct its activities in a manner that conserves resources and minimizes pollution in accordance with Executive Order 13101 "Greening the Government Through Waste Prevention, Recycling and Federal Acquisition" and Executive Order 13123 "Greening the Government Through Efficient Energy Management".

Minimize the amount of energy required during construction and operation by using resource efficient construction techniques, building systems (including HVAC, heating, electrical, water, lighting, heat-pumps and boilers), insulation, fixtures, appliances, and controls.

Whenever possible, utilize energy efficient office equipment through the Environmental Protection Agency's Energy Star labeling program (@ http://www.epa.gov/energystar/).

Use automated monitors and controls for energy, water, waste, temperature, moisture, and ventilation.

Conserve water with systems that reduce consumption and recycle water through reclamation and treatment systems.

Maximize the reduction, reuse, recycling or composting of waste and scrap materials.

Minimize waste, spillage, pilferage, spoil, and misuse of building materials.

Follow federal Comprehensive Procurement Guidelines (@ http://www.epa.gov/epaoswer/non-hw/procure/) for building materials and products, and select materials that have a long-life cycle; select least toxic materials; select recyclable materials; select materials that are resource-efficient; select materials with the maximum recycled content; select materials harvested on a sustained yield basis; select products causing the least pollution during their manufacture, use and reuse.

1.13 TRAINING REQUIREMENTS

Personnel handling hazardous materials shall have received Hazard Communication Training per 29 CFR 1910.1200(h), and personnel handling hazardous waste shall have received appropriate DOT and Hazardous Waste and Emergency Response Operations (HAZWOPER) Emergency Response Awareness Level Training per 29 CFR 1910.120. Employee training documents shall be kept at the jobsite.

Personnel containing spills or conducting cleanup of small spills shall have received First Responder Operators level training per 29 CFR 1910.120. (Note: Personnel with First Responder Operators level training can contain a spill to stop its spread from a safe distance. Their function is to contain the release from a safe distance, keep it from spreading, and prevent exposures.

Personnel generating hazardous waste shall have receive training on the proper management of hazardous waste per 40 CFR 265.16.

Personnel Handling Refrigerants shall have training in accordance with 40 CFR 82.

1.14 CHEMICAL USAGE, STORAGE, AND HANDLING

Hazardous material shall be used only as described on the Safety Data Sheet and/or Contractor's written instructions. The Contractor shall wear the protective equipment recommended by the manufacturer of the hazardous

material. Containers of hazardous materials and hazardous wastes shall be kept closed except when in use. Containers of liquid hazardous materials shall be stored in secondary containment at the end of each work shift on an impervious surface.

1.14.1 Hazardous Materials Storage

Hazardous materials storage shall be in accordance with Federal, State, and local regulations, and the General Storm Water Permit. Hazardous materials shall be handled in a manner that minimizes the potential for releases. All liquid hazardous materials must be secondarily contained on an impervious surface. Adequate spill response equipment shall be readily available.

Hazardous materials and hazardous wastes shall be labeled, handled properly, and stored in secondary containment at the end of each work day. Secondary containment shall be of adequate size and compatible with the materials stored. Storage areas shall be properly labeled and secured. Storage areas shall be in accordance with Section 01 57 23.98, Storm Water Pollution Prevention.

At the beginning of the project, an accurate inventory of hazardous materials and hazardous wastes to be generated including the estimated maximum quantity of each hazardous material to be brought on-site shall be provided to the COR. Safety Data Sheets (SDSs) for hazardous materials shall be maintained by the Contractor so they are immediately available to assist emergency response personnel in the event of a hazardous materials incident. Copies of the SDSs shall be provided in the Health and Safety Plan (HASP).

1.14.2 Refuse Bins

Refuse bins shall not be overloaded. Liquid materials shall not be placed in dumpsters or bins. Leaking dumpsters shall be replaced. Dumpsters and bins shall not be cleaned on-site. Dumpsters shall remain covered except when actively being loaded.

1.14.3 Site Inspections

The project site and storage areas shall be inspected weekly to ensure compliance. Compliance status shall be verified by the Contractor. The checklists shall be submitted to the COR, within 48 hours following the inspection.

1.14.4 Labeling

Containers, drums, vessels, tanks, and associated piping containing hazardous materials shall be labeled in accordance with 29 CFR 1910.1200 (f).

Hazardous material labels must have a description of the contents (including percentages of components for compounds), an appropriate hazard warning and the name and address of the manufacturer or other responsible party.

Hazardous waste and solid waste containers shall be appropriately marked, pending analysis, in accordance with 40 CFR 262 with, at a minimum, accumulation start date and contents and documented during weekly inspections.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

3.1 SITE OPERATIONS AND MAINTENANCE

Site Operations shall be conducted in accordance with the Clean Water Act and GRC Storm Water Pollution Prevention Plan. For projects over 1 acre (total) in size, a Storm Water Pollution Prevention Plan (SWP3) must be submitted to the EEMO 2 months prior to project commencement for review and approval. Time to receive an approved permit from Ohio EPA may take longer than 2 months from the submittal of the SWP3 to EEMO. [See Storm Water Pollution Prevention Section 01 57 23.98.]

Equipment Fueling and Maintenance - Equipment fluid changes and fueling shall be conducted over drip pans to prevent spilled materials from contacting the ground surface. The operator of leaking equipment shall contain and control the leak. All storm drains in close proximity shall be protected with absorbent socks. The Contractor shall contact NASA GRC Waste Management through the Contracting Officer to coordinate proper disposal of waste materials generated during equipment maintenance.

When operating any hydraulic equipment all storm drains in close proximity shall be protected with absorbent socks.

3.1.1 Paint Clean-up

Painting operations must be conducted in accordance with GRC Storm Water Pollution Prevention Plan and applicable State of Ohio requirements.

Water Based Paints:

The Contractor shall paint out as much excess paint as possible from brushes, rollers, and equipment before starting clean up. Rinse brushes, rollers, and other tools over a sink that drains to the sanitary sewer using water only. Tools and equipment shall not be cleaned into streets, gutters, storm drains, or creeks. Dispose of dry brushes, rollers, rags, and drop cloths as solid waste.

Disposal of containers with any liquids as a solid waste is prohibited. These materials must be used elsewhere or handled as a regulated waste and disposed of in accordance with paragraph entitled Contractor Disposal. All empty paint containers and surplus paint shall be turned over to the government via a NASA C260A form along with the product's
SDS.

Oil Based Paints:

The Contractor shall paint out as much excess paint as possible from brushes, rollers, and equipment before starting clean up. Cleaning solutions shall be containerized and disposed of as hazardous waste. Reuse thinners and solvents by pouring back into original container through a filter.

Dispose of waste thinners, solvents, paint sludge, and solutions from cleaning of equipment and tools as hazardous waste. Containers with residual product shall be managed as a hazardous waste and disposed of. All empty paint containers and surplus paint shall be turned over to the government via a NASA C260A form along with the product's SDS.

3.1.2 Concrete/Asphalt Cutting and Core Drilling

The Contractor shall prevent not allow slurry run-off from saw cutting or core drilling to enter the storm or sanitary sewer collection systems. Catch basins and drains shall be protected.

3.1.3 Sweeping

Roadways and on-site paved areas impacted by the project shall be cleaned to the satisfaction of the COR and swept at the end of each phase or at project completion. Hosing down paved areas and streets is prohibited.

3.1.4 Sewage Sludge

Sewage Sludge and Compost Materials containing human waste is prohibited from use at GRC.

3.1.5 Draining, Tanks, Piping, and Equipment

Tanks, piping, and equipment shall be drained as required. Devices to properly contain the product shall be provided by the Contractor. Storm drains in the vicinity shall be covered during drainage operations.

The Government will obtain the necessary sanitary sewer discharge permits if the discharge is sewerable. Non-sewerable water shall be treated to a level to allow discharge to the sanitary sewer or managed and disposed of properly by the Government.

3.1.6 Monitoring Wells

Monitoring Wells shall not be disturbed for any reason. If they are disturbed, inadvertently or not, the contractor shall incur all costs associated with the abandonment (i.e. removal) of the well in accordance with Ohio EPA requirements.

3.2 SOIL MANAGEMENT

The Contractor shall immediately stop work and notify the COR if soil appears discolored or has an odor different from what is expected.

No excavation shall proceed without an approved excavation permit and a soil determination checklist issued by the EEMO.

3.3 PCBs/PCB CONTAMINATED EQUIPMENT

All PCB-contaminated material shall be handled in accordance with 40 CFR 761.

The Contractor shall dial 911 from any NASA phone or 216-433-8888 from an outside phone to inform Emergency Dispatch of any spills or leaks of PCB-contaminated material.

The contractor shall notify the Contracting Officer of any PCB-contaminated material that needs disposal.

3.4 SPILL PREVENTION, CONTROL AND REPORTING

All liquid petroleum products must be secondarily contained in accordance with Annex Q of GRC's Emergency Preparedness Plan and 40 CFR 112. Spill clean-up materials (such as rags, absorbent booms/pads), and tools (such as shovels and brooms) shall be maintained at the project site and be readily accessible. Releases of hazardous materials to the environment shall be contained and measures implemented to prevent leaks and spills from entering storm drains.

Dial 911 from any NASA phone or 216-433-8888 from an outside phone to inform Emergency Dispatch of any spills or leaks.

If the contractor stores fuel on site, that fuel shall be stored within a double containment vessel manufactured for fuel storage. Plastic lined structures are not acceptable for the double containment. Fuel storage shall comply with Chapter 31 of the NASA GRC Safety Manual, Chapter 22 of the GRC Environmental Programs Manual and NASA technical standard 8719.11. Tank shall not be sited near a storm sewer.

3.5 HAZARDOUS WASTE DISPOSAL

The Contractor shall label, package, and secondarily contain hazardous waste in accordance with 40 CFR 173, 40 CFR 177, 40 CFR 178 and 49 CFR 171. [Refer to Section 02 61 00.98 REMOVAL AND DISPOSAL OF CONTAMINATED SOILS for hazardous waster soils disposal.]

Storage of hazardous waste shall not exceed 90 days from the date of generation in accordance with 40 CFR 262. Hazardous waste shall be shipped for disposal no later than 90 days from the date of generation/accumulation start date.

No hazardous material or waste shall remain at the worksite upon completion of the project unless specified otherwise.

3.5.1 Hazardous Waste Manifest

NASA Glenn Research Center shall be designated as the generator on the manifest and only approved GRC EEMO personnel shall sign any shipping documents, including Uniform Hazardous Waste Manifests.

NASA Glenn Research Center EEMO shall be designated as the emergency contact.

The Contractor shall perform transportation services in compliance with 49 CFR 100-185.

The Contractor shall use only disposal facilities that have a valid permit to manage hazardous waste, and shall be responsible for determining that permit allows for the type of management and disposal intended for that waste. The Contractor shall be responsible for ensuring that any party handling hazardous waste, including subcontractors, transporters, and TSDF

Letter of Acceptance and Hazardous Waste Manifests are in compliance with applicable federal, state, and local regulations. GRC EEMO shall have final approval of TSDFs.

3.5.2 Containerized Hazardous Waste

Hazardous wastes and other materials shipped by the Contractor with wastes from other facilities shall not be commingled.

3.5.3 Bulk Hazardous Waste

Bulk hazardous waste shipments shall be weighed to confirm shipping weight.

3.5.4 Miscellaneous Hazardous Waste

Fluorescent light tubes, mercury containing items (batteries, emergency and exit lights) and PCB lighting ballasts and thermostats shall be turned over to the Government for recycling.

-- End of Section --

SECTION 01 42 00

SOURCES FOR REFERENCE PUBLICATIONS
02/19

PART 1 GENERAL

1.1 REFERENCES

Various publications are referenced in other sections of the specifications to establish requirements for the work. These references are identified in each section by document number, date and title. The document number used in the citation is the number assigned by the standards producing organization (e.g. ASTM B564 Standard Specification for Nickel Alloy Forgings). However, when the standards producing organization has not assigned a number to a document, an identifying number has been assigned for reference purposes.

1.2 ORDERING INFORMATION

The addresses of the standards publishing organizations whose documents are referenced in other sections of these specifications are listed below, and if the source of the publications is different from the address of the sponsoring organization, that information is also provided.

AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS (AASHTO)
444 North Capital Street, NW, Suite 249
Washington, DC 20001
Ph: 202-624-5800
Fax: 202-624-5806
E-Mail: info@aashto.org
Internet: https://www.transportation.org/

ASTM INTERNATIONAL (ASTM)
100 Barr Harbor Drive, P.O. Box C700
West Conshohocken, PA 19428-2959
Ph: 610-832-9500
Fax: 610-832-9555
E-mail: service@astm.org
Internet: https://www.astm.org/

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION (NASA)
NASA Headquarters
300 E. Street SW, Suite 5R30
Washington, DC 20546
Ph: 202-358-0001
Fax: 202-358-4338
Internet: https://www.nasa.gov/

U.S. DEPARTMENT OF AGRICULTURE (USDA)
Order AMS Publications from:
AGRICULTURAL MARKETING SERVICE (AMS)
Seed Regulatory and Testing Branch
801 Summit Crossing Place, Suite C

Gastonia, NC 28054-2193
Ph: 704-810-8884
E-mail: PA@ams.usda.gov
Internet: https://www.ams.usda.gov/
Order Other Publications from:
USDA Rural Development
Rural Utilities Service
STOP 1510, Rm 5135
1400 Independence Avenue SW
Washington, DC 20250-1510
Phone: (202) 720-9540
Internet:
https://www.rd.usda.gov/about-rd/agencies/rural-utilities-service

U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)
8601 Adelphi Road
College Park, MD 20740-6001
Ph: 866-272-6272
Internet: https://www.archives.gov/
Order documents from:
Superintendent of Documents
U.S. Government Publishing Office (GPO)
732 N. Capitol Street, NW
Washington, DC 20401
Ph: 202-512-1800 or 866-512-1800
Bookstore: 202-512-0132
Internet: https://www.gpo.gov/

PART 2 PRODUCTS

Not used

PART 3 EXECUTION

Not used

-- End of Section --

SECTION 01 45 00.98

QUALITY CONTROL
12/12

PART 1 GENERAL

1.1 SUMMARY

The requirements of this Section apply to, and are a component part of, each section of the specifications.

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-06 Test Reports

Contractor shall submit the following items in accordance with the paragraph entitled, "Records," of this section.

Quality Control Data
Quality Control Coordinating Actions
Quality Control Training
Inspection Records
Letters of Authority or Delegation
Field Tests
Factory Tests

SD-07 Certificates

Contractor shall submit a detailed written statement describing procedures that will be implemented to achieve quality on the project according to the paragraph entitled, "Quality Assurance (QA) Plan," of this section.

Contractor shall submit the following in accordance with the paragraph entitled, "Qualifications," of this section.

Contractor's Quality Representative Qualifications Special Certifications

1.2.1 Quality Assurance (QA) Plan

QA plan shall address the following:

Description of the authority, responsibilities and coordinating procedures, of an-site/off-site quality assurance personnel, including those QA personnell not under direct control of the Contractor.

QA plan shall list personnel designated by the Contractor to accomplish the work required by the contract.

QA plan shall also contain an appendix with a copy fo each form, report format, or similar record to be used in the QA program.

Contractor's organization that handles construction contract activities.

Contractor's operational plan for accomplishing and reviewing work controls, fabrication controls, certifications, and dcumentation of quality control operations, inspections, and test records, including those for subcontractors.

These provisions shall include the methods to be used during the procurement cycle (order to delivery) for these materials or equipment that require source inspections, shop fabrications, or similar operations located separately from the work site.

Description of on site personnel training.

Certifications(s) of personnel, procedures, processes, and equipment.

Nondestructive testing requirements.

Identification of independent certifying and testing laboratories.

1.2.2 Records

Records shall include all quality control data; factory tests or manufacturer's certifications, quality control coordinating actions; records of quality control training/certifications as well as routine hydrostatic, electrical continuity, grounding, welding, line cleaning, field tests and similar tests. Quality records shall be available for examination by the Contracting Officer.

Legible copies of the test and inspection records shall be furnished to the Contracting Officer. Records shall cover work placement traceable to the contract schedule, specifications and drawings, and shall be verified by the Contractor.

Contractor shall submit for approval, the narrative description of an inspection system which provides for compliance with the quality requirements and technical ceriteria of the contract within 7 calendar days after notice to proceed.

Contractor shall submit a monthly performance report that summarize the quality operations. This report shall identify inspections made, tests performed, nonconformances, corrective actions taken, status of plans/procedures being developed, and statue of open items/problems in work.

Contractor shall submit Letters of Authority or Delegation outlining the authority and responsibilities of quality control personnel along with a copy of the letter of delegation to the Contracting Officer that defines delegated duties and responsibilities.

1.3 QUALITY ASSURANCE

1.3.1 Qualifications

Contractor's Quality Representative Qualifications shall be submitted to the Contracting Officer for approval. Quality Representative may be

assigned to more than one contract provided that the assigned contracts are located at the same site.

When approval or certifiation of special processes, operating personnel, and special equipment or procedures is required by the specifications, the Contractor shall obtain necessary approvals or special certifications prior to starting the work.

1.3.2 Quality Control Requirements

Contractor shall provide a quality control program encompassing: selection of construction materials and sources; suppliers; subcontractors; on site and off site fabrication of Contracting furnished assemblies; on site and off site assembly; erection; work procedures; workmanship; inspection; and testing.

Contractor's program shall provide document systems ensuring that quality provisions of contract schedule, specificaitons, and drawings have been performed.

1.3.2.1 Management and Organization

The Quality Program Manager shall report to the Contractor's management and shall have the necessary authority to discharge contractual responsibilities.

1.3.2.2 Identification and Data Retrieval

Contractor shall have an identification and data retrieval system.

Records, drawings, submittals, and equipment shall be identified by referencing the Contract Number; Contract Specification Number; Contract Drawing Number; Submittal Document Number: Contract Change Number; and the Contractor's Drawing Number System.

1.3.2.3 Procurement

Contractor shall be responsible for controlling procurement sources and those of his subcontractors to ensure that each purchase meets quality requirements.

1.3.2.4 Receiving Inspection System

Contractor shall maintain a site receiving inspection system that ensures procured materials and equipment are inspected and tested.

Receiving inspection records shall accompany each procurement delivery to the construction site. Records of site receiving inspections shall be maintained by the Contractor.

Records shall show defects, discrepancies, dispositions, and waivers, including evidence of Government source inspection.

1.3.2.5 Nonconforming Articles and Material Control

The Contractor shall control nonconformances discovered by the Contractor, subcontractors, suppliers or Government quality representatives to prevent their use and to correct deficient operations.

a. Contractor shall prepare a "nonconformance" report for each instance comprising:

(1) Identification of the nonconforming article or material.

(2) A description of the nonconformance and the applicable requirement.

(3) Cause or reason for the nonconformance.

(4) Remedial actions taken or recommended.

(5) Disposition of the nonconforming article or material.

b. The Contractor shall identify and mark each nonconforming article for removal from the work area.

c. The Contractor shall monitor and correct deficient operations.

1.3.2.6 Fabrication, Process, and Work Control

Contractor's procedures and controls shall ensure compliance with requirements in contract specifications and drawings.

Contractor shall establish in-process inspections, to ensure compliance with quality requirements.

1.3.2.7 Quality Control Records

Quality control records shall be maintained at a central on-site location.

Maintenance of quality control records shall not relieve the Contractor from submitting samples, test data, detail drawings, material certificates, or other information required by each section in the specification.

Contractor shall ensure each record is identified and traceable to specific requirements in the specifications and drawings.

1.3.2.8 Drawings and Change Control

Drawing-control system shall be maintained to provide revised drawings and ensure continuous removal of obsolete drawings from work areas. Changes involving interface with other work areas, or affecting materials controlled by others shall be controlled by the Contractor. This system shall be integrated with the document requirements of the contract.

Drawing changes shall be clearly annotated. Implemented changes shall be clearly identified and associated drawings shall be revised accordingly. Drawings that have been approved, or approved as noted, by the Contracting Officer shall be used for fabrication and inspection.

1.3.3 Quality Inspections

1.3.3.1 Government Inspections

Work performed under this contract will be subject to inspection by the

Contracting Officer. Changes to the specifications or drawings will not be allowed without written authorization of the Contracting Officer.

When the Contracting Officer determines that inspected work needs to be corrected, the Contracting Officer will be allowed [24] [_____] [hours] [_____] to complete reinspection of the corrected work.

Contracting Officer shall be notified before backfilling or encasing any [underground] utility so that work may be inspected. Failure to notify the Contracting Officer before backfill or encasement occurs shall require the work be uncovered at no additional cost to the Government.

Contractor's program is subject to continuous evaluation, review, and verification by the Contracting Officer. Contractor will be notified in writing of any noncompliance and will be given [_____] calendar days to correct identified deficiencies.

1.3.3.2 Contractor's Quality Inspections

Contractor shall implement an inspection system. Documentation shall indicate quality control through records of inspections, tests, and procedures.

Contractor's quality assurance system shall include the following:

a. Contractor's representative responsible for on-stie communication and operation of the inspection program.

b. Purchasing control system documenting project procurement to drawings, specifications, and approved submittals.

c. Receiving inspection system documenting inspections for each procurement.

d. Documentation for handling and disposing of nonconforming components and materials.

e. Inspection records for each specific section of the specification and drawings.

f. Identification of test(s) to be performed, test procedures, records, and independent organizations used.

g. Documenting and maintaining certification or re-certification of procedures.

h. Management of government-furnished equipment, components, and materials.

i. Calibration of gages, tools, measuring instruments, and independent laboratories used.

Contractor shall establish a system of scheduled or random audits to ensure task completion.

1.3.4 Field Services

1.3.4.1 Responsibility for Inspection and Testing

Contractor shall be responsible for all inspections and tests, and the accompanying documentation for each inspection and test. Contractor may utilize independent inspection and testing laboratories or services as approved by the Contracting Officer.

Contractor shall also be responsible for tests of construction materials utilizing the services of an approved independent testing laboratory.

1.3.4.2 Inspection and Test Records

Contractor shall provide on-site records of each inspection and test performed throughout the life of the contract. Records shall include, but not be limited to, factual evidence that the required inspections or tests have been performed, including type and number of inspections or tests involved, identification of operators and inspectors, result of inspections or tests, nature of defects, causes for rejection, proposed remedial action, and corrective actions taken.

Inspection records, test procedures, test results, and associated forms be verified by and provided to the Contracting Officer. Final test data shall have a cover letter/sheet clearly marked with the system name, date, and the words "Final Test Data".

1.4 HANDLING AND STORAGE

Contractor shall provide controls, procedures and documentation with each shipment, that meet requirements of each section of the specifications.

The Contractor shall include documentation with each shipment. The data shall consist of documentation required by the contract along with specifications required to identify, store, preserve, operate, and maintain the items shipped.

1.5 SEQUENCING AND SCHEDULING

Contractor shall notify the Government at least [_____] hours prior to scheduled inspections and tests.

Contractor shall provide [24] [_____] hour notice to the Government of the date when the contract work will begin at the site.

When Contractor suspends work for [_____] calendar days or longer prior to completion, the Contracting Officer shall be notified. Work shall not resume without notification of the Contracting Officer.

Contracting Officer shall be notified at least 48 hours in advance of backfilling or encasing any underground utility.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

Not Used

-- End of Section --

SECTION 01 57 23.98

TEMPORARY STORM WATER POLLUTION CONTROL
08/12

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM D 4439	(1997) Standard Terminology for Geosynthetics
ASTM D 4491	(1996) Water Permeability of Geotextiles by Permittivity
ASTM D 4533	(1991; R 1996) Trapezoid Tearing Strength of Geotextiles
ASTM D 4632	(1991; R 1996)) Grab Breaking Load and Elongation of Geotextiles
ASTM D 4751	(1995) Determining Apparent Opening Size of a Geotextile
ASTM D 4873	(1995) Identification, Storage, and Handling of Geosynthetic Rolls

1.2 GENERAL

The Contractor shall implement the storm water pollution prevention measures specified in this section in a manner which will meet the requirements of Section 01 35 43 98 ENVIRONMENTAL PROTECTION PROCEDURES, and the requirements of the National Pollution Discharge Elimination System (NPDES) permit attached to that Section.

1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-07 Certificates

Mill Certificate or Affidavit; [_____],

Certificate attesting that the Contractor has met all specified requirements.

1.4 EROSION AND SEDIMENT CONTROLS

The controls and measures required by the Contractor are described below.

1.4.1 Stabilization Practices

The stabilization practices to be implemented shall include [temporary seeding,] [mulching,] [geotextiles,] [sod stabilization,] [vegetative buffer strips,] [erosion control matts,] [protection of trees,] [preservation of mature vegetation,] [etc]. On his daily CQC Report, the Contractor shall record the dates when the major grading activities occur, (e.g., [clearing] [and grubbing,] [excavation,] [embankment,] [and] [grading]); when construction activities temporarily or permanently cease on a portion of the site; and when stabilization practices are initiated. Except as provided in paragraphs UNSUITABLE CONDITIONS and NO ACTIVITY FOR LESS THAN 21 DAYS, stabilization practices shall be initiated as soon as practicable, but no more than 14 days, in any portion of the site where construction activities have [temporarily or] permanently ceased.

1.4.1.1 Unsuitable Conditions

Where the initiation of stabilization measures by the fourteenth day after construction activity [temporarily or] permanently ceases is precluded by unsuitable conditions caused by the weather, stabilization practices shall be initiated as soon as practicable after conditions become suitable.

1.4.1.2 No Activity for Less Than 21 Days

Where construction activity will resume on a portion of the site within 21 days from when activities ceased (e.g., the total time period that construction activity is temporarily ceased is less than 21 days), then stabilization practices do not have to be initiated on that portion of the site by the fourteenth day after construction activity temporarily ceased.

1.4.2 Structural Practices

Structural practices shall be implemented to divert flows from exposed soils, temporarily store flows, or otherwise limit runoff and the discharge of pollutants from exposed areas of the site. Structural practices shall be implemented in a timely manner during the construction process to minimize erosion and sediment runoff. Structural practices shall include the following devices. [Location and details of installation and construction are shown on the drawings.]

1.4.2.1 [Silt Fences

The Contractor shall provide silt fences as a temporary structural practice to minimize erosion and sediment runoff. Silt fences shall be properly installed to effectively retain sediment immediately after completing each phase of work where erosion would occur in the form of sheet and rill erosion (e.g. clearing and grubbing, excavation, embankment, and grading). Silt fences shall be installed in the locations indicated on the drawings. Final removal of silt fence barriers shall be upon approval by the Contracting Officer.]

1.4.2.2 [Straw Bales

The Contractor shall provide bales of straw as a temporary structural practice to minimize erosion and sediment runoff. Bales shall be properly placed to effectively retain sediment immediately after completing each phase of work (e.g., clearing and grubbing, excavation, embankment, and grading) in each independent runoff area (e.g., after clearing and

grubbing in a area between a ridge and drain, bales shall be placed as work progresses, bales shall be removed/replaced/relocated as needed for work to progress in the drainage area). Areas where straw bales are to be used are shown on the drawings. Final removal of straw bale barriers shall be upon approval by the Contracting Officer. Rows of bales of straw shall be provided as follows:

a. Along the downhill perimeter edge of all areas disturbed.

b. Along the top of the slope or top bank of drainage ditches, channels, swales, etc. that traverse disturbed areas.

c. Along the toe of all cut slopes and fill slopes of the construction areas.

d. Perpendicular to the flow in the bottom of existing drainage ditches, channels, swales, etc. that traverse disturbed areas or carry runoff from disturbed areas. Rows shall be spaced [a maximum of [_____] feet apart] [as shown on the drawings].

e. Perpendicular to the flow in the bottom of new drainage ditches, channels, and swales. Rows shall be spaced [a maximum of [_____] feet apart] [as shown on the drawings].

f. At the entrance to culverts that receive runoff from disturbed areas.

g. [_____].]

1.4.2.3 [Diversion Dikes

Diversion dikes shall have a maximum channel slope of 2 percent and shall be adequately compacted to prevent failure. The minimum height measured from the top of the dike to the bottom of the channel shall be 18 inches. The minimum base width shall be 6 feet and the minimum top width shall be 2 feet. The Contractor shall ensure that the diversion dikes are not damaged by construction operations or traffic. Diversion dikes shall be located as shown on the drawings.]

PART 2 PRODUCTS

2.1 COMPONENTS FOR SILT FENCES

2.1.1 Filter Fabric

The geotextile shall comply with the requirements of ASTM D 4439, and shall consist of polymeric filaments which are formed into a stable network such that filaments retain their relative positions. The filament shall consist of a long-chain synthetic polymer composed of at least 85 percent by weight of ester, propylene, or amide, and shall contain stabilizers and/or inhibitors added to the base plastic to make the filaments resistance to deterioration due to ultraviolet and heat exposure. Synthetic filter fabric shall contain ultraviolet ray inhibitors and stabilizers to provide a minimum of six months of expected usable construction life at a temperature range of 0 to 120 degrees F. The filter fabric shall meet the following requirements:

FILTER FABRIC FOR SILT SCREEN FENCE

PHYSICAL PROPERTY	TEST PROCEDURE	STRENGTH REQUIREMENT
Grab Tensile	ASTM D 4632	100 lbs. min.
Elongation (%)		30 % max.
Trapezoid Tear	ASTM D 4533	55 lbs. min.
Permittivity	ASTM D 4491	0.2 sec-1
AOS (U.S. Std Sieve)	ASTM D 4751	20-100

2.1.2 Silt Fence Stakes and Posts

The Contractor may use either wooden stakes or steel posts for fence construction. Wooden stakes utilized for silt fence construction, shall have a minimum cross section of 2 inches by 2 inches when oak is used and 4 inches by 4 inches when pine is used, and shall have a minimum length of 5 feet. Steel posts (standard "U" or "T" section) utilized for silt fence construction, shall have a minimum weight of 1.33 pounds per linear foot and a minimum length of 5 feet.

2.1.3 Mill Certificate or Affidavit

A mill certificate or affidavit shall be provided attesting that the fabric and factory seams meet chemical, physical, and manufacturing requirements specified above. The mill certificate or affidavit shall specify the actual Minimum Average Roll Values and shall identify the fabric supplied by roll identification numbers. The Contractor shall submit a mill certificate or affidavit signed by a legally authorized official from the company manufacturing the filter fabric.

2.1.4 Identification Storage and Handling

Filter fabric shall be identified, stored and handled in accordance with ASTM D 4873.

2.2 COMPONENTS FOR STRAW BALES

The straw in the bales shall be stalks from oats, wheat, rye, barley, rice, or from grasses such as byhalia, bermuda, etc., furnished in air dry condition. The bales shall have a standard cross section of 14 inches by 18 inches. All bales shall be either wire-bound or string-tied. The Contractor may use either wooden stakes or steel posts to secure the straw bales to the ground. Wooden stakes utilized for this purpose, shall have a minimum dimensions of 2 inches x 2 inches in cross section and shall have a minimum length of 3 feet. Steel posts (standard "U" or "T" section) utilized for securing straw bales, shall have a minimum weight of 1.33 pounds per linear foot and a minimum length of 3 feet.

PART 3 EXECUTION

3.1 INSTALLATION OF SILT FENCES

Silt fences shall extend a minimum of 16 inches above the ground surface and shall not exceed 34 inches above the ground surface. Filter fabric shall be from a continuous roll cut to the length of the barrier to avoid the use of joints. When joints are unavoidable, filter fabric shall be

spliced together at a support post, with a minimum 6 inch overlap, and securely sealed. A trench shall be excavated approximately 4 inches wide and 4 inches deep on the upslope side of the location of the silt fence. The 4-inch by 4-inch trench shall be backfilled and the soil compacted over the filter fabric. Silt fences shall be removed upon approval by the Contracting Officer.

3.2 INSTALLATION OF STRAW BALES

Straw bales shall be placed in a single row, lengthwise on the contour, with ends of adjacent bales tightly abutting one another. Straw bales shall be installed so that bindings are oriented around the sides rather than along the tops and bottoms of the bales in order to prevent deterioration of the bindings. The barrier shall be entrenched and backfilled. A trench shall be excavated the width of a bale and the length of the proposed barrier to a minimum depth of 4 inches. After the bales are staked and chinked (gaps filled by wedging with straw), the excavated soil shall be backfilled against the barrier. Backfill soil shall conform to the ground level on the downhill side and shall be built up to 4 inches against the uphill side of the barrier. Loose straw shall be scattered over the area immediately uphill from a straw bale barrier to increase barrier efficiency. Each bale shall be securely anchored by at least two stakes driven through the bale. The first stake or steel post in each bale shall be driven toward the previously laid bale to force the bales together. Stakes or steel pickets shall be driven a minimum 18 inches deep into the ground to securely anchor the bales.

3.3 MAINTENANCE

The Contractor shall maintain the temporary and permanent vegetation, erosion and sediment control measures, and other protective measures in good and effective operating condition by performing routine inspections to determine condition and effectiveness, by restoration of destroyed vegetative cover, and by repair of erosion and sediment control measures and other protective measures. The following procedures shall be followed to maintain the protective measures.

3.3.1 Silt Fence Maintenance

Silt fences shall be inspected in accordance with paragraph INSPECTIONS. Any required repairs shall be made promptly. Close attention shall be paid to the repair of damaged silt fence resulting from end runs and undercutting. Should the fabric on a silt fence decompose or become ineffective, and the barrier is still necessary, the fabric shall be replaced promptly. Sediment deposits shall be removed when deposits reach one-third of the height of the barrier. When a silt fence is no longer required, it shall be removed. The immediate area occupied by the fence and any sediment deposits shall be shaped to an acceptable grade. The areas disturbed by this shaping shall [receive erosion control if required by Section [02___ EROSION CONTROL]], paragraph [AREAS TO RECEIVE EROSION CONTROL] [be seeded in accordance with Section [02___]] [ESTABLISHMENT OF TURF], [except that the coverage requirements in paragraph ESTABLISHMENT do not apply].

3.3.2 Straw Bale Maintenance

Straw bale barriers shall be inspected in accordance with paragraph INSPECTIONS. Close attention shall be paid to the repair of damaged bales, end runs and undercutting beneath bales. Necessary repairs to

barriers or replacement of bales shall be accomplished promptly. Sediment deposits shall be removed when deposits reach one-half of the height of the barrier. Bale rows used to retain sediment shall be turned uphill at each end of each row. When a straw bale barrier is no longer required, it shall be removed. The immediate area occupied by the bales and any sediment deposits shall be shaped to an acceptable grade. The areas disturbed by this shaping shall be seeded in accordance with Section [02___] TURF.

3.3.3 Diversion Dike Maintenance

Diversion dikes shall be inspected in accordance with paragraph INSPECTIONS. Close attention shall be paid to the repair of damaged diversion dikes and necessary repairs shall be accomplished promptly. When diversion dikes are no longer required, they shall be shaped to an acceptable grade. The areas disturbed by this shaping shall be seeded in accordance with Section [02___] TURF.

3.4 INSPECTIONS

3.4.1 General

The Contractor shall inspect disturbed areas of the construction site, areas used for storage of materials that are exposed to precipitation that have not been finally stabilized, stabilization practices, structural practices, other controls, and area where vehicles exit the site at least once every seven (7) calendar days and within 24 hours of the end of any storm that produces 0.5 inches or more rainfall at the site. Where sites have been finally stabilized, such inspection shall be conducted at least once every month.

3.4.2 Inspections Details

Disturbed areas [and areas used for material storage that are exposed to precipitation] shall be inspected for evidence of, or the potential for, pollutants entering the drainage system. Erosion and sediment control measures identified in the Storm Water Pollution Prevention Plan shall be observed to ensure that they are operating correctly. Discharge locations or points shall be inspected to ascertain whether erosion control measures are effective in preventing significant impacts to receiving waters. Locations where vehicles exit the site shall be inspected for evidence of offsite sediment tracking.

3.4.3 Inspection Reports

For each inspection conducted, the Contractor shall prepare a report summarizing the scope of the inspection, name(s) and qualifications of personnel making the inspection, the date(s) of the inspection, major observations relating to the implementation of the Storm Water Pollution Prevention Plan, maintenance performed, and actions taken. The report shall be furnished to the Contracting Officer within 24 hours of the inspection as a part of the Contractor's daily CQC REPORT. A copy of the inspection report shall be maintained on the job site.

3.4.4 [Monthly Inspection Report and Certification Form for Erosion and Sediment Controls

On the first working day of each month the Contractor shall complete, sign, and submit the original form to the State of [____], [Office of

Pollution Control (OPC)] at the following address:

Chief, [_____]
[_____]
[_____]
[_____]

A copy of the State of [_____]'s [Monthly Inspection Report and Certification Form for Erosion and Sediment Controls] is attached to the end of this section. On the first working day of each month the Contractor shall also furnish one copy of the form submitted to the [OPC] to the Contracting Officer as part of the Contractor's daily CQC Report and attach a copy of the completed form to the Plan. Unless otherwise notified by the [OPC], the Contractor shall submit the [Monthly Inspection Report and Certification Forms] for an additional two months after the final completion of all storm water pollution prevention measures required in this contract have been implemented.]

-- End of Section --

SECTION 02 61 00.98 00

REMOVAL AND DISPOSAL OF CONTAMINATED SOILS
09/17

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

29 CFR 1910	Occupational Safety and Health Standards
40 CFR 261	Identification and Listing of Hazardous Waste
40 CFR 262	Standards Applicable to Generators of Hazardous Waste
49 CFR 171	General Information, Regulations, and Definitions
49 CFR 172	Hazardous Materials Table, Special Provisions, Hazardous Materials Communications, Emergency Response Information, and Training Requirements
49 CFR 178	Specifications for Packagings

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-07 Certificates

Statements shall be submitted for the following items in accordance with paragraphs entitled, "Site Specific Health and Safety Plan" and "Site Specific Work Plan," of this section.

Site Specific Health and Safety Plan G
Site Specific Work Plan G

1.2.1 Site Specific Health and Safety Plan

For companies performing contaminated waste soil operations, a Detailed Description of the work to be performed shall be submitted. The plan shall include but not be limited to objectives, methods, resources and personnel required to complete the task and shall evaluate the potential hazards of the chemical contaminants and explain how workers shall be protected from those hazards. Personnel performing [solid and]hazardous

waste activities shall be trained pursuant to 29 CFR 1910, Hazardous Waste Operations and Emergency Response (HAZWOPER) and 49 CFR 172, Transportation of Hazardous Materials. For all workers and supervisors performing [solid and] hazardous waste activities, include 40-hour HAZWOPER training certificates. Employees handling hazardous materials shall be trained in compliance with 49 CFR 172, and the Work Plan shall include evidence of such training. For companies performing hazardous waste operations, a copy of the Contractor's Hazard Communication Program shall be attached to the Site Specific Health and Safety Plan as an Appendix. The Program shall address the evaluation of the potential hazards of chemicals in the work place, communicating information concerning these hazards to employees and descriptions of appropriate measures. Six (6) copies of the Site Specific Health and Safety Plan (including the Hazard Communication Program if required) shall be submitted at least three (3) weeks prior to beginning excavation activities.

1.2.2 Site Specific Work Plan

For contaminated waste soil operations, a Detailed Description of the work to be performed shall be submitted. The work plan shall include but not be limited to objectives, methods, resources and personnel required to complete the task including plans for the decontamination of equipment and personnel. The following shall be included:

1. Licenses/Permits - Provide the name and licenses for the waste hauler and the disposal facility.

2. Container Sizes and Suppliers - Provide sizes and suppliers of drums, roll-offs, dump trailers, dump trucks, tanker trucks and frac tank.

3. Profiles - Provide completed Waste Profile Sheets, Waste Product Questionnaires, or Waste Characterization Reports describing the type of solid or hazardous waste generated, volume, frequency, generator name and address, broker and certification statement. Land Disposal Restriction Notification forms shall be included if applicable. Analytical data, to be provided by NASA, shall accompany the Waste Profile. The COR will obtain the required NASA signatures on the Waste Profiles.

4. Draft Manifests - Provide completed DRAFT Hazardous Waste and Solid Waste Manifests describing the waste being disposed of in accordance with 40 CFR 261.

5. A description of how stormwater and surface runoff will be prevented from entering the excavation shall also be included.

6. If Hazardous Waste soils are to be excavated, a description of the Hazardous Waste Zones Implementation shall be included (see paragraph 3.3 of this specification section).

Six (6) copies of the Site Specific Work Plan shall be submitted at least three (3) weeks prior to beginning excavation activities.

1.3 NOTIFICATIONS

1.3.1 Landfill Approval Letter

Letters, forms, or other written documents supplied to the Contractor from

the facility designated for the disposal of hazardous or solid waste acknowledging the wastes are acceptable for disposal. All approvals shall be on company letterhead and bear the signature of an authorized representative of the disposal facility. Provide approval letters at least one week (1) prior to beginning excavation activities. No excavation activities shall be permitted prior to NASA's receipt and acknowledgement of the landfill approval letter.

1.3.2 Disposal Records

Provide Disposal Tickets, Weigh Tickets or other records supplied by the disposal facility documenting the weight of waste material disposed of at the disposal facility.

Provide disposal records to NASA within one (1) week of receipt by the Contractor.

1.3.3 Final Manifests

Provide Final, Signed Hazardous Waste and Solid Waste Manifests completed by the Contractor and the disposal facility in accordance with 40 CFR 261. The NASA Waste Management Team (WMT) (address: Glenn Research Center, Mail Stop 6-1, 21000 Brookpark Road, Cleveland, Ohio 44135) shall receive the final signed Manifest directly from the disposal facility. In the event that the Contractor receives the Final signed manifests, it shall be immediately forwarded to the NASA WMT.

1.4 QUALITY ASSURANCE

No contaminated soil shall be removed from the site without written authorization from the Government in the form of completed and signed Waste Manifests and Property Passes.

The COR will obtain the required NASA signature on all waste profiles, (Land Disposal Restriction Forms, if applicable), property passes and manifests for contaminated waste soil shipments.

The COR may perform inspections of containers intended for the storage or transportation of soils at any time, and will perform weekly inspections of all containers storing contaminated waste soils.

PART 2 PRODUCTS

2.1 DRUMS

Metal and fiberglass drums shall comply with 49 CFR 178.

Drums shall be marked with the manufacturer's certification, specification, approval, or exemption mark.

Reconditioned drums shall be free of old labels and markings.

Containers shall be of a suitable size and constructed of material which is compatible with the waste being placed in them. Containers shall be leak proof, sift proof and lined with 10 mil (minimum) plastic liner to prevent materials from coming into contact with the inner surface of the container.

Drums shall be identified with number provided by the COR.

2.2 ROLL-OFFS

Containers shall be leak proof, sift proof and lined with 10 mil (minimum) plastic liner to prevent materials from coming into contact with the inner surface of the container.

Containers shall be constructed of materials which are compatible with the waste being placed in them.

Containers shall be covered with leak proof tarpaulin and secured at all times except when being loaded so that no foreign materials, debris, or rainwater enters the container.

Rolloff boxes shall be identified with number provided by the COR.

2.3 DUMP TRAILERS AND SUMP TRUCKS

Containers shall be leak proof, sift proof and lined with 10 mil (minimum) plastic liner to prevent materials form coming into contact with the inner liner surface of the container.

Containers shall be covered with a tarpaulin and secured at all times except when loaded so that no foreign materials, debris, or rainwater enters the container.

2.4 TANKER TRUCKS

Inner and outer valves shall be in working condition with visible means of secure closure to prevent leakage.

2.5 FRAC TANKS

Inner and outer valves shall be in working condition with visible means of secure closure to prevent leakage.

Holding tanks used for the temporary storage shall be made of material which are compatible with the liquid waste.

2.6 CONTAINERS

All containers used for storage and transportation of hazardous waste soils shall meet the requirements of 49 CFR 178. Containers and liners shall also meet the requirements of the disposal facility. Containers used for the transportation of hazardous waste soils shall be labeled in accordance with 49 CFR 171 and 49 CFR 172.

PART 3 EXECUTION

3.1 STORAGE AND TRANSPORTATION

The Contractor shall obtain approval from the COR for the location of any temporary stored soils and containers.

Excavated solid waste soil shall be placed directly into containers or trucks to prohibit infusion of rainwater or foreign debris. Excavated solid waste soils shall not be permitted to be stockpiled.

Excavated hazardous waste soil shall be placed directly into a container

or truck and covered to prohibit infusion of rainwater or foreign debris. Excavated hazardous waste soils shall not be permitted to be stockpiled.

All containers shall be properly labeled and marked prior to filling. If the soil is non-hazardous solid waste, the standard green non-hazardous waste label shall be used. If the soil is hazardous waste, the standard red and white Environmental Protection Agency (EPA)/ Department of Transportation (DOT) label shall be used until shipped. At the time of shipping, the yellow and red hazardous waste label shall be placed over the red and white label and completely filled out. Labels shall include, at a minimum, the date of generation, the project title, the Contractor's name and phone number, and the COR's name and phone number.

Storage of any hazardous waste soil shall not exceed 90 days from the date of generation in accordance with 40 CFR 262.

Vehicles transporting waste soils for disposal shall be weighed on NASA scales located at Building 119. Vehicles shall be weighed by the Government prior to and after loading of excavated materials. The resulting weight of the waste shall be recorded on the Waste Manifests.

Vehicles transporting waste soils for disposal shall not leave NASA without a completed and signed Property Pass, and completed, numbered and signed Waste Manifest. This paperwork is required for each load leaving GRC. NASA employees are the only ones legally authorized to sign a manifest on the Government's behalf. The Contractor shall not sign any Waste Manifests. The COR shall also obtain manifest numbers for each document. The top white copy of the Property Pass with the actual signature shall be surrendered to the Security Guards at the Main Gate when exiting the Glenn Research Center.

3.2 DISPOSAL

All soil designated as a solid waste shall be disposed of at an OEPA licensed solid waste facility. The Contractor shall comply with the requirements of the disposal facility. Soil has been designated a solid waste [in areas shown on drawings][location] due to [describe contamination].

All soil designated as a hazardous waste shall be disposed of at a state permitted hazardous waste facility. The Contractor shall comply with the requirements of the disposal facility. Soil has been designated a hazardous waste in [in areas shown on drawings][location] due to the presence of [describe contamination] which requires the soil to be considered as a RCRA listed hazardous waste with a waste code of [FO02] [_____]

3.3 HAZARDOUS WASTE OPERATIONS

To reduce the spread of hazardous waste soil form contaminated areas, the Contractor shall delineate zones on the site where different types of operations will occur. The flow of personnel among these zones shall be controlled. This information shall be provided in the Work Plan.

The site shall be divided into at least 3 zones.

1. Exclusion Zone - This is the area where most of the work is accomplished and contamination is present. The outer boundary shall be identified as the Hotline. The Hotline shall be marked by hazard

tape, signs, barricades and fences. Flow of personnel and equipment shall be controlled.

2. Containment Reduction Zone - This is the transition area between the contamination area and the clean area. Decontamination of personnel and equipment shall take place in this area. The outer boundary shall be identified as Contamination Control Line.

3. Support Zone - This is the outermost area. No contamination of any kind shall exist in this area. Administrative and support functions shall be performed in this area.

3.4 STORM AND SURFACE WATER

The Contractor shall prevent Storm Water runoff from entering any open Solid Waste or Hazardous Waste excavation. The Contractor shall notify the COR of the presence of Storm Water in excavations. Any Storm Water that accumulates in such an excavation shall be considered as a solid waste or a hazardous waste liquid and shall be containerized by the Contractor for analysis. The Contractor shall obtain sampling and analysis of the liquid in accordance with the Northeast Ohio Regional Sewer District (NEORSD) Pre-Treatment Standards. The Contractor shall coordinate the sampling and analytical through the COR. Once the data is available, NASA will coordinate with the COR, and shall be in accordance with this Section. If NEORSD determines that the liquid meets the Pre-Treatment Standards, NASA will direct the Contractor on the appropriate method of discharge to the Sanitary Sewer System. With either determination, the Contractor shall be responsible for all costs associated with the sampling, analysis, containerizing, transportation and disposal of the Storm Water Runoff.

3.5 GROUNDWATER

The Contractor shall notify the COR of the presence of groundwater in excavations. Any groundwater that accumulates in such an excavation shall be considered as a solid waste or a hazardous waste liquid and shall be containerized for analysis. NASA shall obtain sampling and analysis of the liquid in accordance with the Northeast Ohio Regional Sewer District (NEORSD) Pre-Treatment Standards and shall coordinate the sampling and analytical. Once the data is available, NASA will coordinate with the NEOSRD and determine the disposition of the water. If NEORSD determines that a liquid does not meet the Pre-Treatment Standards, all subsequent transportation and disposal shall be coordinated with the COR, and shall be in accordance with this Section. If NEORSD determines that the liquid meets the Pre-Treatment Standards, NASA will direct the Contractor on the appropriate method of discharge to the Sanitary Sewer System. With either determination, NASA shall be responsible for all costs associated with the sampling, analysis, containerizing, transportation and disposal of the groundwater.

3.6 DIFFERING SITE CONDITIONS

There is the possibility that the Contractor, in the execution of the Work, may encounter a pre-existing soil or groundwater contamination, of which NASA is unaware. If a condition occurs where contamination appears that is different than the contamination expected, the Contractor shall stop work within the immediate area of the impact and notify the COR. The Contractor shall isolate the impacted area of the differing site condition to the smallest possible footprint, and may continue work in areas outside

of the impacted area.

-- End of Section --

SECTION 31 00 00.98

EARTHWORK
01/18

PART 1 GENERAL

1.1 RELATED REQUIREMENTS (LEED)

Section 01 35 43.98 ENVIRONMENTAL PROTECTION PROCEDURES for disposal of construction and demolition waste.

Section 32 92 19 SEEDING for topsoil placement.

Section 32 93 00 EXTERIOR PLANTS for planting soil mixture placement.

1.2 CRITERIA FOR BIDDING

Base bids on the following criteria:

a. Surface elevations are as indicated.

b. Pipes or other artificial obstructions, except those indicated, will not be encountered.

c. Dewatering is the responsibility of the contractor regardless of when water is encountered.

1.3 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS (AASHTO)

AASHTO T 103	(2008) Standard Method of Test for Soundness of Aggregates by Freezing and Thawing
AASHTO T 180	(2017) Standard Method of Test for Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18-in.) Drop
AASHTO T 2	(2000) Sampling of Aggregates
AASHTO T 224	(2010) Standard Method of Test for Correction for Coarse Particles in the Soil Compaction Test
AASHTO T 87	(1986; R 2000) the Dry Preparation of Disturbed Soil and Soil Aggregate Samples for Test

ASTM INTERNATIONAL (ASTM)

ASTM C 117	(2004) Standard Test Method for Materials Finer than 75-um (No. 200) Sieve in Mineral Aggregates by Washing
ASTM C 131	(2006) Standard Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine
ASTM C 136	(2006) Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates
ASTM C 88	(2005) Standard Test Method for Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate
ASTM D 1140	(2000; R 2006) Amount of Material in Soils Finer than the No. 200 (75-micrometer) Sieve
ASTM D 1556	(2007) Density and Unit Weight of Soil in Place by the Sand-Cone Method
ASTM D 1557	(2009) Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3) (2700 kN-m/m3)
ASTM D 2216	(2010) Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass
ASTM D 2487	(2006e1) Soils for Engineering Purposes (Unified Soil Classification System)
ASTM D 2922	(2005) Standard Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)
ASTM D 2940/D 2940M	(2009) Standard Specification for Graded Aggregate Material for Bases or Subbases for Highways or Airports
ASTM D 422	(1963; R 2007) Particle-Size Analysis of Soils
ASTM D 4318	(2010) Liquid Limit, Plastic Limit, and Plasticity Index of Soils

STATE OF OHIO DEPARTMENT OF TRANSPORTATION (ODOT)

ODOT	(2008) Construction and Material Specifications

1.4 DEFINITIONS FOR GENERAL EARTHWORK

1.4.1 Satisfactory Materials

Satisfactory materials comprise any materials classified by ASTM D 2487 as GW, GP, GM, GP-GM, GW-GM, SW, SP, SM, SW-SM, SP-SM, CL, ML, and CL-ML. Satisfactory materials for grading comprise stones less than 8 inches, except for fill material for pavements which comprise stones less than 3 inches in any dimension. Satisfactory materials for filling and backfilling comprise fill materials able to be compacted as specified and approved by the geotechnical engineer for the specific purpose.

1.4.2 Unsatisfactory Materials

Materials which do not comply with the requirements for satisfactory materials are unsatisfactory. Unsatisfactory materials also include man-made fills; trash; refuse; backfills from previous construction; and material classified as satisfactory which contains root and other organic matter or frozen material. Notify the Contracting Officer when encountering any contaminated materials.

1.4.3 Cohesionless and Cohesive Materials

Cohesionless materials include materials classified in ASTM D 2487 as GW, GP, SW, and SP. Cohesive materials include materials classified as GC, SC, ML, and CL. Materials classified as GM and SM will be identified as cohesionless only when the fines are nonplastic. Perform testing, required for classifying materials, in accordance with ASTM D 4318, ASTM C 136, ASTM D 422, and ASTM D 1140.

1.4.4 Degree of Compaction

Degree of compaction required, except as noted in the second sentence, is expressed as a percentage of the maximum density obtained by the test procedure presented in ASTM D 1557 abbreviated as a percent of laboratory maximum density. Since ASTM D 1557 applies only to soils that have 30 percent or less by weight of their particles retained on the 3/4 inch sieve, express the degree of compaction for material having more than 30 percent by weight of their particles retained on the 3/4 inch sieve as a percentage of the maximum density in accordance with AASHTO T 180 and corrected with AASHTO T 224. To maintain the same percentage of coarse material, use the "remove and replace" procedure as described in NOTE 8 of Paragraph 7.2 in AASHTO T 180.

1.4.5 Topsoil

All topsoil shall be stockpiled and used in grass areas per ODOT Item 651.02. Material suitable for topsoils obtained from excavations is defined as: Natural, friable soil representative of productive, well-drained soils in the area, free of subsoil, stumps, rocks larger than one inch diameter, brush, weeds, toxic substances, and other material detrimental to plant growth. Amend topsoil pH range to obtain a pH of 5.5 to 7. All preparation of topsoil areas to be per ODOT Item 659.10. All landscape bed areas and parking lot grass islands shall use natural screened topsoil approved by NASA and NASA testing requirements.

1.4.6 Rock

Solid homogeneous interlocking crystalline material with firmly cemented,

laminated, or foliated masses or conglomerate deposits, neither of which can be removed without systematic drilling and blasting, drilling and the use of expansion jacks or feather wedges, or the use of backhoe-mounted pneumatic hole punchers or rock breakers; also large boulders, buried masonry, or concrete other than pavement exceeding 1/2 cubic yard in volume. Removal of hard material will not be considered rock excavation because of intermittent drilling that is performed merely to increase production.

1.4.7 Unstable Material

Unstable material are too wet to properly support the utility pipe, conduit, or appurtenant structure or to be properly compacted.

1.4.8 Select Granular Material

1.4.8.1 General Requirements

All aggregate to meet ODOT 703 and must be limestone, except slag will not be permitted.

1.4.9 Initial Backfill Material

Initial backfill consists of select granular material or satisfactory materials free from rocks 3 inches or larger in any dimension or free from rocks of such size as recommended by the pipe manufacturer, whichever is smaller. When the pipe is coated or wrapped for corrosion protection, free the initial backfill material of stones larger than 3 inches in any dimension or as recommended by the pipe manufacturer, whichever is smaller.

1.4.10 Soils

All earthwork activities shall be per ODOT Items 203 and 204 wherever applicable.

1.5 SYSTEM DESCRIPTION

Subsurface soil boring logs and subsoil investigation report are appended to the SPECIAL CONTRACT REQUIREMENTS. The data represents the best subsurface information available; however, variations may exist in the subsurface between boring locations. This information is provided for informational purposes only.

1.5.1 Classification of Excavation

Finish the specified excavation on a classified basis, in accordance with the following designations and classifications.

1.5.1.1 Common Excavation

Include common excavation with the satisfactory removal and disposal of all materials not classified as rock excavation.

1.5.2 Blasting

Blasting will not be permitted.

1.5.3 Dewatering Work Plan

Submit procedures for accomplishing dewatering work.

1.6 SUBMITTALS

Government approval is required for all submittals. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-03 Product Data

Utilization of Excavated Materials
Opening of any Excavation or Borrow Pit

Procedure and location for disposal of unused satisfactory material. Proposed source of borrow material. Advance notice on the opening of excavation or borrow areas.

SD-06 Test Reports

Testing; G
Borrow Site Testing; G

Within 24 hours of conclusion of physical tests, 6 copies of test results, including calibration curves and results of calibration tests. Results of testing at the borrow site.

SD-07 Certificates

Testing; G

Qualifications of the Corps validated commercial testing laboratory or the Contractor's validated testing facilities.

Qualifications of Contractor's geotechnical engineer.

1.7 SAMPLING AND TESTING

1.7.1 Tests for Proposed Soil Materials

Materials shall be approved by the Contracting Officer prior to start of work.

Soil materials proposed for use in the work shall be tested as follows.

MATERIAL	REQUIREMENT	TEST METHOD	NUMBER OF TESTS
Satis-factory soil materials	Sampling	AASHTO T 2	One from each source of materials to determine con-formance to definition of satisfactory soil materials; additional tests whenever there is any apparent change
	Preparation of samples	AASHTO T 87	
	Sieve analysis is of fine and coarse aggre-gates	ASTM C 136	

MATERIAL	REQUIREMENT	TEST METHOD	NUMBER OF TESTS
	Amount of material passing No. 200 sieve	ASTM C 117	
	Liquid limit	ASTM D 4318	
	Plastic limit and plasticity index	ASTM D 4318	
	Mechanical analysis	ASTM D 422	
	Moisture-density relations	ASTM D 1557	As required to determine moisture-density requirement of materials from each source
	Los Angeles abrasion of coarse aggregates	ASTM C 131	One for each soil material from each source if called for in reference specification
	Freezing and thawing soundness of aggregates	AASHTO T 103	
	Magnesium Sulfate Soundness Test	ASTM C 88	

1.7.2 Quality Control Testing During Construction

Soil materials shall be tested during construction as follows:

MATERIAL	REQUIREMENT	TEST METHOD	NUMBER OF TESTS
Soil materials specified	Sieve analysis of fine and coarse aggregates	ASTM C 136	One daily for each soil material from each source; additional test whenever there is any apparent change
	Amount of material passing No. 200	ASTM C 117	

MATERIAL	REQUIREMENT	TEST METHOD	NUMBER OF TESTS
	sieve		
	Moisture content of subbase material	ASTM D 2216	
Soil materials prior to compaction	Moisture-density relations of soil	ASTM D 1557	One of each type of subgrade soil material except under backfill for structures; one for each backfill and fill material from each source
Soil material-in-place after compaction	Density of soil-in-place	ASTM D 1556, Sand Cone Method or ASTM D 2922, Nuclear Method (when approved by Contracting Officer)	At least three daily for each subgrade soil material and for each layer of backfill and fill material; additional test whenever there is any change in moisture conditions

1.7.3 Test Reports

No soil material shall be used until test reports have been reviewed and approved.

1.7.4 Evaluation of Test Results

Results of density of soil-in-place tests shall be considered satisfactory if the average of any group of four consecutive density tests which may be selected is in each instance equal to or greater than the specified density, and if not more than one density test in five has a value more than 2 percentage points below the specified density.

PART 2 PRODUCTS

2.1 REQUIREMENTS FOR OFFSITE SOILS

2.1.1 Requirements for Offsite Soils

All testing shall conform to NASA Environmental and SHED standards. The testing for the soil shall be per contractor at no additional cost to the Government. All testing and offsite soil shall be approved by NASA. Do not bring material onsite until tests have been approved by the Contracting Officer.

2.1.2 Environment Testing Requirements

- Contractor shall provide the source of the soil. If the soil is taken from multiple areas and then taken to the suppliers site to manufacture soil then a list of locations that the soil was sourced from will be required.

- Contractor shall provide chemical analysis of the soil coming into NASA GRC. The parameters that the soil shall be tested for are as follows:

  > Volatile Organic Compounds (VOCs)
  > Semi-Volatile Organic Compounds (SVOCs)
  > RCRA Metals
  > Polychlorinated Biphenyl (PCBs)

- For non-manufactured soil from a single virgin source, existing soil analysis data may be used if it meets the list of analysis parameters above. If no analytical data exists, the contractor may need to have a sample analyzed for the parameters listed above. If Phase 1 Environmental Site Assessment (ESA) and Phase 2 ESA reports exist then this data may be supplied to NASA for review to determine if the soil meets NASA GRC's Environmental Standards. If data is not acceptable by NASA GRC, soil tests must be completed at no additional cost to the government.

  > NASA GRC base line levels in Appendix "Z". Levels must be less than or equal to numbers provided.

2.2 SOIL MATERIALS

2.2.1 RIP-RAP

All material shall conform to ODOT Item 600; however no concrete shall be used.

2.2.2 Bedding Material

All items shall meet ODOT specifications. Stone backfill shall conform to ODOT 703.01. All sand shall conform to ODOT 703.06.

2.2.3 Engineered Fill

Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940/D 2940M; with at least 90 percent passing a 1-1/2 inch sieve and not more than 12 percent passing a No. 200 sieve.

PART 3 EXECUTION

3.1 STRIPPING OF TOPSOIL

Where indicated or directed, completely strip topsoil. Spread topsoil on areas already graded and prepared for topsoil, or transported and deposited in stockpiles convenient to areas that are to receive application of the topsoil later, or at locations indicated or specified. Keep topsoil separate from other excavated materials, brush, litter, objectionable weeds, roots, stones larger than 2 inch in diameter, and

other materials that would interfere with planting and maintenance operations. Stockpile in locations indicated any surplus of topsoil from excavations and gradings.

3.2 FILLING OF SITE

3.2.1 Preparation of Ground Surface to Receive Fill

Vegetation, debris, unsatisfactory soil materials, obstructions, and deleterious materials shall be removed from ground surface prior to the placement of fills. Sloped surfaces steeper than 1 vertical to 4 horizontal shall be plowed, stripped, or broken up in such manner that fill material will bond with the existing material.

When the ground surface has a density less than that specified for the particular area classification, the ground surface shall be broken up, pulverized, moisture-conditioned to near optimum moisture content of the soil material, and compacted to the required depth and percentage of maximum density.

3.2.2 Placement and Compaction

Fill materials shall be placed in layers not more than 8 inches in loose depth. Before compaction, each layer of fill material shall be moistened or aerated as necessary to provide the optimum moisture content of the soil material and shall then be compacted to the percentage of maximum density for each area classification as specified. Testing is required for each lift. Fill material shall not be placed on surfaces that are muddy, frozen, icy, or contain frost.

Place and compact fill material in layers to required elevations as follows:

Under grass and planted areas, use satisfactory soil material.

Under walks and pavements, use satisfactory soil material.

Under steps and ramps, use satisfactory soil material.

Under building footprint, use satisfactory soil material.

Under footings and foundations, use satisfactory soil material.

Fill materials adjacent to structures shall be brought up evenly around structures and shall be carried up to the indicated elevations.

Compaction adjacent to structures, within a horizontal distance from the face of the structure equal to the depth of fill material (measured from the bottom of footing or bottom of foundation or retaining wall) to final grade, shall be done with power-driven hand tampers.

3.3 GENERAL EXCAVATION

Perform excavation of every type of material encountered within the limits of the project to the lines, grades, and elevations indicated and as specified. Perform the grading in accordance with the typical sections shown and the tolerances specified in paragraph FINISHING. Transport satisfactory excavated materials and place in fill or embankment within the limits of the work. Excavate unsatisfactory materials encountered

within the limits of the work below grade and replace with satisfactory materials as directed. Include such excavated material and the satisfactory material ordered as replacement in excavation. Dispose surplus satisfactory excavated material not required for fill or embankment in areas approved for surplus material storage or designated waste areas. Dispose unsatisfactory excavated material in designated waste or spoil areas. During construction, perform excavation and fill in a manner and sequence that will provide proper drainage at all times. Excavate material required for fill or embankment in excess of that produced by excavation within the grading limits from the borrow areas indicated or from other approved areas selected by the Contractor as specified.

3.3.1 Ditches, Gutters, and Channel Changes

Finish excavation of ditches, gutters, and channel changes by cutting accurately to the cross sections, grades, and elevations shown on grading plan. Do not excavate ditches and gutters below grades shown. Backfill the excessive open ditch or gutter excavation with satisfactory, thoroughly compacted, material or with suitable stone or cobble to grades shown. Dispose excavated material as shown or as directed, except in no case allow material be deposited a maximum 4 feet from edge of a ditch. Maintain excavations free from detrimental quantities of leaves, brush, sticks, trash, and other debris until final acceptance of the work.

3.3.2 Drainage Structures

Make excavations to the lines, grades, and elevations shown, or as directed. Provide trenches and foundation pits of sufficient size to permit the placement and removal of forms for the full length and width of structure footings and foundations as shown. Remove loose disintegrated rock and thin strata. Do not disturb the bottom of the excavation when concrete or masonry is to be placed in an excavated area. Do not excavate to the final grade level until just before the concrete or masonry is to be placed.

3.3.3 Drainage

Provide for the collection and disposal of surface and subsurface water encountered during construction. Completely drain construction site during periods of construction to keep soil materials sufficiently dry. Construct storm drainage features (ponds/basins) at the earliest stages of site development, and throughout construction grade the construction area to provide positive surface water runoff away from the construction activity and provide temporary ditches, swales, and other drainage features and equipment as required to maintain dry soils. When unsuitable working platforms for equipment operation and unsuitable soil support for subsequent construction features develop, remove unsuitable material and provide new soil material as specified herein. It is the responsibility of the Contractor to assess the soil and ground water conditions presented by the plans and specifications and to employ necessary measures to permit construction to proceed.

3.3.4 Dewatering

Control groundwater flowing toward or into excavations to prevent sloughing of excavation slopes and walls, boils, uplift and heave in the excavation and to eliminate interference with orderly progress of construction. Do not permit French drains, sumps, ditches or trenches

within 3 feet of the foundation of any structure, except with specific written approval, and after specific contractual provisions for restoration of the foundation area have been made. Take control measures by the time the excavation reaches the water level in order to maintain the integrity of the in situ material. While the excavation is open, maintain the water level continuously, at least 2 feet below the working level. Operate dewatering system continuously until construction work below existing water levels is complete. Submit performance records weekly. Measure and record performance of dewatering system at same time each day by use of observation wells or piezometers installed in conjunction with the dewatering system. Relieve hydrostatic head in previous zones below subgrade elevation in layered soils to prevent uplift.

3.3.5 Underground Utilities

The Contractor is responsible for movement of construction machinery and equipment over pipes and utilities during construction. Contractor is required to contact NASA to mark all utilities prior to commencing site work. For work immediately adjacent to or for excavations exposing a utility or other buried obstruction, excavate by hand. Start hand excavation on each side of the indicated obstruction and continue until the obstruction is uncovered or until clearance for the new grade is assured. Support uncovered lines or other existing work affected by the contract excavation until approval for backfill is granted by the Contracting Officer. Report damage to utility lines or subsurface construction immediately to the Contracting Officer. Damage to Government utility/property by the contractor due to heavy equipment shall be repaired to the satisfaction of the Government and at no cost to the Government.

3.3.6 Structural Excavation

Ensure that footing subgrades have been inspected and approved by the Geotechnical Engineer and Contracting Officer prior to concrete placement.

3.4 SELECTION OF BORROW MATERIAL

Select borrow material to meet the requirements and conditions of the particular fill or embankment for which it is to be used. Unless otherwise provided in the contract, the Contractor is responsible for obtaining the right to procure material, pay royalties and other charges involved, and bear the expense of developing the sources, including rights-of-way for hauling from the owners. Borrow material from approved sources on Government-controlled land may be obtained without payment of royalties. Unless specifically provided, do not obtain borrow within the limits of the project site without prior written approval. Consider necessary clearing, grubbing, and satisfactory drainage of borrow pits and the disposal of debris thereon related operations to the borrow excavation.

3.5 OPENING AND DRAINAGE OF EXCAVATION

Notify the Contracting Officer sufficiently in advance of the opening of any excavation to permit elevations and measurements of the undisturbed ground surface to be taken. Except as otherwise permitted, excavate excavation areas providing adequate drainage. Transport overburden and other spoil material to designated spoil areas or otherwise dispose of as directed. Ensure that excavation of any area, operation of borrow pits, or dumping of spoil material results in minimum detrimental effects on natural environmental conditions.

3.6 GEOTECHNICAL ENGINEER

Hire a Professional Geotechnical Engineer licensed in the State of Ohio to provide inspection of excavations and soil/groundwater conditions throughout construction. The Geotechnical Engineer is responsible for performing pre-construction and periodic site visits throughout construction to assess site conditions. The Geotechnical Engineer is responsible for updating the excavation, sheeting and dewatering plans as construction progresses to reflect changing conditions and submit an updated plan if necessary. Submit a monthly written report, informing the Contractor and Contracting Officer of the status of the plan and an accounting of the Contractor's adherence to the plan addressing any present or potential problems. The Contracting Officer is responsible for arranging meetings with the Geotechnical Engineer at any time throughout the contract duration.

3.7 GRADING AREAS

Where indicated, divide work into grading areas within which satisfactory excavated material will be placed in embankments, fills, and required backfills. Do not haul satisfactory material excavated in one grading area to another grading area except when so directed in writing. Place and grade stockpiles of satisfactory materials as specified. A Soil Relocation Permit will be required. Keep stockpiles in a neat and well drained condition, giving due consideration to drainage at all times. Clear, grub, and seal by rubber-tired equipment, the ground surface at stockpile locations; separately stockpile excavated satisfactory and unsatisfactory materials. Protect stockpiles of satisfactory materials from contamination which may destroy the quality and fitness of the stockpiled material. If the Contractor fails to protect the stockpiles, and any material becomes unsatisfactory, remove and replace such material with satisfactory material from approved sources.

3.8 FINAL GRADE OF SURFACES TO SUPPORT CONCRETE

Do not excavate to final grade until just before concrete is to be placed. Only use excavation methods that will leave the foundation rock in a solid and unshattered condition. Roughen the level surfaces, and cut the sloped surfaces, as indicated, into rough steps or benches to provide a satisfactory bond. Protect shales from slaking and all surfaces from erosion resulting from ponding or water flow.

3.9 GROUND SURFACE PREPARATION

3.9.1 General Requirements

Remove and replace unsatisfactory material with satisfactory materials, as directed by the Contracting Officer, in surfaces to receive fill or in excavated areas. Scarify the surface to a depth of 6 inch before the fill is started. Plow, step, bench, or break up sloped surfaces steeper than 1 vertical to 4 horizontal so that the fill material will bond with the existing material. When subgrades are less than the specified density, break up the ground surface to a minimum depth of 6 inch, pulverizing, and compacting to the specified density. When the subgrade is part fill and part excavation or natural ground, scarify the excavated or natural ground portion to a depth of 12 inch and compact it as specified for the adjacent fill.

3.9.2 Frozen Material

Do not place material on surfaces that are muddy, frozen, or contain frost. Finish compaction by sheepsfoot rollers, pneumatic-tired rollers, steel-wheeled rollers, or other approved equipment well suited to the soil being compacted. Moisten material as necessary to plus or minus 2 percent of optimum moisture.

3.10 UTILIZATION OF EXCAVATED MATERIALS

Dispose unsatisfactory materials removing from excavations into designated waste disposal or spoil areas. Use satisfactory material removed from excavations, insofar as practicable, in the construction of fills, embankments, subgrades, shoulders, bedding (as backfill), and for similar purposes. Do not waste any satisfactory excavated material without specific written authorization. Dispose of satisfactory material, authorized to be wasted, in designated areas approved for surplus material storage or designated waste areas as directed. Clear and grub newly designated waste areas on Government-controlled land before disposal of waste material thereon. Stockpile and use coarse rock from excavations for constructing slopes or embankments adjacent to streams, or sides and bottoms of channels and for protecting against erosion. Do not dispose excavated material to obstruct the flow of any stream, endanger a partly finished structure, impair the efficiency or appearance of any structure, or be detrimental to the completed work in any way.

3.11 COMPACTION OF SOIL FILLS

Place fill soil materials in layers not more than 8 inches in loose depth for material compacted by heavy compaction equipment, and not more than 4 inches in loose depth for material compacted by hand-operated tampers.

Compact soil materials to not less than the following percentages of maximum dry unit weight according to Paragraph 1.4.4 Degree of Compaction.

Under structures, building slabs, steps, and pavements, scarify and recompact top 12 inches of existing subgrade and each layer of fill soil material at 98 percent.

Under walkways, scarify and recompact top 6 inches below subgrade and compact each layer of fill soil material at 95 percent.

Under turf or unpaved areas, scarify and recompact top 6 inches below subgrade and compact each layer of fill soil material at 90 percent.

3.11.1 Moisture Control

Moisture content in soil material at time of compaction shall be within limits specified.

Where the moisture content of a layer of soil material is below optimum before compaction, the required amount of water shall be uniformly applied to the surface of the layer of soil material and the layer of soil disked or otherwise mixed until a uniform moisture content is reached.

Moisture of a layer of soil material that is above optimum shall be removed by drying.

3.12 EARTHWORK EMBANKMENTS

Construct earth embankments from satisfactory materials free of organic or frozen material and rocks with any dimension greater than 3 inches. Place the material in successive horizontal layers of loose material not more than 8 inches in depth. Spread each layer uniformly on a soil surface that has been moistened or aerated as necessary, and scarified or otherwise broken up so that the fill will bond with the surface on which it is placed. After spreading, plow, disk, or otherwise brake up each layer; moisten or aerate as necessary; thoroughly mix; and compact as indicated above. Finish compaction by sheepsfoot rollers, pneumatic-tired rollers, steel-wheeled rollers, vibratory compactors, or other approved equipment.

3.13 SUBGRADE PREPARATION

3.13.1 Proof Rolling

Finish proof rolling on an exposed subgrade free of surface water (wet conditions resulting from rainfall) which would promote degradation of an otherwise acceptable subgrade. Proof roll the existing subgrade with six passes of a 20 ton tandem axle dump truck at speeds between 2.5-3.5 mph. Notify the Geotechnical Engineer and Contracting Officer a minimum of 3 days prior to proof rolling. Perform proof rolling in the presence of the Contracting Officer. Undercut rutting or pumping of material as directed by the Contracting Officer and replace with fill and backfill with fabric and 1's and 2's 6" thick. Prepare bids based on replacing approximately 100 square yards, with an average depth of 6 inch at various locations.

3.13.2 Construction

Shape subgrade to line, grade, and cross section, and compact as specified. Include plowing, disking, and any moistening or aerating required to obtain specified compaction for this operation. Remove soft or otherwise unsatisfactory material and replace with approved material as directed. Excavate rock encountered in the cut section to a depth of 6 inch below finished grade for the subgrade. Bring up low areas resulting from removal of unsatisfactory material or excavation of rock to required grade with approved materials, and shape the entire subgrade to line, grade, and cross section and compact as specified. Do not vary the elevation of the finish subgrade more than 0.05 foot from the established grade and cross section.

3.13.3 Compaction

Finish compaction by sheepsfoot rollers, pneumatic-tired rollers, steel-wheeled rollers, vibratory compactors, or other approved equipment.

3.14 SHOULDER CONSTRUCTION

Construct shoulders of approved excavated or borrow material or as otherwise shown or specified. Construct shoulders immediately after adjacent paving is complete. In the case of rigid pavements, do not construct shoulders until permission of the Contracting Officer has been obtained. Compact the entire shoulder area to at least the percentage of maximum density as specified for specific ranges of depth below the surface of the shoulder. Finish compaction by sheepsfoot rollers, pneumatic-tired rollers, steel-wheeled rollers, vibratory compactors, or other approved equipment. Finish shoulder construction in proper sequence

in such a manner that adjacent ditches will be drained effectively and that no damage of any kind is done to the adjacent completed pavement. Align the completed shoulders true to grade and shaped to drain in conformity with the cross section shown.

3.15 FINISHING

Finish the surface of excavations, embankments, and subgrades to a smooth and compact surface in accordance with the lines, grades, and cross sections or elevations shown. Provide the degree of finish for graded areas within 0.1 foot of the grades and elevations indicated. Finish gutters and ditches in a manner that will result in effective drainage and no puddling occurs. Finish the surface of areas to be turfed from settlement or washing to a smoothness suitable for the application of turfing materials. Repair graded, topsoiled, or backfilled areas prior to acceptance of the work, and re-established grades to the required elevations and slopes.

3.15.1 Subgrade and Embankments

During construction, keep embankments and excavations shaped and drained. Maintain ditches and drains along subgrade to drain effectively at all times. Do no disturb the finished subgrade by traffic or other operation. Protect and maintain the finsihed subgrade in a satisfactory condition until ballast, subbase, base, or pavement is placed. Do not permit the storage or stockpiling of materials on the finished subgrade. Do not lay subbase, base course, ballast, or pavement until the subgrade has been checked and approved, and in no case place subbase, base, surfacing, pavement, or ballast on a muddy, spongy, or frozen subgrade.

3.16 TESTING

Perform testing by the Contractor's validated testing facility. If the Contractor elects to establish testing facilities, do not permit work requiring testing until the Contractor's facilities have been inspected, NASA validated and approved by the Contracting Officer.

3.16.1 Fill and Backfill Material Gradation

Random testing of stockpiled or in-place source material shall be completed. Determine gradation of fill and backfill material in accordance with ASTM D 422. The testing can be requested by NASA if stockpiled soil is in question for use of fill/backfill.

3.17 DISPOSITION OF SURPLUS MATERIAL

Surplus material or other soil material not required or suitable for filling or backfilling, and brush, refuse, stumps, roots, and timber shall be removed from Government property as directed by the Contracting Officer to a NASA approved disposal site. All materials removed from site shall be approved by NASA GRC Waste Management.

3.18 FIELD QUALITY CONTROL

Special Inspections: Geotechnical engineer will perform the following special inspections and report findings to the Contracting Officer:

Determine prior to placement of fill that site has been prepared in compliance with requirements.

Determine that fill material and maximum lift thickness comply with requirements.

Determine, at the required frequency, that in-place density of compacted fill complies with requirements.

Geotechnical engineer to inspect and test subgrades and each fill or backfill layer. Proceed with subsequent earthwork only after test results for previously completed work comply with requirements.

Footing Subgrade: At footing subgrades, at least one test of each soil stratum will be performed to verify design bearing capacities.

When Geotechnical engineer reports that subgrades, fills, or backfills have not achieved degree of compaction specified, scarify and moisten or aerate, or remove and replace soil materials to depth required; recompact and retest until specified compaction is obtained.

-- End of Section --

SECTION 31 23 01.98

EXCAVATING, BACKFILLING, AND COMPACTING FOR STRUCTURES
01/18

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS (AASHTO)

AASHTO M 145	(1991; R 2012) Standard Specification for Classification of Soils and Soil-Aggregate Mixtures for Highway Construction Purposes
AASHTO T 103	(2008) Standard Method of Test for Soundness of Aggregates by Freezing and Thawing
AASHTO T 180	(2017) Standard Method of Test for Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18-in.) Drop
AASHTO T 2	(2000) Sampling of Aggregates
AASHTO T 87	(1986; R 2000) the Dry Preparation of Disturbed Soil and Soil Aggregate Samples for Test

ASTM INTERNATIONAL (ASTM)

ASTM C 117	(2004) Standard Test Method for Materials Finer than 75-um (No. 200) Sieve in Mineral Aggregates by Washing
ASTM C 131	(2006) Standard Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine
ASTM C 136	(2006) Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates
ASTM C 32	(2009) Standard Specification for Sewer and Manhole Brick (Made from Clay or Shale)
ASTM C 33	(2003) Standard Specification for Concrete Aggregates
ASTM C 387	(2000e1) Standard Specification for Packaged, Dry, Combined Materials for Mortar and Concrete

ASTM C 88	(2005) Standard Test Method for Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate
ASTM D 1556	(2007) Density and Unit Weight of Soil in Place by the Sand-Cone Method
ASTM D 1557	(2009) Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3) (2700 kN-m/m3)
ASTM D 2216	(2010) Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass
ASTM D 226	(2009) Standard Specification for Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing
ASTM D 227	(2003) Coal-Tar-Saturated Organic Felt Used in Roofing and Waterproofing
ASTM D 2729	(2003) Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings
ASTM D 2922	(2005) Standard Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)
ASTM D 3740	(2010) Minimum Requirements for Agencies Engaged in the Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction
ASTM D 422	(1963; R 2007) Particle-Size Analysis of Soils
ASTM D 4318	(2010) Liquid Limit, Plastic Limit, and Plasticity Index of Soils

U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

29 CFR 1926	Safety and Health Regulations for Construction
29 CFR 1926.652	Safety and Health Regulations for Construction; Subpart P, Excavations; Requirements for Protective Systems

1.2 RELATED REQUIREMENTS (LEED)

Section 01 35 43.98 ENVIRONMENTAL PROTECTION PROCEDURES for disposal of construction and demolition waste.

Section 31 00 00.98 EARTHWORK

Section 31 23 23.33 98 FLOWABLE FILL

Section 32 92 19.98 SEEDING

1.3 SUBMITTALS

Government approval is required for all submittals. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Contractor shall record Existing Conditions prior to starting work in accordance with the paragraph entitle, "Existing Conditions," of this section.

SD-03 Product Data

Local/Regional Materials; (LEED)

Submit documentation indicating distance between manufacturing facility and the project site. Indicate distance of raw material origin from the project site. Indicate relative dollar value of local/regional materials to total dollar value of products included in project.

SD-06 Test Reports

Test Reports shall be submitted for Soil Test results within 7 calendar days. Test reports shall be submitted according to paragraph entitled, "Quality Control Testing During Construction," of this section.

SD-07 Certificates

Certificates of Compliance for Proposed Soil Materials shall be submitted according to paragraph entitled, "Tests for Proposed Soil Materials," of this section.

Certificates of Compliance for Compost shall be submitted indicating grade and compliance with state and local regulations.

1.4 LIMITS OF CONSTRUCTION

Work in this section relates to excavation, fill, and backfill to a point 5 feet beyond the building or structure line.

1.5 SAMPLING AND TESTING

1.5.1 Soil Test and Inspection Service

Soil survey for satisfactory soil materials and samples of soil materials shall be furnished by the Contractor. A certified soil-testing service approved by the Contracting Officer shall be provided by the Contractor. Testing shall include soil survey for satisfactory soil materials; sampling and testing soil materials proposed for use in the work, and field-testing facilities for quality control during construction period.

Testing agencies shall conform to the requirements of ASTM D 3740.

1.5.2 Tests For Proposed Soil Materials

Materials shall be approved by the Contracting Officer prior to start of work.

Soil materials proposed for use in the work shall be tested as follows.

MATERIAL	REQUIREMENT	TEST METHOD	NUMBER OF TESTS
Satis-factory soil materials	Sampling	AASHTO T 2	One from each source of materials to determine con-formance to definition of satisfactory soil materials; additional tests whenever there is any apparent change
	Preparation of samples	AASHTO T 87	
	Sieve analysis is of fine and coarse aggre-gates	ASTM C 136	
	Amount of material pass-ing No. 200 sieve	ASTM C 117	
	Liquid limit	ASTM D 4318	
	Plastic limit and plasticity index	ASTM D 4318	
	Mechanical analysis	ASTM D 422	
	Moisture-density relations	ASTM D 1557	As required to determine moist-ure-density re-quirement of materials from each source
	Los Angeles abrasion of coarse aggre-gates	ASTM C 131	One for each soil material from each source if called for in reference specification
	Freezing and thawing sound-ness of aggre-gates	AASHTO T 103	
	Magnesium Sul-fate Soundness Test	ASTM C 88	

1.5.3 Quality Control Testing During Construction

Soil materials shall be tested during construction as follows:

MATERIAL	REQUIREMENT	TEST METHOD	NUMBER OF TESTS
Soil materials specified	Sieve analysis of fine and coarse aggregates	ASTM C 136	One daily for each soil material from each source; additional test whenever there is any apparent change
	Amount of material passing No. 200 sieve	ASTM C 117	
	Moisture content of subbase material	ASTM D 2216	
Soil materials prior to compaction	Moisture-density relations of soil	ASTM D 1557	One of each type of subgrade soil material except under backfill for structures; one for each backfill and fill material from each source
Soil material-in-place after compaction	Density of soil-in-place	ASTM D 1556, Sand Cone Method or ASTM D 2922, Nuclear Method (when approved by Contracting Officer)	At least three daily for each subgrade soil material, and for each layer of backfill and fill material; additional test whenever there is any change in moisture conditions

1.5.4 Test Reports

No soil material shall be used until test reports have been reviewed and approved.

1.5.5 Evaluation of Test Results

Results of density of soil-in-place tests shall be considered satisfactory

if the average of any group of four consecutive density tests which may be selected is in each instance equal to or greater than the specified density, and if not more than one density test in five has a value more than two percentage points below the specified density.

1.6 EXISTING CONDITIONS

Existing Conditions shall be recorded, in the presence of the Contracting Officer, and shall include all structures and other facilities adjacent to areas of alteration or removal. Such records shall contain the location of existing utilities, the elevation of the top of foundation walls, the location and extent of cracks and other damage, and a description of surface conditions that exist prior to the start of work. Copies of the record shall be submitted and the conditions prior to starting work shall be verified.

PART 2 PRODUCTS

2.1 BACKFILL AND FILL MATERIALS

Materials for backfill and fill shall be free of clay clods, rock or gravel larger than 2 inches in any dimension, debris, waste, frozen materials, and other deleterious matter and shall be satisfactory soil materials as follows and as defined in Section 31 00 00 EARTHWORK:

AREA CLASSIFICATION	BACKFILL OR FILL MATERIALS
In excavations, unless otherwise specified	Excavated or borrow material that has been sampled, tested, and approved as "Satisfactory Soil Material"
Against face of structures where footing drains from top of porous fill for footing drains to indicated elevation, and from face of structure a distance equal to three footing drain diameters	Filtering material
Against surfaces having applied waterproofing for a distance of at least 6 inches from surface	Sand
In foundation subdrain trenches over porous fill drain pipe	Filtering material
Directly under building slabs	Drainage fill

2.1.1 Satisfactory Materials

Non-expansive materials; Pyritic and/or potential expansive materials, such as mine tailings and slag are not satisfactory material, contain less than 3 percent by weight of organic matter, waste construction debris, or other deleterious materials. Standard Proctor maximum dry density greater

than 110 pounds per cubic foot (pcf), an Atterberg Liquid Limit less than 40, a Plasticity Index of less than 15, and a maximum particle size of 2 inches or less.

2.1.2 Unsatisfactory Materials

Pyritic and/or potentially expansive materials, such as mine tailings and slag. Standard Proctor maximum dry density less than 110 pounds per cubic foot (pcf), and Atterberg Liquid Limit greater than 2 inches. Peat and other highly organic soil, and soil materials of any classification that have moisture content at the time of compaction beyond the range of 1 percentage point below and 3 percentage points above the optimum moisture content of the soil material as determined by moisture-density relations test.

2.2 TOPSOIL

Topsoil shall be any soil removed from the project site which consists of clay or sandy loam.

The topsoil shall be reasonably free from subsoil, clay lumps, brush, objectionable weeds, and other litter, and shall be free from stones, stumps, roots, and other objectionable materials larger than 2 inches in any dimension. Topsoil used on-site must also comply with Section 32 92 19 "Seeding".

2.3 COMPOST

Compost shall be yard trimmings or yard waste compost processed and graded according to state and local regulations. Compost shall be grade A.

Compost shall be well-composted, stable, and weed-free organic matter, pH range of 5.5 to 8; moisture content 35 to 55 percent by weight; 100 percent passing through 1-inch sieve; soluble salt content less than 2.5 decisiemens/m and less than 1.25 decisiemens/m where seeds, young seedings, or salt sensitive plants are used; not exceeding 0.5 percent inert contaminants and free of substances toxic to plantings.

2.4 TOPSOIL BLEND

Where insufficient topsoil is removed from the project site the topsoil removed shall be stockpiled and blended with compost at the site to achieve the required volume.

2.5 COHESIONLESS AND COHESIVE MATERIALS

Cohesionless materials include materials classified in ASTM D2487 as GW, GP, SW, and SP. Cohesive materials include materials classified as GC, SC, ML, CL, MH, and CH. Materials classified as GM, GP-GM, GW-GM, SW-SM, SP-SM, and SM shall be identified as cohesionless only when the fines are nonplastic (plasticity index equals zero). Materials classified as GM and SM will be identified as cohesive only when the fines have a plasticity index greater than zero.

2.6 SUBBASE MATERIAL

Subbase material shall be a naturally or artificially graded mixture of natural or crushed gravel, crushed stone, or sand.

2.7 DRAINAGE FILL

Drainage fill shall be #57 stone per ODOT 703.01. Drainage fill shall be a washed, uniformly graded mixture of crushed stone or crushed or uncrushed gravel, with 100 percent passing 1-1/2-inch sieve and not more than 5 percent passing No. 4 sieve.

2.8 FILTERING MATERIAL

Filtering material shall conform to ASTM C 33 and shall be a uniformly graded mixture of natural or crushed gravel, crushed stone, and natural sand, with 100 percent passing 3/8-inch sieve and 2 to 10 percent passing a No. 100 sieve or per ODOT 703.02.

2.9 SAND

Sand shall be natural sand per ODOT 703.06.

2.10 DRAINAGE PIPE AND FITTINGS

Drainage pipe shall be perforated, PVC sewer pipe, underdrainage pipe of size indicated, and shall conform to ASTM D 2729.

Fittings shall be of corresponding weight and quality as drainage pipe.

2.11 SEWER BRICK AND MORTAR MATERIALS

Sewer brick shall be standard brick size and shall conform to ASTM C 32, Grade MM.

Mortar materials shall be dry packaged, proportioned for Type M unit masonry mortar, and shall conform to ASTM C 387.

Mixing water for mortar shall be potable.

2.12 FABRIC

Provide a pervious sheet of polyester, nylon, glass or polypropylene, ultraviolet resistant filaments woven, spun bonded, fused, or otherwise manufactured into a nonraveling fabric with uniform thickness and strength. Fabric shall have the following manufacturer certified minimum average roll properties as determined by ASTM D 4759:

	Class A	Class B
a. Grab tensile strength (ASTM D 4632) machine and transversed direction	min. 180	80 lbs.
b. Grab elongation (ASTM D 4632) machine and transverse direction	min. 15	15 percent
c. Puncture resistance (ASTM D 4833)	min. 80	25 lbs.
d. Mullen burst strength (ASTM D 3786)	min. 290	130 psi.
e. Trapezoidal Tear (ASTM D 4533)	min. 50	25 lbs.
f. Apparent Opening Size (ASTM D 4751)	See Criteria Below	

	Class A	Class B
(1) Soil with 50 percent or less particles by weight passing US No. 200 Sieve, AOS less than 0.6 mm (greater than #30 US Std. Sieve)		
(2) Soil with more than 50 percent particles by weight passing US No. 200 Sieve, AOS less than 0.297 mm (greater than #50 US Std. Sieve)		
g. Permeability (ASTM D 4491)	0.5 sec -1	0.2 sec -1
h. Ultraviolet Degradation (ASTM D 4355)	70 percent Strength retained at 150 hours	

PART 3 EXECUTION

3.1 PREPARATION

Before earthwork is started, the location of underground utilities shall be carefully verified by hand methods. Utilities to be left in place shall be protected from damage.

Prior to starting any excavation work, Contractor shall submit NASA form C-927 "Digging, Trenching, and Excavating Permit" to the COR.

All excavation shall be done in accordance with Chapter 35 - Digging, Trenching, and Excavation Procedures, of Glenn Research Center, Glenn Safety Manual.

3.2 UNAUTHORIZED EXCAVATION

Unauthorized excavation shall consist of removal of materials beyond indicated subgrade elevations or side dimensions specified without specific direction and shall be replaced as specified at no additional cost to the Government.

Unauthorized excavation under foundations or retaining walls shall be filled by lowering the bottom elevation of the footing or base to the excavation bottom without altering the approved top elevation.

Elsewhere unauthorized excavations shall be backfilled and compacted as specified for authorized excavations of the same classification.

3.3 SHORING AND BRACING

Contractor shall follow OSHA regulations, 29 CFR 1926.652 for "Excavation, Trenching, and Shoring" requirement for the protection of personnel.

Shoring and bracing in excavations shall be maintained regardless of the length of time excavations will be open. Shoring and bracing shall be carried down with the excavation.

Wherever subsequent removal of sheet piling could permit the lateral movement of soil under adjacent structures, steel sheet piling or pressure-creosoted timber sheet piling shall be used and left permanently in place, cut off as required.

3.4 WATER REMOVAL

Water shall not be permitted to accumulate in excavations, or flood the site and surrounding area. Dewatering systems shall be provided by the Contractor to convey water away from excavations so that softening of foundation bottoms, footing undercutting, and soil changes detrimental to subgrade stability and foundation will not occur. Dewatering systems and methods of disposal shall be approved by the Contracting Officer.

Dewatering shall be continued until construction subject to water pressure has obtained full specified strength and backfill is completed.

Water removal from excavations shall be conveyed to approved collecting or runoff areas. Temporary drainage ditches and other diversions as necessary shall be provided and maintained outside of excavation limits.

Trench excavations for utilities shall not be used for temporary drainage ditches.

Dewatering shall be in the Base Bid.

3.5 MATERIAL STORAGE

Excavated materials classified as satisfactory soil material shall be stockpiled, where directed, until required for backfill or fill. Stockpiles shall be placed, graded, and shaped for proper drainage.

Materials required in the work shall be located and retained a sufficient distance from the edge of excavations to prevent overloading, slides, and cave-ins.

3.6 EXCAVATION FOR STRUCTURES

Excavation for structures shall conform to the dimensions and elevations indicated within a tolerance of plus or minus 0.10 foot and shall extend a sufficient distance from footings and foundations to permit placing and removal of concrete formwork, installation of services and other construction indicated, and for inspection.

In excavating for footings and foundations, care shall be taken not to disturb the bottom of the excavation. Excavation to final grade shall be done just before concrete is placed. Bottoms shall be trimmed to the required lines and grades to leave a solid bed to receive concrete.

3.7 EXCAVATION FOR FOUNDATION SUBDRAINAGE SYSTEM

Contractor shall adhere to and enforce precautions as outlined in OSHA Regulations, 29 CFR 1926.

Excavation for foundation subdrainage system, except for footing drains located in the excavations for footings and foundations, shall have vertical sides for a vertical dimension above the bottom of the trench not less than two times the outside dimension of the drain pipe, and shall have a clear horizontal distance between the drain pipe barrel and the trench wall, on both sides, of not less than 6 inches nor more than 9 inches. Bottom of the trench excavations shall be graded to obtain the required slope and shall be tamped to provide a firm bed for the drain pipe bedding material.

3.8 REMOVAL OF UNSATISFACTORY SOIL MATERIALS

Unsatisfactory soil materials encountered that extend below the required elevations shall be excavated to the depth directed.

3.9 REMOVAL OF EXISTING UNDERGROUND UTILITIES

Existing underground utilities indicated to be removed shall be demolished and completely removed from the excavation.

3.10 CLOSING ENDS OF ABANDONED UNDERGROUND UTILITIES

Open ends of abandoned underground utilities to remain shall be closed to prevent water that may accumulate in such utilities from flowing into excavated areas. Closures shall withstand any hydrostatic or earth pressure that may result after ends of the abandoned utilities have been closed.

Open ends of metallic conduit and pipe shall be closed with threaded galvanized metal caps or plastic plugs or other approved method suitable for the type of material and size of pipe. Wood plugs will not be permitted.

3.11 FOUNDATION SUBDRAINAGE SYSTEM

Foundation subdrainage system outlets shall drain by gravity to free outfall until connected to the storm-drainage system.

3.11.1 Impervious Fill At Footings

After concrete footings have been cured as specified, impervious fill at least 6 inches in depth and 12 inches in width shall be placed on the subgrade adjacent to the bottom of footing and shall be compacted at optimum moisture content by means of hand tampers to not less than the density specified for cohesive material. Impervious fill shall be clayey soil material conforming to AASHTO M 145, Soil Classification Groups A-2-6 and A-2-7.

3.11.2 Laying Drain Pipe

Drain pipe shall be laid with the perforations down and firmly bedded in specified drainage fill material, with each pipe section having full bearing throughout its length to true grades and alignment and continuous fall in the direction of flow. One-eighth bends shall be used for changes in direction; Y-fittings shall be used at intersections. Drain pipe joints shall be closed.

Recesses in the excavation bottom shall be excavated to receive bells for drain pipe having bell and spigot ends. Such pipe shall be laid with bells facing up the slope and with spigot end entered fully into the adjacent bell.

3.11.3 Testing Drain Lines

Drain lines shall be tested with water before backfilling to ensure free flow. Any obstruction encountered shall be removed, damaged components replaced, and system retested until satisfactory. Test to be witnessed and approved by the Contracting Officer.

3.11.4 Porous Fill Over Drain Pipe

After drain lines have been tested, drain pipe shall be backfilled to a width of at least 4 inches on sides and 12-inches above the top of pipe with specified drainage fill material. Fill material shall be placed in layers not exceeding 3 inches in loose depth and compacted with not less than two passes of a hand-operated platetype vibrating compactor. Fill material shall be overlaid with one layer of 15-pound per 100 square foot asphalt or tar-saturated felt conforming to ASTM D 226 or ASTM D 227, respectively.

3.12 FILLING AND BACKFILLING

3.12.1 Preparations Prior to Backfill Placement

Excavations shall be backfilled as promptly as the work permits but not until completion of the following:

Approval of construction below finish grade

Inspection, testing, approval, and recording location of underground utilities

Removal of concrete formwork

Removal of shoring and bracing; backfilling of voids with satisfactory soil material; temporary sheet piling driven below bottom of structures; and cutting off and removing of utilities in a manner that prevents settlement of the structure or utilities

Removal of trash and debris

Completion of concrete waterproofing

3.12.2 Placement and Compaction

Backfill materials shall be placed in layers not more than 8 inches in loose depth. Before compaction, each layer of backfill material shall be moistened or aerated as necessary to provide the optimum moisture content of the soil material and shall then be compacted to the percentage of maximum density for each area classification as specified. Testing is required for every other lift. Backfill material shall not be placed on surfaces that are muddy, frozen, icy, or contain frost.

Backfill materials adjacent to structures shall be brought up evenly around structures and shall be carried up to the indicated elevations.

Compaction adjacent to structures, within a horizontal distance from the face of the structure equal to the depth of backfill material (measured from the bottom of footing or bottom of foundation or retaining wall) to final grade, shall be done with power-driven hand tampers.

3.13 COMPACTION

Degree of compaction required is expressed as a percentage of the maximum density obtained by the test procedure in AASHTO T 180, Methods B or D.

3.13.1 Percentage of Maximum Density Requirements

Actual density of each layer of soil material-in-place shall be not less than the following percentages of the maximum density of the same soil material determined by the moisture-density test specified.

AREA CLASSIFICATION	PERCENT MAXIMUM DENSITY COHESIONLESS SOIL MATERIAL	COHESIVE SOIL MATERIAL
Structures		
Each layer of back-fill material in 8" Lifts	98	98
Building slabs and steps		
Drainage fill	98	

3.13.2 Moisture Control

Moisture content in soil material at time of compaction shall be within limits specified.

Where the moisture content of a layer of soil material is below optimum before compaction, the required amount of water shall be uniformly applied to the surface of the layer of soil material and the layer of soil disked or otherwise mixed until a uniform moisture content is reached.

Moisture of a layer of soil material that is above optimum shall be removed by drying.

3.14 GRADING

Areas within the limits of grading under this section, including adjacent transition areas, shall be uniformly graded. Finished surface shall be smooth within the specified tolerances, compacted, and with uniform levels or slopes between points where elevations are indicated or between such points and existing grades.

3.14.1 Grading Outside Building Lines

Areas outside the building lines for each structure shall be hand-graded to drain away from the structure and to prevent ponding of water after rains. Finished surface shall be within the tolerance specified below for each area classification, compacted as specified, and free from irregular surface changes.

Grassed or planted areas:

Finished surface of areas to receive topsoil shall be not more than 0.10 foot above or below the indicated finish elevations. In all cases, the minimum slope shall be 1.5% in grass and planted areas. Grades shall promote positive flow away from building.

Walks:

Surface of areas under walks shall be shaped to line, grade, and cross section; finished surface shall be not more than 0.0 foot above or 0.10 foot below the indicated finish elevation. In all cases, the minimum slope shall be 1% and the maximum slope shall be 2%. Grades shall promote positive flow away from building.

Pavements:

Surface of areas under pavements shall be shaped to line, grade, and cross section; the finished surface shall be not more than 1-inch above or below the indicated finish elevation when tested with a 10-foot straightedge applied both parallel with and at right angles to the centerline of the area. Finished surface shall vary no more than 1 inch. In all cases, slopes shall be 1% minimum to 3% maximum unless otherwise noted. Handicapped accessible areas shall be 2% maximum slope. Grades shall promote positive flow away from building.

3.14.2 Grading Surface of Fill Under Structures

Surface of fill under building slabs shall be smooth and even, free of voids, compacted as specified and to indicated grade within the specified tolerances. When tested with a 10-foot straightedge, parallel with and at right angles to the building lines, the finished surface shall show no deviation in excess of 1 inch.

3.15 MAINTENANCE

3.15.1 Protection of Graded Areas

Newly graded areas shall be protected from traffic and erosion and shall be maintained free of trash and debris.

3.15.2 Reconditioning Compacted Areas

Where approved compacted areas are disturbed by subsequent construction operations or adverse weather, the surface shall be scarified, reshaped, and compacted as specified to the required density prior to further construction.

3.16 DISPOSAL OF EXCESS AND WASTE MATERIALS

Surplus material or other soil material not required or suitable for filling or backfilling, and brush, refuse, stumps, roots, and timber shall be removed from Government property as directed by the Contracting Officer to a NASA approved disposal site. The Contractor, with the assistance of the COR, shall obtain the required NASA signatures on all soil manifests and property passes. All materials removed from site shall be approved by NASA GRC Waste Management.

The Contractor shall pay all permits and fees for disposal.

In no case shall the excavated soil be allowed to come into contact with a waterway.

-- End of Section --

SECTION 32 92 00.98

TURF AND GRASSES
12/12

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

STATE OF OHIO DEPARTMENT OF TRANSPORTATION (ODOT)

ODOT 659	(2010) Seeding and Mulching; and Subparts as Specified

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. Submit the following in accordance with Section 01 33 00.98 SUBMITTAL PROCEDURES:

SD-03 Product Data

Laboratory Analysis of Grass Seed for percent pure, percent germination, and percent weed seed, along with laboratory analysis of Proposed Top Soil shall be submitted.

1.3 SAMPLING AND TESTING

Sampling and testing of grass seed and topsoil shall be by an approved testing service and show compliance with all specified requirements.

1.4 DELIVERY AND STORAGE

1.4.1 Seed and Fertilizer

Grass seed and fertilizer shall be delivered in sealed containers or bags, each labeled in accordance with the applicable federal and state regulations and bearing the name, trade name or trademark, and certification of the producer.

Packaged materials shall be stored off the ground, under watertight cover, and away from damp surfaces.

1.5 WEATHER LIMITATIONS

Topsoil shall not be placed when the subgrade is frozen, excessively wet, extremely dry or in a condition detrimental to grass seed planting or finish grading.

Seeding shall be done between August 15 and October 1, or between April 1 and May 30 unless otherwise permitted by the COTR.

PART 2 PRODUCTS

2.1 TOPSOIL

Topsoil previously removed and stockpiled shall be used in the work. Topsoil shall be free from subsoil, litter, and other objectionable material.

Topsoil shall be fertile, friable, natural surface soil obtained from well-drained areas and possessing characteristics of representative soils in the project vicinity that produce heavy growths of crops, grass, or other vegetation. Topsoil shall be free of material that might be harmful to plant growth or hindrances to planting or maintenance operations.

Chemical and physical properties of topsoil proposed for use in the work shall be as follows:

Organic matter shall be at least 6 percent, but not more than 20 percent, as determined by loss on ignition of moisture-free samples of topsoil.

The pH range shall be from 5.0 to 7.0.

The physical analysis of the topsoil shall be within the following limits:

SIEVE SIZE	PERCENT PASSING
	97 to 100
No. 100	40 to 60
No. 200	20 to 40

2.2 GRASS SEED

Grass seed for lawn areas shall be as follows:

KIND OF GRASS SEED	GRASS SEED IN MIXTURE BY WEIGHT PERCENTAGE	GRASS SEED PURITY MINIMUM PERCENTAGE	GRASS SEED GERMINATION MINIMUM PERCENTAGE
Kentucky Bluegrass	40	98	90
Creeping Red Fescue	40	98	90
Annual Ryegrass	20	98	90

Grass seed which has become wet, moldy, or otherwise damaged in transit or storage will not be acceptable.

2.3 LIME

Lime shall conform to ODOT 659.03.

2.4 FERTILIZER

Fertilizer shall conform to ODOT 659.04

2.5 MULCH

Mulch shall be fresh, shredded straw of wheat, rye, oats, or barley and shall be clean and free of seeds.

Mulch that is fresh and excessively brittle or that is in such an advanced stage of decomposition as to smother or retard the growth of grass will not be acceptable.

PART 3 EXECUTION

3.1 TOPSOIL PREPARATION

3.1.1 Subgrade

Before topsoil is placed, the subgrade surface shall be cleared of all materials that might hinder the performance of the work or subsequent maintenance operations.

3.1.2 Grading

Grades on areas that have been previously established shall be maintained in a true and even condition.

Where grades have not been established and where improperly graded, areas shall be uniformly graded. Finished surfaces shall be smooth within a tolerance of 30.5 mm above or below the indicated subgrade elevations, with uniform levels or slopes between the points where elevations are indicated or between such points and existing grades and free from irregular surface changes to prevent the formation of depressions where water will accumulate.

3.1.3 Tillage

Immediately prior to placing the topsoil, the subgrade, wherever excessively compacted by traffic or other cause, shall be loosened to a depth of at least by plowing, discing, harrowing, or other approved means.

3.1.4 Placing Topsoil

Suitable topsoil shall be placed in the top 75 mm of all grassed areas stripped under this project. All areas to receive topsoil, including cut and fill areas, shall be shaped to provide a minimum of 75 mm topsoil. Prior to placement of the topsoil, the subgrade shall be scarified to a depth of 76.2 mm. The topsoil shall be uniformly distributed and evenly spread to an average thickness of 75 mm. The spreading shall be performed in such a manner that planting can proceed with little additional soil preparation or tillage, and the area shall be left smooth and suitable for lawns. Irregularities in the surface from topsoiling or other operations shall be corrected so as to prevent the formation of depressions where water will stand. Topsoil shall not be hauled and placed when wet or when the subgrade is frozen, excessively wet, extremely dry or in a condition otherwise detrimental to the proposed planting or to proper grading. Topsoil shall be spread uniformly but shall not be compacted. Where any portion of the surface becomes gullied or otherwise damaged, the affected

area shall be repaired to establish the condition and grade prior to topsoiling, and then shall be re-topsoiled.

3.1.5 Application of Lime

The application of lime shall conform to ODOT 659.03.

Lime shall be uniformly distributed over the topsoil surface at a rate of and incorporated into the topsoil to a depth of at least 76.2 mm by discing, harrowing, or other approved means.

3.1.6 Application of Fertilizer

The application of fertilizer shall conform to ODOT 659.04.

Fertilizer shall be uniformly distributed over the topsoil surface at a rate of , and incorporated into the topsoil to a depth of at least 76.2 mm by discing, harrowing, or other approved means.

Fertilizer may be applied mixed with seed and water as specified in paragraph entitled, "Seeding."

3.1.7 Smooth Grading

Undulations or irregularities in the topsoil surface resulting from operations shall be leveled.

The topsoil surface shall be made smooth and uniform.

3.1.8 Cleanup

After smooth grading, the topsoil surface shall be cleared of stones or other objects that might be a hindrance to planting or maintenance operations.

Topsoil or other material that has been brought upon the surfacing of paved areas by operations shall be removed daily.

3.2 HYDROSEEDING

3.2.1 Preparation of Seedbed

Preparation of seedbed shall conform to ODOT 659.10 for residential and commercial properties.

Seedbed shall be loose and porous at the time of seeding. The seedbed shall be loosened to a depth of at least by harrowing or other suitable means and the surface smooth-graded and cleared of objectionable material as specified.

3.2.2 Mixture Preparation

Mix specified seed, fertilizer, and fiber mulch in water, using equipment specifically designed for hydroseed application. Continue mixing until uniformly blended into momogenous slurry suitable for hydraulic application.

Mix slurry with nonasphaltic tackifier.

Type A fertilizer (5:10:10) shall be mixed in the slurry to be broadcast at the rate of 20 kilograms per 100 square meter.

3.2.3 Planting

Apply slurry uniformly to all areas to be seeded in a one-step process. apply mulch at the minimum rate of 16.5 kilograms per 100 square meter (1,500 pounds per acre) dry weight, but not less than the rate required to obtain 17.1 kilograms per 100 square meter seed-sowing rate.

Apply slurry uniformly to all areas to be seeded in a two-step process. Apply first slurry application at the minimum rate of 5.5 kilograms per 100 square meter (500 pounds per acre) dry weight, but not less than the rate required to obtain specified seed-sowing rate. Apply slurry cover coat of fiber mulch at a rate of 11 kilograms per 100 square meter (1,000 pounds per acre).

All structures, buildings, walks, roads, and plant materials shall be brushed or swept to remove any mulch impinged thereon.

3.3 MULCHING

3.3.1 Placing Mulch

Placement, repair and maintenance of mulch shall conform to ODOT 659.13 through 659.20.

Hydro-mulch shall be applied at recommended rates, when hydraulic methods are employed for grass seed application.

Where grass seed is applied, areas shall be covered immediately with a uniform blanket of straw mulch not exceeding a loose depth of .

Straw mulch shall be applied by hand or approved equipment.

3.3.2 Anchoring of Mulch

Where straw mulch is employed, straw mulch shall be anchored with tacking agents noted in ODOT 659.14, or approved fiber mesh netting.

3.4 GRASS ESTABLISHMENT

3.4.1 General

The period of grass establishment shall begin immediately after the completion of mulching in an area and shall continue for a period of 2-months after the completion of seeding on the entire project unless the desired grass cover is established in a shorter period of time and shortening of the grass-establishment period is authorized.

3.4.2 Watering

Immediately after the completion of mulching in an area, the area shall be moistened to a depth of 75 millimeter or more.

After the initial watering, the seeded areas shall be watered as required to maintain the soil in a moist condition for the entire grass-establishment period.

Watering shall conform to ODOT 659.17.

The Contractor shall provide and maintain temporary piping and lawn-watering equipment required to convey water from the water source to uniformly water the seeded areas. Water shall be free from substances detrimental to the growth of vegetation. Water sources located on Government property will be subject to approval prior to use. Temporary watering equipment shall be removed after grass area acceptance.

Watering schedules shall be arranged and lawn-watering equipment laid out in a manner to avoid the necessity of walking over muddy and newly seeded areas.

Watering shall be done in a manner to prevent the displacement of seed and mulch and to prevent puddling and water erosion.

3.4.3 Weeding

Weeds or other undesirable vegetation that threaten to smother the grass shall be uprooted and removed from the area.

3.4.4 Reseeding

After the first mowing, bare areas shall be reseeded.

Reseeding shall be with the grass seed specified for each seeded area and shall be sown at the rate specified and in a manner that will cause a minimum of disturbance to the existing stand of grass and mulch.

3.4.5 Remulching

In areas where mulch has been disturbed sufficiently to nullify its purpose, new mulch shall be added and anchored as specified.

3.4.6 Refertilizing

After the first mowing and during a period when the grass is dry, fertilizer shall be uniformly distributed over the seeded area at a rate of of actual nitrogen per 93 square meter. Fertilizer shall be as specified.

3.5 ACCEPTANCE PROVISIONS

3.5.1 Acceptance Requirements

Completed grass areas shall have been recently mowed and be covered with a uniform stand of the specified grass, be free of rank growths of weeds or other undesirable vegetation, and be free of irregular surface changes and other depressions where water will accumulate.

Scattered bare spots not larger than 152.4 mm in any dimension will be allowed, up to a maximum of 3 percent of any grass area.

The condition of grass areas at the time of inspection will be noted and a determination, made whether the grass-establishment period shall be extended for any area.

3.5.2 Repairs

If, before completion and acceptance of the entire work, portions of the surface become gullied or otherwise damaged following seeding or the grass seedings have been destroyed, the affected area shall be repaired to re-establish the condition and grade of the soil prior to seeding and then re-seeded, remulched, and the grass established as specified.

3.6 PROTECTION

Seeded areas shall be protected against traffic or other use by erecting barricades around each area immediately after seeding is completed and by placing warning signs of an approved type on each seeded area.

-- End of Section --

SECTION 32 92 19.98

SEEDING
4/20

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ASTM INTERNATIONAL (ASTM)

ASTM C 602	(2007) Agricultural Liming Materials
ASTM D 4427	(2007) Peat Samples by Laboratory Testing
ASTM D 4972	(2001; R 2007) pH of Soils

U.S. DEPARTMENT OF AGRICULTURE (USDA)

AMS Seed Act	(1940; R 1988; R 1998) Federal Seed Act
DOA SSIR 42	(1996) Soil Survey Investigation Report No. 42, Soil Survey Laboratory Methods Manual, Version 3.0

1.2 DEFINITIONS

1.2.1 Stand of Turf or Lawn

95 percent ground cover of the established species. Contractor is responsible to reseed until 95% of grass is established.

1.3 RELATED REQUIREMENTS

Section 31 00 00 EARTHWORK, Section 32 93 00 EXTERIOR PLANTS applies to this section for pesticide use and plant establishment requirements, with additions and modifications herein.

1.4 SUBMITTALS

Government approval is required for all submittals. The following shall be submitted in accordance with Section 01 33 00.98 SUBMITTAL PROCEDURES:

SD-03 Product Data

Wood cellulose fiber mulch

Erosion Control Mesh

Fertilizer

Include physical characteristics, and recommendations.

LEED Submittals

Data for Credits MR 4.1 and MR 4.2 (Recycled Content): For products having pre-consumer and/or post-consumer recycled content, submit documentation indicating:

Description of product.
Manufacturer/Vendor.
Product Cost (excluding labor and equipment).
Cut sheets or manufacturer's letters documenting percentages by weight of post-consumer and/or pre-consumer recycled content.
Source of the recycled content data.

Data for Credits MR 5.1 and MR 5.2 (Regional Materials): For products that are extracted/harvested/recovered and manufactured within 500 miles of the project site, submit documentation indicating:

Product name.
Manufacturer/Vendor.
Product cost (excluding labor and equipment.
Percentage of product by weight that meet both the extraction and manufacture criteria.
Distance between the project site and extraction/harvest/recovery site.
Distance between the project site and the final manufacturing location.

SD-06 Test Reports

Topsoil composition tests (reports and recommendations).

SD-07 Certificates

State certification and approval for seed

SD-08 Manufacturer's Instructions

Erosion Control Materials

1.5 DELIVERY, STORAGE, AND HANDLING

1.5.1 Delivery

1.5.1.1 Seed Protection

Protect from drying out and from contamination during delivery, on-site storage, and handling.

1.5.1.2 Fertilizer, Gypsum, Sulfur, Iron and Lime Delivery

Deliver to the site in original, unopened containers bearing manufacturer's chemical analysis, name, trade name, trademark, and indication of conformance to state and federal laws. Instead of containers, fertilizer gypsum sulphur iron and lime may be furnished in bulk with certificate indicating the above information.

1.5.2 Storage

1.5.2.1 Seed, Fertilizer, Gypsum, Sulfur, Iron and Lime Storage

Store in cool, dry locations away from contaminants.

1.5.2.2 Topsoil

Contractor shall scarify soil to 4" depth prior to seeding.

Prior to installing stockpiled topsoil, treat growing vegetation with application of appropriate specified non-selective herbicide.

1.5.2.3 Handling

Do not drop or dump materials from vehicles.

1.6 TIME RESTRICTIONS AND PLANTING CONDITIONS

1.6.1 Restrictions

Do not plant when the ground is frozen, snow covered, muddy, or when air temperature exceeds 90 degrees Fahrenheit or below 45 degrees Fahrenheit.

1.7 TIME LIMITATIONS

1.7.1 Seed

Apply seed within twenty four hours after seed bed preparation.

PART 2 PRODUCTS

2.1 SEED

2.1.1 Classification

Provide State-certified seed of the latest season's crop delivered in original sealed packages, bearing producer's guaranteed analysis for percentages of mixtures, purity, germination, weedseed content, and inert material. Label in conformance with AMS Seed Act and applicable state seed laws. Wet, moldy, or otherwise damaged seed will be rejected. Field mixes will be acceptable when field mix is performed on site in the presence of the Contracting Officer.

2.1.2 Planting Dates

Planting Season	Planting Dates
Season 1	April 15 to June 20
Season 2	September 20 to November 1
Temporary Seeding	April 1 to November 1

2.1.3 Seed Purity and Mixture by Weight

JMD COMPANY, 1290 Highland Rd, Macedonia, OH 44056
Product: PENN STATE LAWN MIX
LOT NUMBER: JMDB-080413

Percent Purity	Common Name	Origin	Min Percent Germination & Hard Seed
19.77	Top Hat 2 Perennial Ryegrass	OR	90%
19.75	All Star 2 Perennial Ryegrass	OR	90%
19.38	Gator 3 Perennial Ryegrass	OR	90%
18.81	Kentucky Bluegrass 85/80	WA	80%
9.86	Maxima Creeping Red Fescue	DNMK	85%
9.76	Boreal Creeping Red Fescue	CAN	85%
0.34	Other Crop		
2.94	Inert Matter		
0.03	Weed Seed	Noxious Weed NONE FOUND	

2.2 TOPSOIL

2.2.1 On-Site Topsoil

Surface soil stripped and stockpiled on site and modified as necessary to meet the requirements specified for topsoil in paragraph entitled "Composition." When available, topsoil shall be existing surface soil stripped and stockpiled on-site in accordance with Section 31 00 00 EARTHWORK.

2.2.2 Off-Site Topsoil

Conform to requirements specified in paragraph entitled "Composition." Additional topsoil shall be furnished by the Contractor.

2.2.3 Composition

Containing from 5 to 10 percent organic matter as determined by the topsoil composition tests of the Organic Carbon, 6A, Chemical Analysis Method described in DOA SSIR 42. Maximum particle size, 3/4 inch, with maximum 3 percent retained on 1/4 inch screen. The pH shall be tested in accordance with ASTM D 4972. Topsoil shall be free of sticks, stones, roots, and other debris and objectionable materials. Other components shall conform to the following limits:

Silt	25-50 percent
Clay	10-30 percent
Sand	20-35 percent
pH	5.5 to 7.5
Soluble Salts	600 ppm maximum

Contractor to adhere to 31 00 00 EARTHWORK Sections 2.1.1 and 2.1.2 "Requirements for Off Site Soil".

2.3 SOIL CONDITIONERS

Add conditioners to topsoil per topsoil analysis recommendations.

2.3.1 Lime

Commercial grade hydrated limestone containing a calcium carbonate equivalent (C.C.E.) as specified in ASTM C 602 of not less than 110 percent.

2.3.2 Aluminum Sulfate

Commercial grade.

2.3.3 Sulfur

100 percent elemental

2.3.4 Iron

100 percent elemental

2.3.5 Peat

Natural product of peat moss derived from a freshwater site and conforming to ASTM D 4427 as modified herein. Shred and granulate peat to pass a 1/2 inch mesh screen and condition in storage pile for minimum 6 months after excavation.

2.3.6 Sand

Clean and free of materials harmful to plants.

2.3.7 Composted Derivatives

Ground bark, nitrolized sawdust, humus or other green wood waste material free of stones, sticks, and soil stabilized with nitrogen and having the following properties:

2.3.7.1 Particle Size

Minimum percent by weight passing:

No. 4 mesh screen	95
No. 8 mesh screen	80

2.3.7.2 Nitrogen Content

Minimum percent based on dry weight:

Fir Sawdust	0.7
Fir or Pine Bark	1.0

2.3.8 Gypsum

Coarsely ground gypsum from recycled scrap gypsum board, comprised of calcium sulfate dihydrate 61 percent, calcium 22 percent, sulfur 17 percent; minimum 96 percent passing through 20 mesh screen, 100 percent passing thru 16 mesh screen.

2.3.9 Calcined Clay

Calcined clay shall be granular particles produced from montmorillonite clay calcined to a minimum temperature of 1200 degrees F. Gradation: A minimum 90 percent shall pass a No. 8 sieve; a minimum 99 percent shall be retained on a No. 60 sieve; and a maximum 2 percent shall pass a No. 100 sieve. Bulk density: A maximum 40 pounds per cubic foot.

2.4 FERTILIZER

2.4.1 Granular Fertilizer

Organic, granular controlled release fertilizer containing minimum percentages, by weight, of plant food nutrients, as recommended by topsoil composition test.

2.4.2 Hydroseeding Fertilizer

Controlled release fertilizer, to use with hydroseeding and composed of pills coated with plastic resin to provide a continuous release of nutrients for at least 6 months and containing minimum percentages, by weight, of plant food nutrients, as recommended by topsoil composition test.

2.5 MULCH

Mulch shall be free from noxious weeds, mold, and other deleterious materials.

2.5.1 Wood Cellulose Fiber Mulch

Use recovered materials of either paper-based (100 percent) or wood-based (100 percent) hydraulic mulch. Processed to contain no growth or germination-inhibiting factors and dyed an appropriate color to facilitate visual metering of materials application. Composition on air-dry weight basis: 9 to 15 percent moisture, pH range from 5.5 to 8.2 . Use with hydraulic application of grass seed and fertilizer.

2.5.2 Straw

Stalks from oats, wheat, rye, barley, or rice. Furnish in air-dry condition and of proper consistency for placing with commercial mulch blowing equipment. Straw shall contain no fertile seed.

2.6 WATER

Source of water shall be approved by Contracting Officer and of suitable quality for irrigation, containing no elements toxic to plant life.

2.7 EROSION CONTROL MATERIALS

Erosion control material shall conform to the following:

2.7.1 Erosion Control Fiber Mesh

Biodegradable jute mesh, a minimum of 0.92 lbs./sq. yd., with 50-64 percent open area.

Basis of Design: North America Green Bionet SC150BN.

2.7.2 Erosion Control Material Anchors

Erosion control anchors shall be steel wire staples as recommended by the manufacturer for 2:1 slopes, 6 inches minimum.

PART 3 EXECUTION

3.1 PREPARATION

3.1.1 EXTENT OF WORK

Provide soil preparation (including soil conditioners as required), fertilizing, seeding, and surface topdressing of all newly graded finished earth surfaces, unless indicated otherwise, and at all areas inside or outside the limits of construction that are disturbed by the Contractor's operations.

3.1.1.1 Topsoil

Provide 6 inches of on-site topsoil with supplemental topsoil from off-site sources if required due to insufficient quantities of on-site topsoil to meet indicated finish grade. After areas have been brought to indicated finish grade, incorporate fertilizer, pH adjusters and soil conditioners into soil a minimum depth of 4 inches by disking, harrowing, tilling or other method approved by the Contracting Officer. Remove debris and stones larger than 3/4 inch in any dimension remaining on the surface after finish grading. Correct irregularities in finish surfaces to eliminate depressions. Protect finished topsoil areas from damage by vehicular or pedestrian traffic.

3.1.1.2 Soil Conditioner Application Rates

Apply soil conditioners at rates as determined by laboratory soil analysis of the soils at the job site. For bidding purposes only apply at rates for the following:

Lime pounds per acre 50 pounds per 1000 square feet.

Peat 3 cubic yards per 1000 square feet.

3.1.1.3 Fertilizer Application Rates

Apply fertilizer at rates as determined by laboratory soil analysis of the soils at the job site.

Organic Granular Fertilizer: Per manufacturer's recommendations for new lawns.

Hydroseeding Fertilizer: Per manufacturer's recommendations for new lawns.

3.2 SEEDING

3.2.1 Seed Application Seasons and Conditions

Immediately before seeding, restore soil to proper grade. Do not seed when ground is muddy, frozen, snow covered, or in an unsatisfactory condition for seeding. If special conditions exist that may warrant a variance in

the above seeding dates or conditions, submit a written request to the Contracting Officer stating the special conditions and proposed variance. Apply seed within twenty four hours after seedbed preparation. Sow seed by approved sowing equipment. Sow one-half the seed in one direction, and sow remainder at right angles to the first sowing.

3.2.2 Seed Application Method

Seeding method shall be hand broadcasted in the stormwater detention basin on 2:1 slopes, or hydroseeding for all other locations.

3.2.2.1 Broadcast and Drop Seeding

Seed shall be uniformly broadcast at the rate of per paragraph 2.1.3. Use broadcast or drop seeders. Sow one-half the seed in one direction, and sow remainder at right angles to the first sowing. Cover seed uniformly to a maximum depth of 1/4 inch in clay soils and 1/2 inch in sandy soils by means of spike-tooth harrow, cultipacker, raking or other approved devices.

3.2.2.2 Hydroseeding

First, mix water and fiber. Wood cellulose fiber, paper fiber, or recycled paper shall be applied as part of the hydroseeding operation. Fiber shall be added at 1,000 pounds, dry weight, per acre. Then add and mix seed and fertilizer to produce a homogeneous slurry. Seed shall be mixed to ensure broadcasting at the rate of per paragraph 2.1.3. When hydraulically sprayed on the ground, material shall form a blotter like cover impregnated uniformly with grass seed. Spread with one application with no second application of mulch.

3.2.2.3 Straw Mulching

Straw mulch shall be spread uniformly at the rate of 2 tons per acre. Mulch shall be spread by hand, blower-type mulch spreader, or other approved method. Mulching shall be started on the windward side of relatively flat areas or on the upper part of steep slopes, and continue uniformly until the area is covered. The mulch shall not be bunched or clumped. Sunlight shall not be completely excluded from penetrating to the ground surface. All areas installed with seed shall be mulched on the same day as the seeding. Mulch shall be anchored with one-year, biodegradable mesh immediately following spreading or sprayed with government approved tackifier. The tackifier must be environmentally safe. It shall be the responsibility of the contractor to maintain the mulch at no additional cost to the government.

3.2.3 Erosion Control Material

Install in accordance with manufacturer's instructions, where indicated or as directed by the Contracting Officer.

3.2.4 Watering

Start watering areas seeded as required by temperature and wind conditions. Apply water at a rate sufficient to insure thorough wetting of soil to a depth of 2 inches without run off. During the germination process, seed is to be kept actively growing and not allowed to dry out.

3.3 PROTECTION OF TURF AREAS

Immediately after turfing, protect area against traffic and other use.

3.3.1 Overseeding

Apply seed in accordance with applicable portions of paragraph entitled "Seed Application Method" at rates in accordance with paragraph entitled "Seed Composition."

3.4 RESTORATION

Restore existing turf areas which have been damaged during construction operations and areas that did not germinate at the Contractor's expense. Keep clean at all times at least one paved pedestrian access route and one paved vehicular access route to each building. Clean other paving when work in adjacent areas is complete.

-- End of Section --

ATTACHMENT E. HEALTH AND SAFETY PLANS

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FINAL

SITE SAFETY AND HEALTH PLAN ADDENDUM
for
FIRING RANGES 3, 4, 5, AND CONSTRUCTION DEBRIS PILE REMOVAL ACTION
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
PLUM BROOK STATION
SANDUSKY, OHIO

Prepared for:

NASA Glenn Research Center
21000 Brookpark Road
Cleveland, OH 44135

Prepared by:

Leidos
8866 Commons Blvd., Suite 201
Twinsburg, OH 44087

February 28, 2020

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SITE SAFETY AND HEALTH PLAN ADDENDUM

This is an addendum to the Construction, Maintenance, Environmental, and Testing Services (COMETS) SSHP prepared by the Prime Contractor, Firelake-Arrowhead NASA Services (FANS), in May 2018 for activities under Contract No. 80GRC018C0022, and was approved by NASA Safety and Health Division (SHeD). Leidos has added the following activities to this SSHP Addendum:

- Site walk and inspections
- Site surveying
- Environmental Sampling (including characterization soil and groundwater sampling)
- Oversight of asbestos waste removal [*performed by licensed Arrowhead Contracting personnel or subcontractor*]
- Oversight of monitoring well installation and abandonment via hollow-stem auger (HSA) drilling with air rotary capabilities [*performed by Subcontractor*]
- Oversight of soil and sediment removal, and treatment via mechanical excavation (i.e., hydraulic excavators, backhoes) [*Arrowhead Contracting will perform excavation activities*]
- Confirmation soil sampling via hand auger.

Activity Hazard Analyses (AHAs) have been added to this SSHP Addendum for the activities to be completed by Leidos, including oversight of subcontractor activities.

Additional activities will be performed by Leidos subcontractors and Arrowhead Contracting (remedial subcontractor under FANS) under separate SSHP addendums.

Contractor Name: Leidos (Subcontractor to Firelake-Arrowhead)

Contract No: 80GRC018C0022 [COMETS) Contract], Subcontract No. FA8-1-S1

Project Name: FIRING RANGES 3&4 AND FIRING RANGE 5 / CONSTRUCTION DEBRIS PILE REMOVAL ACTIONS (RA)

Work Location: NASA Glenn Research Center, Plum Brook Station (PBS), Sandusky, Ohio

Task Name: Removal Action Implementation

Task Order: E117 / E124

Projected Job Start Date: Firing Ranges 3&4 July 2020 / Firing Range 5 and CDP August 2020

Projected Job Finish Date: Firing Ranges 3&4 August 2020 / Firing Range 5 and CDP

September 2020

Prepared by: Lindsey Moyer Phone: (717) 395-7404 Date Submitted: 02/28/2020

Leidos Approvals: Signature below indicates review and approval of the plan and agreement that the anticipated hazards are correct and that planned hazard controls are sufficient.

Heather Adams, Leidos Project Manager	**2/25/2020** Date	Rich Sprinzl, Leidos FM/SSHO	**2/25/2020** Date
Stephen Lowery, CIH, CSP FE&E Health and Safety Manager	**2/25/2020** Date		

Subcontractor Concurrence:
Leidos Subcontractor is in concurrence with the provisions of this Site Safety and Health Plan Addendum and will ensure conformance by employees performing work at the NASA Glenn Research Center (GRC).

Authorized Representative	Date	Company Name
Authorized Representative	Date	Company Name
Authorized Representative	Date	Company Name

IN CASE OF EMERGENCY CALL 419-621-3222

EMERGENCY CONTACTS

Emergency	Responder	Location	NASA Phone*	Mobile/Other Phone
Fire	NASA PBS Fire Department	Building 7233	911	419-621-3222
Police	NASA PBS Security	Building 7233	911	419-621-3222
Ambulance	NASA PBS Security	Building 7233	911	419-621-3222
Hospital	Firelands Regional Medical Ctr.	1111 Hayes Ave	(419) 557-7455	(419) 557-7455

*Dialing 911 from the NASA GRC phone system will connect to NASA emergency assistance. From a PAYPHONE OR cellular phone, dial **(419) 621-3222**.

Map and directions to Firelands Medical Ctr. and the nearest WorkCare Clinic are located on the following page.

NASA NON-EMERGENCY CONTACTS

	Plum Brook Station
NASA Dispatch	419-621-3326 or 419-621-3221
Environmental, Health, and Safety (EHS) Helpline (for reporting non-emergencies)	216-433-8848
NASA Health and Safety Division POC Joyce Jordan	216-433-3873
Leidos WorkCare Incident Intervention	888-449-7787

On Site phone dial "8" to obtain an outside line

PROJECT CONTACT NUMBERS

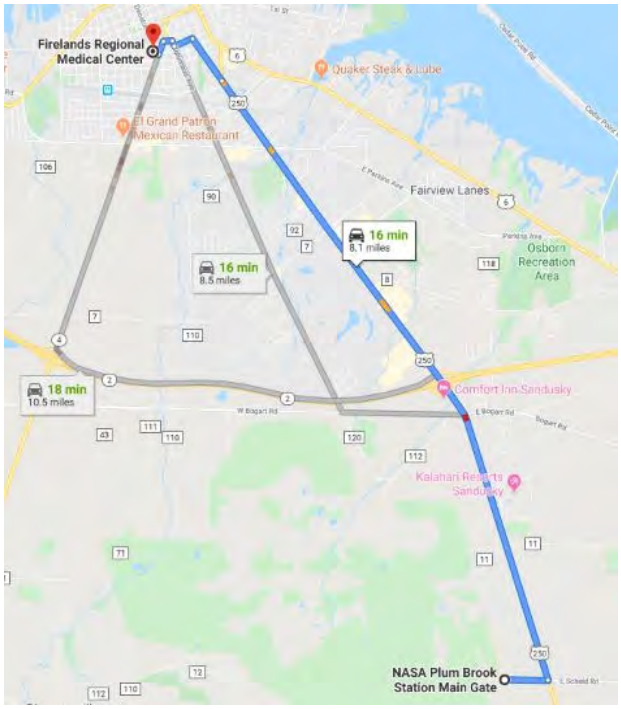
Leidos COMETS Environmental Program Manager Jen Thomas	Work: (216) 433-3184 Cell: (216) 854-6219
Leidos Project Manager Heather Adams, PG	Work: (330) 405-5814 Cell: (330) 573-8571
Leidos Field Manager/Site Safety and Health Officer/Competent Person Rich Sprinzl, PE	Work: (330) 405-5808 Cell: (330) 348-1378
Leidos Geologist/Competent Person Jasmine Stefansky Alternate: Charles Spurr	Work: (865) 481-8565 Cell: (865) 228-1367 Work: (330) 405-5809 Cell: (216) 317-5726
Leidos FEE Health & Safety Manager Stephen Lowery, CIH, CSP	Work: (571) 526-6659 Cell: (405) 919-4176
NASA GRC Representative(s) John Brodt Christie Myers	Work: (216) 433-6028 Cell: (216) 299-8628 Work: (216) 433-8874 Cell: (216) 315-0390

PROJECT CONTACT NUMBERS

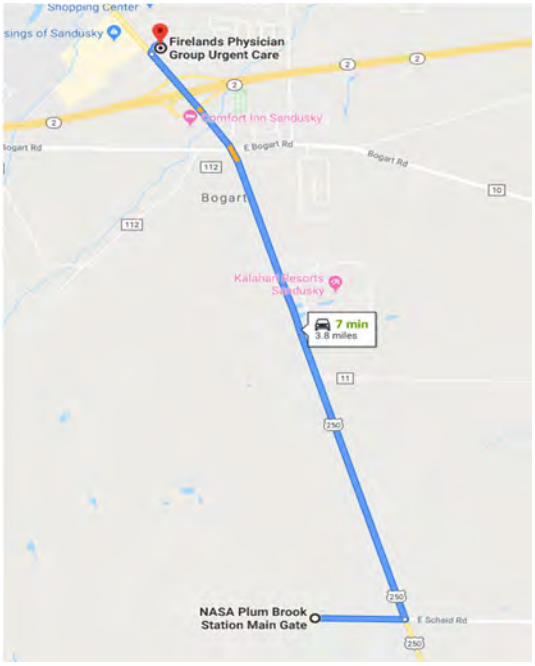
NASA Natural Resources Manager Christine Staschiak	Work: (216) 433-6662
NASA PBS Construction Manager Rick Bressler	Work: (419) 621-2244 Cell: (216) 409-6698
Subcontractor Field Manager (Driller)/Drilling Competent Person - TBD TTL Associates Inc.	TBD (prior to mobilization)
Arrowhead Project Manager Jeremy Soenen	Work: (515) 961-8000 Cell: (515) 664-7308
Arrowhead Site Supervisor Dirk Doege	Cell: (567) 274-1557

MAP FOR HOSPITAL AND WORK CARE CLINIC

Firelands Regional Medical Center, 1111 Hayes Ave, Sandusky, OH, 419-557-7400
After leaving the site from the Main Gate on Scheid Road, turn left onto Route 250. Turn left onto Bogart Road. Turn right onto County Rd 120/Columbus Ave. Turn left onto Townsend St. Turn left onto Hayes Ave. Firelands Regional Medical Center is on the right.



Nearest WorkCare Clinic: Firelands Physician Group Urgent Care - Corporate Health Center, 5420 Milan Road, Sandusky, OH, 419-557-6490
After leaving the site from the Main Gate on Scheid Road, turn left onto US-250 W/Milan Rd. Firelands Physician Group Urgent Care will be on the right.



SAFETY PLAN ACKNOWLEDGMENT:

I hereby acknowledge that I have read and understand the attached safety and health plan and I agree to perform work on this task in accordance with this plan, safe work practices and OSHA regulations. I further acknowledge that I have received a Plum Brook Station safety orientation in the form of either a safety video viewing or a presentation by Safety Office personnel.

Employee:	Company:	Date:

INTRODUCTION: The purpose of this Site Safety and Health Plan (SSHP) Addendum is to set forth, in an orderly and logical fashion, appropriate health and safety (H&S) procedures to be followed during onsite investigation and construction activities at National Aeronautics and Space Administration (NASA) John H. Glenn Research Center (GRC), Plum Brook Station (PBS) in Sandusky, Ohio. This SSHP Addendum identifies potential hazards which personnel may be exposed to, during the performance of this Task. Leidos personnel shall not participate in this Task without having read this plan in its entirety. This plan has been developed to be as complete as possible; however, should conditions dictate revisions or additions to this plan, amendments shall be drafted, added, and distributed to all persons involved with this plan. This plan works in concert with the "Safety and Health Plan," the NASA GRC Safety Manual, Occupational Health Manual and Environmental Programs Manual, Occupational Safety and Health Administration (OSHA) standards, *Code of Federal Regulations* (*CFR*) 1926, United States Environmental Protection Agency regulations, National Fire Protection Association Codes, and any other applicable codes stated in the NASA contract. It shall be the prime contractor's responsibility to ensure that all of its subcontractors comply with the provisions set forth in this plan.

STATEMENT OF COMPANY'S SAFETY GOALS AND OBJECTIVES:
It is the policy of Leidos that all accidents and environmental regulatory violations are preventable. In keeping with this policy, a goal of zero accidents has been adopted. The safety and health of employees, subcontractors, visitors, customers, and the public as well as protection of the environment is a core value incorporated into the performance of all work. Safety is planned into all work and documented through procedures, procurement documents, activity hazard analyses (AHAs), H&S plans, and other equivalent means, as appropriate. It is Leidos policy to operate in compliance with all environmental, health and safety (EH&S) rules and regulations, and to comply with our client's policies and procedures. Leidos will cooperate with NASA to ensure that every precaution is taken in establishing a safe working environment for employees.

DESCRIPTION OF WORK:
The work performed under this contract is for removal actions (RAs) at the Firing Ranges 3 and 4 and Firing Range 5/Construction Debris Pile (CDP) at PBS. Leidos will work collaboratively with Arrowhead Contracting to complete the tasks. The scope of work under this addendum includes: (1) implement the RA plan in conjunction with Arrowhead, including tree and brush clearing and removal of debris and soil; (2) Leidos will conduct quality control oversight, waste characterization soil sampling, verification soil sampling, and confirmation soil sampling; (3) install monitoring wells using a hollow-stem auger (HSA) with air rotary capabilities; (4) perform groundwater well abandonment; and (6) Arrowhead will perform construction activities under a separate SSHP. This contract is also for the RA at Firing Range 5 and the CDP. The scope of work includes work in conjunction with Arrowhead for brush clearing and tree removal, excavation of concrete debris and soil, and restoration of the site. Leidos will perform waste characterization sampling prior to removal of the earthen berm backstop and sandblast grit piles. Leidos will collect composite soil samples per 100 cubic yards for the soil from the earthen berm and the sandblast grit pile. Post-RA confirmatory sampling will be performed.

EMPLOYEE AWARENESS OF SAFETY: (Describe methods used to foster or promote employee awareness of health and safety matters (e.g., safety meetings, incentives, etc.)
Employees are trained and qualified to perform their work safely and are held accountable for intentional or negligent noncompliance. Each employee is empowered and expected to stop his or her own work or the work of co-workers if any person's safety or the environment is at risk. The Field Manager (FM) is expected to support and reinforce this expectation. Stopped work shall not resume until the hazard has been controlled and a review has been performed. In addition, all employees are encouraged to seek ways to enhance the effectiveness of the EH&S Program.

The Site Safety and Health Officer (SSHO) shall ensure that at the start of each work day, a tailgate safety briefing is performed that reviews the AHAs applicable to the daily activities, unique site conditions, personal protective equipment (PPE), applicable emergency information, and stop work authority (SWA). The SSHO shall ensure all site personnel involved attend the tailgate briefing and that they sign as having attended. If personnel do not attend the tailgate briefing, the SSHO shall approach personnel when they arrive onsite, provide them with an individual tailgate briefing, and have them sign as attending.

Project training shall include at least the following. The FM and SSHO shall have current hazardous waste safety training (40-hour Hazardous Waste Operations and Emergency Response [HAZWOPER], 3 days of on-the-job training [OJT], and 8-hour refresher within the past 12 months); hazardous waste supervisor training; Excavation-Competent Person training; and sufficient experience to understand the potential hazards. All other field personnel, including subcontractors, shall have current hazardous waste safety training, including 40-hour HAZWOPER, 3 days OJT, and current 8-hour refresher course. The FM shall present a project kick-off safety briefing to cover this plan, physical hazards, safe work zones, hazardous contaminants (lead) and chemicals, required hazard controls, emergency contacts, and additional safety briefings as needed (at least once per week). At least two people onsite shall have current first aid and cardiopulmonary resuscitation (CPR) training. The FM shall maintain documentation of completed training onsite (or readily available via online database). See corporate EH&S Procedures 8.0 and 20.0 for details. Additional training may include, but not be limited to, Lead Awareness Training (as required in corporate EH&S Procedure 29.0), Asbestos Awareness Training (as required in corporate EH&S Procedure 29.0), and Hearing Conservation (as required in corporate EH&S Procedure 15.0). Field personnel shall be enrolled in a medical surveillance program and have current hazardous waste medical clearance (corporate EH&S Procedures 12.0 and 20.0). Excavation-Competent Person qualifications will be submitted to NASA's Facilities Division as part of their excavation permit review process.

In addition, all personnel onsite shall be required to view the NASA PBS construction safety video or presentation.

POSITION & RESPONSIBILTIES	Name
Field Manager	Rich Sprinzl
Site Safety and Health Officer	Rich Sprinzl
Corporate H&S Manager	Steve Lowery
Project Manager:	Heather Adams

COMPETENT PERSONS: Identify the Qualified and/or certified person(s) responsible for oversight of a particular hazardous operation. The Competent Person is required to conduct daily, documented site inspections.

Competent Person(s)

Rich Sprinzl, PE
Heather Adams, PG
Jasmine Stefansky
Alternates: Heather Adams, PG; Charles Spurr

SUBCONTRACTORS

This plan has been prepared for the use of Leidos employees to identify potential hazards and required controls necessary to provide a safe work environment. This plan identifies the minimum hazard controls that shall be implemented and addressed in Leidos subcontractors' safety plans and procedures. Leidos subcontractors are required to provide trained, experienced personnel and to operate equipment as required by the manufacturer's procedures, or the subcontractor's written standard operating procedures, and are required to supplement the requirements of this plan as necessary to ensure that their employees perform their specific tasks safely. Leidos will provide subcontractors with a copy of this plan; Leidos subcontractors are solely responsible for ensuring their onsite activities are conducted safely and in conformance with applicable requirements specified in this plan, Leidos Civil EH&S Procedure 2.0, *Subcontractor Environmental Compliance and Health and Safety,* and all applicable laws and regulations. Any other person or entity relying on this plan hereby acknowledges they do so at their own risk, and Leidos has no responsibility or liability for the consequences thereof. The Subcontractor will submit an Addendum to this SSHP for review by the Leidos FEE H&S Manager and NASA GRC Safety Office.

Subcontractors to complete site activities include the following:

- TTL Associates Inc. (drilling, monitoring well installation/abandonment)
- John Hancock and Associates (well surveying)

Each Subcontractor is required to provide a Subcontractor FM and Competent Person for this project. These two positions will be determined and evaluated by the Leidos SSHO prior to mobilization.

WORK ACTIVITIES

Firing Ranges 3, 4, and 5 and CDP RA task activities include:

- Site walk and inspections
- Site surveying
- Environmental sampling (including characterization soil and groundwater sampling)

- Oversight of asbestos waste removal [*performed by licensed Arrowhead personnel*]
- Monitoring well installation and abandonment via HSA/air rotary drilling (*performed by Subcontractor*)
- Oversight of soil and sediment removal, and treatment via mechanical excavation (e.g., heavy equipment such as hydraulic excavators, backhoes) [excavation performed by Arrowhead]
- Confirmation soil sampling via hand auger.

POTENTIAL HAZARDS: (Identify those hazards that relate to the work activity)

X	Chemicals or Flammables		Scaffolding		Traffic Control
X	Spills or Leaks		Ladders	X	Barricading
	Hazardous Energy (Lockout/Tagout)	X	Demolition		Cranes/Aerial
X	Eye, Face, or Head Hazards (PPE)	X	Power Tools		Falls (Heights > 6 feet)
X	Respiratory Hazards	X	Excavation (Permit Req'd)		Radiation (Contact Health Physics @3173)
X	General Maintenance Checkout	X	Noise	X	Biological
X	Sanitation		Egress		Road Blockage
	Utility Service Interruption (May be Req'd)				High-Pressure Systems
	Hot Work (Permit Req'd)				Cryogenic Spills, Burns
	Confined-Space Entry (Permit Req'd)			X	Temperature Extremes/Weather
X	Special Hazards – **lead, asbestos, PAHs**				

Other: Dust hazards (containing lead) from large equipment movement and mixing treatment stockpiles; physical hazards associated with mechanical excavation and treating/stockpiling. Lead maximum concentrations are 767 to 44,000 ppm at the Firing Range 3 and 4 target area, and 71,800 ppm in the Firing Range 3 shooting area. **Total dust/particulate action levels will be set as 0.34 mg/m^3 in the Firing Range 3 and 4 target areas and 0.21 mg/m^3 in the Firing Range 3 shooting area.** Monitoring of Firing Ranges 4 (shooting area), 5, and the CDP is not required. If practical, use water spray to reduce dust/particulates as needed. Results for polycyclic aromatic hydrocarbons (PAHs) were too low to represent an airborne exposure health risk.

Contaminants of Concern:

Contaminant	Max Conc. (ppm)	PEL/TLV	IDLH	Warning	Signs, Symptoms
Lead	44,000 (FR 3&4 target) 71,800 (FR 3 shooting area)	0.05 mg/m^3	100 mg/m^3	Dust	Weakness, lassitude, Central Nervous System, blood, kidney, reproductive effects
Benzo(a)pyrene (and other similar PAHs)	39 (FR 3&4 Target Area) 3.9 (Firing FR 5 Target Area	PEL: 0.02 mg/m^3 TLV: 0.1 mg/m^3	80 mg/m$^{3;}$	Dust	Suspected carcinogen per NIOSH, dermatitis, bronchitis
Asbestos	90% chrysotile (CDP)	0.1 f/cc	Carcinogen	Fiber	Dyspnea, restricted pulmonary function

PROPOSED CONTROLS: (Work practices, PPE, training, and/or emergency procedures that will be used to ensure the safety of workers, and onsite personnel, against the hazards identified above.)
***Please see AHAs in Appendices B and D (Subcontractor Job Safety Analyses) for proposed controls to the above-listed potential hazards.**

Project Management Review

Project Leaders, Group Supervisors, Managers who review the work site are to acknowledge so at least once per day for the duration of the project.

Date	Time	Name	Activity	Issues/Comments

Overall Comments:

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APPENDIX A
SUMMARY OF LEIDOS ENVIRONMENTAL, HEALTH & SAFETY PROCEDURES

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Summary of Leidos Corporate Environmental, Health & Safety Procedures

A summary of the Leidos Corporate Environmental, Health and Safety (EH&S) Procedures are presented below. As stated previously, since essentially all contract requirements take place on the National Aeronautics and Space Administration (NASA) John H. Glenn Research Center (GRC) facility, following NASA programs provides a framework consistent with the location of the work. To the extent that Leidos requirements may extend beyond the NASA programs, Leidos personnel located at NASA GRC will conform to those additional requirements.

1. ***EH&S Program Responsibilities and Implementation****
Identifies responsibilities for the implementation of an EH&S Program in order to ensure statutory and regulatory requirements are met, and to support adherence to the requirements of the Leidos EH&S Policy, LP-LG-11 Environmental, Health and Safety.

2. ***Emergency Action & Fire Prevention****
Defines requirements and establishes responsibilities for the creation and maintenance of emergency action and fire prevention plans (emergency response procedures) at all locations where Leidos employees are permanently assigned, and for fire safety plans for work aboard vessels or in shipyards. Minimum elements for the plan(s) are outlined, as are the requirements for information and training of affected employees, and for the maintenance of related records. Establishes initial reactionary procedures to be followed in the event of reasonably anticipated emergency events (e.g., fire, medical emergencies, weather-related emergencies, hazardous material releases, etc.) likely to impact employee health or safety, and to establish procedures for the control of potential fire related hazards.

3. ***EH&S Workplace Inspections****
This procedure defines responsibilities and establishes requirements for planned and informal workplace inspections in order to identify and ensure timely correction of unsafe conditions and/or work practices.

4. ***Incident Reporting & Investigation****
This procedure defines responsibilities and establishes requirements for the reporting and investigation of "incidents" and "close call incidents" as defined herein, in order to decrease the probability of future similar incidents. Specific actions required by this procedure are: (1) reporting incidents immediately, (2) investigation of incidents by the responsible manager, (3) identifying underlying incident causes, (4) identifying corrective actions to address direct causes and underlying factors, and (5) tracking execution of those actions to closure.

5. ***EH&S Training****
Defines responsibilities and establishes minimum requirements for providing new employees with information on Leidos' environmental, health, and safety compliance programs and resources. Describes the responsibilities and procedures related to EH&S training and how all Leidos personnel assigned to non-office type work activities or exposures (e.g., work involving hazardous materials, warehousing, machine tools, hazardous field activities, etc.) will be instructed in the recognition and avoidance of unsafe conditions and the regulations applicable to his/her work environment to control or eliminate any hazards or other exposure to illness or injury.

6. ***OSHA Recordkeeping and Reporting****
This procedure defines responsibilities and establishes requirements for the recordkeeping and reporting of work-related injuries, illnesses, and fatalities, in accordance with company management requirements and those of the Occupational Safety and Health Administration (OSHA) at 29 *Code of Federal Regulations* (*CFR*) Part 1904.

7. ***Hazardous Waste Management***
Establishes company policies and procedures for managing hazardous waste. In addition, this section provides instructions for identifying, storing, and disposing/recycling hazardous waste. Locations that generate hazardous waste are required to modify and implement this procedure to ensure compliance with local, state, and federal environmental regulations.

8. ***Hazard Communication Program***
Establishes a program for informing employees of the hazards associated with hazardous chemicals through container labeling and other forms of warning, safety data sheets (SDSs), and training.

9. ***Respiratory Protection***
This procedure defines responsibilities and establishes minimum requirements for the use of a respirator either on a voluntary basis or when such equipment is necessary to protect the health of an employee.

10. ***Confined Space Entry***
Establishes minimum requirements for the safe performance of confined space entry operations by Leidos or Leidos contractors/subcontractors. This includes establishing minimum requirements for: identifying permit- and non-permit required confined spaces; entrance into permit-required confined spaces; contracting and/or subcontracting confined space entry work; conducting confined space entries at client facilities; annual program reviews; training; and recordkeeping.

11. ***Lock Out/Tag Out***
Establishes minimum program requirements to ensure that machinery or equipment is isolated from all potentially hazardous energy, and locked out and tagged out before employees perform any servicing or maintenance activities where the unexpected energization, start-up, or release of stored energy could cause injury. This includes, except in specified circumstances, development and utilization of machine or equipment-specific energy control procedures. Corporate/Group/Operation EH&S Officials are responsible for ensuring energy control procedures are developed, periodic inspections of energy control procedures are conducted, all required training is provided and properly documented, and that all required program records are maintained.

12. ***Medical Clearance and Surveillance***
This procedure defines responsibilities and identifies requirements for obtaining medical clearances or performing medical surveillance on employees with occupational exposures to hazardous agents, or where otherwise required by applicable regulations.

13. ***Personal Protective Equipment***
Defines responsibilities and establishes minimum requirements for: (i) conducting a workplace hazard assessment to determine personal protective equipment (PPE) requirements; (ii) the selection and payment of PPE; and (iii) training employees on the use, care, maintenance, and limitations of PPE.

14. ***Chemical Hygiene Plan and Laboratory Safety Program***
Summarizes and implements the OSHA standard for laboratory safety. This procedure includes guidelines for making determinations on hazard identification, employee exposure to hazardous and toxic substances, required use of respirators, and medical consultation and examinations. The Corporate/Group/Operation EH&S Official is responsible for training and education concerning chemical hygiene and safety, and coordination with the EH&S Director, examining physicians, and affected employees. The Corporate/Group/Operation EH&S Official must also maintain a reporting and recordkeeping system and periodically monitor laboratory operations and working conditions.

15. ***Hearing Conservation and Noise Control***
This procedure defines responsibilities and establishes minimum requirements for assessing noise exposures and, where required, implementing noise control strategies and/or hearing conservation program elements.

16. ***Injury and Illness Prevention Program (California Only)***
This program taken together with other defined elements of the Corporate EH&S Program outlines methods for communicating with and training employees on matters relating to occupational safety and health, assessing and controlling work place hazards, and ensuring employees comply with safe and healthy work practices.

17. ***Laser Safety***
This procedure defines responsibilities and establishes requirements for the use of lasers and laser systems, including requirements for user training and, in specified instances, the development, implementation and maintenance of standard operating, maintenance, and service procedures (standard operating procedures [SOPs]) for the control of laser related hazards.

18. ***Environmental, Health and Safety Records Management***
Presents internal corporate procedures for the preparation, control, storage, and retrieval of EH&S records in compliance with the United States Environmental Protection Agency (USEPA), OSHA, and other regulatory agencies' requirements. Corporate/Group/Operation EH&S Officials must ensure the provision of all relevant EH&S records to the EH&S Records Retention Center, and further ensure that all records are complete and accurate.

19. ***Radiation Protection***
Sets forth Nuclear Regulatory Commission (NRC), OSHA, and Leidos standards for occupational radiation protection to ensure that employee radiation exposure is minimized to doses as low as reasonably achievable, and that releases of radioactive materials are within regulatory and permit limits. This procedure requires the designation of a local Radiation Safety Officer who is responsible for preparing and implementing a radiation protection program, to include periodic surveys, training, investigation, and reporting requirements.

20. ***Hazardous Waste Operations***
Implements OSHA requirements for the protection of workers engaged in hazardous waste operations. The procedure includes guidelines for proper training of covered employees, preparation of site-specific health and safety plans (HASPs), compliance with applicable medical surveillance and care requirements, and recordkeeping. The Group/Operation EH&S Official, in concert with each designated site Health and Safety Officer (SHSO), is responsible for implementing the procedure.

21. ***Regulatory Agency Inspections and Related Reporting***
This procedure defines responsibilities and establishes requirements related to the handling and reporting of regulatory agency inspections or other regulatory enforcement related events (e.g., receipt of a formal complaint, notice of violation, or other code citation or enforcement mechanism).

22. ***Powered Industrial Trucks***
This procedure defines responsibilities and establishes minimum requirements for the safe use and maintenance of powered industrial trucks.

23. ***Universal Waste Management***
Establishes minimum requirements for the management of universal wastes (e.g., waste fluorescent lamps, batteries, pesticides, and thermostats) from Leidos facilities and/or activities. Corporate/Group/Operation EH&S Officials are responsible for ensuring that site-specific universal waste management programs are established addressing accumulation and labeling, off-site shipment, training, and recordkeeping.

24. ***Hazardous Material Transportation***
This procedure defines responsibilities and establishes minimum requirements for company employees involved in the offering or preparation of hazardous material for transportation, or the self-transportation of hazardous material meeting the "material of trade" exception.

25. ***Commercial Motor Vehicle Operation***
This procedure defines responsibilities and establishes minimum requirements for the operation of commercial motor vehicles by company employees, including but not limited to: (i) the qualification, hiring, investigation, and testing of commercial motor vehicle drivers ("driver" herein); (ii) the identification, inspection, and maintenance of commercial motor vehicles; and (iii) the creation and maintenance of individual driver trip (i.e., hours of service) records.

26. ***Electrical Safety***
Establishes procedures to protect Leidos employees and contractors from potential electrical hazards. The program focuses on safe work practices along with application of engineering controls, administrative controls, and use of PPE. Employees working on electrical conductors or circuit parts that have not been put into an "electrically safe working condition" must be qualified persons and trained to understand the hazards and to select and use safe work practices as well as personal and other protective equipment.

27. ***Fall Protection, Ladders & Scaffolds***
Establishes procedures to ensure compliance with the OSHA Fall Protection standard (29 *CFR* 1926, Subpart M, Fall Protection) through fall hazard identification and evaluation and use of fall protection systems. Establishes fall protection training requirements and requirements for work on ladders and scaffolds.

28. ***Construction Operations***
Specifies requirements applicable to construction operations performed by Leidos. Covers training, staffing, management of design/build project safety, and health and safety plan requirements.

29. ***Substance-Specific Hazardous Materials***
Establishes minimum requirements and responsibilities for the control of heavy metal exposure [i.e., arsenic, cadmium, chromium (VI), and lead], benzene, asbestos, hydrogen sulfide, silica, and ammonia during work conducted by Leidos employees. Applies to employees engaged in work-related activities where the likelihood for exposure to these materials at or above established exposure limits exists.

30. ***Heat Illness Prevention***
Provides a description of illness associated with heat stress and preventive measures to be used where Leidos employees are exposed to heat temperature extremes.

31. ***Cold Stress Prevention***
Provides a description of illness associated with cold stress and preventive measures to be used where Leidos employees are exposed to cold temperature extremes.

32. ***Vehicle Operations***
Describes requirements for operation of Leidos vehicles. It is intended to minimize the probability of work-related vehicle accidents. The procedure applies to Leidos use of vehicles. Vehicle use covered by this procedure includes any operation by Leidos personnel of Leidos owned leased, and rented vehicles, and personal vehicles when operated on Leidos business.

33. ***Subsurface Asset and Hazard Avoidance***
Establishes the minimum requirements for avoiding damage to subsurface assets and harm to employees or others from unintentional contact with buried utilities when performing drilling or excavation. This procedure applies to Leidos work that involves penetrating the soil surface with hand or powered equipment.

34. ***Heavy/Mobile Equipment Operation***
Describes procedures that will be followed when heavy equipment is in use at Leidos project sites. Requires subcontractors to provide information demonstrating that their employees are qualified by training or experience to operate equipment at the site.

35. ***Excavation Operations***
Provides procedures to ensure that all excavation, shoring, and trenching activities performed by Leidos are conducted in accordance with the requirements outlined in this section and Subpart P of 29 *CFR* Part 1926. Requires that subcontractors performing excavation operations provide an individual capable of performing competent person duties as described in this procedure.

36. ***Project Site Spill and Fire Prevention and Control***
Specifies general requirements for maintaining appropriate spill and fire protection and prevention on Leidos projects. Discusses fire extinguishers, incipient firefighting, flammables, secondary containment, and smoking/open flames.

37. ***Welding, Cutting and Hot Work***
Describes Leidos welding, cutting, and hot work requirements at Leidos locations and where the client or site owner does not have requirements in place or when welding. Covers equipment operation and training, equipment maintenance, ventilation, PPE, first aid, gas welding safety, arc welding safety, confined spaces, storage and handling of compressed gas cylinders, fire protection, and permitting procedures.

38. ***Machine Shop, Hand and Power Tool Safety***
Describes requirements for machine shops, tool selection and use, housekeeping, and PPE that must be followed by all Leidos and subcontractor personnel when utilizing hand (includes open-blade knifes) or power tools.

39. ***Lifting and Rigging***
Specifies requirements necessary to lift and move heavy loads safely. Includes specifications for chains, hoists, and rigging, as well as safe lifting practices and employee training.

40. ***Aerial Lifts***
Outlines safe operating rules and the minimum requirements to be completed by employees prior to operating or conducting work from a boom-supported aerial work platform (aerial lift).

41. ***Automated External Defibrillator (AED) Program***
Establishes a consistent guideline for the selection, placement, care, and maintenance of AEDs for voluntary use in the event of a sudden cardiac arrest emergency.

42. ***First Aid and Emergency Rinse Equipment***
Specifies requirements for first aid at Leidos project sites. Specifies assignment of personnel certified in first aid, first aid kit requirements, transportation of injured personnel, and eyewash/quick drench requirements.

43. ***Bloodborne Pathogens Exposure Control***
Describes Leidos procedures for eliminating or minimizing the danger of exposure to human blood or other potentially infectious materials in compliance with the OSHA Bloodborne Pathogens Standard, 29 *CFR* Part 1910.1030. The procedure is intended to cover Leidos employees trained in first aid operations and personnel performing activities with potential exposure to human blood of other potentially infectious materials.

44. ***Process Safety Management***
Describes responsibilities and requirements for Leidos when working at facilities that are covered by the OSHA Process Safety Management Standard, 29 *CFR* 1910.119. This section focuses on training and reporting requirements applicable to contractors.

45. ***Project Site Emergency Planning and Response***
Describes responsibilities and requirements for Leidos regarding emergency planning and response at client facilities. This section covers emergency response plans and procedures, training, protective clothing, post-emergency response, and medical surveillance.

46. ***Management of Waste Generated at Project Sites***
Establishes management practices to ensure that all wastes generated from Leidos activities at project sites involving hazardous substances are properly managed in accordance with all applicable environmental laws and regulations. The procedure provides direction and guidance on specific contract language [to ensure that Leidos does not perform any activities which may pose potential liability under the Resource Conservation and Recovery Act of 1976 (RCRA), Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), or any equivalent state laws, as a generator of hazardous waste or an arranger of hazardous substance transportation, treatment, or disposal on a client's behalf], as well as on the development of management plans for project generated waste.

47. ***Naturally Occurring Radioactive Material***
This procedure establishes the minimum requirements that Leidos projects must meet to protect personnel where naturally occurring radioactive material (NORM) exposure may occur. Compliance with this program is mandatory and is applicable to all company employees who work in an environment where NORM may be present in any amount.

48. ***Stop Work Authority***
Every Leidos employee has the responsibility and authority to stop work immediately, without fear of reprisal, when perceived that a situation places themselves, their coworkers, or the environment in danger, or when the work will result in an unacceptable product. This procedure describes the steps and requirements for employees to implement "Stop Work Authority" (SWA).

49. ***Short Service Employees***
This program is utilized for project sites where Leidos client require contractors to implement their own Short Service Employee (SSE) program and Leidos has employee(s) or temporary employees with less than six months service with Leidos working at the project site. The purpose of the program is to ensure that the SSE is oriented to the client's EH&S, quality, and technical requirements prior to working at a client location and is working under the direct onsite supervision of a designated contractor employee who also serves as a mentor/trainer.

50. ***Manual Lifting***
Establishes guidelines, minimum requirements, and responsibilities for the control of hazards associated with manual lifting. The primary requirements are:

- The responsible manager must assess the lifting tasks performed by his/her employees and ensure the safety of those lifts.
- Fifty pounds is the maximum limit for individual lifts

51. ***Fatigue Management***
Provides minimum requirements to minimize the risk associated with fatigue when employees are performing field work on Leidos projects. The program addresses employee hours of service requirements as well as other general requirements to ensure employees are fit for duty.

52. ***Working Near Open Water***
Provides minimum requirements including life-saving equipment and pre-planning to minimize the risk of drowning when employees are performing field work near open water during Leidos projects.

53. ***Permit to Work***
Describes process for eliminating incidents associated with inadequately planned work by serving as an administrative control to prevent unauthorized work; and identifying all precautions and restrictions necessary to perform the work safely. The permit to work (PTW) process is applicable at all Leidos project sites with high-risk tasks where workers/subcontractors are exposed, or potentially exposed, to dangerous physical, chemical, or environmental conditions.

54. ***UXO/MEC/CWM Safety***
Establishes responsibilities for unexploded ordnance (UXO) personnel and minimum requirements under which field work that may involve exposure to UXO, munitions and explosives of concern (MEC), or chemical warfare materials (CWM) may be performed. This procedure applies to Leidos and Leidos subcontractor field activities involving potential exposure to UXO/MEC/CWM.

SUMMARY OF LEIDOS CIVIL GROUP's SUPPLEMENTAL ENVIRONMENTAL, HEALTH AND SAFETY PROCEDURES

CV-1. ***Behavior-Based Safety Process***
A behavior-based safety process (BBSP) has been developed by Leidos to reduce at risk practices that lead to incidents and to promote safety as an organizational value. A BBSP provides an avenue for employee involvement and a systematic approach to identify and correct practices and conditions that lead to employee injuries. It includes elements for personal task analysis, job safety analysis, observation and feedback, incident investigation, and BBSP administration.

CV-2. ***Subcontractor Environmental, Health and Safety***
Establishes minimum requirements and responsibilities for the evaluation and selection of subcontractors and defines the Environmental, Health and Safety (EH&S) requirements applicable to field work or construction work subcontracted by Leidos.

CV-3. ***Injury/Illness Management***
Provides requirements regarding work-related injury/illness management at Leidos including the utilization of WorkCare, a national occupational health-consulting firm, to provide work-related injury/illness management services.

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APPENDIX B
ACTIVITY HAZARD ANALYSIS

CONSTRUCTION SITE INSPECTIONS/NON-INTRUSIVE PHYSICAL SURVEYS

ENVIRONMENTAL SAMPLING/MONITORING

OVERSIGHT OF INSTALLATION AND ABANDONMENT OF GROUNDWATER MONITORING WELL USING HOLLOW-STEM AUGER/AIR ROTARY DRILL RIG

WELL DEVELOPMENT, WELL PURGING, AND GROUNDWATER SAMPLING

EXCAVATION OR CONSTRUCTION AND COLLECTION OF SOIL SAMPLES

GATOR/MULE ATV VEHICLE USE

DRUM SAMPLING AND IDW MANAGEMENT

EQUIPMENT DECONTAMINATION

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ACTIVITY HAZARD ANALYSIS		
WORK ACTIVITY: CONSTRUCTION SITE INSPECTIONS / NON-INTRUSIVE PHYSICAL SURVEYS (e.g., UTILITY CLEARANCES, SITE RECONNAISSANCE, WELL SURVEY)		
Personal Protective Equipment (PPE)	**Selected**	**Comments**
Safety Shoes	X	Overboots/disposable booties if walking through disturbed contaminated areas or stockpiles.
Hard Hat	X	If near operating heavy equipment or overhead hazards are present.
Safety Glasses With Side Shields	X	
Fire-Resistant Clothing		
Face Shields		
Goggles		
Lifeline/Body Harness		
Hearing Protection	X	As required, if posted or if exposed to noise greater than or equal to 82 dBA.
Air-Purifying Respirator		
Supplied Air Respirator – SCBA		
Personal Floatation Device	X	If within 6 feet of unguarded water 2 feet or more in depth.
Gloves	X	Nitrile, PVC, or similar for potentially contaminated material. Heavy-duty work gloves for material handling.
Other:		
Safety Cones/Barricades	X	As needed, to control/alert traffic and exclude unauthorized personnel.
High-Visibility Vest/Clothing	X	As necessary for traffic safety.
Knee Pads		
Caution Tape	X	As needed, to exclude unauthorized personnel.
Competent Person	Rich Sprinzl, Leidos	
Subcontractor	John Hancock and Associates	

WORK ACTIVITY: CONSTRUCTION SITE INSPECTIONS / NON-INTRUSIVE PHYSICAL SURVEYS (e.g., UTILITY CLEARANCES, SITE RECONNAISSANCE WELL SURVEY)		
Job Steps	**Potential Hazard**	**Critical Actions to Control Hazard**
Mobilization to site and around site.	Vehicle accident	Compliance with Leidos Corporate EH&S Procedure 32, *Vehicle Operations* (valid driver's license, seat belt use, routine vehicle inspections, and no cell phone use while driving).
Inspection of construction site	General hazards	Employees shall be alert to their surroundings and take suitable precautions if unexpected conditions are encountered. Inspect the immediate and surrounding work area for potential hazards and take prudent corrective actions or stop work, as needed. Review any applicable hazard analysis or safety permits for the work being inspected and adhere to requirements.
	Slips, trips, and falls	Keep walking surfaces free of hazards such as slippery surfaces, holes, and trip hazards. Maintain good housekeeping. Keep eyes on path and/or task and keep a hand on handrail when ascending/descending stairs. Wear footwear suitable for setting. Flat-soled shoes with separate heel and a non-slip sole or sturdy boots with lugged sole in construction or field settings. Protective-toe footwear if required by site. Wear ice cleats when there is potential for ice or frozen snow. Maintain a safe distance from trenches, holes, pits, etc. Avoid areas that have debris or where footing may shift. Avoid unstable slopes or steep slopes. Walk around if possible.
	Pinch hazards	Keep all body parts clear of all articulated or moving parts. Guards shall be maintained for all machinery representing a pinch hazard. Inspection of equipment with articulating or moving parts shall be performed only after control keys have been put under control by competent mechanics/operators only.
	Noise	Hearing protection required within 25 feet of operating gasoline-powered generators, or if posted or if exposed to noise greater than or equal to 82 dBA (where voice has to be raised to be heard).
	Fire or other emergencies	Identify location of fire extinguishers onsite and posted evacuation routes. Follow Site Health and Safety Plan Emergency and Evacuation procedures.

WORK ACTIVITY: CONSTRUCTION SITE INSPECTIONS / NON-INTRUSIVE PHYSICAL SURVEYS (e.g., UTILITY CLEARANCES, SITE RECONNAISSANCE WELL SURVEY)		
Job Steps	**Potential Hazard**	**Critical Actions to Control Hazard**
Inspection of construction site (continued)	Biological hazards	Inspect area for hazardous plants and organism conditions. Avoid such areas if possible. Wear clothing that covers potentially affected body parts. Pretreat clothing with permethrin. Use insect/tick repellant (> 30% DEET or > 10% picaridin) to supplement. Use insect/tick repellant whenever possible. Additional tick control measures include the following: (1) Seal bottoms of pants legs with tape, tuck into boots, or use permethrin-treated tick/chigger gaiters; tuck in shirt tails. (2) Inspect for ticks on clothing during work. Inspect for ticks on skin at least once a day and more often if ticks are prevalent. (3) Take hot showers as soon after as possible. (4) If ticks are prevalent, consider wearing white Tyvek pants or other non-porous, slick, light-colored outer garments. (5) If bitten by a tick, use fine-tipped tweezers. When possible, avoid removing ticks with bare hands. Grasp the tick as close to the skin surface as possible and pull upward with steady, even pressure. Do not twist or jerk the tick; this may cause the mouthparts to break off and remain in the skin. If this happens, remove mouthparts with the tweezers. Do not squeeze, crush, or puncture the body of the tick because its fluids (saliva and gut contents) may contain infectious organisms. After removing the tick, thoroughly disinfect the bite site and wash hands thoroughly with soap and water. Disinfect the tweezers. (6) Save the tick for identification in case illness occurs. This may help the doctor make an accurate diagnosis. Place the tick in a vial or plastic zip-lock bag with a wet cotton ball. Write the date of the bite on a piece of paper with a pencil and place it in the bag. (7) Medical Follow-Up – Contact WorkCare if an embedded tick is found. In most circumstances, medical treatment of persons who only have a tick bite is not recommended. However, WorkCare will set up a clinic visit for further medical evaluation if any signs and symptoms of tick-borne disease develop over the weeks following the tick bite. Use the buddy system and inform co-workers of any potential allergic condition, and instruct the co-worker on actions if an allergic reaction occurs and use of prescribed medication for the affected individual. Review route to hospital if allergic to insect/spider sting/bite. Wear snake chaps if probability of encountering snakes.

WORK ACTIVITY: CONSTRUCTION SITE INSPECTIONS / NON-INTRUSIVE PHYSICAL SURVEYS (e.g., UTILITY CLEARANCES, SITE RECONNAISSANCE WELL SURVEY)		
Job Steps	**Potential Hazard**	**Critical Actions to Control Hazard**
Inspection of construction site (continued)	Chemical hazards	If working near intrusive activities, monitor total dust/particulate levels with a direct reading total dust/particulate monitor. Stop work and leave the area if established total dust/particulate action levels are exceeded. **Total dust/particulate action levels are set at 0.34 mg/m^3 in the Firing Range 3 and 4 Target Area and 0.21 mg/m^3 in the Firing Range 3 Shooting Area (based on lead concentrations).** Disposable booties will be worn (or decontaminate boots) within disturbed contaminated areas.
	Severe weather	Locate nearest severe weather shelter/strong structure before beginning inspection. Suspend field work if thunder is heard (lightning hazard) or tornado warning issued. Do not work in areas subject to flash flooding (arroyo, ditch, etc.) if rain is forecast in immediate area or upstream of site.
	Electrical/energized sources	Avoid exposed energized components. No contact with exposed wiring or circuits. Wear appropriate PPE (hard hat as required, safety glasses, gloves, work boots, or shoes). Refer to Glenn Safety Manual Chapter 8, "Electrical Systems Safety," Chapter 9, "Lockout/Tagout," and Leidos Corporate EHS Procedure 26.0, *Electrical Safety*.
	Heavy equipment	Maintain a safe distance equivalent to the full, extended reach of all moving/mobile equipment. Approach mobile/moving equipment only after getting permission of the operator. Maintain visual contact with equipment operators at all times.
	Drowning	If water > 2 feet at bank, USCG minimum Class II PFD is required. Do not enter water if fast flowing or approximately knee deep. Buddy system to be utilized.
	Temperature stress	If temperature is above 80°F or below 40°F, administrative controls will be implemented (cooled or warmed drinks, routine breaks in heated or shaded area, and provisions for emergency heating or cooling).
	Lifting/musculoskeletal injuries	Compliance with Corporate EH&S Procedure 50.0, *Manual Lifting*. If equipment is to be moved, an evaluation of potential pinch points and/or weight strain will be conducted. Clear area of all unnecessary equipment and slip/trip hazards. Additional help will be obtained by workers or mechanical assistance used onsite if equipment to be moved is unwieldy, has a weight > 50 pounds, or has to be moved by maneuvering through awkward positioning. Take occasional breaks from repetitive tasks to change body position and stretch. Keep joints in "neutral" position to minimize stress (i.e., wrists straight, not tilted); never lift and twist but rather move feet to turn and lift and place containers.

ACTIVITY HAZARD ANALYSIS		
WORK ACTIVITY: ENVIRONMENTAL SAMPLING AND MONITORING (e.g., SOIL SAMPLING, GROUNDWATER SAMPLING, MISCELLANEOUS SAMPLING, FIELD OBSERVATIONS)		
Personal Protective Equipment (PPE)	**Selected**	**Comments**
Safety Shoes	X	Overboots/disposable booties if walking through disturbed contaminated areas or stockpiles.
Hard Hat	X	If within 25 ft of operating heavy equipment or if overhead hazards are present.
Safety Glasses With Side Shields	X	If sampling or performing intrusive work (e.g., disturbing soil).
Fire-Resistant Clothing		
Face Shields		
Goggles	X	If splash potential, pouring corrosives or free product recovery.
Lifeline/Body Harness		
Hearing Protection	X	As required, if posted or if exposed to noise greater than or equal to 82 dBA.

Half- or Full-Face Air-Purifying Respirator		If established total dust/particulate action levels, as measured with a direct reading total dust/particulate monitor, are exceeded. **Total dust/particulate action levels are set at 0.34 mg/m^3 in the Firing Range 3 and 4 Target Area and 0.21 mg/m^3 in the Firing Range 3 Shooting Area (based on lead concentrations).**
		
		Each employee who will use respiratory protection will follow the requirements in their employer's respiratory protection program and must comply with the following requirements:
		
		• The worker will be assigned a respirator; the respirator may not be used by another worker.
		• The worker must be medically certified as being capable of wearing a respirator.
		• The worker will only use a well-maintained, NIOSH-approved respirator for which he/she has passed a qualitative fit test (manufacturer, model, and size) within the past 12 months.
		• The worker must have no facial hair that touches the sealing surface of his/her respirator.
		• The worker will verify that the cartridges that will be used on his/her respirator are P100 cartridges.
		• Respirator cartridges will be disposed at the end of each work shift (not to exceed eight [8] hours of continuous or intermittent use). Cartridges may be disposed more frequently if one of more of the following conditions is noted:
		  o A cartridge has become damaged.
		  o A cartridge has become clogged or blocked, causing additional resistance to breathing.
		• The worker will inspect his/her respirator for damage prior to use and perform a positive and negative pressure test upon donning his/her respirator.

ACTIVITY HAZARD ANALYSIS		
WORK ACTIVITY: ENVIRONMENTAL SAMPLING AND MONITORING (e.g., SOIL SAMPLING, GROUNDWATER SAMPLING, MISCELLANEOUS SAMPLING, FIELD OBSERVATIONS)		
Personal Protective Equipment (PPE)	**Selected**	**Comments**
		The worker will inspect his/her respirator for damage after each use and will clean and disinfect the respirator. After each use, the respirator will be cleaned using a disinfecting/ cleansing wipe. At the end of each work day, the respirator will be disinfected by disassembling the respirator (including removing the cartridges) and washing the facepiece and associated parts in warm, sanitizing solution. The respirator will be rinsed with clean, warm water and allowed to air-dry in a clean area. The respirator will be reassembled and stored in a clean, dry plastic bag (a "zipper"-type or equivalent bag) or airtight container. The respirator must be stored in an area that is out of direct sunlight.
Supplied Air Respirator – SCBA		
Personal Floatation Device	X	If within 6 feet of unguarded water 2 feet or more in depth, or on a boat.
Gloves	X	Nitrile, PVC, or similar for potentially contaminated material. Heavy-duty work gloves for material handling.
Other	X	Use total dust/particulate monitor during blast wall soil removal. Wear respirator if breathing zone reading for total dust is greater than 0.34 mg/m^3 (voluntary if below action level). Wear Tyvek coveralls/booties during waste characterization sampling.
Safety Cones/Barricades	X	If needed to control/alert traffic and exclude unauthorized personnel. All traffic cones must be at least 36 inches tall.
High-Visibility Vest/Clothing	X	As necessary for traffic safety.
Knee Pads		
Caution Tape	X	As needed, to exclude unauthorized personnel.
		`
Competent Person		Rich Sprinzl, Leidos
Subcontractor		TTL Associates Inc.

WORK ACTIVITY: ENVIRONMENTAL SAMPLING AND MONITORING (e.g., SOIL SAMPLING, GROUNDWATER SAMPLING, MISCELLANEOUS SAMPLING, FIELD OBSERVATIONS)		
Job Steps	**Potential Hazard**	**Critical Actions to Control Hazard**
Mobilize to work site	Traffic accident	Compliance with Leidos Corporate EH&S Procedure 32, *Vehicle Operations* (valid driver's license, seat belt use, routine vehicle inspections, and no cell phone use while driving).
Environmental sampling or monitoring	Being struck by vehicles	Traffic control by traffic cones, barricade tape, and/or sawhorse barricades (more substantial barriers required as traffic hazard increases). Vehicle(s) placed between workers and oncoming traffic. High-visibility safety vests in traffic areas. Flashing rotating beacon in high-traffic parking areas or brief roadwork. *Manual on Uniform Traffic Control Devices* (MUTCD)-compliant traffic control plan for work in road/street, roadside parking strip, sidewalk, or shoulder. Artificial lighting provided for work after twilight.
	General hazards, slips, and trips	Avoid areas that have debris or where footing may shift. Wear footwear suitable for setting. Flat-soled shoes with separate heel and a non-slip sole or sturdy boots with lugged sole in construction or field settings. Wear ice cleats when there is potential for ice or frozen snow. Protective-toe footwear if required by site. Avoid unstable slopes or steep slopes. Walk around if possible. Inspect the immediate and surrounding work area for potential hazards and take prudent corrective actions or stop work, as needed. The use of safety vests or shirts, as well as hard hats, will be employed when working in any construction zone in addition to any other required PPE.
	Temperature stress	If temperature is above 80°F or below 40°F, administrative controls will be implemented (cooled or warmed drinks, routine breaks in heated or shaded area, and provisions for emergency heating or cooling).
	Lifting (musculoskeletal injuries)	Compliance with Leidos Corporate EH&S Procedure 50, *Manual Lifting*. If equipment is to be moved, an evaluation of potential pinch points and/or weight strain will be conducted. Clear area of all unnecessary equipment and slip/trip hazards. Additional help will be obtained by workers or mechanical assistance used onsite if equipment to be moved is unwieldy, has a weight > 50 pounds, or has to be moved by maneuvering through awkward positioning.
	Electric shock	Portable electrical tools and all portable electrical equipment that poses a shock hazard must be connected through ground fault circuit interrupters (GFCIs). Reference Glenn Safety Manual Chapter 8, "Electrical Systems Safety," and Chapter 9, "Lockout/Tagout." Refer to Leidos Corporate EH&S Procedure 26.0, *Electrical Safety*.
	Battery fire/explosion	Use only batteries that are not installed in vehicles and are not being charged during use for powering equipment. If no other battery is available, use vehicle battery by making the final connection away from the battery.
	Fire or other emergency	Identify location of fire extinguishers onsite and posted evaluation routes. Follow Emergency and Evacuation procedures set forth by Site Safety and Health Plan. Fire extinguishers rated 2A and 5B (serviced annually and inspected monthly) available in all fuel use areas. Allow gasoline-powered equipment to cool prior to fueling.

WORK ACTIVITY: ENVIRONMENTAL SAMPLING AND MONITORING (e.g., SOIL SAMPLING, GROUNDWATER SAMPLING, MISCELLANEOUS SAMPLING, FIELD OBSERVATIONS)		
Job Steps	**Potential Hazard**	**Critical Actions to Control Hazard**
Environmental sampling or monitoring (continued)	Chemical exposure	Monitor total dust/particulates during soil sampling activities with direct reading total dust/particulate monitor. **Total dust/particulate action levels are set at 0.34 mg/m^3 in the Firing Range 3 and 4 Target Area and 0.21 mg/m^3 in the Firing Range 3 Shooting Area (based on lead concentrations).** Use water spray to reduce dust/particulate levels if needed and where practical. Don half- or full-face respirators equipped with P100 cartridges if established total dust/particulate action levels, as measured with a direct reading total dust/particulate monitor, are exceeded. Disposable booties will be worn (or decontaminate boots) within disturbed contaminated areas. Current medical clearance and 40-hour HAZWOPER for hazardous waste work. Wash hands before eating or drinking. Nitrile gloves for chemical/contaminant contact. Chemical containers labeled with identity and hazard. SDSs onsite for all chemicals in use. Site-specific training must address chemicals, hazards, and proper handling. A 15-minute eyewash must be within 20 feet if pouring corrosives. Eyewash bottle must be within 10 feet if adding water samples to pre-preserved containers.
	Contact with buried structures or utilities	NASA digging permit obtained. Pin flags will not be set deeper than 6 inches. Wooden or plastic stakes will be used if greater depth required. If penetrating more than 1 foot during sampling, NASA will clear area for underground utilities before work begins. Follow Leidos Corporate EH&S Procedure 33.0, *Subsurface Assess and Hazard Avoidance*.
	Noise	Hearing protection required within 25 feet of operating gasoline-powered generators, or if posted or if exposed to noise greater than or equal to 82 dBA (where voice has to be raised to be heard).
	Falls	Compliance with Leidos Corporate EH&S Procedure 27, *Fall Protection*. Working at heights above 4 feet (unless on a construction project) requires fall protection.

WORK ACTIVITY: ENVIRONMENTAL SAMPLING AND MONITORING (e.g., SOIL SAMPLING, GROUNDWATER SAMPLING, MISCELLANEOUS SAMPLING, FIELD OBSERVATIONS)		
Job Steps	**Potential Hazard**	**Critical Actions to Control Hazard**
Environmental sampling or monitoring (continued)	Biological hazards	Inspect area for hazardous plants and organism conditions. Avoid such areas if possible. Wear clothing that covers potentially affected body parts. Seal pants legs against contact with plants and to prevent access by organisms. Pretreat clothing with permethrin. Use insect/tick repellant (> 30% DEET or > 10% picaridin) to supplement. Use insect/tick repellant whenever possible. Pretreat drop cloth for area around sample table. Additional tick control measures include the following: (1) Seal bottoms of pants legs with tape, tuck into boots, or use permethrin-treated tick/chigger gaiters; tuck in shirt tails. (2) Inspect for ticks on clothing during work. Inspect for ticks on skin at least once a day and more often if ticks are prevalent. (3) Take hot showers as soon after as possible. (4) If ticks are prevalent, consider wearing white Tyvek pants or other non-porous, slick, light-colored outer garments. (5) If bitten by a tick, use fine-tipped tweezers. When possible, avoid removing ticks with bare hands. Grasp the tick as close to the skin surface as possible and pull upward with steady, even pressure. Do not twist or jerk the tick; this may cause the mouthparts to break off and remain in the skin. If this happens, remove mouthparts with the tweezers. Do not squeeze, crush, or puncture the body of the tick because its fluids (saliva and gut contents) may contain infectious organisms. After removing the tick, thoroughly disinfect the bite site and wash hands thoroughly with soap and water. Disinfect the tweezers. (6) Save the tick for identification in case illness occurs. This may help the doctor make an accurate diagnosis. Place the tick in a vial or plastic zip lock bag with a wet cotton ball. Write the date of the bite on a piece of paper with a pencil and place it in the bag. (7) Medical Follow-Up – Contact WorkCare if an embedded tick is found. In most circumstances, medical treatment of persons who only have a tick bite is not recommended. However, WorkCare will set up a clinic visit for further medical evaluation if any signs and symptoms of tick-borne disease develop over the weeks following the tick bite. Use the buddy system and inform co-workers of any potential allergic condition, and instruct the co-worker on actions if an allergic reaction occurs and use of prescribed medication for the affected individual. Review route to hospital if allergic to insect/spider sting/bite. Wear snake chaps if probability of encountering snakes. Review route to hospital if allergic to insect/spider sting/bite. Do not touch face before thoroughly washing hands with detergent if working in poison ivy/oak/sumac.
	Severe weather	Locate nearest severe weather shelter/strong structure before beginning field work. Suspend field work if thunder is heard (lightning hazard) or tornado warning issued. Do not work in areas subject to flash flooding (arroyo, ditch, etc.) if rain is forecast in immediate area or upstream of site.
	Pinch points	Keep hands from between components. Keep fingers out of all openings.

WORK ACTIVITY: ENVIRONMENTAL SAMPLING AND MONITORING (e.g., SOIL SAMPLING, GROUNDWATER SAMPLING, MISCELLANEOUS SAMPLING, FIELD OBSERVATIONS)		
Job Steps	**Potential Hazard**	**Critical Actions to Control Hazard**
Environmental sampling or monitoring (continued)	Drowning	If water > 2 feet at bank, USCG minimum Class II PFD is required. Do not enter water if fast flowing or approximately knee deep. Buddy system to be utilized.
	Spill control	Basic spill kit suitable for handling small spills of decontamination fluids, hydraulic fluid, or fuels and containing absorbent pads, tubes, and nitrile or similar gloves.
X-Ray fluorescence (XRF) lead in soil	General hazards using XRF	Operation in accordance with all manufacturers' specifications. Experienced operators only. All personnel using the XRF analyzer will be required to take the online equipment-specific training for the XRF model, which is provided by the manufacturer. Verify that all XRF equipment is inspected by trained operators prior to use.
	Exposure to radiation	All personnel using XRF equipment with a sealed radioactive source (cobalt-57 or cadmium-109) will be required to take the manufacturer's online radiation safety course. This documentation will be recorded and maintained by the SSHO to ensure that only trained personnel use the XRF equipment. In addition, all personnel using the XRF equipment must participate in a medical monitoring program. Check areas behind walls/below table to be surveyed to make sure they are clear of occupants. Keep track of XRF equipment at all times, keep locked when not in use, and never visible in employee vehicle. The XRF unit is calibrated by the manufacturer in accordance with industry guidelines and is registered in the State of Ohio as a radioactive source. Regularly scheduled wipe tests of the unit are performed in accordance with licensing requirements to ensure the integrity of the device's housing.
	Chemical exposure	Wear nitrile gloves and avoid contact with dust. Minimize handling of soil samples, particularly dry or dried samples. Wash hands before eating or drinking. Hazard communication labels required on all chemical containers. SDSs onsite for all chemicals in use. Site-specific training must address chemicals, hazards, and proper handling. Current 40-hour HAZWOPER and medical clearance for hazardous waste work.
	Burns	Use oven mitts while transferring hot tray of dried samples from toaster oven to XRF testing table. Allow samples (and foil cups if used) to cool before handling.
Containing and managing soil, decon fluids, purge water, and other IDW	General safety hazards (lifting equipment, manual lifting, slips, etc.)	Equipment will be operated per subcontractor's standard procedures or per manufacturer's directions. Unnecessary personnel will stay well clear of operating equipment.
	Temperature extremes	Temperature stress controls as in "Environmental Sampling or Monitoring" step above.
	Chemical exposure	Chemical exposure controls as in "Environmental Sampling or Monitoring" step above.
	Lifting (musculoskeletal injury)	Lifting (musculoskeletal injuries) controls as in "Environmental Sampling or Monitoring" step above.

WORK ACTIVITY: ENVIRONMENTAL SAMPLING AND MONITORING (e.g., SOIL SAMPLING, GROUNDWATER SAMPLING, MISCELLANEOUS SAMPLING, FIELD OBSERVATIONS)		
Job Steps	**Potential Hazard**	**Critical Actions to Control Hazard**
	Drum handling	Evaluation of potential pinch points and/or weight strain will be conducted. Clear area of all unnecessary equipment and slip/trip hazards. Additional help or mechanical aids will be obtained by workers onsite if equipment to be moved is unwieldy, has a weight > 50 pounds, or has to be moved by maneuvering through awkward positioning.
	Pinch points	Pinch point controls as in "Environmental Sampling or Monitoring" step above.
	Exposure to chemicals	Nitrile gloves for chemical/contaminant contact. Wash hands before eating or drinking. Hazard communication labels on all chemical containers. SDSs onsite for all chemicals in use. Site-specific training must address chemicals, hazards, and proper handling. Current 40-hour HAZWOPER and medical clearance for hazardous waste work.
	IDW control	Label or mark IDW containers to indicate container number, contents (including physical state), investigation location, date of collection, and client name. Ensure that storage area provides adequate protection against physical damage or disturbance. Work in conjunction with NASA WM personnel.
	Spill control	Spill controls as in "Environmental Sampling or Monitoring" step above.
Equipment decontamination by washing and water rinse	Lifting (musculoskeletal injury)	Lifting (musculoskeletal injuries) controls as in "Environmental Sampling or Monitoring" step above.
	Temperature stress	Temperature stress controls as in "Environmental Sampling or Monitoring" step above.
	Electric shock	Electric shock controls as in "Environmental Sampling or Monitoring" step above.
	Fire	Fire extinguishers rated 2A and 5B (serviced annually and inspected monthly) available in all fuel/flammable liquid use areas.
	Chemical exposure	Current 40-hour HAZWOPER and medical clearance for hazardous waste work. Nitrile gloves for chemical/contaminant contact. Wash hands before eating or drinking. Chemical containers labeled with identity and hazard. SDSs onsite for all chemicals in use. Site-specific training must address chemicals, hazards, and proper handling. A 5-minute eyewash must be within 20 feet if pouring corrosives. Eyewash bottle must be within 10 feet if adding water samples to pre-preserved containers.
	IDW control	IDW controls as in "Containing and managing soil cuttings, decon fluids, purge water and other IDW" step above.
Shipping/packing environmental samples	Hazardous material shipping/ transportation regulatory violation or spill	Notify Leidos H&S prior to shipment. Ensure United States Department of Transportation/International Air Transport Association compliance if shipping chemicals or other hazardous materials or samples. Hazardous material shippers must be trained and certified. Compliance with Leidos Field Technical Procedure (FTP)-651.

WORK ACTIVITY: ENVIRONMENTAL SAMPLING AND MONITORING (e.g., SOIL SAMPLING, GROUNDWATER SAMPLING, MISCELLANEOUS SAMPLING, FIELD OBSERVATIONS)		
Job Steps	**Potential Hazard**	**Critical Actions to Control Hazard**
	Lifting	Compliance with Leidos Corporate EH&S Procedure 50, *Manual Lifting*. If equipment is to be moved, an evaluation of potential pinch points and/or weight strain will be conducted. Clear area of all unnecessary equipment and slip/trip hazards. Additional help will be obtained by workers or mechanical assistance used on-site if equipment to be moved is unwieldy, has a weight > 50 pounds or has to be moved by maneuvering through awkward positioning

ACTIVITY HAZARD ANALYSIS		
WORK ACTIVITY: OVERSIGHT OF INSTALLATION AND ABANDONMENT OF GROUNDWATER MONITORING WELLS USING HOLLOW-STEM AUGER /AIR ROTARY DRILL RIG		
Personal Protective Equipment (PPE)	**Selected**	**Comments**
Safety Shoes	X	Protective toe footwear
Hard Hat	X	Within 25 feet of rig or other overhead hazards.
Safety Glasses With Side Shields	X	
Fire-Resistant Clothing		
Face Shields		If air excavating, grinding, pavement saw cutting, welding, or if splash potential exists.
Goggles		If splash potential exists.
Lifeline/Body Harness		
Hearing Protection	X	When within 25 feet of hollow-stem auger rig, or air rotary rig.
Air-Purifying Respirator		
Supplied Air Respirator – SCBA		
Welding Hood		If hot work performed.
Welding/Pipe Clothing		If hot work performed.
Welding Mask/Goggles		If hot work performed.
Personal Floatation Device		If within 6 feet of unguarded water 3 feet or more in depth.
Gloves	X	Nitrile or PVC for potentially contaminated material. Heavy-duty work gloves for material handling.
Other	X	Use four-way gas meter (calibration checked daily and documented during bedrock drilling - deep well installation). Stop work if breathing zone readings exceed 5 parts per million (ppm) [H_2S or CO]; or 10 percent lower explosion limit (LEL); or <19.5 or > 23.5 percent oxygen for more than one minute.
Fall restraint/arrest PPE	X	If working from elevated surface ≥ 6 feet above next lower level.
Safety Cones/Barricades	X	As needed, to control/alert traffic and exclude unauthorized personnel.
High-Visibility Vest/Clothing		If near active traffic areas.
Knee Pads		
Caution/Danger Tape	X	As needed, to exclude unauthorized personnel.
Competent Person	Jasmine Stefansky, Alternates: Charles Spurr - Leidos	
Subcontractor	TTL Associates Inc.	

WORK ACTIVITY: OVERSIGHT OF INSTALLATION AND ABANDONMENT OF GROUNDWATER MONITORING WELLS USING HOLLOW-STEM AUGER / AIR ROTARY DRILL RIG		
Job Steps	**Potential Hazard**	**Critical Actions to Control Hazard**
Mobilize to work site	Traffic accident	Compliance with Leidos Corporate EH&S Procedure 32, *Vehicle Operations* (valid driver's license, seat belt use, routine vehicle inspections, and no cell phone use while driving).
Oversight of rig set-up	Being struck by moving equipment	Leidos personnel will stay out of immediate work area. Rig equipped with functional back-up alarm.
	Contact with overhead structures or utilities	FM shall survey location and ensure absence of obstructions and overhead utilities prior to rig set-up. Rig shall not be allowed to come within 10 feet of overhead power lines. Ensure that at the time the mast is towered up, drill crew members should not be engaged in any other activity; the task at that time is to assist in towering up in the safest manner possible. Ensure that at the time the mast is towered down, other drill crew members should not be engaged in any other activity; the task at that time is to assist in towering down in the safest manner possible. The mast of the drill rig shall be towered down before moving to the next location.
	Temperature extremes	If temperature is above 80 °F or below 40 °F, administrative controls shall be implemented (cooled or warmed drinks, routine breaks in heated or shaded area, and provisions for emergency heating or cooling).
	Severe weather	FM shall check weather report prior to each day and alter schedule to prevent severe weather exposure. Locate nearest severe weather shelter/strong structure before beginning field work. Avoid water, high ground, open spaces, and metal objects. Suspend field work when lightning is first seen, thunder is first heard, or if tornado warning is issued until 30 minutes after last lightning or thunder.
	Biological hazards	Inspect area for hazardous plants and organisms. Wear clothing that covers potentially affected body parts. Seal pant legs against contact with plants and to prevent access by organisms. Pretreat clothing with permethrin. Use insect/tick repellant (> 30% DEET or > 10% picaridin) to supplement. Use insect/tick repellant whenever possible. Pretreat drop cloth for area around sample table. Additional tick control measures include the following: (1) Seal bottoms of pants legs with tape, tuck into boots or use permethrin-treated tick/chigger gaiters; tuck in shirt tails. (2) Inspect for ticks on clothing during work. Inspect for ticks on skin at least once a day and more often if ticks are prevalent. (3) Take hot showers as soon after as possible. (4) If ticks are prevalent, consider wearing white Tyvek pants or other non-porous, slick, light-colored outer garments. (5) If bitten by a tick, use fine-tipped tweezers. When possible, avoid removing ticks with bare hands. Grasp the

WORK ACTIVITY: OVERSIGHT OF INSTALLATION AND ABANDONMENT OF GROUNDWATER MONITORING WELLS USING HOLLOW-STEM AUGER / AIR ROTARY DRILL RIG		
Job Steps	**Potential Hazard**	**Critical Actions to Control Hazard**
Oversight of rig set-up (continued)		tick as close to the skin surface as possible and pull upward with steady, even pressure. Do not twist or jerk the tick; this may cause the mouthparts to break off and remain in the skin. If this happens, remove mouthparts with the tweezers. Do not squeeze, crush, or puncture the body of the tick because its fluids (saliva and gut contents) may contain infectious organisms. After removing the tick, thoroughly disinfect the bite site and wash hands thoroughly with soap and water. Disinfect the tweezers. (6) Save the tick for identification in case illness occurs. This may help the doctor make an accurate diagnosis. Place the tick in a vial or plastic zip-lock bag with a wet cotton ball. Write the date of the bite on a piece of paper with a pencil and place it in the bag. (7) Medical Follow-Up – Contact WorkCare if an embedded tick is found. In most circumstances, medical treatment of persons who only have a tick bite is not recommended. However, WorkCare will set up a clinic visit for further medical evaluation if any signs and symptoms of tick-borne disease develop over the weeks following the tick bite. Use the buddy system and inform co-workers of any potential allergic condition, and instruct the co-worker on actions if an allergic reaction occurs and use of prescribed medication for the affected individual. Review route to hospital if allergic to insect/spider sting/bite. Wear snake chaps if probability of encountering snakes. Review route to hospital if allergic to insect/spider sting/bite. Do not touch face before thoroughly washing hands with detergent if working in poison ivy/oak/sumac.
	Lifting (musculoskeletal injuries) hazards	Compliance with Leidos Corporate EH&S Procedure 50, *Manual Lifting*. If equipment is to be moved, an evaluation of potential pinch points and/or weight strain shall be conducted. Clear area of all unnecessary equipment and slip/trip hazards. Additional help shall be obtained by workers or mechanical assistance used onsite if equipment to be moved is unwieldy, has a weight > 50 pounds, or has to be moved by maneuvering through awkward positioning.

WORK ACTIVITY: OVERSIGHT OF INSTALLATION AND ABANDONMENT OF GROUNDWATER MONITORING WELLS USING HOLLOW-STEM AUGER / AIR ROTARY DRILL RIG		
Job Steps	**Potential Hazard**	**Critical Actions to Control Hazard**
Oversight of boring and addition/ manipulation of drill string	Rotating and/or moving equipment	Leidos employees will stay out of immediate area of drill rig. Only experienced operators. Rigs shall be operated per subcontractor's standard procedures or per manufacturer's directions; all hoses and cables shall be visually inspected daily. Rigs shall have, at a minimum, two functional kill switches or "dead-man" control, which will be checked daily. At no time should anyone work in proximity to rotating augers.
	Kickback	Leidos employees will stay out of immediate area of operation.
	Falling equipment	Leidos employees will stay out of immediate area of operation. No workers under suspended loads. Exclusion zone around drill rig.
	Pinch/laceration	Leidos employees will stay out of immediate area of mobile drill rig. Keep hands from between drill string components. Keep fingers out of all openings. Comply with Leidos Corporate EH&S Procedure 38, *Machine Shop, Hand and Power Tool Safety*. Inspect all hand or power tools prior to use and remove all damaged equipment from site. Select only the best tool for the job.
	Pressurized lines	Leidos employees will stay out of the immediate area of operation. Hoses and connections should be inspected daily and whip checks maintained as appropriate.
	Subsurface utilities (electric shock, fire, or damage to utilities)	Obtain NASA dig permit; utilities located and cleared. FM shall ensure that each boring location has been cleared to preclude contact with buried utilities through compliance with Leidos Corporate EH&S Procedure 33, *Subsurface Asset/Hazard Avoidance*.
	Noise	Hearing protection when within 25 feet unless equipment-specific monitoring indicates that noise levels are less than 82 decibels. Hearing protection required when operating drill rig hammer.
	Drowning	If water > 2 feet at bank, USCG minimum Class II PFD is required. Do not enter water if fast flowing or approximately knee deep. Buddy system to be utilized.
	Temperature extremes	If temperature is above 80 °F or below 40 °F, administrative controls shall be implemented (cooled or warmed drinks, routine breaks in heated or shaded area, and provisions for emergency heating or cooling).
	Severe weather	FM shall check weather report prior to each day and alter schedule to prevent severe weather exposure. Locate nearest severe weather shelter/strong structure before beginning field work. Avoid water, high ground, open spaces, and metal objects. Suspend field work when lightning is first seen, thunder is first heard, or if tornado warning is issued.
	Biological hazards	Inspect area for hazardous plants and organisms. Wear clothing that covers potentially affected body parts. Seal pant legs against contact with plants and to prevent access by organisms. Pretreat clothing with permethrin. Use

WORK ACTIVITY: OVERSIGHT OF INSTALLATION AND ABANDONMENT OF GROUNDWATER MONITORING WELLS USING HOLLOW-STEM AUGER / AIR ROTARY DRILL RIG		
Job Steps	**Potential Hazard**	**Critical Actions to Control Hazard**
Oversight of boring and addition/ manipulation of drill string (continued)		insect/tick repellant (> 30% DEET or > 10% picaridin) to supplement. Use insect/tick repellant whenever possible. Pretreat drop cloth for area around sample table. Additional tick control measures include the following: (1) Seal bottoms of pants legs with tape, tuck into boots or use permethrin-treated tick/chigger gaiters; tuck in shirt tails. (2) Inspect for ticks on clothing during work. Inspect for ticks on skin at least once a day and more often if ticks are prevalent. (3) Take hot showers as soon after as possible. (4) If ticks are prevalent, consider wearing white Tyvek pants or other non-porous, slick, light-colored outer garments. (5) If bitten by a tick, use fine-tipped tweezers. When possible, avoid removing ticks with bare hands. Grasp the tick as close to the skin surface as possible and pull upward with steady, even pressure. Do not twist or jerk the tick; this may cause the mouthparts to break off and remain in the skin. If this happens, remove mouthparts with the tweezers. Do not squeeze, crush, or puncture the body of the tick because its fluids (saliva and gut contents) may contain infectious organisms. After removing the tick, thoroughly disinfect the bite site and wash hands thoroughly with soap and water. Disinfect the tweezers. (6) Save the tick for identification in case illness occurs. This may help the doctor make an accurate diagnosis. Place the tick in a vial or plastic zip-lock bag with a wet cotton ball. Write the date of the bite on a piece of paper with a pencil and place it in the bag. (7) Medical Follow-Up – Contact WorkCare if an embedded tick is found. In most circumstances, medical treatment of persons who only have a tick bite is not recommended. However, WorkCare will set up a clinic visit for further medical evaluation if any signs and symptoms of tick-borne disease develop over the weeks following the tick bite. Use the buddy system and inform co-workers of any potential allergic condition, and instruct the co-worker on actions if an allergic reaction occurs and use of prescribed medication for the affected individual. Review route to hospital if allergic to insect/spider sting/bite. Wear snake chaps if probability of encountering snakes. Review route to hospital if allergic to insect/spider sting/bite. Do not touch face before thoroughly washing hands with detergent if working in poison ivy/oak/sumac.

WORK ACTIVITY: OVERSIGHT OF INSTALLATION AND ABANDONMENT OF GROUNDWATER MONITORING WELLS USING HOLLOW-STEM AUGER / AIR ROTARY DRILL RIG		
Job Steps	**Potential Hazard**	**Critical Actions to Control Hazard**
Oversight of boring and addition/ manipulation of drill string (continued)	Lifting (musculoskeletal injuries) hazards	Compliance with Leidos Corporate EH&S Procedure 50, *Manual Lifting*. If equipment is to be moved, an evaluation of potential pinch points and/or weight strain shall be conducted. Clear area of all unnecessary equipment and slip/trip hazards. Additional help shall be obtained by workers or mechanical assistance used onsite if equipment to be moved is unwieldy, has a weight > 50 pounds, or has to be moved by maneuvering through awkward positioning.
	Fire	Fire extinguishers rated 2A and 5B (serviced annually and inspected monthly) available in work areas. Ensure any onsite fueling happens when equipment is cool and off, preferably prior to work activities occurring for the day. DOT-approved portable fuel containers will not exceed 25 gallons. Combustible gas action level is 10% of LEL.
	Chemical exposure	Breathing zone monitoring with 4-way gas meter (calibration checked daily and documented) during bedrock drilling (deep well installation). Stop work if breathing zone readings exceed 5 ppm (H_2S or CO); or 10% LEL; or <19.5 or > 23.5% oxygen for more than one minute. Evaluate relocating monitoring well. Wet methods (water spray) shall be utilized to prevent dust during drilling. Complete 40-hour HAZWOPER and current refresher training for workers. Complete 8-hour additional supervisor training for FM, SSHO, and all other onsite supervisors. Wash hands before eating or drinking. Nitrile gloves and safety glasses for chemical/contaminant contact. Chemical containers labeled with identity and hazard. SDSs onsite for all chemicals in use. Site-specific training shall address chemicals, hazards, and proper handling.
Oversight of well construction or abandonment	Slips/trips/falls	Observe area ahead for hazards before proceeding. Ensure subcontractor maintains good housekeeping in work area. Avoid trip hazards and wet surfaces. Do not walk backwards.
	Silica/particulate exposure	Restrict access to the work area to only personnel involved in the mixing operations. All other personnel shall stay at least 5 feet away from the operations. Ensure workers tip bags of cement/grout contents gently – never dump. Bags should be emptied with the open end facing away. Use water sprays to control dust emissions. Bag crushing creates a lot of dust. Workers should gently roll up empty bags. In order to dispose of empty bags without creating dust, drop them into a large plastic sack supported and held open by a metal frame. When it is full,

WORK ACTIVITY: OVERSIGHT OF INSTALLATION AND ABANDONMENT OF GROUNDWATER MONITORING WELLS USING HOLLOW-STEM AUGER / AIR ROTARY DRILL RIG		
Job Steps	**Potential Hazard**	**Critical Actions to Control Hazard**
		seal the sack and dispose of it in a suitable waste container. Do not let the waste sack overflow. Clean work area on a regular basis. Deal with spills immediately. Do not clean up with a dry methods - use vacuum or wet cleaning methods.
Containing and managing soil cuttings, decon fluids, and other IDW	Temperature extremes	If temperature is above 80 °F or below 40 °F, administrative controls shall be implemented (cooled or warmed drinks, routine breaks in heated or shaded area, and provisions for emergency heating or cooling).
	Lifting (musculoskeletal injuries)	Compliance with Leidos Corporate EH&S Procedure 50, *Manual Lifting*. If equipment is to be moved, an evaluation of potential pinch points and/or weight strain shall be conducted. Clear area of all unnecessary equipment and slip/trip hazards. Additional help shall be obtained by workers or mechanical assistance used onsite if equipment to be moved is unwieldy, has a weight > 50 pounds, or has to be moved by maneuvering through awkward positioning.
	Pinch/laceration	Comply with Leidos Corporate EH&S Procedure 38, *Machine Shop, Hand and Power Tool Safety*. Inspect all hand or power tools prior to use and remove all damaged equipment from site. Select the best tool for the job. Keep hands from between IDW containers (e.g., drums). Keep fingers out of all openings.
	Electric shock	Comply with Leidos Corporate EH&S Procedure 26, *Electrical Safety*. Inspect all electrical cords and tools prior to use and remove all damaged equipment from site. Connect all electrical cords through GFCI. Portable electrical tools and all portable electrical equipment shall be connected through ground-fault circuit interrupters.
	Fire	Fire extinguishers rated 2A and 5B (serviced annually and inspected monthly) available in all work areas.
	Chemical exposure	Handle carefully to avoid dust generation. Current medical clearance for hazardous waste work. Complete 40-hour HAZWOPER and current refresher training for workers. Complete 8-hour additional supervisor training for FM, SSHO, and all other onsite supervisors. Wash hands before eating or drinking. Nitrile gloves for chemical/contaminant contact. Chemical containers labeled with identity and hazard. SDSs onsite for all chemicals in use. Site-specific training shall address chemicals, hazards, and proper handling.
	IDW control	Label or mark IDW containers to indicate container number, contents (including physical state), investigation location, date of collection, and client name. Ensure storage area provides adequate protection against physical damage or disturbance.

ACTIVITY HAZARD ANALYSIS		
WORK ACTIVITY: WELL DEVELOPMENT, WELL PURGING, AND GROUNDWATER SAMPLING		
Personal Protective Equipment (PPE)	**Selected**	**Comments**
Safety Shoes	X	
Hard Hat		If within 25 feet of an operating rig or other overhead hazards.
Safety Glasses With Side Shields	X	
Fire-Resistant Clothing		
Face Shields		If air excavating, grinding, pavement saw cutting, welding, or splash potential exists.
Goggles		If splash potential exists.
Lifeline/Body Harness		
Hearing Protection	X	When within 25 feet of DPT/hollow-stem auger/air rotary rig during hammer operation.
Air-Purifying Respirator		
Supplied Air Respirator – SCBA		
Personal Floatation Device		If within 6 feet of unguarded water 3 feet or more in depth.
Gloves	X	Nitrile or PVC for potentially contaminated material. Heavy-duty work gloves for material handling. Leather for hot work.
Other		
Fall restraint/arrest PPE		If working from elevated surface ≥ 6 feet above next lower level.
Safety Cones/Barricades	X	As needed, to control/alert traffic and exclude unauthorized personnel.
High-Visibility Vest/clothing		If near active traffic areas.
Knee Pads		
Caution/Danger Tape	X	As needed, to exclude unauthorized personnel.
Competent Person	Jasmine Stefansky, Charles Spurr, Leidos	
Subcontractor	TTL Associates Inc.	

WORK ACTIVITY: WELL DEVELOPMENT, WELL PURGING, AND GROUNDWATER SAMPLING		
Job Steps	**Potential Hazard**	**Critical Actions to Control Hazard**
Mobilize to work site	Traffic accident	Compliance with Leidos Corporate EH&S Procedure 32, *Vehicle Operations* (valid driver's license, seat belt use, routine vehicle inspections, and no cell phone use while driving).
Well development and purging equipment set-up	Temperature extremes	If temperature is above 80 °F or below 40 °F, administrative controls shall be implemented (cooled or warmed drinks, routine breaks in heated or shaded area, and provisions for emergency heating or cooling).
	Severe weather	FM shall check weather report prior to each day and alter schedule to prevent severe weather exposure. Locate nearest severe weather shelter/strong structure before beginning field work. Avoid water, high ground, open spaces, and metal objects. Suspend field work when lightning is first seen, thunder is first heard, or tornado warning issued.
	Biological hazards	Inspect area for hazardous plants and organisms. Wear clothing that covers potentially affected body parts. Seal pant legs against contact with plants and to prevent access by organisms. Pretreat clothing with permethrin. Use insect/tick repellant (> 30% DEET or > 10% picaridin) to supplement. Use insect/tick repellant whenever possible. Pretreat drop cloth for area around sample area. Additional tick control measures include the following: (1) Seal bottoms of pants legs with tape, tuck into boots or use permethrin-treated tick/chigger gaiters; tuck in shirt tails. (2) Inspect for ticks on clothing during work. Inspect for ticks on skin at least once a day and more often if ticks are prevalent. (3) Take hot showers as soon after as possible. (4) If ticks are prevalent, consider wearing white Tyvek pants or other non-porous, slick, light-colored outer garments. (5) If bitten by a tick, use fine-tipped tweezers. When possible, avoid removing ticks with bare hands. Grasp the tick as close to the skin surface as possible and pull upward with steady, even pressure. Do not twist or jerk the tick; this may cause the mouthparts to break off and remain in the skin. If this happens, remove mouthparts with the tweezers. Do not squeeze, crush, or puncture the body of the tick because its fluids (saliva and gut contents) may contain infectious organisms. After removing the tick, thoroughly disinfect the bite site and wash hands thoroughly with soap and water. Disinfect the tweezers. (6) Save the tick for identification in case illness occurs. This may help the doctor make an accurate diagnosis. Place the tick in a vial or plastic zip-lock bag with a wet cotton ball. Write the date of the bite on a piece of paper with a pencil and place it in the bag.

WORK ACTIVITY: WELL DEVELOPMENT, WELL PURGING, AND GROUNDWATER SAMPLING		
Job Steps	**Potential Hazard**	**Critical Actions to Control Hazard**
Well development and purging equipment set-up (continued)		(7) Medical Follow-Up – Contact WorkCare if an embedded tick is found. In most circumstances, medical treatment of persons who only have a tick bite is not recommended. However, WorkCare will set up a clinic visit for further medical evaluation if any signs and symptoms of tick-borne disease develop over the weeks following the tick bite. Use the buddy system and inform co-workers of any potential allergic condition, and instruct the co-worker on actions if an allergic reaction occurs and use of prescribed medication for the affected individual. Review route to hospital if allergic to insect/spider sting/bite. Wear snake chaps if probability of encountering snakes. Review route to hospital if allergic to insect/spider sting/bite. Do not touch face before thoroughly washing hands with detergent if working in poison ivy/oak/sumac.
	Musculoskeletal injuries (fatigue, strains, and lifting)	Compliance with Leidos Corporate EH&S Procedure 50, *Manual Lifting*. If equipment is to be moved, an evaluation of potential pinch points and/or weight strain shall be conducted. Clear area of all unnecessary equipment and slip/trip hazards. Additional help shall be obtained by workers or mechanical assistance used onsite if equipment to be moved is unwieldy, has a weight > 50 pounds, or has to be moved by maneuvering through awkward positioning. Avoid jerking movements if operating bailer or surge block, and take breaks as appropriate.
	Pinch	Comply with Leidos Corporate EH&S Procedure 38, *Machine Shop, Hand and Power Tool Safety*. Inspect all hand or power tools prior to use and remove all damaged equipment from site. Select only the best tool for the job. Keep hands from between IDW containers (e.g., drums). Keep fingers out of all openings and fittings. Keep hands from between monitoring well lids. Use correct tools to open monitoring well lids. Keep head away from well cap when removing as cap may release under pressure. Do not use fixed-open blade knives to cut rope or tubing. Do not over-tighten sample containers.
	Electric shock	Comply with Leidos Corporate EH&S Procedure 26, *Electrical Safety*. Inspect all electrical cords and tools prior to use and remove all damaged equipment from site. Portable electrical tools and all portable electrical equipment shall be connected through GFCIs.
	Chemical exposure	Current medical clearance for hazardous waste work. Complete 40-hour HAZWOPER and current refresher training for workers. Complete 8-hour additional supervisor training for FM, SSHO, and all other onsite supervisors. Wash hands before eating or drinking. Safety glasses and nitrile gloves for chemical/contaminant contact. Disposable booties will be worn (or decontaminate boots) within disturbed contaminated areas. Chemical containers labeled with identity and hazard. SDSs onsite for all chemicals in use. Site-specific training shall address chemicals, hazards, and proper handling.

WORK ACTIVITY: WELL DEVELOPMENT, WELL PURGING, AND GROUNDWATER SAMPLING		
Job Steps	**Potential Hazard**	**Critical Actions to Control Hazard**
Groundwater development, purging, and sampling	Temperature extremes	If temperature is above 80 °F or below 40 °F, administrative controls shall be implemented (cooled or warmed drinks, routine breaks in heated or shaded area, and provisions for emergency heating or cooling).
	Severe weather	FM shall check weather report prior to each day and alter schedule to prevent severe weather exposure. Locate nearest severe weather shelter/strong structure before beginning field work. Avoid water, high ground, open spaces, and metal objects. Suspend field work when lightning is first seen, thunder is first heard, or tornado warning issued.
	Biological hazards	Inspect area for hazardous plants and organisms. Wear clothing that covers potentially affected body parts. Seal pant legs against contact with plants and to prevent access by organisms. Pretreat clothing with permethrin. Use insect/tick repellant (> 30% DEET or > 10% picaridin) to supplement. Use insect/tick repellant whenever possible. Pretreat drop cloth for area around sample area. Additional tick control measures include the following: (1) Seal bottoms of pants legs with tape, tuck into boots or use permethrin-treated tick/chigger gaiters; tuck in shirt tails. (2) Inspect for ticks on clothing during work. Inspect for ticks on skin at least once a day and more often if ticks are prevalent. (3) Take hot showers as soon after as possible. (4) If ticks are prevalent, consider wearing white Tyvek pants or other non-porous, slick, light-colored outer garments. (5) If bitten by a tick, use fine-tipped tweezers. When possible, avoid removing ticks with bare hands. Grasp the tick as close to the skin surface as possible and pull upward with steady, even pressure. Do not twist or jerk the tick; this may cause the mouthparts to break off and remain in the skin. If this happens, remove mouthparts with the tweezers. Do not squeeze, crush, or puncture the body of the tick because its fluids (saliva and gut contents) may contain infectious organisms. After removing the tick, thoroughly disinfect the bite site and wash hands thoroughly with soap and water. Disinfect the tweezers. (6) Save the tick for identification in case illness occurs. This may help the doctor make an accurate diagnosis. Place the tick in a vial or plastic zip-lock bag with a wet cotton ball. Write the date of the bite on a piece of paper with a pencil and place it in the bag. (7) Medical Follow-Up – Contact WorkCare if an embedded tick is found. In most circumstances, medical treatment of persons who only have a tick bite is not recommended. However, WorkCare will set up a clinic visit for further medical evaluation if any signs and

WORK ACTIVITY: WELL DEVELOPMENT, WELL PURGING, AND GROUNDWATER SAMPLING		
Job Steps	**Potential Hazard**	**Critical Actions to Control Hazard**
Groundwater development, purging, and sampling (continued)		symptoms of tick-borne disease develop over the weeks following the tick bite. Use the buddy system and inform co-workers of any potential allergic condition, and instruct the co-worker on actions if an allergic reaction occurs and use of prescribed medication for the affected individual. Review route to hospital if allergic to insect/spider sting/bite. Wear snake chaps if probability of encountering snakes. Review route to hospital if allergic to insect/spider sting/bite. Do not touch face before thoroughly washing hands with detergent if working in poison ivy/oak/sumac.
	Pinch	Comply with Leidos Corporate EH&S Procedure 38, *Machine Shop, Hand and Power Tool Safety*. Inspect all hand or power tools prior to use and remove all damaged equipment from site. Select only the best tool for the job. Keep hands from between IDW containers (e.g., drums). Keep fingers out of all openings and fittings. Keep hands from between monitoring well lids. Use correct tools to open monitoring well lids. Keep head away from well cap when removing as cap may release under pressure. Do not use fixed-open blade knives to cut rope or tubing. Do not over-tighten sample containers.
	Electric shock	Comply with Leidos Corporate EH&S Procedure 26, *Electrical Safety*. Inspect all electrical cords and tools prior to use and remove all damaged equipment from site. Portable electrical tools and all portable electrical equipment shall be connected through GFCIs.
	Musculoskeletal injuries (fatigue, strains, and lifting)	Compliance with Leidos Corporate EH&S Procedure 50, *Manual Lifting*. If equipment is to be moved, an evaluation of potential pinch points and/or weight strain shall be conducted. Clear area of all unnecessary equipment and slip/trip hazards. Additional help shall be obtained by workers or mechanical assistance used onsite if equipment to be moved is unwieldy, has a weight > 50 pounds, or has to be moved by maneuvering through awkward positioning. Avoid jerking movements if operating bailer or surge block, and take breaks as appropriate.
	Fire	Fire extinguishers rated 2A and 5B (serviced annually and inspected monthly) available in all work areas.
	Chemical exposure	Current medical clearance for hazardous waste work. Complete 40-hour HAZWOPER and current refresher training for workers. Complete 8-hour additional supervisor training for FM, SSHO, and all other onsite supervisors. Wash hands before eating or drinking. Nitrile gloves for chemical/contaminant contact. Disposable booties will be worn (or decontaminate boots) within disturbed contaminated areas. Chemical containers labeled with identity and hazard. SDSs onsite for all chemicals in use. Site-specific training shall address chemicals, hazards, and proper handling.

WORK ACTIVITY: WELL DEVELOPMENT, WELL PURGING, AND GROUNDWATER SAMPLING		
Job Steps	**Potential Hazard**	**Critical Actions to Control Hazard**
Containing and managing purge, development water, and other IDW	Temperature extremes	If temperature is above 80 °F or below 40 °F, administrative controls shall be implemented (cooled or warmed drinks, routine breaks in heated or shaded area, and provisions for emergency heating or cooling).
	Lifting (musculoskeletal injuries)	Compliance with Leidos Corporate EH&S Procedure 50, *Manual Lifting*. If equipment is to be moved, an evaluation of potential pinch points and/or weight strain shall be conducted. Clear area of all unnecessary equipment and slip/trip hazards. Additional help shall be obtained by workers or mechanical assistance used onsite if equipment to be moved is unwieldy, has a weight > 50 pounds, or has to be moved by maneuvering through awkward positioning.
	Electric shock	Comply with Leidos Corporate EH&S Procedure 26, *Electrical Safety*. Inspect all electrical cords and tools prior to use and remove all damaged equipment from site. Portable electrical tools and all portable electrical equipment shall be connected through ground-fault circuit interrupters.
	Chemical exposure	Current medical clearance for hazardous waste work. Complete 40-hour HAZWOPER and current refresher training for workers. Complete 8-hour additional supervisor training for FM, SSHO, and all other onsite supervisors. Wash hands before eating or drinking. Nitrile gloves for chemical/contaminant contact. Chemical containers labeled with identity and hazard. SDSs onsite for all chemicals in use. Site-specific training shall address chemicals, hazards, and proper handling.
	Pinch	Comply with Leidos Corporate EH&S Procedure 38, *Machine Shop, Hand and Power Tool Safety*. Inspect all hand or power tools prior to use and remove all damaged equipment from site. Select only the best tool for the job. Keep hands from between IDW containers (e.g., drums). Keep fingers out of all openings.
	IDW control	Label or mark IDW containers to indicate container number, contents (including physical state), investigation location, date of collection, and client name. Ensure storage area provides adequate protection against physical damage or disturbance.

ACTIVITY HAZARD ANALYSIS		
WORK ACTIVITY: OVERSIGHT OF EXCAVATION OR CONSTRUCTION AND COLLECTION OF SOIL SAMPLES		
Personal Protective Equipment (PPE)	**Selected**	**Comments**
Safety Shoes	X	Overboots/disposable booties if walking through disturbed excavation areas or stockpiles.
Hard Hat	X	Within 25 feet of excavation equipment or if overhead hazards are present.
Safety Glasses With Side Shields	X	If sampling or performing intrusive work (e.g., disturbing soil).
Fire-Resistant Clothing		
Face Shields		
Goggles		
Lifeline/Body Harness		
Hearing Protection	X	As required, if posted or if exposed to noise greater than or equal to 82 dBA.

Full- or Half-Face Air-Purifying Respirator Equipped with P100 Cartridges		If established total dust/particulate action levels, as measured with a direct reading total dust/particulate monitor, are exceeded. **Total dust/particulate action levels will be set as 0.34 mg/ m^3 in firing range 3 & 4 target areas and 0.21 mg/m^3 in firing range 3 shooting area.** Arrowhead will evaluate method of excavation and use of respirators. If greater than 0.34 mg/m^3 during removal of blast wall, a respirator will be worn by the Leidos sampler and Arrowhead operator (if equipment not enclosed cab equipped with HEPA air filter).
		
		Each employee who will use respiratory protection will follow the requirements in their employer's respiratory protection program and must comply with the following requirements:
		• The worker will be assigned a respirator; the respirator may not be used by another worker.
		• The worker must be medically certified as being capable of wearing a respirator.
		• The worker will only use a well-maintained, NIOSH-approved respirator for which he/she has passed a qualitative fit test (manufacturer, model, and size) within the past 12 months.
		• The worker must have no facial hair that touches the sealing surface of his/her respirator.
		• The worker will verify that the cartridges that will be used on his/her respirator are P100 cartridges.
		• Respirator cartridges will be disposed at the end of each work shift (not to exceed eight [8] hours of continuous or intermittent use). Cartridges may be disposed more frequently if one of more of the following conditions is noted:
		  o A cartridge has become damaged.
		  o A cartridge has become clogged or blocked, causing additional resistance to breathing.

ACTIVITY HAZARD ANALYSIS		
WORK ACTIVITY: OVERSIGHT OF EXCAVATION OR CONSTRUCTION AND COLLECTION OF SOIL SAMPLES		
Personal Protective Equipment (PPE)	**Selected**	**Comments**
		• The worker will inspect his/her respirator for damage prior to use and perform a positive and negative pressure test upon donning his/her respirator. The worker will inspect his/her respirator for damage after each use and will clean and disinfect the respirator. After each use, the respirator will be cleaned using a disinfecting/cleansing wipe. At the end of each work day, the respirator will be disinfected by disassembling the respirator (including removing the cartridges) and washing the facepiece and associated parts in warm, sanitizing solution. The respirator will be rinsed with clean, warm water and allowed to air-dry in a clean area. The respirator will be reassembled and stored in a clean, dry plastic bag (a "zipper"-type or equivalent bag) or airtight container. The respirator must be stored in an area that is out of direct sunlight.
Supplied Air Respirator – SCBA		
Personal Floatation Device		
Gloves	X	Fit-for-use gloves (nitrile, cut-resistant, or similar for potentially contaminated material; heavy-duty work gloves for material handling).
Other	X	Dust monitoring (visual and real-time readings). Mitigate dust/particulate readings greater than 0.34 mg/ m^3 in the Firing Range 3 and 4 target areas and 0.21 mg/m^3 in the Firing Range 3 shooting area (water misting/wetting). Tyvek/booties during berm trench sampling.
Safety Cones/Barricades	X	If needed to control/alert traffic and exclude unauthorized personnel. All traffic cones must be at least 36 inches tall.
High-Visibility Vest/Clothing	X	As necessary for traffic safety.
Knee Pads		
Caution Tape	X	As needed, to exclude unauthorized personnel.
Competent Person	Rich Sprinzl, Leidos	
Subcontractor	(Arrowhead is lead on excavation)	

WORK ACTIVITY: TECHNICAL OVERSIGHT OF EXCAVATION OR CONSTRUCTION AND COLLECTION OF SOIL SAMPLES		
Job Steps	**Potential Hazard**	**Critical Actions to Control Hazard**
Mobilize to work site	Traffic accident to/from site	Compliance with Corporate EH&S Procedure 32.0, *Vehicle Operations* (valid driver's license, seat belt use, routine vehicle inspections, and no cell phone use while driving). Refer to Glenn Safety Manual Chapter 19 "Vehicle and Pedestrian Safety."
	Unauthorized personnel	Posted exclusion zone around work area.
Oversight of vegetation clearing (*to be performed by Arrowhead*)	Heavy equipment operation	Heavy equipment operated in accordance with 29 *CFR* 1926, Subpart O. Only experienced operators. Personnel are to remain in the field of vision of the operator and remain clear of moving parts. Never walk directly behind or to the side of heavy equipment without the operator's knowledge. Be knowledgeable of/mark "swing zones" for rotating equipment (e.g., backhoes).
	Incorrectly functioning equipment/fluid release from equipment	Verify that a visual inspection of all equipment has been performed prior to its initial use. Discuss the need for plastic sheeting or other methods to contain drips (e.g., hydraulic oil, motor oil) to determine if measures are needed to prevent releases to the ground. Verify that all hydraulic lines and fittings on equipment have been inspected prior to each daily use.
	Rotating and/or moving equipment	Workers will maintain a safe distance equivalent to the full, extended reach of all moving/mobile equipment. Approach mobile/moving equipment only after getting permission of the operator. Maintain visual contact with equipment operators at all times. The exclusion zone will be delineated by at least 4-foot-high, orange, HDPE construction fencing and postings.
	Unguarded equipment	Only experienced operators. Guards kept in place.
	Pinch and crush	Inspect equipment for articulated or moving/rotating pinch points prior to use. Use two-person lift for heavy/unwieldy objects. Keep hands and feet from between equipment or surfaces. Keep hands and fingers from between articulated parts. Protective toe footwear required for all tasks. Maintain situational awareness/avoid distractions.
	Broken, damaged, or unsuitable hand tools	Comply with Leidos Corporate EH&S Procedure 38, *Machine Shop, Hand and Power Tool Safety*. Inspect tools prior to use for damage or defects; remove damaged tools from use. Use tools only for their intended purpose (e.g., no "cheater bars," use of pliers in place of wrench). Hand or lower tools from person to person or one working level to another; do not throw. Always cut, hammer, screw, or drill away from the body. Use scissors and self-retracting utility blades where appropriate. Wear cut-resistant gloves.

WORK ACTIVITY: TECHNICAL OVERSIGHT OF EXCAVATION OR CONSTRUCTION AND COLLECTION OF SOIL SAMPLES		
Job Steps	**Potential Hazard**	**Critical Actions to Control Hazard**
Oversight of vegetation clearing (continued)	Musculoskeletal injuries from twisting or repetitive motion/overexertion	Use proper form when manipulating hand tools; rotate from the hips and not the back. Exercise patience and smooth application of force; avoid jerking and straining. Avoid working overhead for prolonged periods. Do not attempt to yank or force unwieldy vegetation or roots. Take breaks or alternate personnel if needed.
	Eye injury (from vegetation strike)	Safety glasses with side shields required when clearing. Wear safety glasses with side shields when working in or near eye level vegetation or where others are clearing. Maintain distance from other personnel and avoid bent limbs that could spring back; remain cognizant of surrounding personnel before bending or releasing branches. Do not throw downed branches.
	Skin abrasions (from sharp vegetation)	Wear Level D PPE, including long sleeves and work gloves (e.g., leather or mechanics). Remain cognizant of surrounding vegetation types; do not try to force oneself through bushes or pick up a bundle of vegetation that may contain broken or sharp tips or thorns. Wear work gloves and grip the branch with fingers in an open location between thorns.
	Tool strike	Position personnel with twice the swing radius of any tool in hand. Maintain distance from other personnel and continue checking for proper distance. Do not enter swing radius of anyone using a machete. Use tools only for their intended purpose; do not swing a saw like a machete or use a knife to cut tree limbs.
Oversight of asbestos waste removal (*removal to be performed only by licensed Arrowhead personnel at Firing Range 5/Construction Debris Pile*)	General hazards	Employees shall be alert to their surroundings and take suitable precautions if unexpected conditions are encountered. Inspect the immediate and surrounding work area for potential hazards and take prudent corrective actions or stop work, as needed. Review any applicable hazard analysis or safety permits for the work being inspected and adhere to requirements.
	Asbestos exposure	Only Ohio Department of Health Certified Asbestos Hazard Evaluation Specialist shall perform asbestos removal, or air monitoring. Board Certified Industrial Hygienist (CIH) may perform asbestos air monitoring. Inspectors shall be in the Medical surveillance program if sampling more than 30 days per year. All Asbestos inspections must follow OSHA 1926.1101 and AHERA training protocols for sampling. Respiratory Protection where potential for airborne exposure to asbestos fibers during sampling. Utilize controls such as wet methods to prevent airborne fiber generation. Leidos will keep away and upwind of removal area. Wash hands prior to hand to mouth contact.

WORK ACTIVITY: TECHNICAL OVERSIGHT OF EXCAVATION OR CONSTRUCTION AND COLLECTION OF SOIL SAMPLES		
Job Steps	**Potential Hazard**	**Critical Actions to Control Hazard**
Oversight of excavation, loading, and restoration	Being struck by vehicles	Traffic control by traffic cones, barricade tape, and/or sawhorse barricades (more substantial barriers required as traffic hazard increases). Vehicle(s) placed between workers and oncoming traffic. High-visibility safety vests worn in traffic areas. Flashing rotating beacon in high-traffic parking areas or brief roadwork.
	Heavy equipment operation	Heavy equipment operated in accordance with 29 *CFR* 1926, Subpart O. Only experienced operators. No workers beneath lifted loads. Personnel are to remain in the field of vision of the operator and remain clear of moving parts. Never walk directly behind or to the side of heavy equipment without the operator's knowledge. Be knowledgeable of/mark "swing zones" for rotating equipment (e.g., backhoes).
	Incorrectly functioning equipment/fluid release from equipment	Verify that a visual inspection of all equipment has been performed prior to its initial use. Discuss the need for plastic sheeting or other methods to contain drips (e.g., hydraulic oil, motor oil) to determine if measures are needed to prevent releases to the ground. Verify that all hydraulic lines and fittings on equipment have been inspected prior to each daily use.
	Rotating and/or moving equipment	Workers will maintain a safe distance equivalent to the full, extended reach of all moving/mobile equipment. Approach mobile/moving equipment only after getting permission of the operator. Maintain visual contact with equipment operators at all times. The exclusion zone will be delineated by at least 4-foot-high, orange, HDPE construction fencing and postings.
	Unguarded equipment	Only experienced operators. Guards kept in place.
	Excavation collapse	Do not enter any excavation or trench that is deeper than 4 feet from ground surface. Keep equipment away from the edge of a trench or excavation to prevent collapse of the wall of the excavation. Do not stand or walk within 6 feet of the edge of any excavation, unless the Excavation Competent Person has established a different 'safe' distance for the excavation. The Excavation Competent Person will be onsite at all times during excavation. Daily inspection of excavation or after any rain/frost. Do not enter excavation if accumulated water. Work activities will be in compliance with Leidos Corporate EH&S Procedure 35.0, *Excavation Safety* and Glenn Safety Manual Chapter 35, "Digging, Trenching, and Excavating."
	Falling equipment	No workers under suspended loads. Exclusion zone around heavy equipment.

WORK ACTIVITY: TECHNICAL OVERSIGHT OF EXCAVATION OR CONSTRUCTION AND COLLECTION OF SOIL SAMPLES		
Job Steps	**Potential Hazard**	**Critical Actions to Control Hazard**
Oversight of excavation, loading, and restoration (continued)	Unauthorized person in work zone	If structures or public access areas fall within radius of raised boom, establish a work schedule to minimize hazard to public, establish an exclusion zone boundary that unauthorized personnel cannot cross, and position heavy equipment so as to minimize inclusion of public access areas within work zone.
	Drowning	If water > 2 feet at bank, USCG minimum Class II PFD is required. Do not enter water if fast flowing or approximately knee deep. Buddy system to be utilized.
	General hazards, slips, and trips	Avoid areas that have debris or where footing may shift. Wear footwear suitable for setting. Flat-soled shoes with separate heel and a non-slip sole or sturdy boots with lugged sole in construction or field settings. Protective-toe footwear if required by site. Wear ice cleats when there is potential for ice or frozen snow. Avoid unstable slopes or steep slopes. Walk around if possible. Inspect the immediate and surrounding work area for potential hazards and take prudent corrective actions or stop work, as needed. The use of safety vests or shirts, as well as hard hats, will be employed when working in any construction zone in addition to any other required PPE.
	Temperature stress	If temperature is above 80°F or below 40°F, administrative controls will be implemented (cooled or warmed drinks, routine breaks in heated or shaded area, and provisions for emergency heating or cooling).
	Lifting (musculoskeletal injuries)	Compliance with Leidos Corporate EH&S Procedure 50.0, *Manual Lifting*. If equipment is to be moved, an evaluation of potential pinch points and/or weight strain will be conducted. Clear area of all unnecessary equipment and slip/trip hazards. Additional help will be obtained by workers or mechanical assistance used onsite if equipment to be moved is unwieldy, has a weight > 50 pounds, or has to be moved by maneuvering through awkward positioning. Refer to GRC Occupational Health Program Manual Chapter 15, "Ergonomics."
	Electrical shock	Portable electrical tools and all portable electrical equipment that poses a shock hazard must be connected through ground fault circuit interrupters. Reference Glenn Safety Manual Chapter 8, "Electrical Systems Safety," and Chapter 9, "Lockout/Tagout."
	Fire or other emergency	Identify location of fire extinguishers onsite and posted evacuation routes. Follow Emergency and Evacuation procedures set forth by Glenn Safety Manual Chapter 27, "Building Emergency Evacuation Plan Program." Fire extinguishers rated 2A and 5B (serviced annually and inspected monthly) available in all fuel use areas. Allow gasoline-powered equipment to cool prior to fueling.

WORK ACTIVITY: TECHNICAL OVERSIGHT OF EXCAVATION OR CONSTRUCTION AND COLLECTION OF SOIL SAMPLES		
Job Steps	**Potential Hazard**	**Critical Actions to Control Hazard**
Oversight of excavation, loading, and restoration (continued)	Chemical exposure	Leidos employees will stay upwind of excavation and trenching operations, and monitor atmospheric conditions (wind speed and direction, humidity). Perform real-time monitoring with a total dust/particulate meter during heavy equipment operations. Stop work if established total dust/particulate action levels, as measured with a direct reading total dust/particulate monitor, are exceeded. **Total dust/particulate action levels are set at 0.34 mg/ m^3 in the Firing Range 3 and 4 target areas and 0.21 mg/m^3 in the Firing Range 3 shooting area.** Arrowhead will take action (e.g., misting/wetting) to suppress if dust/particulate action levels are reached. Half- or full-face respirator equipped with P100 cartridges must be worn by operator (following Arrowhead Respiratory Protection Program) during berm trenching and excavator bucket decontamination unless excavator has enclosed cab and HEPA air filter. Current medical clearance and 40-hour HAZWOPER for hazardous waste work. Wash hands before eating or drinking. Nitrile gloves for chemical/contaminant contact. Tyvek coveralls/booties will be worn during berm trench sampling; booties within disturbed excavation areas. Chemical containers labeled with identity and hazard. SDSs onsite for all chemicals in use. Site-specific training must address chemicals, hazards, and proper handling. A 15-minute eyewash must be within 20 feet if pouring corrosives. Eyewash bottle must be within 10 feet if adding water samples to pre-preserved containers.
	Contact with overhead utilities or high-voltage equipment	Survey location and ensure absence of obstructions and overhead utilities prior to set-up. Minimum safe distance for equipment operation will be in accordance with Leidos Corporate EH&S Procedure 26.0, *Electrical Safety*, guidance.
	Contact with buried structures or utilities	NASA digging permit obtained and have site utilities located. Ensure that each location has been cleared to preclude contact with buried utilities through compliance with Corporate EH&S Procedure 33.0, *Subsurface Asset and Hazard Avoidance*. Reference Glenn Safety Manual Chapter 35, "Digging, Trenching, and Excavating."
	Noise	Hearing protection required within 25 feet of operating gasoline powered generators or heavy equipment, or if posted or if exposed to noise greater than or equal to 82 dBA. If employees are exposed to sound levels exceeding 85 dBA, TWA 8 hours, the employees will be added to GRC's hearing conservation program, and hearing protection will be worn as required. Follow posted noise signs and wear appropriate noise protection when inspection areas contain noise hazards. Refer to GRC Occupational Health Program Manual Chapter 3, "Hearing Conservation."
	Falls	Compliance with Leidos Corporate EH&S Procedure 27.0, *Fall Protection, Ladders & Scaffolds*. Working at heights above 4 feet (unless on a construction project) requires fall protection. Refer to Glenn Safety Manual Chapter 34, "Fall Protection."

WORK ACTIVITY: TECHNICAL OVERSIGHT OF EXCAVATION OR CONSTRUCTION AND COLLECTION OF SOIL SAMPLES		
Job Steps	**Potential Hazard**	**Critical Actions to Control Hazard**
Oversight of excavation, loading, and restoration (continued)	Biological hazards	Inspect area for hazardous plants and organism conditions. Avoid such areas if possible. Wear clothing that covers potentially affected body parts. Seal pants legs against contact with plants and to prevent access by organisms. Pretreat clothing with permethrin. Use insect/tick repellant (> 30% DEET or > 10% picaridin) to supplement. Use insect/tick repellant whenever possible. Pretreat drop cloth for area around sample table. Additional tick control measures include the following: (1) Seal bottoms of pants legs with tape, tuck into boots or use permethrin-treated tick/chigger gaiters; tuck in shirt tails. (2) Inspect for ticks on clothing during work. Inspect for ticks on skin at least once a day and more often if ticks are prevalent. (3) Take hot showers as soon after as possible. (4) If ticks are prevalent, consider wearing white Tyvek pants or other non-porous, slick, light-colored outer garments. (5) If bitten by a tick, use fine-tipped tweezers. When possible, avoid removing ticks with bare hands. Grasp the tick as close to the skin surface as possible and pull upward with steady, even pressure. Do not twist or jerk the tick; this may cause the mouthparts to break off and remain in the skin. If this happens, remove mouthparts with the tweezers. Do not squeeze, crush, or puncture the body of the tick because its fluids (saliva and gut contents) may contain infectious organisms. After removing the tick, thoroughly disinfect the bite site and wash hands thoroughly with soap and water. Disinfect the tweezers. (6) Save the tick for identification in case illness occurs. This may help the doctor make an accurate diagnosis. Place the tick in a vial or plastic zip lock bag with a wet cotton ball. Write the date of the bite on a piece of paper with a pencil and place it in the bag. (7) Medical Follow-Up – Contact WorkCare if an embedded tick is found. In most circumstances, medical treatment of persons who only have a tick bite is not recommended. However, WorkCare will set up a clinic visit for further medical evaluation if any signs and symptoms of tick-borne disease develop over the weeks following the tick bite. Use the buddy system and inform co-workers of any potential allergic condition and instruct the co-worker on actions if an allergic reaction occurs and use of prescribed medication for the affected individual. Review route to hospital if allergic to insect/spider sting/bite. Wear snake chaps if probability of encountering snakes. Review route to hospital if allergic to insect/spider sting/bite. Do not touch face before thoroughly washing hands with detergent if working in poison ivy/oak/sumac.

WORK ACTIVITY: TECHNICAL OVERSIGHT OF EXCAVATION OR CONSTRUCTION AND COLLECTION OF SOIL SAMPLES		
Job Steps	**Potential Hazard**	**Critical Actions to Control Hazard**
Oversight of excavation, loading, and restoration (continued)	Severe weather	Locate nearest severe weather shelter/strong structure before beginning field work. Suspend field work if thunder is heard (lightning hazard) or tornado warning issued until 30 minutes after last thunder or lighting or warning cancelled. Do not work in areas subject to flash flooding (arroyo, ditch, etc.) if rain is forecast in immediate area or upstream of site.
	Pinch points	Keep hands from between components. Keep fingers out of all openings.
	Spill control	Basic spill kit suitable for handling small spills of decontamination fluids, hydraulic fluid, or fuels and containing absorbent pads, tubes, and nitrile or similar gloves.
Soil Sampling	Rotating and/or moving equipment	Keep clear of all rotating/moving equipment components.
	Falling equipment	No workers under suspended loads. Sampling areas to be staged outside of any potential fall areas.
	Noise	Leidos employees will stay out of immediate area of excavation equipment. Hearing protection when within 25 feet unless equipment-specific monitoring indicates that noise levels are less than 85 decibels.
	Temperature extremes	If temperature is above 80 °F or below 40 °F, administrative controls shall be implemented (cooled or warmed drinks, routine breaks in heated or shaded area, and provisions for emergency heating or cooling).
	Severe weather	FM shall check weather report prior to each day and alter schedule to prevent severe weather exposure. Locate nearest severe weather shelter/strong structure before beginning field work. Avoid water, high ground, open spaces, and metal objects. Suspend field work when lightning is first seen, thunder is first heard, or if tornado warning is issued. Do not resume work until 30 minutes after last lighting or thunder or until the warning is cancelled.

WORK ACTIVITY: TECHNICAL OVERSIGHT OF EXCAVATION OR CONSTRUCTION AND COLLECTION OF SOIL SAMPLES		
Job Steps	**Potential Hazard**	**Critical Actions to Control Hazard**
Soil sampling (continued)	Biological hazards	Inspect area for hazardous plants and organisms. Wear clothing that covers potentially affected body parts. Seal pant legs against contact with plants and to prevent access by organisms. Pretreat clothing with permethrin. Use insect/tick repellant (> 30% DEET or > 10% picaridin) to supplement. Use insect/tick repellant whenever possible. Pretreat drop cloth for area around sample table. Additional tick control measures include the following: (1) Seal bottoms of pants legs with tape, tuck into boots or use permethrin-treated tick/chigger gaiters; tuck in shirt tails. (2) Inspect for ticks on clothing during work. Inspect for ticks on skin at least once a day and more often if ticks are prevalent. (3) Take hot showers as soon after as possible. (4) If ticks are prevalent, consider wearing white Tyvek pants or other non-porous, slick, light-colored outer garments. (5) If bitten by a tick, use fine-tipped tweezers. When possible, avoid removing ticks with bare hands. Grasp the tick as close to the skin surface as possible and pull upward with steady, even pressure. Do not twist or jerk the tick; this may cause the mouthparts to break off and remain in the skin. If this happens, remove mouthparts with the tweezers. Do not squeeze, crush, or puncture the body of the tick because its fluids (saliva and gut contents) may contain infectious organisms. After removing the tick, thoroughly disinfect the bite site and wash hands thoroughly with soap and water. Disinfect the tweezers. (6) Save the tick for identification in case illness occurs. This may help the doctor make an accurate diagnosis. Place the tick in a vial or plastic zip lock bag with a wet cotton ball. Write the date of the bite on a piece of paper with a pencil and place it in the bag. (7) Medical Follow-Up – Contact WorkCare if an embedded tick is found. In most circumstances, medical treatment of persons who only have a tick bite is not recommended. However, WorkCare will set up a clinic visit for further medical evaluation if any signs and symptoms of tick-borne disease develop over the weeks following the tick bite. Use the buddy system and inform co-workers of any potential allergic condition, and instruct the co-worker on actions if an allergic reaction occurs and use of prescribed medication for the affected individual. Review route to hospital if allergic to insect/spider sting/bite. Wear snake chaps if probability of encountering snakes. Review route to hospital if allergic to insect/spider sting/bite. Do not touch face before thoroughly washing hands with detergent if working in poison ivy/oak/sumac.

WORK ACTIVITY: TECHNICAL OVERSIGHT OF EXCAVATION OR CONSTRUCTION AND COLLECTION OF SOIL SAMPLES		
Job Steps	**Potential Hazard**	**Critical Actions to Control Hazard**
Soil sampling (continued)	Lifting (musculoskeletal injuries) hazards	Compliance with Leidos Corporate EH&S Procedure 50, *Manual Lifting*. If equipment is to be moved, an evaluation of potential pinch points and/or weight strain shall be conducted. Clear area of all unnecessary equipment and slip/trip hazards. Additional help shall be obtained by workers or mechanical assistance used onsite if equipment to be moved is unwieldy, has a weight > 50 pounds, or has to be moved by maneuvering through awkward positioning.
	Electric shock	Comply with Leidos Corporate EH&S Procedure 26, *Electrical Safety*. Inspect all electrical cords and tools prior to use and remove all damaged equipment from site. Connect all electrical cords through GFCI. Portable electrical tools and all portable electrical equipment shall be connected through GFCIs.
	Pinch/laceration	Comply with Leidos Corporate EH&S Procedure 38, *Machine Shop, Hand and Power Tool Safety*. Inspect all hand or power tools prior to use and remove all damaged equipment from site. Select the best tool for the job. Keep fingers out of all openings.
	Cuts/contusions	Use dedicated tube cutter or hooked safety blades when opening polymer sample tubes. Wear cut-resistant gloves when opening polymer sample tubes. Keep fingers from between split-spoon halves.
	Fire	Fire extinguishers rated 2A and 5B (serviced annually and inspected monthly) available in all work areas.
	Chemical exposure	Use real-time total dust/particulate meter during heavy equipment operations. Water spray shall be utilized to prevent airborne dust during DPT or drilling. Stop work if established total dust/particulate action levels, as measured with a direct reading total dust/particulate monitor, are exceeded. **Total dust/particulate action levels are set at 0.34 mg/m^3 in the Firing Range 3 and 4 target areas and 0.21 mg/m^3 in the Firing Range 3 shooting area.** Personnel will don half- or full-face respirators equipped with P100 cartridges (Leidos' Respiratory Protection Program) if established total dust/particulate action levels, as measured with a direct reading total dust/particulate monitor, are exceeded. Disposable booties will be worn (or decontaminate boots) within disturbed contaminated areas. Current medical clearance for hazardous waste work. Complete 40-hour HAZWOPER and current refresher training for workers. Complete 8-hour additional supervisor training for FM, SSHO, and all other onsite supervisors. Wash hands before eating or drinking. Nitrile gloves for chemical/contaminant contact. Chemical containers labeled with identity and hazard. SDSs onsite for all chemicals in use. Site-specific training shall address chemicals, hazards, and proper handling.
Containing and managing decon fluids and other IDW	General safety hazards (Lifting equipment, manual lifting, slips, etc.)	Equipment will be operated per subcontractor's standard procedures or per manufacturer's directions. Unnecessary personnel will stay well clear of operating equipment.
Containing and managing decon	Temperature extremes	Temperature stress controls as in "Oversight of excavation and loading" step above.

WORK ACTIVITY: TECHNICAL OVERSIGHT OF EXCAVATION OR CONSTRUCTION AND COLLECTION OF SOIL SAMPLES		
Job Steps	**Potential Hazard**	**Critical Actions to Control Hazard**
fluids and other IDW (continued)	Chemical exposure	Chemical exposure controls as in "Oversight of excavation and loading" step above.
	Lifting (musculoskeletal injury)	Lifting (musculoskeletal injuries) controls as in "Oversight of excavation and loading" step above.
	Drum handling	Evaluation of potential pinch points and/or weight strain will be conducted. Clear area of all unnecessary equipment and slip/trip hazards. Additional help or mechanical aids will be obtained by workers onsite if equipment to be moved is unwieldy, has a weight > 50 pounds, or has to be moved by maneuvering through awkward positioning.
	Pinch points	Pinch point controls as in "Oversight of excavation and loading" step above.
	Exposure to chemicals	Nitrile gloves for chemical/contaminant contact. Wash hands before eating or drinking. Hazard communication labels on all chemical containers. SDSs onsite for all chemicals in use. Site-specific training must address chemicals, hazards, and proper handling. Current 40-hour HAZWOPER and medical clearance for hazardous waste work.
	IDW control	Label or mark IDW containers to indicate container number, contents (including physical state), investigation location, date of collection, and client name. Ensure that storage area provides adequate protection against physical damage or disturbance. Work in conjunction with NASA WM personnel.
	Spill control	Spill controls as in "Oversight of excavation and loading" step above.
Equipment decontamination by washing	Lifting (musculoskeletal injury)	Lifting (musculoskeletal injuries) controls as in "Oversight of excavation and loading" step above.
	Temperature stress	Temperature stress controls as in "Oversight of excavation and loading" step above.
	Electrical shock	Electrical shock controls as in "Oversight of excavation and loading" step above.
	Fire	Fire extinguishers rated 2A and 5B (serviced annually and inspected monthly) available in all fuel/flammable liquid use areas.
	Chemical exposure	Current 40-hour HAZWOPER and medical clearance for hazardous waste work. Nitrile gloves for chemical/contaminant contact. Wash hands before eating or drinking. Chemical containers labeled with identity and hazard. SDSs onsite for all chemicals in use. Site-specific training must address chemicals, hazards, and proper handling. A 5-minute eyewash must be within 20 feet if pouring corrosives. Eyewash bottle must be within 10 feet if adding water samples to pre-preserved containers.
	IDW Control	IDW controls as in "Containing and managing soil cuttings, decon fluids, excavation water and other IDW" step above.

ACTIVITY HAZARD ANALYSIS		
WORK ACTIVITY: GATOR / MULE ATV VEHICLE USE		
Personal Protective Equipment (PPE)	**Selected**	**Comments**
Safety Shoes	X	Overboots/disposable booties if walking through disturbed excavation areas or stockpiles.
Hard Hat	X	Within 25 feet of excavation equipment or if overhead hazards are present.
Safety Glasses With Side Shields	X	
Fire-Resistant Clothing		
Face Shields		
Goggles		
Lifeline/Body Harness		
Hearing Protection	X	As required, if posted or if exposed to noise greater than or equal to 85 dBA.

Air-Purifying Respirator		Stop work if dust/particulate monitoring action level (visible) is exceeded and dust/particulate mitigation (water misting/wetting) is not adequate. Arrowhead will evaluate method of excavation and use of respirators.
		
		Each employee who will use respiratory protection will follow the requirements in their employer's respiratory protection program and must comply with the following requirements:
		
		• The worker will be assigned a respirator; the respirator may not be used by another worker.
		• The worker must be medically certified as being capable of wearing a respirator.
		• The worker will only use a well-maintained, NIOSH-approved respirator for which he/she has passed a qualitative fit test (manufacturer, model, and size) within the past 12 months.
		• The worker must have no facial hair that touches the sealing surface of his/her respirator.
		• The worker will verify that the cartridges that will be used on his/her respirator are P100 cartridges.
		• Respirator cartridges will be disposed at the end of each work shift (not to exceed eight [8] hours of continuous or intermittent use). Cartridges may be disposed more frequently if one of more of the following conditions is noted:
		  o A cartridge has become damaged.
		  o A cartridge has become clogged or blocked, causing additional resistance to breathing.
		• The worker will inspect his/her respirator for damage prior to use and perform a positive and negative pressure test upon donning his/her respirator.
		
		The worker will inspect his/her respirator for damage after each use and will clean and disinfect the respirator. After each use, the respirator will be cleaned using a disinfecting/cleansing wipe. At the end of each work day, the respirator will be

ACTIVITY HAZARD ANALYSIS		
WORK ACTIVITY: GATOR / MULE ATV VEHICLE USE		
Personal Protective Equipment (PPE)	**Selected**	**Comments**
		disinfected by disassembling the respirator (including removing the cartridges) and washing the facepiece and associated parts in warm, sanitizing solution. The respirator will be rinsed with clean, warm water and allowed to air-dry in a clean area. The respirator will be reassembled and stored in a clean, dry plastic bag (a "zipper"-type or equivalent bag) or airtight container. The respirator must be stored in an area that is out of direct sunlight.
Supplied Air Respirator – SCBA		
Personal Floatation Device		
Gloves	X	Fit-for-use gloves (nitrile, cut-resistant, or similar for potentially contaminated material; heavy-duty work gloves for material handling).
Other		Dust monitoring (visual and real-time readings, if visible). Mitigate visible dust/particulate (water misting/wetting).
Safety Cones/Barricades	X	If needed to control/alert traffic and exclude unauthorized personnel. All traffic cones must be at least 36 inches tall.
High-Visibility Vest/Clothing	X	As necessary for traffic safety.
Knee Pads		
Caution Tape	X	As needed, to exclude unauthorized personnel.
Competent Person	Rich Sprinzl, Leidos	
Subcontractor	Not Applicable	

WORK ACTIVITY: GATOR / MULE ATV VEHICLE USE		
Job Steps	**Potential Hazard**	**Critical Actions to Control Hazard**
Inspecting gator/mule	General safety hazards (unexpected movement of vehicle, hand and eye injuries)	Place wheel chocks to prevent movement while inspecting. Wear hard hat, leather gloves, safety shoes, etc., as specified in this AHA. Vehicle must be turned off with key removed from ignition. Wear leather gloves. Identify pinch points before performing inspection. Ensure the hood and seat latches are secured before placing fingers, hands, or arms in these areas. Wear safety glasses with side shields and stand to the side of the tire when checking tire pressure. Ensure the vehicle meets the manufacturer's guidelines before operating. If anything is in question, issue a stop work authorization and contact supervisor. Do not operate the vehicle. Note it on the daily inspection sheet.
Starting and warming	Movement of vehicle	Perform walk-around inspection before entering the vehicle and starting the engine. Look for obstructed objects that might be hidden in the grass, weeds, etc., and mark these objects where their location can be seen before proceeding. Do not disengage the emergency brake until ready to move the vehicle to prevent unexpected movement. Wear seat belt, hard hat, and leather gloves at all times. Do not carry extra passengers without seat belts. Everyone must have a manufacturer-installed seat belt. Start and warm the engine per manufacturer's requirements.
Operating	Struck by injuries or property damage from contact with other vehicles or pedestrians, obstacles, or traffic; tip over; or falling out of vehicle	Experienced operator. No bystanders in area. Perform walk-around inspection. Use spotter when backing every time. Backup alarm must be audible. Watch for low-hanging limbs or other fixed obstacles. Clear them out or mark them before work begins. Follow established traffic routes. Use a spotter when entering or exiting the work shop every time. Rollover protection system use. Travel up and down slopes, never across slopes. Do not exceed 15 mph and reduce speed according to conditions such as rough, uneven, or slippery terrain. Make turns slowly and cautiously, never in a hurry. Secure cargo and do not exceed cargo weight limit per manufacturer's guidelines. Reduce speed when loaded with cargo. Cargo must be centered over the axle. Keep head, hands, arms, and legs inside vehicle at all times. Avoid sudden starts, stops, and turns. Remain seated and wear seat belt. Keep both hands on steering wheel. No passengers in the cargo area. No horseplay. Before beginning work and throughout the day, remove debris from the floorboard. Place wheel chocks whenever leaving the operator's seat.

WORK ACTIVITY: GATOR / MULE ATV VEHICLE USE		
Job Steps	**Potential Hazard**	**Critical Actions to Control Hazard**
Fueling	Fire or explosion	When refueling, use a UL-approved metal container. Set the container on the ground before fueling to eliminate static discharge. Inspect the area to make sure there is nothing that could produce a spark. Do not smoke or use electrical or electronic devices, including cell phones, while refueling (the use of cell phones and other electronic devices is prohibited). Allow engine to cool for at least 5 minutes before fueling. Fire extinguisher must be located in the vehicle and in the fueling area.
	Chemical exposure or spill	When fueling, proceed slowly, do not rush. Wear safety glasses with side shields, face shield, and chemical-resistant gloves. First aid kit contains eye wash solution in the event of an emergency. Watch fuel level while filling the tank. Fill to only 90% full to prevent spillage. Clear hose before removing so that no fuel drips. Replace the fuel cap tightly. Keep spill kit in the area. If spill occurs, contain the spill, and contact supervisor immediately. Avoid driving where contaminated soil is disturbed or saturated, unless equipment/tires are decontaminated to prevent tracking outside of excavation area.

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ACTIVITY HAZARD ANALYSIS		
WORK ACTIVITY: DRUM SAMPLING AND IDW MANAGEMENT		
Personal Protective Equipment (PPE)	**Selected**	**Comments**
Safety Shoes	X	
Hard Hat		If near operating heavy equipment or overhead hazards are present.
Safety Glasses With Side Shields	X	
Fire-Resistant Clothing		
Face Shields		
Goggles		
Lifeline/Body Harness		
Hearing Protection		As necessary.
Air-Purifying Respirator		
Supplied Air Respirator – SCBA		
Personal Floatation Device		
Gloves	X	Nitrile, PVC, or similar for potentially contaminated material. Heavy-duty work gloves for material handling.
Other:		
Safety Cones/Barricades	X	As needed, to control/alert traffic and exclude unauthorized personnel.
High-Visibility Vest/Clothing		As necessary for traffic safety.
Knee Pads		
Caution Tape	X	As needed, to exclude unauthorized personnel.
Competent Person	Rich Sprinzl, Leidos	
Subcontractor	TTL Associates Inc.	

WORK ACTIVITY: DRUM SAMPLING AND IDW MANAGEMENT		
Job Steps	**Potential Hazard**	**Critical Actions to Control Hazard**
Mobilize to work site	Traffic accident	Compliance with Leidos Corporate EH&S Procedure 32.0, *Vehicle Operation* (valid driver's license, seat belt use, routine vehicle inspections, no cell phone use while driving).
	Unauthorized personnel	Posted exclusion zone around work area.
IDW drum sampling and management	Temperature extremes	If temperature is above 80°F or below 40°F, administrative controls shall be implemented (cooled or warmed drinks, routine breaks in heated or shaded area, and provisions for emergency heating or cooling).
	Severe weather	FM shall check weather report prior to each day and alter schedule to prevent severe weather exposure. Locate nearest severe weather shelter/strong structure before beginning field work. Avoid water, high ground, open spaces, and metal objects. Suspend field work when lightning is first seen, thunder is first heard, or tornado warning issued, and do not return to work for 30 minutes after the last evidence of same.
	Lifting (musculoskeletal injuries)	Compliance with Leidos Corporate EH&S Procedure 50.0, *Manual Lifting*. If equipment is to be moved, an evaluation of potential pinch points and/or weight strain shall be conducted. Clear area of all unnecessary equipment and slip/trip hazards. Additional help shall be obtained by workers or mechanical assistance used onsite if equipment to be moved is unwieldy, has a weight > 50 pounds, or has to be moved by maneuvering through awkward positioning. Filled drums will not be handled by hand.
	Electrical shock	Compliance with Leidos Corporate EH&S Procedure 26.0, *Electrical Safety*. Portable electrical tools, and all portable electrical equipment that poses a shock hazard, shall be connected through GFCIs and inspected prior to use.
	Fire	Fire extinguishers rated 2A and 5B (serviced annually and inspected monthly) available in all work areas.
	Pinch	Keep hands from between IDW containers (e.g., drums). Keep fingers out of all openings.
	Chemical exposure	Handle carefully to avoid visible dust generation. Current medical clearance for hazardous waste work. Complete 40-hour HAZWOPER and current refresher training for workers. Complete 8-hour additional supervisor training for FM, SSHO, and all other onsite supervisors. Wash hands before eating or drinking. Nitrile gloves and safety glasses for chemical/contaminant contact. Chemical containers labeled with identity and hazard. SDSs onsite for all chemicals in use. Site-specific training shall address chemicals, hazards, and proper handling. A 15-minute eyewash shall be located within 20 feet if pouring corrosives. Eyewash bottle shall be within 10 feet if adding water samples to pre-preserved containers.
	IDW control	Label or mark IDW containers to indicate container number, contents (including physical state), investigation location, date of collection, and client name. Ensure storage area provides adequate protection against physical damage or disturbance.

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ACTIVITY HAZARD ANALYSIS		
WORK ACTIVITY: EQUIPMENT DECONTAMINATION		
Personal Protective Equipment (PPE)	**Selected**	**Comments**
Safety Shoes	X	
Hard Hat	X	If near operating equipment, or overhead hazards present.
Safety Glasses With Side Shields	X	
Faceshield		
Goggles		
Lifeline/Body Harness		
Hearing Protection		
Air-Purifying Respirator		
Supplied Air Respirator – SCBA		
Personal Floatation Device		
Gloves	X	Nitrile or similar for potentially contaminated material. Heavy-duty work gloves for material handling.
Other		
Safety Cones/Barricades	X	As necessary, to control/alert traffic and exclude unauthorized personnel.
High-Visibility Vest/Clothing		As necessary for traffic safety.
Knee Pads		
Caution Tape	X	As needed, to exclude unauthorized personnel.
Competent Person	Rich Sprinzl, Leidos	
Subcontractor	TTL Associates Inc.	

WORK ACTIVITY: EQUIPMENT DECONTAMINATION		
Job Steps	**Potential Hazard**	**Critical Actions to Control Hazard**
Mobilize to work site	Traffic accident	Compliance with Leidos Corporate EHS Procedure 32.0, *Vehicle Operation* (valid driver's license, seat belt use, routine vehicle inspections, and no cell phone use while driving).
	Unauthorized personnel	Posted exclusion zone around work area.
Equipment decontamination by hand washing	Lifting (musculoskeletal injury)	Compliance with Leidos Corporate EH&S Procedure 50.0, *Manual Lifting*. If equipment is to be moved, an evaluation of potential pinch points and/or weight strain shall be conducted. Clear area of all unnecessary equipment and slip/trip hazards. Additional help shall be obtained by workers or mechanical assistance used onsite if equipment to be moved is unwieldy, has a weight > 50 pounds, or has to be moved by maneuvering through awkward positioning.
	Temperature extremes	If temperature is above 80°F or below 40°F, administrative controls shall be implemented (cooled or warmed drinks, routine breaks in heated or shaded area, and provisions for emergency heating or cooling).
	Severe weather	FM shall check weather report prior to each day and alter schedule to prevent severe weather exposure. Locate nearest severe weather shelter/strong structure before beginning field work. Avoid water, high ground, open spaces, and metal objects. Suspend field work when lightning is first seen, thunder is first heard, or tornado warning issued, and do not return to work for 30 minutes after the last evidence of same.
	Pinch	Keep hands and fingers from between fittings. Keep fingers out of all openings.
	Fire	Fire extinguishers rated 2A and 5B (serviced annually and inspected monthly) available in all fuel/flammable liquid use areas.
	Chemical exposure	Complete 40-hour HAZWOPER and current refresher training for workers. Complete 8-hour additional supervisor training for FM, SSHO, and all other onsite supervisors. Current medical clearance for hazardous waste work. Nitrile gloves and safety glasses for chemical/contaminant contact. Wash hands before eating or drinking. Chemical containers labeled with identity and hazard. SDSs onsite for all chemicals in use. Site-specific training shall address chemicals, hazards, and proper handling.
	IDW control	Label or mark IDW containers to indicate container number, contents (including physical state), investigation location, date of collection, and client name. Ensure storage area provides adequate protection against physical damage or disturbance.

APPENDIX C
SAFETY DATA SHEETS

ALCONOX® (DECONTAMINATION) [OR LIQUINOX®]
BENTONITE
BUG SPRAY (DEET BASED)
COMBUSTIBLE GAS INDICATOR CALIBRATION GAS
CONCRETE MIX
GASOLINE, UNLEADED
DIESEL
DRY CHEMICAL FIRE EXTINGUISHER
HYDRAULIC FLUID
HYDROCHLORIC ACID (SAMPLE PRESERVATIVE)
ISOBUTYLENE CALIBRATION GAS
ISOPROPYL ALCOHOL (DECONTAMINATION)
MOTOR OIL
NITRIC ACID (SAMPLE PRESERVATIVE, DECONTAMINATION)
pH CALIBRATION BUFFER SOLUTIONS
SPRAY PAINT, AEROSOL
SULFURIC ACID (SAMPLE PRESERVATIVE)
WELL SAND

[*NOTE: SSHO will assemble applicable SDSs and attach to SSHP prior to field mobilization. A copy of the SDSs shall be provided to NASA GRC Waste Management and PBS Construction Manager during field mobilization.*]
SDS sheets are not included in this review.

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APPENDIX D

SUBCONTRACTOR HEALTH AND SAFETY PLANS (HASPs)

TTL ASSOCIATES INC. – DRILLING AND WELL INSTALLATION AND ABANDONMENT

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GRC SITE-SPECIFIC HEALTH AND SAFETY PLAN

Prime Contractor: **Leidos, Inc.**

Field Contractor: **TTL Associates, Inc.**

Project Name: **E117: Firing Ranges 3 and 4 Removal Action**

Work Location: **NASA Plum Brook Station, Sandusky, OH**

Projected Start Date: **May 1, 2020**

Prepared By: **Rich Sprinzl/ Rick Mielcarek** **Phone: (330) 405-5808**

Date Submitted: **February 28, 2020**

INTRODUCTION: The purpose of this Health and Safety Plan (HASP) is to set forth, in an orderly and logical fashion, appropriate health and safety procedures to be followed during onsite construction activities at the Glenn Research Center (GRC). During the performance of the task to be performed, this HASP identifies potential hazards which TTL Associates, Inc. (TTL) personnel may be exposed to. TTL personnel shall not participate in this Task without having read this plan in its entirety. This plan has been developed to be as complete as possible; however, should conditions dictate revisions or additions to this plan, amendments shall be drafted, added, and distributed to all persons involved with this plan. This plan works in concert with the TTL Corporate "Safety and Health Plan," the GRC Safety Manual, the GRC Occupational Health Manual, the GRC Environmental Programs Manual, (OSHA) standard *Code of Federal Regulations* 1926, United States Environmental Protection Agency regulations, National Fire Protection Association Codes, and any other applicable codes stated in the NASA contract. It shall be the prime contractor's responsibility to ensure that all of its subcontractors comply with the provisions set forth in this plan.

A. DESCRIPTION OF WORK
Brief description of project
TTL will provide drilling services for installation and abandonment of one groundwater monitoring well within the restored blast wall footprint.
All solid and liquid materials created from drilling activities will be containerized in drums and coordinated for disposal with GRC Waste Management.

IN CASE OF EMERGENCY CALL 419-621-3222

***Dialing 911 from the NASA GRC phone system will connect to NASA emergency assistance. From a cellular phone or non-NASA landline, you must dial (419) 621-3222.**

EMERGENCY CONTACTS

Emergency	Responder	Location	NASA Phone	Mobile/ Other Phone
Fire	NASA PBS Fire Department	Building 7233	911	(419) 621-3222
Police	NASA PBS Security	Building 7233	911	(419) 621-3222
Ambulance	NASA PBS Security	Building 7233	911	(419) 621-3222
Hospital	Firelands Regional Medical Ctr.	1111 Hayes Ave.	(419) 557-7455	(419) 557-7455

Directions to Hospital: 1111 Hayes Ave., Sandusky, OH, (419) 557-7455
After leaving the site Main Gate on Scheid Rd., turn left onto Route 250. Turn left onto Bogart Rd. Turn right onto County Rd. 120/Columbus Ave. Turn left onto Townsend St. Turn left onto Hayes Ave. Firelands Regional Medical Center is on the right.
Map to Firelands Medical Center is located on next page (page 3).

NASA NON-EMERGENCY CONTACTS

	Plum Brook Station
NASA Dispatch	(419) 621-3326 or (419) 621-3221
Environmental, Health, and Safety (EHS) Helpline (for reporting non-emergencies)	(216) 433-8848
NASA Health and Safety Division Point of Contact (POC): Joyce Jordan	(216) 433-3873

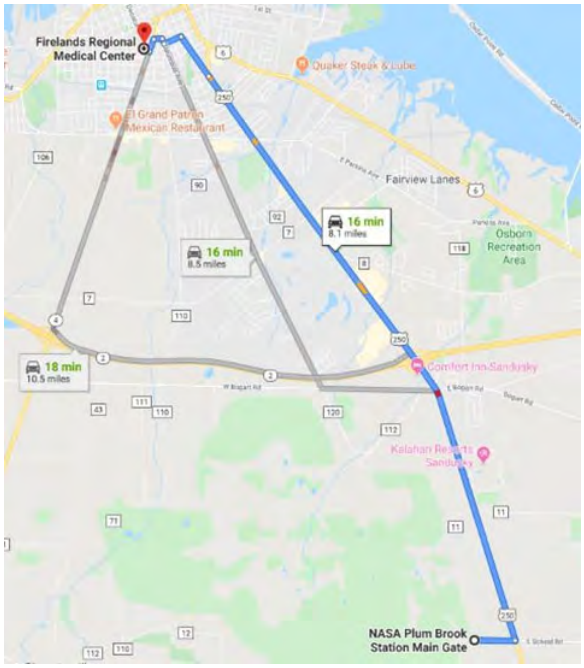
On Site phone, dial "8" to obtain an outside line

PROJECT CONTACT NUMBERS

Leidos COMETS Environmental Program Manager Jen Thomas	Work: (216) 433-3184 Cell: (216) 854-6219
Leidos Project Manager Heather Adams, Professional Geologist	Work: (330) 405-5822 Cell: (614) 330-9857
Leidos Field Manager/Site Safety and Health Officer Rich Sprinzl, PE	Work: (330) 405-5808 Cell: (330) 348-1378
Leidos Geologist/Competent Person Jasmine Stefansky, Geologist Alternate: Charles Spurr, Geologist	Work: (865) 481-8565 Cell: (865) 228-1367 Work: (330) 405-5809 Cell: (216) 317-5726
Leidos FE&E Health and Safety Manager Stephen Lowery, Certified Industrial Hygienist, Certified Safety Professional	Work: (571) 526-6659 Cell: (405) 919-4176
NASA GRC Technical Representative(s): John Brodt Christie Myers	Work: (216) 433-6028 Cell: (216) 299-8628 Work: (216) 433-8874 Cell: (216) 315-0390
Drilling Subcontractor Field Manager (Driller) TBD (prior to mobilization) TTL Associates Inc.	TBD (prior to mobilization)

MAP FOR HOSPITAL

Firelands Regional Medical Center, 1111 Hayes Ave., Sandusky, OH, (419) 557-7455
After leaving the site Main Gate on Scheid Rd., turn left onto Route 250. Turn left onto Bogart Rd. Turn right onto County Rd. 120/Columbus Ave. Turn left onto Townsend St. Turn left onto Hayes Ave. Firelands Regional Medical Center is on the right.



B. SUBCONTRACTOR(S)	
List all subcontractors working on this task and the activities they will perform	
Subcontractor Company Name	**Activities Performing in Task**
No subcontractors will be utilized by TTL	

C. SAFETY PLAN ACKNOWLEDGMENT		
I acknowledge that I have read and understand the attached safety and health plan and I agree to perform work on this task in accordance with this plan, safe work practices and OSHA regulations. I acknowledge that I have received a Glenn Research Center safety orientation.		
Employee Signature	**Company**	**Date**

FIELD CONTRACTOR ASSUMPTION OF RESPONSIBILITY

Contractor POC: Rick Mielcarek, Drilling Manager Date: February 26, 2020

D. WORK ACTIVITIES

General description of tasks to be performed.

Hollow-Stem Auger and/or Air Rotary Drilling services; installation of groundwater monitoring well; equipment decontamination; and investigation-derived waste (IDW) management.

E. POTENTIAL HAZARDS

Identify those hazards that relate to the work activities noted above. ***Use numbers next to the hazard and correspond with the* PROPOSED CONTROLS *table below.***

1 Chemicals or flammables	3 Eye, face, or Head Hazards (PPE)	__Egress
__Scaffolding	4 Power Tools	__Road Blockage
__Traffic Control	__Falls (Heights > 4')	__Utility Service Interruption (Area Clearance Req'd)
2 Spills or Leaks	5 Respiratory Hazards	__High Pressure Systems
__Ladders	6 Excavation (Permit Req'd)	__Hot Work (Permit Req'd)
__Barricading	__Radiation (Contact Health Physics @3173)	__Cryogenic Spills, Burns
__Hazardous Energy (LO/TO Req'd)	7 Noise	__Confined Space Entry (Permit Req'd)
__ Demolition	8 Biological	__Special Hazards – ACM, LCM, Cadmium, Mercury
__Cranes/Aerial	__Sanitation	__Other

F. PROPOSED CONTROLS

Work practices, personal protective equipment, training, and/or emergency procedures that will be used to ensure the safety of workers, and onsite personnel, against the hazards identified above.

General	TTL personnel have current OSHA 40-hour Hazardous Waste Operations and Emergency Response (HAZWOPER) training and 8-hour HAZWOPER refresher training (as applicable).
General	TTL employees will follow all facility safety requirements as per site-specific training. TTL employees will follow procedures outlined in the attached Job Safety Analysis (JSA) and HASP in the event of an emergency.
1	Chemicals – Safety Data Sheets (SDSs) for Diesel and Gasoline fuels will be reviewed and available onsite. Equipment will be fueled prior to coming to the site to minimize onsite fueling needs. SDS for drilling materials (bentonite, concrete, sand, and hydraulic fluid) will be reviewed and available onsite.
2	Spills/Leaks – Portable spill kit will be available at the drilling site in case of fuel or oil leaks from equipment. All equipment will be inspected prior to first use each day to verify it is in first class working condition with no visually observed leaks. Equipment identified with leaks will be tagged out of service and removed from the site.
3	Eye, Face, or Head Hazards (Personal Protective Equipment [PPE]) – Level D PPE consisting of Hard Hat, Safety Toe Boots, hearing protection, Safety Glasses, and task appropriate gloves will be required during site activities.
4	Power Tools – Only employees trained in the safe operation of drilling equipment and authorized to operate the drilling rig will be used to complete this project. Equipment will be equipped with dead man controls.

F. PROPOSED CONTROLS (Continued)	
Work practices, personal protective equipment, training, and/or emergency procedures that will be used to ensure the safety of workers, and onsite personnel, against the hazards identified above.	
5	Respiratory Hazards – All concrete work is to be performed in accordance with OSHA 1926.1153, "Respirable Silica Standard." Concrete sawing/cutting is not anticipated, only concrete mixing. Task is to be performed outside in less than 4 hours and requires no Assigned Protection Factor (APF).
6	Excavation – Verify that Dig/Excavation permit has been obtained by NASA representative before work commences.
7	Noise – It is anticipated that noise will exceed the permissible noise exposure levels so hearing protection will be required. Ear Plugs must be worn by personnel working within proximity to the drilling rig.
8	Utilize permethrin on clothing to minimize ticks. Perform frequent tick inspections throughout the day.

G. COMPETENT PERSONS

Identify the Field Contractor's Competent Person(s) responsible for oversight of the particular hazards identified above. The Competent Person is required to conduct daily, documented site inspections.

Field Contractor Company Name	Competent Person Name	Field Contact Number
TTL Associates, Inc.	Rick Mielcarek, Drilling Manager	(419) 214-5138

H. SUPPORT DOCUMENTATION

Provide as needed. Ensure all checked items below are signed, approved, and placed on jobsite. To check a box, Double Click the box and select "Checked" under Default Value on the popup window.

Check all that apply and attach to approved HASP:

☒ ATTACH SDS to final, approved HASP **(Not old MSDS forms) – included as Appendix C to Leidos (Prime) SSHP**
☐ C-787 LO/TO Form

☐ C-199 Confined Space Permit
☐ C-7 Hot Work Permit
☐ C-260a Waste Removal Form

☐ Support Drawings
☒ Other: _JSA_____

TTL ASSOCIATES, INC.
Job Hazard Analysis

Subcontractor: TTL Associates, Inc.	Date: February 19, 2020 Project: E123 Multi Site Characterization – NASA Glenn Research (Review for latest use before the job is performed)	
Description of the work: Performance of hollow stem augering, monitor well installation, abandonment & vapor point borings with installation at the NASA Plum Brook Site (Sandusky, OH) using a Geo-Probe direct push rig. The work site includes Fox, Snake River & Taylor Road Burning Grounds and surrounding areas in Erie County, Ohio.		
Work Activity Sequence (Identify the principal steps involved and the sequence of work activities)	**Potential Health and Safety Hazards** (Analyze each principal step for potential hazards)	**Hazard Controls** (Develop specific controls for each potential hazard)
Mobilization/demobilization to borehole locations	Pedestrians, utilities, moving in tight areas, road conditions & steep grades.	Use caution, drive slowly, pay attention to surroundings, use a spotter, scout area for utilities and other obstacles that may create a hazardous situation, obey all traffic signs and signals, drive on grades safe to operate on, scout areas for hidden obstacles such as rocks brush piles or large holes. Never exceed recommended grades posted by the manufacturer of equipment.
Setting up the equipment for drilling.	Pinch points, striking over head utilities, physical and biological hazards, slips trips and falls, uneven drilling surface, and being struck by other vehicles.	Stay away from moving parts, only the operator shall run the machine, scout area for poisonous plants, animals and insects (Wear and use proper clothing and sprays to protect against ticks, mosquitoes, poison ivy, and other biological hazards), remove any debris that may cause any tripping or entanglement hazards, mark hazards with tape or pant, wear high visibility clothing, use traffic control, and use safety cones, signs and caution tape.

Tripping tools in and out of the ground. Direct push tooling as well as soil gas probe materials.	Pinch points, loud noise, flying particles, underground utilities, exposure to hazardous materials in the soil or ground water (dermal or airborne), weather, fire, asphyxiation due to engine exhaust, being hit by other equipment or vehicles, potential for overhead utilities and suspended loads.	Stay away from moving parts / do not wear loose clothing, use hearing protection and eye protection, hand protection, steel toe boots, use utility locators, , call OUPS (Ohio utilities), and hand clear to depth if unsure of utility markings (Do not drill closer than 5ft. to identified utilities unless daylighted), use the proper PPE as specified in HSP that relates to the specific hazards associated with the site, consult the MSDS for the site history of chemicals and contaminants, use air monitoring techniques, do not operate machine in inclement weather, lower the mast while bad weather is occurring, utilize 30-30 rule at minimum for lightning, know location of nearest tornado shelter, take frequent water breaks in cool environments during times of very hot conditions, keep fire extinguishers at an available position, no smoking around the work area, make sure drilling is done in well ventilated areas, use barricades and signs, and wear high visible clothing such as a vest. Maintain safe distance (20ft. minimum from drill mast) from overhead utilities and suspended loads, stop work when there is any over head work being performed that may have a potential for anything being dropped from above. Know where the kill switches are located on the rig in case an emergency shut-down is necessary and test daily as part of equipment inspection. Make sure hands are away from any point of impact e.g. using hammer on auger while holding.

Extracting samples from sample tubes.	Use a wrench &/or proper Geo-Probe liner cutting tool – wear hand protection to avoid cuts and from sharp edge, be aware of sample being pressurized, and contamination on skin and in eyes, and exposure to airborne contaminants, broken or cracked soil liners.	Use proper (cut resistant) gloves, point sample in a safe direction, and use recommended PPE by consulting the MSDS for known contaminants, if contaminants are unknown, use the maximum level of PPE according to site history, know where safety showers and eyewash stations are, keep eye wash bottles in close proximity to drilling location and easily accessible, use ventilation, use respiratory protection when ventilation does not exist, use only approved liner cutting device, do not run fingers along cut surface of liners.
Decontaminating tools between boreholes.	Chemical splash, high pressure steam, water slip hazard, noise hazards.	Use proper PPE, gloves, eye protection, ear plugs and Poly Tyvek suits as needed to prevent splash on work clothes, use face shield when using pressure washers, safety cone off area from other people, spray in a safe direction, and keep area from accumulating large quantities of water on the walking surface. Do not point wand at another person or use to decon boots, gloves, etc.
Entire direct push procedure and operation.	Site emergencies.	Know how to identify on-site emergencies by listening for warning alarms or sirens, identify wind direction throughout the day, know were the closest shelter in place is located, in case of emergency shut down the equipment, yield to all emergency vehicles, follow emergency response plan and go to safe place. Identify all key switches and safety stops on equipment in case it needs to be turned off in an emergency.

Containment of IDW	Exposure to chemicals, opening drums, opening pressurized drums, liquid splash, sharp edges on soil liners, slips trips falls.	Properly contain small quantities of IDW for transport to drum storage area, use proper lifting techniques, use the buddy system, open drums with heavy duty protective gloves, purge air from drums through bungs slowly to make sure there is no pressure, wear proper PPE, gloves, keep drum storage area clean from debris for slip, trip, and fall hazards.
Use of hand auger to clear boreholes for utilities.	Hazards involved are: back and arm fatigue, use of spud bar, and pinch points.	Use of safety cones and signs for working area to warn pedestrians. Use of spud bar is limited to only prying rocks and large debris from the borehole, never use a spud bar to throw into the borehole to break rocks or other construction debris. When using a hand auger, have proper posture and never strain to bust debris in the borehole. Use air monitoring techniques to test the breathing zone at all times. If the breathing zone becomes contaminated, all work will be stopped until a review of what can be done to eliminate the hazardous atmosphere. When opening a drum, always use hand protection such as leather gloves to avoid pinch points.

Use of hand tool such as drill, angle grinder, and thread tap and use of a generator	Electric shock, hand puncture, sparks, cuts, sparks, flying debris, exhaust from generator	Use approved electric cords, GFCI, leather or Kevlar gloves, face shield, spark arrestor, use a fire watch with fire extinguisher, keep generator away from flammable materials, make sure exhaust is aimed away from work area and plenty of ventilation
Travel by vehicle on and off sites up to and including area roadways.	Collisions with other vehicles, buildings, utilities, people, animals, etc. Falling out of or being ejected from vehicle.	Follow all traffic signs and signals. Adjust speed to weather conditions. If too bad pull over and wait for better conditions. Never talk, text or e-mail while driving. Drive defensively and look out for the other person and pedestrians. Learn to recognize actions of other drivers that are being aggressive, and stay away. When backing, use a spotter and or do a 360 walk around. Always wear a seat belt. Never haul a passenger unless there is a seat and belt provided for them. Never operate a vehicle under the influence of alcohol, drugs or medicine. Perform daily inspections as required by the DOT of motor vehicles before you driving.

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SITE SPECIFIC HEALTH AND SAFETY PLAN
FIRING RANGES 3 AND 4 EXCAVATION ACTIVITIES
NASA PLUM BROOK STATION
SANDUSKY, OHIO

Submitted to:

NASA Glenn Research Center
Cleveland, Ohio

Submitted by:

Arrowhead Contracting, Inc.

Revision 0b

February 2020

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- Daily Tailgate Safety Meeting Log
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- Intrusive Activities Permit
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B Activity Hazard Analyses (AHAs)

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C Safety Data Sheets (SDSs)

List of Acronyms

ACGIH	American Conference of Governmental Industrial Hygienists
ANSI	American National Standards Institute
ASME	American Society of Mechanical Engineers
CFR	Code of Federal Regulation
CHSO	Corporate Health and Safety Officer
COC	contaminant of concern
CPR	Cardio Pulmonary Resuscitation
DOT	Department of Transportation
ECCL	Erie County Conservation League
EMS	Emergency Medical Services
FANS	Firelake-Arrowhead NASA Services
FMCSR	Federal Motor Carrier Safety Regulations
GCR	NASA Glenn Research Center
GFCI	Ground Fault Circuit Interrupter
H&S	health and safety
HASP	Health and Safety Plan
HAZWOPER	Hazardous Waste Operations and Emergency Response
HBV	hepatitis B virus
HIV	human immunodeficiency virus
LEL	lower explosive limit
SDS	Safety Data Sheet
NASA	National Aeronautics and Space Administration
NIOSH	National Institute of Occupational Safety and Health
OSHA	Occupational Safety and Health Administration
PBS	Plum Brook Station
PPE	Personal Protective Equipment
PM	Project Manager
RSL	Regional Screening Levels
SDS	Safety Data Sheet
SSO	Site Safety Officer
USEPA	United States Environmental Protection Agency
VAP	Voluntary Action Program

1.0 Introduction

This document constitutes the Health and Safety Plan (HASP) for field activities associated with Firing Ranges 3 and 4, located in the southcentral area of NASA's Plum Brook Station (PBS), Sandusky, Ohio.

This document was prepared for the National Aeronautics and Space Administration (NASA), Plum Brook Station (PBS), Sandusky, Ohio by Arrowhead Contracting, Inc (Arrowhead). This HASP is specific to the excavation work at Firing Ranges 3 and 4 and incorporates by reference the previously approved Site-Specific Health and Safety Plan for NASA Glenn Research Center (GRC) facilities submitted by Firelake-Arrowhead NASA Services dated May 2018.

This HASP covers excavation and associated activities conducted by Arrowhead in accordance with the subcontract scope of work (SOW). Additional HASPs have been or will be developed, as needed, for other on-site construction activities. The purpose of the HASP is to present the health and safety procedures and guidelines for protecting on-site personnel, visitors, and the public from physical harm and potential hazardous exposures during excavation and related activities, which include the following:

- Excavation of contaminated soil, sediment, and shooting range backstop materials
- Treatment of contaminated material to render the material non-hazardous, if needed
- Loading contaminated material into trucks for transport to the disposal facility
- Backfilling and site restoration of the disturbed areas
- Surveying
- Confirmation and waste characterization sampling (*performed by Leidos*)
- Decontamination of equipment

This HASP is intended to ensure compliance with standards established by the Occupational Safety and Health Administration (OSHA) in 29 Code of Federal Regulations (CFR) Parts 1910 and 1926, including the Hazardous Waste Operations and Emergency Response (HAZWOPER) standards (29 CFR 1910.120 and 29 CFR 1926.65.

This document is intended for use by Arrowhead personnel, including Arrowhead subcontractors. The health and safety measures presented herein are in effect for the duration of

the excavation activities. All project personnel are required to abide by these measures. Where not specifically mentioned, all project personnel are required to comply with applicable OSHA standards while conducting the work. The procedures and guidelines contained herein are based on best available information at the time of preparation of the HASP. Specific requirements may be revised as new information is received or site conditions change.

1.1 Site Description

Firing Ranges 3 and 4 are located in the southcentral area of the PBS. The area was originally used as a rail car loading area for reactive materials. A blast wall was constructed to deflect any explosion that might occur while loading the reactive materials. The blast walls were later used for backstops for the firing ranges, with Firing Range 3 on the southern face and Firing Range 4 on the northern face. The chemicals of concern are lead, arsenic, antimony, and benzo(a)pyrene in soil. There is about 89 tons of wooden blast wall debris and 702 tons of soil. The removal objective is to attain soil concentrations below residential objectives that will allow unrestricted reuse of the area.

1.2 Field Activities

The objective of the work is to mitigate public exposure risk to hazardous substances due to past activities at Firing Range 3 and 4 using a two-phased approach:

Phase 1:

- Task #1 – Provide Technical Support for Community Outreach (ongoing)
- Task #2 – Delineate Wetlands (completed 2019)
- Task #3 – Develop an Action Memorandum (AM) (planned for 2020)
-

Phase 2:

- Task #4 – Develop Removal Action Work Plan
- Task #6 – Implement Removal Action (planned for 2020). The clearing and grubbing phase of this task was completed during January and February of 2020 under a HASP specific to that task. This HASP covers the excavation and associated activities phase of this task.
- Task #7 – Produce Removal Action Completion Report (planned for 2020)
- Task #8 – Abandon Groundwater Monitoring Well (planned for 2020)

This HASP covers only excavation and related activities. Other HASPs have been or will be developed, as necessary, to cover the other on-site activities. Leidos will have a separate HASP that covers confirmation sampling and QC oversight.

For purposes of developing Activity Hazard Analyses (AHAs) (refer to Appendix B), the excavation activities work has been broken down into seven distinct tasks with similar H&S requirements and hazards:

- AHA 01 General Site Work and Oversight Activities
- AHA 03 Excavation of Contaminated Soil
- AHA 04 Decontamination
- AHA 06 Treatment of Contaminated Material
- AHA 07 Loading Contaminated Material
- AHA 08 Backfilling and Site Restoration
- AHA 10 Surveying

1.3 Arrowhead Policy Statement

It is the policy of Arrowhead to provide a safe and healthful work place for all employees, subcontractors, and clients in compliance with governmental requirements. Every associate will receive the appropriate training, equipment, and other resources necessary to complete assigned tasks in a safe and efficient manner. Subcontractors shall also be appropriately trained, participate in the necessary medical surveillance programs, and comply with the required policies, procedures, and regulations. Safety, industrial hygiene, and loss prevention are the direct responsibility of all members of management, who must create an environment in which everyone shares a concern for their own safety and the safety of other associates. Safety will take precedence over expediency or short cuts. It is a condition of employment that all employees work safely and follow established safety rules and procedures.

1.4 Field Crew Safety Summary

Workers in the field should be mindful of the following health and safety issues while completing excavation activities at the site:

- The primary contaminant of concern (COC) at the site is lead in soil. The following control measures will be employed to mitigate the dust/lead issue on the site:
    1. Using real-time perimeter air monitoring (DustTrak™ or similar) and perimeter air sampling (variable airflow sampling pumps and laboratory analysis) to monitor dust conditions at the site perimeter
    2. Using personal air monitoring to collect samples in the worker breathing zone for

laboratory analysis to gauge the concentrations of dust/lead and adjust the level of PPE, if needed

3. Starting the excavation phase using half-face air purifying respirators while dust sampling data is collected to determine the appropriate level of respiratory protection
4. Minimizing dust by avoiding traveling through the impacted areas of the site and instead travel along the perimeter areas of the site
5. Equipping the cab of the equipment that works with impacted materials with a HEPA filtration system.
6. Keeping workers away from the excavation and other equipment operations unless required to be there. Workers required to be in the general area of equipment operations (grade checker, Site Supervisor, Site Safety Officer, etc.) will stay upwind of the work and inside a support vehicle when possible
7. Washing hands and face before eating, smoking, or drinking

- Personal protective equipment (PPE) to be used by field crews while completing excavation and associated activities include the following standard level D work clothing:
  1. Hard hat
  2. Steel toed boots
  3. Safety glasses
  4. Work gloves
  5. Shirt and long pants
  6. High visibility vest

- Personal protective equipment (PPE) to be used by field crews while completing excavation and associated activities include the following standard level C work clothing, during the first few weeks of the excavation work and if determined to be needed by the SSO based on air monitoring results:
  1. Hard hat
  2. Safety glasses
  3. Work gloves
  4. Vinyl or nitrile gloves
  5. Shirt and long pants
  6. High visibility vest

7. Disposable Tyvek™ coverall or pants, if determined to be needed by the SSO based on wipe sample or air monitoring results
8. Disposable or washable steel toed boots, if determined to be needed by the SSO based on wipe sample or air monitoring results
9. Half-face air-purifying respirator with HEPA filter, if determined to be needed by the SSO based on air monitoring results

- Because dust can be generated during excavation and related activities, personal and perimeter dust monitoring will be required. Visual dust monitoring will also be employed and if dust is observed, the Site Safety Officer will determine the best course of action to mitigate the dust issue. Likely, the mitigation efforts will involve stopping operations until the dust has abated or using dust control measures such as wetting the dusty area with water or covering the area with a tarp or poly sheeting.

2.0 Organization and Responsibilities

This section describes Arrowhead personnel responsibilities for health and safety. Table 2-1 identifies Key Health and Safety (H&S) personnel from Arrowhead.

2.1 On-Site Personnel

All on-site personnel are responsible for continuous adherence to H&S procedures during the performance of assigned work. In no case may work be performed in a manner that conflicts with the inherent safety and environmental precautions outlined in this plan. After due warning, personnel violating safety procedures will be dismissed from the site and possibly terminated from further work. Any person who observes unsafe acts or conditions or other safety problems should immediately report them to supervisory personnel.

2.2 Corporate Health and Safety Officer

The Corporate Health and Safety Officer (CHSO) has ultimate authority and responsibility for establishing, implementing and enforcing Arrowhead's H&S program. Accordingly, the CHSO develops and/or approves site-specific HASPs, ensures that Arrowhead personnel meet applicable training and medical monitoring requirements, and develops company policies and procedures for H&S in accordance with OSHA and other applicable standards.

2.3 Project Manager

The Project Manager (PM) is responsible for coordinating the development, implementation, and enforcement of this HASP. The PM is responsible for ensuring that the necessary resources are available for the project to be completed safely and in compliance with HASP requirements, OSHA regulations, and other applicable standards.

2.4 Site Safety Officer

The Site Safety Officer (SSO) will conduct inspections to ensure that operations are conducted in accordance with the HASP, OSHA regulations, and the subcontract specifications. The SSO reports directly to the PM. An open dialogue between the SSO and the PM will be maintained in order to quickly address safety issues and implement corrective actions as necessary. The SSO has the authority to suspend operations at the site due to the ineffectiveness of or non-conformance to this HASP. The most senior associate will be assigned the duties of the SSO (Alternate SSO) when the SSO is not on-site. The SSO has an independent reporting line

of authority to the Corporate Health and Safety Officer. This reporting authority provides for suitable checks and balances for production and safety related decisions.

2.5 Site Supervisor

The Site Supervisor is primarily charged with production at the site and coordinating all on-site aspects of the project. The Site Supervisor is responsible for implementing the scope of work, schedule, and budget in the field. The Site Supervisor maintains contact with the Arrowhead PM and also reports to the PM.

2.6 Subcontractors

Subcontractors, if used at the site, are responsible for the H&S of their employees and for complying with the standards established in this HASP and all other project requirements. The following are some of the requirements that apply to subcontractors:

- All subcontractors under the direction of Arrowhead will report to the PM.
- Subcontractors shall submit all training and medical surveillance documents to Arrowhead prior to mobilization, as applicable.
- Planned operations for the day shall be verbally conveyed to the Site Supervisor at the beginning of each day. Any changes in scopes of work or specified quantities shall also be conveyed to the Site Supervisor on a regular basis.
- The Site Entry Log shall be signed at the beginning and end of each workday by all subcontractor employees working on-site.
- All subcontractor personnel shall attend a project safety orientation (refer to Section 11.3) prior to beginning work on-site.
- All subcontractor personnel shall attend the morning tailgate safety meeting (refer to Section 11.2). If scheduling precludes attendance, then subcontractors shall hold and document their own safety meeting. Safety meeting documentation is to be submitted to the SSO.
- All accidents, fires, injuries, illnesses, and spills shall be immediately reported to the SSO.
- Heavy equipment is to be inspected daily by the equipment operator. Inspection documentation shall be submitted to the SSO.
- Subcontractors are required to frequently inspect work sites for safety deficiencies and correct all deficiencies.

2.7 Visitors

All visitors shall check in with on-site personnel to verify that all appropriate entry requirements are met. Visitors will also require clearance by the Site Supervisor. Visitors will only be allowed in support areas unless they are properly trained and equipped to enter exclusion zones / restricted areas. All visitors will be given a safety briefing upon arriving at the site. Visitors will be escorted by on-site personnel at all times.

3.0 General Health and Safety Requirements

This section addresses general safety issues, rules, and miscellaneous topics.

3.1 Project Safety Goal

Safety is Arrowhead's highest priority. Arrowhead has established a goal of zero accidents for this project. The process of planning the project work is performed to identify, evaluate, and control the site hazards and to help realize the goal of zero accidents. All activities shall be conducted in a manner that minimizes the probability of incidents, accidents, injuries, or illnesses.

3.2 Compliance Agreements

All field personnel will receive a copy of the HASP and read the plan prior to commencement of fieldwork. The HASP Acknowledgment Form presented in Appendix A will be signed by field personnel after reviewing the plan and acknowledging the plan's provisions. This agreement will be retained as part of the project files.

3.3 Safety Meetings

A project-specific safety orientation meeting will be conducted by the SSO prior to work on-site. During the meeting, an overview of the objectives of the project and the HASP will be discussed. Once discussions conclude, field personnel will be required to sign an acknowledgment of the HASP (Appendix A).

A daily "tailgate" safety meeting will also occur each morning prior to starting the day's field activities. All field and construction personnel will be required to attend the daily tailgate safety meeting. All safety meetings will be documented and kept on file in the field office.

3.4 General Safety Provisions

The following general provisions will be in effect during all site activities:

- There will be no activities conducted on-site without sufficient backup personnel. At a minimum, two persons or some means of communication must be present during site activities.
- No loose jewelry, clothing, or long hair shall be permitted on or near equipment with moving parts.

- Except as necessary to perform the required field assignments, personnel shall avoid contact with contamination (pooled liquids, discolored areas, etc.) or any area that shows obvious evidence of contamination.
- Personnel shall not enter contaminated areas (i.e., exclusion zones) unless it is necessary.
- Field personnel must observe one another for signs of chemical exposure and or physical stress (changes in skin color, coordination, speech, breathing, etc.) and inform co-workers and management of other signs and/or symptoms (headaches, nausea, dizziness, etc.).
- Damaged personal protective equipment (PPE) or clothing will be immediately repaired or replaced.
- Smoking, eating, drinking, or any other activity involving hand-to-mouth contact while in the exclusion zone is prohibited.
- Personnel must thoroughly wash their hands and face before eating, smoking, or drinking.
- All regulated work zones, as established on the site, shall be observed. Entry into a restricted area or exclusion zone shall be by prior notification and authorization of the Site Supervisor or SSO. All required PPE shall be worn prior to entering these zones.

3.5 Fire Prevention and Protection

Fire prevention and protection procedures/resources at the site include:

- Fire extinguishers will be made available at the site. A minimum of one ABC-rated fire extinguisher will be maintained at each active work area.
- Flammable materials will be stored in marked ("No Smoking") areas with fire extinguishers available.
- Smoking will only be permitted in designated areas.
- Project personnel are only permitted to extinguish fires in their incipient stages. Fighting large fires beyond the incipient stage is prohibited by project personnel and shall only be performed by the local fire department (refer to Section 10.4).
- As necessary, hot work permits will be obtained (refer to Section 5.6).
- All equipment will be turned off at the end of each workday.

3.6 Housekeeping

The following provisions are specified to maintain a high standard of housekeeping:

- The importance of housekeeping and the expectations that good housekeeping shall be maintained will be regular topics of the daily safety meetings.
- The site shall be cleaned on a daily basis.
- Subcontractors shall be informed of their responsibilities to maintain their housekeeping.

Housekeeping is an operational/safety item, which is regularly considered during routine inspections.

3.7 Heavy Equipment Inspections

All heavy mechanical equipment shall be inspected by the SSO and Site Supervisor upon arrival at the site, and will be inspected by operator(s) on a daily basis thereafter. Daily inspections shall be documented on inspection checklists as presented in Appendix A. Deficiencies in the equipment shall be noted on the form. All inspection documentation shall be submitted to the SSO so that repairs can be initiated. Prior to the demobilization of equipment, all equipment will be inspected by the SSO or the Site Supervisor prior to the equipment leaving the site.

3.8 First-Aid and Medical Facilities

The following provisions apply to first aid and medical facilities:

- A first-aid kit(s) will be provided and maintained on-site.
- A blood borne pathogen exposure control kit will be provided and maintained on-site.
- Eye wash bottles will be provided to individual construction crews.
- Emergency phone numbers will be posted on-site (refer to Table 7-1).
- The route to the hospital will be posted on-site (refer to Figure 3-1)
- At a minimum, two on-site employees shall be certified in first aid and cardio pulmonary resuscitation (CPR).

3.9 Sanitation

The following provisions will be made to address sanitation:

- A portable lavatory unit will be set up in the support area when four or more workers are routinely working at the site. Additional lavatory units will be set up (as needed) where the work is being performed.
- A portable hand-wash station will be set up adjacent to the lavatory units. Additional hand-wash units will be set up (as needed) where the work is being performed.
- Safe drinking water will be made available as necessary to provide drinking water at individual work locations.

3.10 Security

To provide general security during field operations, the following facilities or measures will be provided:

- Existing fence gates at the PBS will remain closed at all times unless authorized by PBS personnel.
- There will not be an office trailer at FR 3 and 4 site. At the conclusion of each workday, the office trailer at the ECCL will be locked. Keys to the office trailer at the ECCL will only be provided to authorized personnel from Arrowhead.
- The keys to heavy construction equipment will be removed from the equipment and placed inside the office trailer at the ECCL at the end of each workday.
- All personnel and visitors to the site will be required to sign in and sign out. Site visitors will not be allowed to enter restricted areas or exclusion zones unless approved by the Site Supervisor or SSO.

3.11 Illumination

Most project operations will occur during daylight hours, between sunrise and sunset. Supplemental illumination at the excavation areas is not anticipated. If additional light is necessary, it will be provided by portable light towers.

3.12 Communication and Buddy System

The "buddy system" will be used at all times while working in restricted areas and exclusion zones. Generally, the "buddy system" requires that personnel must maintain visual and voice communication with other personnel in the same general work area. However, cell phones and two-way radios can be used to maintain contact and meet the "buddy system" requirement in some instances and if approved on a case-by-case basis by the SSO.

4.0 Activity Hazard Assessment

A hazard assessment is performed to identify the potential safety, health, and environmental hazards associated with specific field activities. It is used to determine the control measures necessary for protecting personnel, the community, and the environment. The SSO, with input from the Site Supervisor and CHSO, will perform a hazard assessment for each major field activity to be performed during the project. Once developed, the hazard assessment may be revised when new tasks/activities are added, job situations change, or when it becomes necessary to alter safety requirements. Additions and changes to the HASP, such as revisions to the hazard assessment, must be documented on the HASP Amendment Form (Appendix A). Based on the field activities anticipated during excavation activities, the following H&S hazards are anticipated:

- Chemical exposure (primary COC lead)
- Chemical exposure (operational chemicals)
- Dust
- Noise
- Fire/flammables
- Eye hazards
- Slip, trip, falls
- Operation of heavy construction equipment
- Operation of small equipment and power tools
- Electrical hazards
- Hazardous energy
- Intrusive activities
- Material handling
- Contact with hot items
- Motor vehicle / traffic control hazards
- Heat stress
- Cold stress
- Blood borne pathogens
- Environmental hazards

Table 4-1 presents a summary of these hazards as they apply to the project construction. Appendix B presents the Activity Hazard Assessment for this scope of work – a breakdown of

the H&S hazards associated with the primary field activities and the control measures that will be implemented to eliminate or minimize theses hazards.

5.0 Hazard Control Measures

There are numerous chemical, physical, environmental and industrial hazards associated with the excavation activities at the Plum Brook Station. These hazards, if not properly controlled, can cause harm to project personnel, visitors, and the public. This section, combined with the remaining sections of this HASP, address the recommended measures for controlling or minimizing the hazards. These control measures are summarized in Table 5-1.

5.1 Chemical Exposure

This phase of the project entails mechanical excavation of contaminated soil, sediment, and backstop materials and associated activities including treating any materials that are hazardous (via TCLP analysis), and loading the material/treated material for transportation and disposal. The chemicals of concern are lead, arsenic, antimony, and benzo(a)pyrene in soil. Based on the analytical data, lead in soil is by far the most serious concern, as discussed in the following sections. These processes will potentially expose construction crews and public receptors to the following environmental hazards and exposure pathways:

- Dermal exposure to lead contaminated soil
- Inhalation exposure to lead laden dust originating from contaminated soils
- Inhalation exposure to nuisance dust from non-contaminated soils

Dermal contact exposure will be controlled through the use of appropriate personal protective equipment as discussed in Section 6.0. Inhalation exposure hazards will be controlled through the implementation of the following control measures:

- Minimizing dust by avoiding traveling through the impacted areas of the site and instead travel along the perimeter areas of the site when possible
- Equipping on-site equipment (e.g., excavator, skid steer, wheel loader, etc.) with a cab that has a HEPA filtration system.
- Keeping workers away from the excavation operations unless required to be there. Workers required to be in the general area of the excavation activities (Site Supervisor, Site Safety Officer, etc.) will stay upwind of the work and inside a support vehicle when possible
- Washing hands and face before eating, smoking, or drinking
- Complying with site-specific action levels (see below)
- Perimeter air monitoring (refer to Section 9.1)

- Personal air sampling (refer to Section 9.2)
- Engineering and administrative controls for dust suppression (refer to Section 5.2)
- PPE and respiratory protection (refer to Section 6.0)

Lead Toxicology and Exposure Limits

Firing Ranges 3 and 4 soils, sediment, and backstop materials contain lead and other chemicals but lead is the most significant and, therefore, the contaminant of concern (COC) for the Firing Ranges 3 and 4 is lead. Arrowhead reviewed the analytical data provided in the Firing Range 3 and 4 Removal Site Evaluation Report by Leidos to ascertain the risk of exposure to site personnel. Based on the analytical data, lead is by far a more serious concern than the other chemicals. Any precautions that mitigate the threat of lead via ingestion, direct contact, and inhalation of dust will also easily mitigate the other threats.

Arrowhead has reviewed the chemical exposure assessment declaration information provided by Leidos. Arrowhead has performed similar evaluations based on the information provided by Leidos in the ECCL Firing Range Removal Action Project Work Plan and data collected from projects that are similar to the ECCL work. Arrowhead has determined that, using proper precautions, there is no reason to believe that employees performing work may be exposed to lead in excess of the permissible exposure limit of 50 ug/m3 or the action level of 30 ug/m^3.

Action levels are calculated for the following three areas of the Firing Range 3 and 4 site:

- Firing Range 3 and 4 target area
- Firing Range 3 shooting area
- Firing Range 4 shooting area

The dust equivalency level for lead in Firing Range 3 and 4 target area is calculated as follows:

$$\frac{\text{Soil (mg/kg)}}{1 \times 10^6 \text{ (mg/kg)}} = \frac{\text{Exposure Limit (mg/m}^3\text{)}}{\text{Dust Equivalency Level (mg/m}^3\text{)}}$$

Where:
Soil lead level = 44,000 mg/kg
Exposure limit = 0.050 mg/m^3

Which results in a dust equivalency level of 1.1 mg/m^3

Applying a safety factor of 4 to the dust equivalency levels for lead results in an Action Level for Respirable Dust of about 0.28 mg/m^3 for Firing Ranges 3 and 4 target area.

The dust equivalency level for lead in the Firing Range 3 shooting area is calculated as follows:

$$\frac{\text{Soil (mg/kg)}}{1 \times 10^6 \text{ (mg/kg)}} = \frac{\text{Exposure Limit (mg/m}^3\text{)}}{\text{Dust Equivalency Level (mg/m}^3\text{)}}$$

Where:
Soil lead level = 71,800 mg/kg
Exposure limit = 0.050 mg/m^3

Which results in a dust equivalency level of 0.70 mg/m^3

Applying a safety factor of 4 to the dust equivalency levels for lead results in an Action Level for Respirable Dust of about 0.17 mg/m^3 for the Firing Range 3 shooting area.

In the Firing Range 4 shooting area, the lead levels in the soil are near or below the Regional Screening Levels (RSL) for lead (400 mg/kg) with only one sample slightly exceeding the RSL. Based on the soil analytical data, lead is not considered a contaminant of concern in Firing Range 4 shooting area.

The actions level calculated for respirable dust at Firing Range 3 and 4 target area (0.28 mg/m^3) is very similar to the action level calculated by Leidos (0.34 mg/m^3). The action levels calculated for Firing Range 3 shooting area (0.17 mg/m^3) is very similar to the action level calculated by Leidos (0.21 mg/m^3). This gives confidence that the action levels are correct. For consistency, Arrowhead will adopt the action levels calculated by Leidos:

- **Action level for respirable dust at Firing Range 3 and 4 target area: 0.34 mg/m^3**
- **Action level for respirable dust at Firing Range 3 shooting area: 0.21 mg/m^3**
- **Action level for respirable dust at Firing Range 4 shooting area: visual dust monitoring**

As a reference to the end-users of this HASP, brief definitions of the important chemical exposure limits are provided below.

- **Threshold Limit Value (TLV)** - Airborne concentrations of substances, generally expressed as an eight-hour time weighted average (TWA) and represent conditions under which it is believed that nearly all workers may be repeatedly exposed day after day for a 40-hour work week without adverse health effects. Threshold limit values are guidelines for occupational exposures established by the American Conference of Governmental Industrial Hygienists (ACGIH) (1998).
- **Permissible Exposure Limit (PEL)** - the 8-hour TWA, short-term exposure limit (STEL), or ceiling (C) concentration above which workers cannot be exposed. PELs are enforceable by OSHA.
- **Recommended Exposure Limit (REL)** - the up to ten-hour per work day, TWA exposure recommended by the National Institute of Occupational Safety and Health (NIOSH).
- **Immediately Dangerous to Life or Health (IDLH)** - Concentration that poses an immediate threat to life or produces irreversible, immediate debilitating effects on health (American National Standards Institute). NIOSH defines IDLH as, air concentrations that represent the maximum concentration from which, in the event of respirator failure, one could escape within 30 minutes without a respirator and without experiencing any escape-impairing or irreversible health effects.

There is also a potential for exposure to operational chemicals used during the project. A stabilization agent such as Calciment® or EnviroBlend® will be used to treat the impacted material, as needed, to bring the TCLP concentrations to below the hazardous waste threshold. These chemicals will be brought onto the site in solid form contained in bags or supersacks. Hazardous chemicals such as diesel fuel and lubricants will be brought on-site for use during the project. Since most of these chemicals are in liquid form, the primary means of exposure to these hazards is inhalation and dermal contact.

The use of operational chemicals is regulated by OSHA under the Hazard Communication Standard (29 CFR 1910.1200). Arrowhead's *Hazard Communication Program* provides requirements for the safe use of operational chemicals, including the requirement to maintain SDSs on-site for each chemical product. Exposure to operational chemicals will be controlled by using the products in the manner recommended by the manufacturer, donning PPE

recommended by the manufacturer, ensuring that chemical containers are properly labeled, and storing the products in approved containers and cabinets.

5.2 Nuisance Dust

During excavation activities operations, there is potential for nuisance dust to be generated. Both operational and administrative controls will be implemented to ensure that ambient dust levels remain safely below the visible dust action level. Operational controls will include:

- Minimizing creating dust while operating equipment and trucks
- Following proper decontamination protocols for equipment entering and leaving the site

Administrative controls will include the following:

- Maintaining speed limits on site access roads
- Stopping or restricting work activities when dust levels become elevated or when the wind speed is excessive
- Positioning personnel upwind

5.3 Noise

The primary sources of noise at the site will be the operation of heavy construction equipment. Sound pressure levels during construction operations may exceed the NASA action level of 82 decibels TWA, particularly in the immediate vicinity of construction equipment.

With respect to construction crews, hearing protection will be required when working in the vicinity of construction equipment. It is Arrowhead policy to don hearing protection whenever operating construction equipment. Using a sound level meter (Spark Super Duty or equivalent), the SSO will conduct real-time noise monitoring to ensure compliance with OSHA's *Hearing Conservation Standard* (29 CFR 1910.95) and Chapter 3—*Hearing Conservation Program* of the NASA Glenn Research Center Occupational Health Programs Manual. The SSO will also perform real-time monitoring to ensure that decibel levels remain below permissible limits at site boundaries and at select locations indicative of public exposure. Noise monitoring will be documented and records will be maintained, controlled, and retrievable at all times.

5.4 Eye Hazards

The potential for eye injuries is high for most construction activities. Eye hazards include projectiles, fumes, dust, heat, and glare. The specific eyewear that will be used to protect workers form these hazards will include:

- Safety glasses with side-shields – all operations except office administration
- Goggles – upgrade for high levels of dust or for splash hazards, as deemed necessary by the SSO
- Face shields (used with safety glasses) – upgrade for splash hazards, as deemed necessary by the SSO

All protective eyewear will meet American National Standards Institute (ANSI) Z87.1 standards. Furthermore, at least one eyewash station will be available near the primary work area.

5.5 Slips, Trips, and Falls

During the project, conditions such as uneven ground surface and other obstructions will create a general slip, trip, and fall hazard for field personnel. The following general provisions shall apply to the prevention of slips, trips, and falls:

- Personnel shall keep working areas clean and orderly. Tools, equipment, and materials shall be used and stored in a fashion to minimize tripping hazards
- Small, loose items such as tools and other small objects shall not be left on the ground surface
- Spills shall be cleaned up immediately
- Personnel using hand and mechanical tools shall position themselves properly and consider the events if a tool slips or suddenly moves
- Personnel shall not walk or climb on equipment not designed as walking surfaces
- Electrical extension cords and electrical wiring shall be kept clear of walking and working areas and/or covered or otherwise secured
- Walking and working surfaces shall be kept clean
- Running is prohibited

5.6 Fire Hazards

The potential for fire explosion hazards at the site is associated with the storage and use of flammable liquids (e.g. diesel fuel). The following provisions shall apply to the storage and use of flammable liquids:

- Flammable liquids shall be kept away from ignition sources
- Flammable liquids shall be used and stored only in areas with good ventilation.
- Containers shall be stored in approved, metal containers.
- Containers shall be grounded and bonded when transferring liquids to safely discharge static electricity.
- Spills shall be immediately cleaned up and reported to the SSO and Site Supervisor

5.7 Operation of Heavy Construction Equipment

Equipment will be used/operated during excavation activities, including:

- Excavators
- Skid-steer loaders
- Wheel loaders
- Off-road dump trucks
- Pickup trucks and trailers

All operators of heavy equipment shall be familiar with the requirements for inspection and operation of the equipment. Before equipment is placed into use and on a daily basis, the operator is to inspect and verify that it is in safe operating condition. The heavy equipment inspections shall be documented on the inspection checklists provided in Appendix A. The following general safety guidelines shall be followed while operating heavy equipment:

- Equipment will not be operated in a manner that will endanger persons or property nor will the safe operating speeds or loads be exceeded
- Getting on or off any equipment while it is in motion is prohibited
- Equipment will be operated in accordance with the manufacturer's instructions and recommendations
- All machinery or equipment will be shut down and positive means taken to prevent its operation while repairs or manual lubrications are being done. Equipment designed to be serviced while running are exempt from this requirement
- Buckets, blades, dump bodies, and similar equipment will be either fully lowered or blocked when being repaired or when not in use. All controls shall be in a neutral position, with the engines stopped and brakes set, unless work being performed on the machine requires otherwise
- No guard, safety appliance, or device will be removed from machinery or equipment, or made ineffective except for making immediate repairs, lubrications, or adjustments, and then only after the power has been shut off. All guards and devices will be replaced immediately after completion of repairs and adjustments and before power is turned on

- Mechanized equipment will be shut down prior to and during fueling operations. Closed systems, with automatic shut-off which prevent spillage if connections are broken, may be used to fuel diesel powered equipment left running
- Each piece of heavy equipment and other similar equipment will be equipped with at least one dry chemical or carbon dioxide fire extinguisher with a minimum rating of 5-pound ABC
- Personnel will not work, pass under, or ride in the buckets or booms of loaders in operation
- All self-propelled construction equipment, whether moving alone or in combination, shall be equipped with a reverse signal alarm
- Seat belt use is required while operating equipment

Spotters for the operator will be the only personnel allowed in the vicinity of the heavy equipment. Spotters shall stay out of the boom radius area. Personnel needing to approach heavy equipment while operating shall observe the following protocols:

- Make eye contact with the operator (and spotter)
- Signal the operator to cease heavy equipment activity
- Approach the equipment only after the operator has given signal to do so

5.8 Operation of Small Equipment and Power Tools

Hand and power tools shall be used, inspected, and maintained in accordance with the manufacturer's instructions and recommendations and will be used only for the purpose for which designed. The following requirements shall be followed:

- The tool housing will be checked to be sure it is in good condition (i.e., free of cracks and defects)
- If provided, trigger locks (to prevent accidental activation) will be checked for proper function prior to using the tool
- Tools designed to accommodate guards will be equipped with the guards when in use
- Reciprocating, rotating, and moving parts of equipment shall be guarded whenever possible if exposed to contact by workers
- Moveable guards shall operate freely
- Tools shall be inspected to ascertain safe operating condition and are to be kept clean and free of accumulated dirt
- Electric power tools and extension cords shall be used with ground fault circuit interrupter (GFCI)
- If the tool is not three-wire ground protected, it will be double-insulated

- Portable power cords will be designated as hard usage or extra hard usage and shall not be used if damaged, patched, oil-soaked, worn, or frayed
- For pneumatic power tools, compressed air hoses will be in good condition (no visible cracks, bubbles, or kinks) and hose connections shall be secured such that there are no noticeable air leaks
- Hydraulic tools will be checked to be sure there is no fluid leakage, hydraulic lines are in good condition (no visible cracks, bubbles, or kinks), and connections are secure
- The motor, muffler, spark plugs, and other components of gasoline-powered tools will be checked to be sure they are in good condition. The tools will also be checked for signs of fuel leakage around the gasoline tank or fuel line

5.9 Electrical Hazards

In accordance with OSHA standards (29 CFR 1926.550 and 1910.33), a minimum clearance of 10 feet must be maintained between mechanical equipment and energized overhead power lines. This clearance distance must be increased by four inches for every 10 kV over 50 kV. If it is necessary to approach closer than 10 feet from a power line, one of the two following options will be implemented in accordance with the OSHA standard:

- The line will be will be de-energized and grounded
- An insulating barrier will be erected to prevent contact with the line. The barrier must be rated for the voltage of the line to be guarded

Arrowhead ***will strive to maintain the minimum clearance distances (at least 10 feet) from overhead power lines.*** During operations near overhead power or communication lines, one person involved in the operation (or the SSO) will be assigned the duty of spotter to visually monitor the operation and provide timely warning to equipment operators in the event the minimum clearance distance is violated. In accordance with OSHA standards, the spotter will be positioned "so as to be able to visually monitor the clearance between the equipment and power lines." The observer cannot be assigned other duties that would interfere with the ability to provide safety oversight and timely warnings.

Signs and/or barricades will be place below power lines to alert truck drivers and equipment operators that there are overhead lines above. Typically, this will be accomplished using Type II plastic barriers with signs noting the overhead power lines. In addition, if there are power poles that are near traffic areas, parking areas, or equipment operations, the poles will be protected from moving equipment using concrete barriers such as Jersey Barriers or similar.

Applicable standards for electrical power 29 include CFR 1926 Subpart K. The following general electrical safety provisions shall apply during construction:

- All portable electrical equipment and extension cords shall be protected with a GFCI as part of the circuit
- Use only three-wire ground protected or double insulated power tools
- If a tool is not three-wire ground protected, it will be double-insulated
- Wear rubber-soled shoes/boots and rubber gloves when using tools in wet locations
- To the extent practical, suspend cords above head height when it is necessary to have them across aisles or traffic areas. If cords are placed across aisles or traffic areas for prolonged periods of time, place protective strips over the cord(s)
- Do not hang cords over nails, bolts, or sharp edges
- Replace damaged or frayed power cords immediately
- Immediately discontinue the use of tools that shock, smoke, smell or spark

5.10 Hazardous Energy

The potential for releasing hazardous energy is a significant concern due to the following conditions:

- Utility lines that could become breached during site work
- Release of hazardous energy during maintenance or service of equipment and tools

To minimize the potential for releasing hazardous energy from live utility lines, the following site-specific procedures will be implemented:

- Lockout/tag out procedures – de-energize, depressurize, or isolate energized lines and equipment, as necessary
- Safe excavation methods
- Maintaining safe distances from energized utility lines and appurtenances

Lockout/tag out procedures (referencing 29 CFR 1926.417) will also be implemented during servicing or maintenance of equipment to preclude the unexpected start-up and/or release of stored energy. To prevent the accidental start-up of equipment while a person's hands are near a hazardous location (i.e., point-of-operation, rotating belts, gears), the operator <u>must</u> turn off the power to the machine <u>and</u> apply a lock or otherwise control the power source to ensure that the equipment cannot be inadvertently energized.

5.11 Intrusive Activities

Before any intrusive activity (excavation) begins, positive steps shall be taken to determine the locations of underground utilities. Excavation personnel shall always be alert for marking tape, wires, pipes, previously disturbed soils, crushed stone or sand bedding/backfill, discolored soil, and other indications of the presence of buried utility lines. The following procedure shall be followed to identify the locations of buried utilities prior to commencing intrusive activities. Intrusive activities shall not begin until the Arrowhead designee has signed off on the Intrusive Activities Form, provided in Appendix A.

Note: The process of clearing underground utilities will be on-going throughout the project. If more than two weeks elapse from the date of the initial utility clearance, or if the original markings are faded or obscured, the utility clearance will be repeated before excavation work commences. Construction crews will ensure that underground utility markings are clear and visible prior to excavating.

- The Arrowhead designee will submit the Excavation Permit to PBS Construction Manager at least 2 weeks prior to beginning site preparation and excavation activities. The PBS Utility Surveyor will verify NASA underground drawing records within PBS
- The Arrowhead designee shall contact the utility locating hot line (Ohio One-Call [Ohio811], 1-800-362-2764 or 811) to notify them of intent to initiate intrusive activity at the given property location. This notification will be made a minimum of two working days prior to the initiation of intrusive activity
- A subcontracted private utility locating service will be used to locate utilities on private property and confirm the marking provided by Ohio One-Call
- The utility clearance task will include marking (with spray paint or pin flags) the locations of any underground utilities on pavement and soil surfaces within the site limits and excavation boundaries
- As necessary, local utility providers will be notified and responsible authorities will confirm the presence/absence of utilities on the property. Those service providers with service in the proximity to any work area will visit to the site and mark the locations of the underground utilities
- The Arrowhead designee will ensure that underground utilities have been located and marked on the ground (using stakes, flags, and/or spray paint).
- Once the clearance process is completed, the Arrowhead designee will sign the Intrusive Activities Form (Appendix A)

5.12 Excavation Hazards

All project personnel shall participate in the site-specific training session and be instructed on the following general safety requirements:

- Before commencing excavation, the existence and location of underground pipes, electrical equipment, telephone, gas lines, etc. shall be determined and documented.
- Operations shall be suspended and ignition sources eliminated if a hazardous atmosphere is encountered or suspected
- If excavating equipment is being operated in the vicinity of overhead power lines, minimum clearance distances from energized overhead electric lines will be maintained or the lines will be grounded or guarded

5.13 Material Handling

Various materials and equipment may be handled manually during project operations. Care should be taken when lifting and handling heavy or bulky items to avoid back injuries. Additionally, workers may be exposed to injury from handling materials with sharp edges and from inadvertently dropping materials with slippery surfaces.

The following fundamentals address the proper lifting techniques that are essential in preventing back injuries:

- The size, shape, and weight of the object to be lifted shall first be considered. No individual employee is permitted to lift any object that weighs over 40 pounds. Multiple employees or the use of mechanical lifting devices are required for objects over the 40-pound limit
- The anticipated path to be taken by the lifter should be inspected for the presence of slip, trip, and fall hazards
- The feet shall be placed far enough apart for good balance and stability (typically shoulder width)
- The worker shall get as close to the load as possible. The legs shall be bent at the knees
- The back shall be kept as straight as possible and abdominal muscles should be tightened
- Twisting motions should be avoided when performing manual lifts, i.e., auger flights
- To lift the object, the legs are straightened from their bending position
- A worker shall never carry a load that cannot be seen over or around
- When placing an object down, the stance and position are identical to that for lifting. The legs are bent at the knees and the object lowered
- For high loads, position the body as close as possible to the load, slide the load towards you, and lift with the arms and legs (not the back)

When two or more workers are required to handle the same object, coordination is essential to equally divide the weight between the individuals carrying the load and to make a uniform lift.

When carrying the object, each worker, if possible, shall face the direction in which the object is being carried. Additionally, each worker shall lift, walk, and lower the load together. When carrying loads on the shoulder, each worker shall carry the load on the same shoulder, walk in step, and put the load down together.

To protect the feet and hands from injury, field personnel will be required to wear steel-toed boots and leather gloves, respectively, while performing construction operations.

5.14 Contact with Hot Items

Contact with hot equipment, such as exhaust pipes of gas-powered equipment, hot water from steam sprayer, generators, and equipment tooling, may subject field personnel to burns. Field work will be monitored by the SSO to ensure that workers are either avoiding hot equipment or are using safe work practices to prevent contact with hot equipment. Safe work practices will include the use of PPE (i.e., leather gloves, face shields, protective suits), as necessary, and allowing equipment to cool off before making contact with affected components. In the event a worker is burned, the following procedure will be followed:

- Cool the burned area with cool water and cool, wet cloths
- Expose the area, but do not remove clothing that sticks
- Cover with dry, sterile dressings or clean cloth
- Do not break blisters, apply ointments, or try to clean third degree burns

5.15 Motor Vehicle / Traffic Control Hazards

It is anticipated that excavation activities will be completed within the Plum Brook Station and Firing Ranges 3 and 4 site footprints and may require working on any of the adjacent roads (unnamed road along western side of site, South Magazine Road). Typical equipment operating on public roads will involve mobilizing a skid steer loader, excavator, and associated equipment on trailers pulled by semis or pickup trucks.

Transport of equipment from the support area to work areas

Travel of construction equipment and support vehicles transporting personnel and material about the site will be on existing site trails, to the extent possible, to minimize disturbing vegetation and soil. This will minimize generating dust.

Parking

Site personnel will park in designated locations within the designated support area at the site.

Personnel Travel

All personnel shall drive defensively and wear seat belts while vehicles are in motion. Since backing accidents at these types of projects are frequent, the following guidelines shall be observed:

- Backing of vehicles shall be avoided when possible. Extra care shall be taken to back vehicles when unavoidable
- When parking vehicles, vehicles shall be backed into the space whenever possible
- Before backing a vehicle which has been parked, the driver shall physically walk to the back of the vehicle to observe the area before entering the vehicle
- Spotters shall be used to back vehicles whenever possible

5.16 Heat Stress

Heat stress is a significant concern for summertime work in the Midwest. Heat stress is caused by a number of interacting factors, including environmental conditions, clothing, PPE, workload, and individual characteristics. Heat stress can cause physical discomfort, loss of efficiency, or personal illness/injury. Reduced work tolerance and the increased risk of heat stress are directly influenced by the amount and type of PPE worn. PPE adds weight, bulk, reduces the body's capability for thermoregulation (i.e., evaporation, convection, and radiation), and increases energy expenditure.

If the body's physiological processes fail to maintain a normal body temperature because of excessive heat, a number of physical reactions can occur - ranging from mild to fatal. These physical reactions to excessive heat include:

- Heat rash is caused by continuous exposure to heat and humidity and aggravated by chafing clothes. Heat rash decreases the body's ability to tolerate heat in addition to being a nuisance
- Heat cramps are caused by profuse perspiration with inadequate electrolytic fluid replacement. Heat cramps cause painful muscle spasms and pain in the extremities and abdomen
- Heat exhaustion is caused by increased stress on various organs to meet increased demand to cool the body. Heat exhaustion causes shallow breathing; pale, cool, moist skin; profuse sweating; and dizziness

- Heat stroke is the most severe form of heat stress. Heat stroke symptoms include hot, dry skin; no perspiration; nausea; dizziness; confusion; strong, rapid pulse; coma; and sometimes death. Heat stroke is a serious medical emergency. The affected person shall be cooled down rapidly and medical attention must be given immediately

The following practices will help prevent heat stress:

- Acclimatize workers to hot working conditions
- Provide plenty of liquids to replace the body fluids lost by perspiration. Fluid intake should be forced because, under conditions of heat stress, the normal thirst mechanism is not adequate to bring about a voluntary replacement of lost fluids
- Provide personal cooling devices
- Conduct strenuous field operations in the early morning
- Rotate personnel to various job duties
- Establish adequate work/rest cycles

Individuals or coworkers expressing the symptoms of heat stress shall notify the SSO or Site Supervisor immediately. **At the onset of heat related illness, activities must be halted and treatment initiated**. Early detection and treatment of heat stress helps to prevent further serious illness or injury. Individuals that have experienced heat related illness can become more sensitive and predisposed to additional heat stress related problems.

Heat exhaustion can be alleviated by having the affected person rest in a cool, shaded location and have them drink cool water. **In a heat stroke situation, the body must be cooled immediately to prevent severe injury or death - medical attention must be immediately obtained**. To cool down the affected person's body:

- Remove impermeable PPE
- Remove worker from the hot environment
- Apply copious amounts of cool (not cold) water to the body
- Have the person drink cool water, not cold, if conscious

Adequate work/rest periods shall be implemented as necessary to prevent heat stress on personnel. However, since individuals vary in their susceptibility to heat stress, field personnel will be reminded to perform physiological monitoring to aid in measuring individual response to heat stress. Physiological monitoring will become applicable when ambient temperatures exceed 70 ºF.

NOAA's National Weather Service

Heat Index

Temperature (°F)

Relative Humidity (%)	80	82	84	86	88	90	92	94	96	98	100	102	104	106	108	110
40	80	81	83	85	88	91	94	97	101	105	109	114	119	124	130	136
45	80	82	84	87	89	93	96	100	104	109	114	119	124	130	137	
50	81	83	85	88	91	95	99	103	108	113	118	124	131	137		
55	81	84	86	89	93	97	101	106	112	117	124	130	137			
60	82	84	88	91	95	100	105	110	116	123	129	137				
65	82	85	89	93	98	103	108	114	121	128	136					
70	83	86	90	95	100	105	112	119	126	134						
75	84	88	92	97	103	109	116	124	132							
80	84	89	94	100	106	113	121	129								
85	85	90	96	102	110	117	126	135								
90	86	91	98	105	113	122	131									
95	86	93	100	108	117	127										
100	87	95	103	112	121	132										

Likelihood of Heat Disorders with Prolonged Exposure or Strenuous Activity

Caution | Extreme Caution | Danger | Extreme Danger

Heat Index	Risk Level Category	Work/Rest Regimen	Mandatory Break Duration
< 91°F	Category 1	Continuous Work, Self-paced rest periods	N/A
91 - 103°F	Category 2	Light Work: Take self-paced breaks Heavy Work: Take a break every 45 minutes	10 - 15 minutes
104 - 114°F	Category 3	Light Work: Take a break every 60 minutes Heavy Work: Take a break every 30 minutes	15 - 20 minutes
115 - 124°F	Category 4	Light Work: Take a break every 45 minutes Heavy Work: Take a break every 15 minutes	30 minutes
> 124°F	Category 5	Break frequency should be reviewed and discussed between project management and safety managers.	

** Workers wearing polypropylene coveralls or pants, adjust the heat index by making an addition of 1°F.*

<u>Work Type Examples (not all inclusive and meant as a guide):</u>

<u>Light Work:</u>

- Operating Equipment (Excavators, Skid Steers, Haul Trucks, etc.)
- Carrying light objects or tools (under 10lbs)
- Sweeping or cleaning up job site/shop area

Heavy Work:

- Hand digging
- Carrying/moving heavy objects or tools (35+lbs)

5.17 Cold Stress

The adverse effects of cold weather are a concern during the winter months. While hypothermia should be recognized as a potential hazard, the highest probability of worker injury is though frost-bite. Workplace monitoring shall begin where the environmental temperatures fall below 60.8°F so that the ACGIH Cold Stress standard (TLV) can be applied. Control measures to prevent adverse physiological affects from cold weather should be implemented prior to the exhibition of any signs or symptoms.

Frostbite occurs when the extremities do not get sufficient heat from the central body stores. The fluids around the cells of the body tissues can freeze from exposure to low temperatures. This freezing can result in damage and loss of tissue. The most vulnerable areas for frostbite are the nose, cheeks, ears, fingers, and toes. Skin and tissue damage from frostbite can result in scarring, tissue death, permanent loss of movement, or amputation. There are three degrees of frostbite:

- First Degree - Freezing without blistering or peeling
- Second Degree - Freezing with blistering or peeling
- Third Degree - Freezing with skin tissue death and possible deeper tissue damage.

Symptoms of frostbite include:

- Skin color changes to white or grayish-yellow, to reddish-violet, and finally black as the tissue dies
- Coldness or numbness of the affected part
- Pain may be felt at first, but subsides.

Hypothermia, or a drop in body core temperature, is a dangerous condition resulting from cold stress. Employees should be protected from exposure to cold so that their deep-core body temperature does not fall below 97.6° F. A lower body temperature can result in reduced mental alertness, reduction in rational decision-making, or loss of consciousness with the threat of fatal consequences. The symptoms of hypothermia are:

- First, uncontrollable shivering and the sensation of cold
- Heartbeat slows and may become irregular
- Pulse weakens and the blood pressure changes
- As the body's core temperature drops, other signs may include cool skin, slow irregular breathing, slurred speech, loss of coordination, and apparent exhaustion
- The victim may become listless, confused, exhibit severe shivering, or develop severe pain in the extremities
- The advanced/final signs of hypothermia are a significant drop in blood pressure, fatigue, shallow respiration, coma, and death.

When the ambient air temperature falls below 36° F (inside or outside the building), the following requirements shall apply:

- If wind chill is a factor, the cooling effect of the wind shall be reduced by shielding the work area or providing employees an outer wind breaking layer of clothing
- Extremities (i.e., fingers, ears, toes, and nose) shall be protected from extreme cold by protective clothing
- Employees performing light work and whose clothing may become wet shall wear an outer layer of clothing that is impermeable to water
- Employees performing moderate to heavy work and whose clothing may become wet shall wear an outer layer of clothing that is water repellent
- Outer garments shall provide for ventilation to prevent wetting of inner clothing by sweat
- If clothing is wet, the employee shall change into dry clothes before entering a cold environment
- Workers shall change socks and removable felt insoles at regular daily intervals or use vapor barrier boots
- Workers who become immersed in water or whose clothing becomes wet shall immediately be provided a change of clothing and be treated for hypothermia if necessary. If the clothing becomes wet from sweating, the employee may finish the task that caused the sweating before changing into dry clothes
- Metal handles of tools and control bars will be covered by thermal insulating materials when temperatures fall below 30º F

Individuals or coworkers expressing the symptoms of hypothermia or frostbite shall notify the SSHO or Field Supervisor immediately. At the onset of cold related illness, <u>activities must be halted and treatment initiated</u>. Early detection and treatment of hypothermia or frostbite will prevent further serious illness or injury.

Frostbite can be alleviated by having the affected body parts gently warmed with room temperature water. Never rub frostbitten skin. Seek medical attention for all but the mildest cases of frostbite. In a hypothermic situation, the body must be warmed immediately to prevent severe injury or death - medical attention must be immediately obtained. To warm up the affected person's body:

- Bring affected person to a warm room
- Remove impermeable PPE and wet clothing
- Wrap person in warm coats
- Have them drink warm liquids, if conscious

5.18 Blood Borne Pathogens

Exposure to blood borne pathogens may occur when rendering first aid or CPR, or when coming into contact with landfill waste or waste streams containing potentially infectious material (PIM).

- Hepatitis B vaccine (HBV) is offered to employees who may be exposed to PIM when they complete training and within 10 working days of assignment. (Note: Employees whose exposure stems only from rendering first aid as a collateral duty receives the vaccine after exposure.)
- Employees who decline the HBV vaccine must sign the declination form (contact regional Safety Program Assistant [SPA]) indicating they declined the vaccination. Anyone who declines the vaccination and chooses to receive the vaccination at a later time may still receive the vaccination by contacting the SPA.
- Hepatitis B and tetanus vaccinations can be requested by completing the medical portion of the enrollment form, located under Tools & Forms at the HS&E web page, or by contacting the regional SPA.

Work Controls

- Observe universal precautions to prevent contact with blood or other PIMs. Where differentiation between body fluid types is difficult or impossible, consider all body fluids to be potentially infectious materials
- Consider all sharps encountered at industrial, medical, dental, or biological waste facilities or sampling locations to be contaminated and PIMs
- Always wash your hands and face with soap and running water after contacting PIMs. If washing facilities are unavailable, use an antiseptic cleanser with clean paper towels or moist towelettes. These must be provided for employees who have been exposed to PIMs. When antiseptic cleansers or towelettes are used, always rewash your hands and

face with soap and running water as soon as available. Do not consume food or beverages until after thoroughly washing your hands and face

- Decontaminate all potentially contaminated equipment and environmental surfaces with chlorine bleach as soon as possible. Clean and decontaminate on a regular basis (and immediately upon visible contamination) all bins, pails, cans, and other receptacles intended for reuse that have the potential for becoming contaminated
- Use one part chlorine bleach (5.25 percent sodium hypochlorite solution) diluted with 10 parts water for decontaminating equipment or surfaces after initially removing blood or other PIMs. Remove contaminated PPE as soon as possible before leaving a work area
- Place regulated waste in containers that are closable and are constructed to contain all contents and prevent leakage of fluids during handling, storage, transport or shipping, are labeled with a biological warning label or color-coded, and are tightly closed prior to removal to prevent spillage or protrusion of contents during handling, storage, transport, or shipping. These activities are typically coordinated through NASA Waste Management.

Employees who participate in waste characterization studies, sort or sample refuse, or contact medical, dental, or biological waste streams should follow these procedures:

- If exposure is anticipated, this group of employees should wear safety goggles or glasses, puncture-resistant utility gloves with inner latex glove liners, Tyvek coveralls or cotton coveralls with a rubber apron, and puncture-resistant shoes or boots
- If splash potential is present, employees should wear a full-face shield
- If a respiratory hazard is present, a full-face respirator with HEPA filters should be worn

Post Exposure

A confidential medical examination will be provided should an exposure to PIM occur. This examination includes the following procedures:

- Documenting the exposure
- Testing the exposed employee's and the source individual's blood (with consent)
- Administering post-exposure prophylaxis

5.19 Environmental Hazards

Bees and Other Stinging Insects

Bees and other stinging insects may be encountered almost anywhere and may present a serious hazard, particularly to people who are allergic. Watch for and avoid nests. Keep exposed skin to a minimum. Carry a kit if you have had allergic reactions in the past, and inform your supervisor

and/or buddy. If a stinger is present, remove it carefully with tweezers. Wash and disinfect the wound, cover it, and apply ice. Watch for allergic reaction; contact 911 immediately if a severe reaction occurs.

Mosquito Bites

Due to the possibility of the West Nile Virus being present at the site, it is recommended that preventative measures be taken to reduce the probability of being bitten by mosquitoes whenever possible. Mosquitoes are believed to be the primary source for exposure to the West Nile Virus as well as several other types of encephalitis. The following guidelines should be followed to reduce the risk of these concerns for working in areas where mosquitoes are prevalent.

- Stay indoors at dawn, dusk, and in the early evening.
- Wear long-sleeved shirts and long pants whenever you are outdoors.
- Spray clothing with repellents containing permethrin or DEET since mosquitoes may bite through thin clothing.
- Apply insect repellent sparingly to exposed skin. An effective repellent will contain 35% DEET (N,N-diethyl-meta-toluamide). Repellents may irritate the eyes and mouth, so avoid applying repellent to the hands.
- Whenever you use an insecticide or insect repellent, be sure to read and follow the manufacturer's DIRECTIONS FOR USE, as printed on the product.
- Note: Vitamin B and ultrasonic" devices are NOT effective in preventing mosquito bites.

Symptoms of Exposure to the West Nile Virus

Most infections are mild, and symptoms include fever, headache, and body aches, occasionally with skin rash and swollen lymph glands. More severe infection may be marked by headache, high fever, neck stiffness, stupor, disorientation, coma, tremors, convulsions, muscle weakness, paralysis, and, rarely, death. The West Nile Virus incubation period is from 3-15 days.

Poison Ivy, Poison Oak, and Poison Sumac

Poison ivy, poison oak, and poison sumac typically are found in brush or wooded areas. They are more commonly found in moist areas or along the edges of wooded areas. Shrubs are usually 12 to 30 inches high, or can also be a tree-climbing vine, with triple leaflets and short, smooth hair underneath. Plants are red and dark green in Spring and Summer, with yellowing leaves anytime especially in dry areas. Leaves may achieve bright reds in Fall, but plants lose its (yellowed, then brown) leaves in Winter, leaving toxic stems. All parts of the plant remain toxic throughout the seasons. These plants contain urushiol (you-ROO-shee-ol), a colorless or pale yellow oil that

oozes from any cut or crushed part of the plant, including the roots, stems and leaves and causes allergic skin reactions when contacted. The oil is active year round.

Snakes

Snakes typically are found in underbrush and tall grassy areas. If you encounter a snake, stay calm and look around, there may be other snakes. Turn around and walk away on the same path you used to approach the area. If a person is bitten by a snake, wash and immobilize the injured area, keeping it lower than the heart if possible. DO NOT apply ice, cut the wound, or apply a tourniquet. Try to identify the type of snake: note color, size, patterns, and markings.

Ticks

Every year employees are exposed to tick bites at work and at home putting them at risk of illness. Ticks typically are in wooded areas, bushes, tall grass, and brush. Ticks are black, black and red, or brown and can be up to one-quarter inch in size.

In some geographic areas, exposure is not easily avoided. The threat can be minimized by wearing tightly woven light-colored clothing with long sleeves, tucking pant legs into boots, spraying only outside of clothing with permethrin or permanone, spraying skin with only DEET, wearing permethrin-treated tick/chigger gaiters, and checking frequently for ticks. Where site conditions warrant (vegetation above knee height, tick endemic area) or when tasks warrant (e.g., having to sit/kneel in vegetation) that diminish the effectiveness of the other controls mentioned above, bug-out suits /Tyvek shall be used. Bug-out suits are more breathable than Tyvek.

Take precautions to avoid exposure by including pre-planning measures for biological hazards prior to starting field work. Use preventative equipment such as repellants, protective clothing and tick removal kits. Use the buddy system and perform tick inspections prior to entering the field vehicle. If ticks were not planned to be encountered and are observed, do not continue field work until these controls can be implemented.

Be aware of the symptoms of Lyme disease or Rocky Mountain spotted fever (RMSF). Lyme: a rash might appear that looks like a bullseye with a small welt in the center. RMSF: a rash of red spots under the skin 3 to 10 days after the tick bite. In both RMSF and Lyme disease, chills, fever, headache, fatigue, stiff neck, and bone pain may develop.

6.0 Personal Protective Equipment

When engineering and administrative controls are not feasible or adequate to protect personnel from the hazards associated with project activities, PPE use will be required. This section discusses the anticipated PPE requirements for the project. However, PPE requirements may be adjusted (upgraded or downgraded) in the field based on actual field conditions and/or results of air monitoring activities. The site-specific PPE requirements are discussed below and are summarized in Table 6-1.

6.1 Respiratory Protection

Arrowhead's approach for respiratory protection involves aggressive dust control measures for maintaining dust / COC at safe levels and using the appropriate level of PPE. The excavation work will start at Level C and downgrade or upgrade as needed based on sampling results and other pertinent factors. As an example, if work is being performed at Level D but dust levels become elevated due to dry conditions and wind, work will be stopped and suppression measures increased until dust levels diminish. If dust suppression cannot bring the dust levels below a safe level, PPE will be increased to Level C with respiratory protection.

The Arrowhead SSO is not restricted from requiring respiratory protection at other times when site conditions become hazardous to personnel. If respiratory protection becomes necessary, personnel will don respirator style appropriate for the task with filters appropriate for the hazard. Respiratory protection equipment shall be NIOSH-approved, and respirator use will conform to ANSI Z88.2 and OSHA 29 CFR 1910.134 requirements. All personnel using APRs shall have successfully passed a respirator fit test within the last 12 months. Fit testing and any training related to respiratory protection for site personnel will be documented. Respirators shall be inspected before each use for damage, missing parts, and proper function.

6.2 Levels of Protection

Excavation activities will be conducted in Level C protection at the start of the project while air sampling is conducted to determine the appropriate level of protection. It is anticipated that about 3 weeks will be needed to collect enough information to make the determination. If appropriate, the level of protection can be decreased to Level D-Modified or Level D. Note that samples will continue to be collected throughout the project and that the level of protection can be changed at any time the SSO deems it appropriate. Levels of PPE shall not be downgraded without prior approval from the Arrowhead SSO.

Level D protection represents the minimum requirements for PPE and shall, at a minimum, consist of:

- High-visibility vests
- Shirt, long pants
- Steel-toed work boots
- Safety glasses with side-shields
- Hearing protection (as required)
- Vinyl or nitrile gloves when handling fluids
- Work gloves, such as leather, cotton, or other material that provides cut/abrasion resistance (as necessary) – i.e. leather gloves when utilizing hand and power tools
- Hard hat

Level D-Modified and Level C PPE shall, at a minimum, consist of:

- High-visibility vests
- Long pants
- Steel-toed boots
- Safety glasses with side-shields
- Uncoated disposable pants or uncoated disposable coveralls, such as Tyvek™ or Kleenguard™, with short sleeve shirt
- Vinyl or nitrile gloves
- Work gloves, such as leather, cotton, or other material that provides cut/abrasion resistance (as necessary) - i.e. leather gloves when utilizing hand and power tools
- Hearing protection
- Hard-hat
- Full-face APR with HEPA filters (Level C only)

In general, levels of PPE are subject to change or modification based on sampling results and changing conditions. PPE can be upgraded or downgraded based on changing site conditions. A change in PPE may occur based on real-time air monitoring, time integrated air sampling results, weather conditions (e.g., dry/windy, rainy/calm), site activities, or any other factor that might impact worker safety. It is the responsibility of all site workers to raise concerns about the level of PPE to the SSO for discussion. However, only the SSO can make the decision to downgrade the level of PPE.

7.0 Site Control and Work Zones

The primary purposes of site control are to protect personnel and public from chemical and physical hazards associated with site activities and to prevent the spread of contamination to clean areas. The work areas that pose physical hazards to personnel will be regarded as regulated or restricted. If significant exposure to site contaminants within a given work area is known or suspected, the area will be designated an exclusion zone. These areas will be established in general accordance with *Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities* (NIOSH, et al. 1985).

7.1 Staging Area

The main staging area for all of the excavation activities will be located at the northern open field area of the Firing Ranges 3 and 4 north of South Magazine Road. Arrowhead will procure an office trailer for use by on-site personnel, located at the ECCL Firing Range's former clubhouse area (outside of PBS boundary). The NASA on-site support contractor (TFOME) will provide a power drop and electrical panel that will be used to provide electrical power to the office trailer. The office will be furnished with desks, drafting table, storage, and meeting area. The office will be equipped with cellular telephones, Hot Spot internet access, portable computers, printer/scanner/fax/copier machine, and potable water.

A small parking area will be designated for private vehicles. A Conex box or enclosed trailer will be set up in the staging area for storage of supplies. Areas will be designated for equipment, tool trailers, and trucks. Lavatory units and hand wash stations will be set up in the staging area as needed.

A temporary equipment decontamination pad will also be constructed in the footprint of Firing Range 3 and 4 with a polyethylene liner and hay bales. The solid material will be added to the contaminated soil pile for transportation and disposal with the soil. The water will be allowed to evaporate, if possible, or will be contained, sampled, and disposed with approval of NASA Waste Management.

7.2 Exclusion Zones / Restricted Areas

Due to the presence of physical and chemical hazards (COCs), all areas where construction activities are in progress will be considered restricted. Until such time that contaminated media

is covered with clean fill, the entire limits of excavation will be treated as an exclusion zone, where only certified (HAZWOPER) personnel will be allowed to enter. Access to excavations will be controlled using orange construction fencing and/or other appropriate barricades.

Where formal work zones are necessary, they will be established as discussed below.

Support Zone

A Support Zone will be established for workers to take breaks, eat lunch, etc. Worker personal items will be left in the Support Zone. The Support Zone will be near the Exclusion Zone but will not interfere with work activities. Emergency equipment and supplies such as first aid kits, eye wash bottles, fire extinguishers, etc. will be staged in the Support Zone. Workers will don PPE in the Support Zone before moving through the Contaminant Reduction Zone into the Exclusion Zone.

Contaminant Reduction Zone

A Contaminant Reduction Zone (CRZ) will be established between the Exclusion Zone and the Support Zone. When exiting the Exclusion Zone, workers will remove PPE in the CRZ prior to entering the Support Zone. In addition, workers can drink water in the CRZ provided that they have removed coveralls to the waist, removed gloves, and cleaned hands using hand wipes. Tyvek pants and boots do not need to be removed prior to drinking water.

Exclusion Zone

The Exclusion Zone will be clearly identified and marked as restricted with construction fencing, traffic cones, warning tape or other appropriate barriers placed at the boundary of each restricted area. Restricted area boundaries will be established and modified by the SSO or Site Supervisor as construction activities progress. Personnel working within exclusion zones will be required to employ PPE, conventional sanitation practices, and personnel / equipment decontamination procedures to minimize the spread of contamination.

7.3 Site Entry Requirements

Project personnel will monitor the site for entry by unauthorized personnel. Visitors will be required to sign an entry/visitor log located inside the site trailer. Visitors not directly involved in onsite project activities will not be permitted to enter restricted areas or exclusion zones without first checking with the Site Supervisor or SSO. In order to allow an individual into a restricted area or exclusion zone, he/she must meet the following requirements:

- Documentation of training requirements (refer to Section 11.0)
- Obtain authorization from Site Supervisor or SSO
- Attend an orientation meeting with the SSO
- Don the appropriate PPE
- Sign the site entry log

Visitors will be escorted at all times.

8.0 Decontamination

8.1 Personnel Decontamination

In general, field personnel will not make direct contact with contaminated media at the site, or contact will be minimal and incidental. The majority of contaminated media will be moved, placed, and covered using heavy construction equipment. Accordingly, personnel decontamination will consist of using "best management" sanitation practices, including:

- Brush / rinse / wash soiled work boots as needed
- Remove and dispose soiled coveralls as needed (Modified D)
- Remove and dispose soiled gloves as needed
- Wash and rinse hands and face on a regular basis
- Shower regularly
- Launder work clothing regularly
- Avoid distributing / transporting contaminated media to clean areas

8.2 Equipment Decontamination

Equipment used to excavate contaminated soil will be dry decontaminated using shovels and brooms prior to moving the equipment from a contaminated area to a clean area.

Prior to demobilizing equipment from the site, all equipment making contact with contaminated soil (including the excavator bucket) will be properly decontaminated to remove all contamination that may be adhering to the equipment surfaces. Decontamination will generally consist of spraying with a low volume, high pressure (or steam) washer. A "decontamination pad" will be constructed (using plastic sheeting, lumber, hay bales, etc.) at the support area to promote the collection / recovery of rinse water. At the conclusion the field work, all equipment will be thoroughly decontaminated prior to being returned to vendors. The SSO or Site Supervisor will inspect all equipment leaving the site for adequacy of decontamination.

The SSO will establish and monitor the decontamination procedures and their effectiveness. Decontamination procedures found to be ineffective will be modified accordingly.

9.0 Air Monitoring

9.1 Perimeter Air Monitoring

Arrowhead will perform perimeter air monitoring and air sampling during excavation and associated activities, including the following:

- Perimeter air monitoring stations at four locations along the perimeter of the site. The perimeter air monitoring stations will be established between the primary work areas and the location of potential receptors
- Real-time air monitoring of particulate dust using DustTrak™ monitors for the analysis of total dust
- Collection of air monitoring samples for analysis of lead. Samples will be collected using variable airflow sampling pumps and drawn through filter cassettes for laboratory analysis
- Evaluation of air sample data to determine if action levels have been exceeded
- Provide air monitoring data to site personnel and others as necessary to manage site work activities to meet air quality action levels at the site perimeter

Arrowhead will conduct personal air sampling using time-integrated air sampling, discussed below, to verify that administrative controls, engineering controls, and PPE are effectively preventing harmful exposures to project personnel.

9.2 Personal Air Sampling

Personal air sampling will be conducted to verify that administrative controls, engineering controls, and PPE are effectively preventing harmful exposures to project personnel. Time-integrated air sampling will be conducted as directed by the SSO to quantify lead in comparison to permissible exposure limits (PELs) and risk-based inhalation levels. Air sampling to assess worker exposure will be conducted in accordance with the NIOSH Method 7300. Personal air samples will be collected from the breathing zone using low-volume sampling pumps. The pump and appropriate filter cassette (37 mm, 2.0 micron, pre-weighed Teflon filter) will be attached to a field crew member performing the operation being evaluated. Personal air samples will be collected at the following general frequencies:

- Two samples per day for the first week, worn by personnel representing worst-case soil and dust exposure, including mechanical excavation crews
- One to two samples per week thereafter based on the results from the first week
- Possible reduction as construction activities near completion, based on historic results

The general procedure for collecting air samples is as follows:

- Components of the air sampling system shall include the sample media (cassette or cartridge), and sampling pumps (low-volume sampling pump for personal samples and perimeter samples)
- The sampler/cassette will be attached to the sampling pump via vinyl tubing
- The sampling pump will be turned on, and the initial flow rate will be checked (with the sampler in line) using a rotameter or other approved air flow measurement device
- The flow rate will then be adjusted to the required flow rate for sampling
- After noting the specific start time, the air sampling system will be operated continuously over a time period sufficient for collecting the required air volume
- Once the sample is completed, the specific finish time will be noted, and the sampling pump will be turned off. The final flow rate will be checked using a rotameter or other air flow measurement device
- The sampler/cassette will then be detached from the tubing and capped at both ends (inlet and outlet) or placed in appropriate vials
- The sample will be labeled with the sample ID and packaged for shipment to the laboratory
- The following parameters will be documented: sample ID, total sample time (in minutes, based on start and finish times), average flow rate (in liters per minute, based on initial and final flow rates), and total volume (flow rate x total time)

10.0 Emergency Response Plan

An emergency situation is defined as a sudden, generally unexpected occurrence demanding immediate action. Emergencies may include accidents, injuries requiring medical care, fires, explosions, spills and other significant releases hazardous substances, and extreme weather events.

10.1 Emergency Responsibilities and Authority

The Site Supervisor/SSO will be responsible for implementing and directing emergency response procedures and determining appropriate response actions, including the decision whether or not to evacuate or take shelter. Local authorities (including NASA Plum Brook Station Dispatch [419-621-3222]) will decide if the emergency requires evacuation of the surrounding community. Responsibility for community evacuations will be with the local authority in charge of the emergency

10.2 Emergency Contacts and Notification

Telephone numbers for emergency contacts will be maintained and posted at the site. The PM, and Site Supervisor/SSO will be notified immediately in the event of an emergency. The Site Supervisor/SSO will immediately evaluate the incident and, if necessary, notify emergency response personnel by calling NASA Plum Brook Station Dispatch (419-621-3222).

DO NOT CALL 911 from a cell phone, dial 419-621-3222. CALL 911 from a NASA phone

The utility owner will be contacted in the event that a gas or electrical utility is struck during excavation. NASA Plum Brook Station Dispatch will be notified in the event of fire, significant hazardous material spill, or other emergency beyond the capabilities of project personnel. Emergency Medical Services (EMS) will be contacted by calling NASA Plum Brook Station Dispatch (419-621-3222) in the event of personal injury or medical emergency (beyond minor first-aid). The information provided to the emergency contact should include the nature of the incident and the exact location. Specifically, the information shall include:

- Name and telephone number of the individual reporting the incident
- Location and type of incident
- Nature of the incident (i.e., fire, explosion, spill, or release) and substances involved (if any)
- Number and nature of medical injuries

- Potential for additional risks or dangers
- Potential off-site risks or dangers
- Movement or direction of spill/vapor/smoke
- Response actions currently in progress
- Estimate of quantity of any released materials
- Status of incident
- Other pertinent information.

10.3 Medical/Personal Injury Response

Minor injuries will be treated on-site by qualified first-aid/CPR responders. In the event of moderate to severe physical injury, NASA Plum Brook Station Dispatch (419-621-3222) shall be contacted to arrange EMS transport. A map to the nearest local medical facility is presented in Figure 3-1. The following procedure will be implemented in the event of an emergency:

1) Assess and Stabilize the Victim (Conscious or Unconscious, severity of injury, life threatening or superficial injury, body temperature) using First Aid
2) Immediately notify Site Manager of incident
3) Call NASA Plum Brook Station Dispatch (419-621-3222)
4) If practical, identify the nature of the injury and vital statistics—this will help the dispatcher identify the type of response equipment needed—i.e., man-basket for head or neck injury or EMT burn unit for burn related injury
5) Describe to the dispatcher the nature and extent of the incident or injury

However, injured personnel who require medical treatment beyond minor first-aid, shall be transported to the hospital by EMS. First-aid and emergency eyewash equipment shall be available at the site. Personnel will be notified as to the locations of first-aid equipment and eyewash stations during the initial safety briefing session. The following procedures will be implemented in the event of a personal injury (other than first-aid only):

- Administer first-aid and contact the Site Supervisor/SSO to arrange for dispatch of the EMS.
- When the situation has been stabilized, decontaminate the injured person. Do not perform decontamination if it interferes with emergency treatment, such as in a life-threatening situation.
- Move the person to the support area if there is no risk of further injury.
- Wait for emergency care, and maintain radio contact with the Site Supervisor/SSO.

If the injury or illness occurs from exposure to a hazardous substance, rapid identification of that substance should be attempted. This information shall be provided to the medical personnel,

which may include SDS for operational chemicals. In the event of a chemical exposure, the following procedures shall be followed:

- **Skin Contact.** Flush with water; remove clothing, flush skin with water; obtain medical attention.
- **Inhalation.** Remove the person from the area; administer first-aid/CPR, as needed; obtain medical attention.
- **Ingestion.** Contact the Poison Control Center (800-222-1222) for immediate treatment, then obtain medical attention. Inducing vomiting may cause further injury to the victim; follow instructions from the SDS and/or Poison Control Center.
- **Eye Contact.** Flush eyes immediately with water. Corrosive materials require flushing with water for a minimum of 15 minutes. Obtain medical attention.

10.4 Fire Response

In the event of a fire or explosion at the site, the following actions shall be implemented:

- Evacuate all personnel to a safe location upwind or crosswind of the incident. Contact the PM and Site Supervisor/SSO.
- Concurrently with the above, contact NASA Plum Brook Station Dispatch (419-621-3222).
- If personnel are present who have had training in the use of fire extinguishers, use available fire extinguishers to extinguish fires in their incipient stages.
- Alert the local hospital of the possibility of fire victims, as appropriate.

Following the incident, details shall be documented in the field logbook or on an Incident Investigation Report form (Appendix A).

10.5 Spill Prevention and Response

The following measures shall be taken to minimize the possibility of spills/discharges:

- Site security and controls are to be maintained so that only authorized personnel have access to work areas.
- Site personnel will be advised of appropriate spill/discharge control measures.
- Containers (drums) will remain closed except when adding/dispensing product.
- Containers will be stored upright and in an orderly fashion.
- Appropriate secondary containment structures will be used for storage of fluids on-site.
- Storage containment will be examined daily.

- Small containers of chemical product will be stored inside the job box when not in use. Flammable products will be stored inside approved cabinets.

If a spill or other release of a hazardous material occurs, the Site Supervisor/SSO will be immediately notified. The Site Supervisor/SSO will immediately notify spill response personnel by calling NASA Plum Brook Station Dispatch (419-621-3222). An assessment will be made of the magnitude and potential impact of the release. If it is safe to do so, site personnel will attempt to locate the source of the release, prevent further release, and contain the spilled and/or affected materials as follows:

- The spill or release area will be approached from upwind (if outside).
- Hazards will be identified based on available information from witnesses or material identification documents (i.e., placards, SDS). The potential hazards will be evaluated to determine the proper personal protection levels, methods, and equipment necessary for response.
- If necessary, the spill area will be evacuated, isolated, and secured.
- The spill area will be sealed off using caution tape or other appropriate means.
- Entry to the spill area will be made by personnel with the PPE, training, methods, and equipment necessary to perform the work. Hazardous spill containment and collection will be performed as follows:
  - Contain the spill with absorbent socks, booms, granules, or construction of temporary dikes. Cover or dike floor drains, storm drains, and other conduits for off-site migration of the spilled material.
  - Control the spill at the source by plugging leaks, up-righting containers, over packing containers, or transferring contents of a leaking container.
  - Collect the spilled material with shovels and other equipment as necessary.
  - Store the spilled material in drums for further treatment or disposal by NASA Waste Management.
  - Decontaminate personnel and equipment after the response is complete.

If site personnel cannot safely respond to an environmental release, evacuation of the area may be warranted. Upon arrival at the site, the Site Supervisor/SSO will brief emergency responders of the current status and potential hazards. Following a spill incident, details shall be documented in the field logbook and on an Incident Investigation Report form (Appendix A).

10.6 Evacuation Procedures

In the event that site evacuation is required, an announcement will be made to field crews using verbal communication, cellular phones, or two-way radios. **Personnel working in the**

restricted area will immediately proceed to the designated safe area (selected by the SSO at the start of the project) for a "head count".

10.7 Severe Weather Procedure

Personnel should be aware of the possibility for severe weather. Necessary precautions or response, directed by the SSO, will be taken in the event of severe weather. Local weather broadcasts will be monitored by the Site Supervisor / SSO when severe weather is imminent. For severe weather associated with lightning, advanced warning notices will be used as a basis for temporarily discontinuing fieldwork. In the event lightning is viewed in the project area the SSO will notify project personnel to stop work and seek shelter. Project personnel shall seek shelter in vehicles or the closest structure available if required. When fieldwork is discontinued due to lightning, field crew members remaining out at the project properties should wait 30 minutes prior to returning to work. For severe weather events, direct announcements will be used to alert crews of threatening weather and recommendations to take shelter. **Accordingly, personnel should take refuge in a nearby building as selected by the SSO at the start of the project**. Pending on-site verification, the Plum Brook Station main gate/security building 7235 will be considered the nearest shelter from severe weather.

10.8 Emergency Equipment

At a minimum, the following emergency equipment shall be maintained at the site:

- Fire extinguishers
- First-aid kits
- Blood-borne pathogen control kit
- Emergency eyewash
- Communication devices (cellular phones and/or two-way radios)

This equipment will be inspected by the SSO on a regular basis during the project to verify that they are in good condition, ready to use, and easily accessible.

11.0 Training and Medical Monitoring Requirements

The SSO is responsible for informing all site personnel and all visitors of the contents of this HASP and ensuring that each person accepts the provisions of the HASP (by signing the HASP Acknowledgment Form in Appendix A) prior to working on the site. Documentation of training certification(s) for project personnel will be reviewed by the SSO and filed on-site.

Supervisors must complete HSE training that covers, at minimum, record keeping, incident investigation, regulatory agency inspections, HSE documentation requirements, and OSHA 10-hour course for construction, unless otherwise specified by local legislation (e.g., by the State OSHA 30-hour course for construction supervisors).

11.1 HAZWOPER Training

Full-time construction personnel will be required to meet the HAZWOPER training requirements per 29 CFR 1926.65 and 29 CFR 1910.120, including an initial 40-hour training course and an 8-hour refresher class within the past 12 months. One or more Arrowhead personnel will have HAZWOPER 8-Hour Supervisor training.

11.2 Daily Tailgate Safety Meetings

The Site Supervisor/SSO (or designee) shall conduct a safety meeting at the beginning of each shift. The topics discussed at this daily "tailgate" safety meeting shall include:

- H&S considerations for the day's activities
- Hazard assessments
- Engineering controls to be implemented
- Required PPE
- H&S supply inventory
- Problems encountered and lesson's learned
- Areas/activities requiring special warning or caution
- Related safety topics

Attendance records and meeting notes will be recorded on the Daily Tailgate Safety Meeting Log (Appendix A). Daily Tailgate Safety Meeting Log will be maintained with the project files.

11.3 Site-Specific Orientation Meetings

All personnel, including subcontractors, working at the site shall attend a site-specific orientation covering the following topics:

- Purpose and review of the HASP
- Names and responsibilities of personnel responsible for site safety
- The provisions for medical care and facilities and the names of CPR and first-aid trained personnel assigned to the project
- H&S hazards on-site and the means to control/eliminate those hazards
- Procedures for reporting and correcting unsafe conditions or practices
- Responsibilities for reporting all accidents and illnesses
- PPE requirements, use, and care
- Location of safety equipment (i.e., fire extinguishers, first-aid kits, eye wash stations)
- Standard operating procedures, safety rules, and safe work practices for the project
- Hazard Communication Program (includes discussion of applicable SDS)
- Fire protection and prevention
- Housekeeping
- Other pertinent aspects of project-specific hazard assessments

The content of the training will be derived from information contained within this HASP.

11.4 Hazard Communication

All personnel performing field activities will receive basic hazard communication and right-to-know training, including a review of Arrowhead's Hazard Communication Program, applicable SDS, container labeling requirements, chemical hazard warnings, and general chemical health hazards. Personnel shall be trained on the hazards of operational chemicals by reviewing SDS. SDS for additional materials brought on-site will be reviewed with personnel prior to the use.

Arrowhead will maintain all SDSs at the Project site in a notebook readily available for inspection with an index arranged by "Brand Name". If such materials or substances are part of any item requiring a shop drawing or other submittal, the SDS will accompany the submittal.

11.5 Asbestos Training

There are no known asbestos issues at the Firing Ranges 3 and 4 so workers from Arrowhead will not have asbestos training or asbestos awareness training.

11.6 First-Aid/CPR

At least two members of Arrowhead's on-site staff will be trained and certified in American Red Cross first-aid and CPR. The certification and recertification requirements for first-aid (three

years) and CPR (one year) are applicable. First-aid and CPR training/certification must be made by a reputable provider, such as the American Red Cross or American Heart Association.

11.7 Additional Training, Certification, and Licenses

In addition to the training and certification discussed previously, commercial drivers must meet applicable certification and licensing requirements as mandated by the DOT. Truck drivers must possess a valid commercial driver's license.

11.8 Medical Monitoring

Medical surveillance requirements will apply to personnel covered under HAZWOPER requirements. Arrowhead and subcontractors will utilize the services of an Occupational Medicine physician for the medical surveillance requirements of this project.

Medical Examination

All affected personnel will have successfully completed a pre-placement or periodic/updated physical examination that complies with HAZWOPER (29 CFR 1926.65 and 29 CFR 1910.120). Pre-placement (baseline) medical examinations shall consist of a standard battery of tests and blood lead testing.

The medical surveillance provided to the employee includes a written opinion by the medical examiner of the employee's ability to use the necessary respiratory protective equipment. Any employee found to have a medical condition, which could directly or indirectly be aggravated by exposure to any chemical substance present at the site, or by the use of respiratory equipment, will not be employed for the project. A copy of the medical examination shall be provided at the employee's request. The employee will be informed of any medical conditions that would result in work restriction or that would prevent him/her from working at hazardous waste sites.

Site personnel may be required to receive an annual update exam in accordance with 29 CFR 1926.65(f)(2) and 29 CFR 1910.120(f)(2). The results of these exams are compared to previous results and the baseline physical to determine if any medical effects due to exposure have occurred. Appropriate actions shall be taken as recommended by the physician should the results indicate an exposure; otherwise, employees are cleared for continued work.

Periodically, the need arises to conduct medical examinations at times other than those previously discussed. These times include reassignment in accordance with 29 CFR 1910.120 (f)(3)(i)(C) and 29 CFR 1926.65 (f)(3)(i)(C), if an employee develops signs or symptoms of

illness relating to work place exposure, if the physician determines examinations need to be conducted more often than once a year, and whenever an employee sustains a lost time injury or develops a lost time illness.

Subcontractor Requirements

Subcontractor personnel that are performing work activities involving contact with contaminated material shall certify that their employees have successfully completed a physical examination by a qualified physician or provide the medical clearance form provide by the physician. The physical examinations shall meet the requirements of 29 CFR 1926.65 and 29 CFR 1910.120.

Medical Records

Medical and personal exposure monitoring records will be maintained according to the requirements of 29 CFR 1926.65 and 29 CFR 1910.120 and will be retained for a minimum of 30 years. The confidentiality of employee medical records shall be maintained. The written medical opinion from the occupational physician will be kept in site files.

Medical Restrictions

When a medical care provider identifies a need to restrict work activity, the terms of the restriction will be discussed by the employee and the SSO. Every attempt will be made to keep the employee working, while not violating the terms of the medical restriction.

12.0 Record Keeping and Reporting

Proper record keeping and data management are essential in the implementation of this HASP. The forms associated with the record keeping and data management requirements shall be completed in an accurate, timely fashion and appropriately filed. The proper completion of H&S forms is the responsibility of the Site Supervisor/SSO. Subcontractors will also be responsible for keeping a copy of the forms pertaining to their activities. A copy of all pertinent H&S forms and logs are provided in Appendix A.

12.1 Daily Safety Forms and Logs

The SSO will maintain and complete a daily log for each day's work. The daily log will document each day's H&S activities in sufficient detail for future reference as needed. The following forms and logs (Appendix A) will be completed daily as applicable:

- Site Entry Log
- Daily Tailgate Safety Meeting Log
- Heavy Equipment Daily Inspection
- Intrusive Activities Permit

12.2 Daily Safety Report

The SSO will record H&S activities and data, not otherwise captured in daily logs or forms, in a field log book. A brief summary of safety issues, along with H&S logs and forms completed during the day, will be included as part of the Daily Quality Control Report (DQCR).

12.3 Safety Inspections

The SSO will inspect the site daily and identify areas of concern or ideas for safety improvement. The Site Supervisor will also inspect site conditions and activities daily to identify changing conditions or potential hazards. Identified safety and occupational health deficiencies and suggested corrective measures will be brought to the attention of the Site Supervisor, PM, and/or SSO. Corrective actions will be documented as described in the CQCP, including the corrective action taken/proposed, responsible person, and the date the corrective action is to be completed. Follow-up inspections will be performed to verify that corrective actions or measures have been implemented. Significant findings during safety inspections will be included in the DQCR. Applicable inspection checklists are provided in Appendix A, including:

- Safety Equipment Daily Inspection Checklist
- Heavy Equipment Initial Inspection Checklist
- Heavy Equipment Daily Inspection Checklist

12.4 Accident Investigation and Reporting

Project personnel are required to **immediately** report all near misses, injuries, illnesses, and accidents to the Site Supervisor and SSO. The SSO shall immediately arrange appropriate medical care as required. Once medical care for the injured personnel has been assured, the SSO shall complete and submit the appropriate reports as soon as possible or with in 72 Hours. The reports that may be applicable include:

- Incident Investigation Report
- Supervisor's Employee Injury Report

All near misses, injuries, illnesses, and accidents shall be immediately investigated by on-site management personnel. The Site Supervisor/SSO will investigate the conditions contributing to the accident. They will document how the accident occurred and identify unsafe acts or conditions that occurred or existed at the time of the accident. Corrective actions will be determined and implemented to prevent the recurrence of the accident, and responsibility for implementation of corrective actions will be assigned. An Incident Investigation Report (Appendix A) will be prepared within two working days of the incident/accident. The report shall specify:

- Company name
- Name of person reporting
- Date and time of incident/accident
- Location of incident/accident
- Summary of incident/accident giving pertinent details, including the field activity in progress at the time of the incident/accident
- Cause of the incident/accident
- Casualties
- Details of chemical hazards or contamination
- Estimated property damage, if applicable
- Nature of damage, effect on schedule
- Action taken to ensure safety/security

The final report and required forms will be completed within five days of the incident. In the event that an accident results in an employee being sent to a doctor, a release will be obtained on the date of treatment indicating one of the following conditions:

- Employee not fit for duty
- Employee fit for light duty
- Employee fit for duty.

A copy of this release shall accompany the accident report.

13.0 References

Final Firing Ranges 3 and 4 Site Investigation Report, National Aeronautics and Space Administration, Plum Brook Station, Sandusky, Ohio, by Leidos, dated December 13, 2019.

National Institute for Occupational Safety and Health, Occupational Safety and Health Administration, U.S. Coast Guard, and U.S. Environmental Protection Agency (USACE et al.), 1985 *Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities*, NIOSH Publication No. 85-115, October 1985.

Site-Specific Health & Safety Plan, Construction, Maintenance, Environmental, and Testing Services (COMETS), Contract No. 80GRC018C0022, Submitted by Firelake-Arrowhead NASA Services, Submitted to NASA Glenn Research Center, May 2018.

Title 29 Code of Federal Regulations (CFR) Part 1910, *Safety and Health Regulations for General Industry*.

Title 29 Code of Federal Regulations (CFR) Part 1926, *Safety and Health Regulations for Construction*.

U.S. Army Corps of Engineers (USACE), *Safety & Health Requirements Manual*, EM 385-1-1, November 2014.

U.S. Army Corps of Engineers, *Safety and Occupational Health Document Requirements for Hazardous, Toxic and Radioactive Waste (HTRW) and Ordnance and Explosive Waste (OWE) Activities,* Appendix A, ER 385-1-92, May 2007.

TABLES

Table 2-1
Safety and Health Responsibilities

Name	Telephone Number(s)	S&H Responsibility
Mr. Scott Siegwald, CIH, CSP	(913) 814-9994 office (913) 461-3804 cell	Arrowhead Health and Safety Officer
Mr. Josh Phillips	(515) 961-8000 Office (515) 577-8503 Cell	Arrowhead Program Manager
Mr. Jeremy Soenen	(515) 961-8000 office (515) 664-7308 cell	Arrowhead Project Manager
Michael Britsch, CIH, CSP	(515) 961-8000 Office (515) 664-7537 Cell	Arrowhead Site Safety Officer
Mr. Dirk Doege	(515) 961-8000 Office (567) 274-1557 Cell	Arrowhead Alternate Site Safety Officer

Table 4-1
Summary of Site Hazards

Hazard	Description
Chemical exposure (site contaminants)	Potential for exposure to COCs present in the subsurface soil at the site (primarily lead) during activities that generate COC-laden dust. Primary routes of entry include inhalation and dermal contact.
Chemical exposure (operational chemicals)	Potential for exposure to operational chemicals (including fuels, lubricants, and stabilization agent such as Calciment® or EnviroBlend®) during use and storage. Primary routes of entry include inhalation, ingestion, and dermal contact.
Dust	Potential for inhaling nuisance dust during field activities, including excavation work, miscellaneous construction work, soil load-out, hauling, and site restoration.
Noise	High noise levels anticipated during activities involving the operations heavy construction equipment, including manual excavation, mechanical excavation, load-out, miscellaneous construction, backfilling, and site restoration.
Eye injury	Hazards to the eye include the potential for: • Projectiles (chips, sparks, and other debris) from construction activities. • Emission of dust, fumes, and exhaust gases. • Liquid splashes from the use of operational chemicals. • Heat and extreme light/glare from welding and cutting.
Slips, trips, falls	Potential for slips, trips, and falls from general site hazards, including: • Slippery surfaces • Obstruction in walkways (i.e. power cords, hoses, small tools) • Uneven surfaces • Poor lighting • Use of ladders
Fire	Potential for fire from the use and storage of flammable liquids and gases, hot work activities (welding and cutting), and generation of sparks.
Operation of small equipment and power tools	Potential for the following hazards associated with the operation of small equipment and tools: • Contact with the point-of-operation (i.e. drill bit, saw blade) • Impact from projectiles (i.e. cuttings, sparks) during use • Damaged or faulty equipment/tools • Accidental activation • Excessive vibrations • Awkward posture during use
Operation of heavy equipment	Major project hazard, due to the operation of numerous pieces of equipment on-site. Potential for hazards from the following conditions: • Contact with moving parts of equipment (i.e. belts, chains, hoist) • Danger zone created by swing radius of equipment • Maneuvering equipment within/around obstructions, tight spaces, and other equipment • Moving equipment near workers, including the “crushing zone” created when workers are positioned between equipment and fixed/stationary object • Operating equipment near overhead power lines

Hazard	Description
Electrical	Potential for electrical shock and fires from the following: • Contact with energized appurtenances at the site • Improper grounding • Work near overhead and below-ground power and communication lines
Hazardous energy	Potential for the unexpected release of hazardous energy, such as: • Breaching live utility lines during intrusive activities. • Unexpected startup of equipment during maintenance and/or change out of tooling. • Hazards associated with pressure vessels.
Intrusive activities	Potential for inadvertently breaching underground utility lines during intrusive posthole excavation or post driving work.
Material handling	Potential hazards with regards to lifting and handling of materials, including: • Back injury from improper lifting technique • Contact with sharp or jagged edges • Dropping materials that are slippery from water, oil, or grease
Contact with hot items	Potential for burns due to contact with hot equipment (i.e. exhaust pipes, steam sprayer, and generators).
Operation of motor vehicles / traffic control	Hazards associated with the operation of motor vehicles, including vehicle accidents, injury to pedestrians, damage to property, and lost loads during transport.
Heat stress	Potential heat-related illnesses from working at high temperatures in an outdoor, summer environment.
Cold stress	Potential cold-related illnesses from working at low temperatures in an outdoor, winter environment.
Bloodborne pathogens	Potential for exposure to blood.
Environmental hazards	Potential for encountering poisonous plants, insects, snakes, spiders, etc. *as well as pet dogs and cats owned by residents*.

Table 5-1
Air and Noise Monitoring Action Levels

Parameter	Equipment	Action Level (Engineering Controls)*	Action Level (Upgrade PPE)
Dust in areas disturbed by excavation and associated activities	Visual Observation	Visible Dust	Level D - Modified
Dust in breathing zone of FR 3 and 4 target area	DustTrak™	0.34 mg/m^3	Level C
Dust in breathing zone of FR 3 shooting area	DustTrak™	0.21 mg/m^3	Level C
Dust in breathing zone of FR 4 Shooting area	Visual Observation	Visible Dust	Level D - Modified
Noise	Sound Level Meter	82 dB	82 dB

Table 6-1
Levels of Protection and Air Monitoring Parameters

Field Activity	Initial Level of Protection (PPE)*	Upgrade Level of Protection (PPE)	Special Requirements	Air Monitoring Parameters
Site preparation	D	Level D - Modified	Hearing Protection**	Dust
Impacted material excavation	C/D	Level C	Hearing Protection**	Dust
Impacted material stabilization	C/D	Level C	Hearing Protection**	Dust
Impacted material loading	C/D	Level C	Hearing Protection**	Dust
Backfilling and site restoration	D	Level D - Modified	Hearing Protection**	Dust
Project administration	D	Level D - Modified	Hearing Protection**	N/A
Mobilization / demobilization	D	Level D - Modified	Hearing Protection**	N/A
Personnel travel to/from site	D	Level D - Modified	Hearing Protection**	N/A
Construction oversight	D	Level D - Modified	Hearing Protection**	N/A
Equipment cleaning and maintenance	D Modified D (spray washer, as necessary)	Level D - Modified	N/A	N/A

* Level D is the minimum level of protection for construction activities. Excavation, stabilization, and loading will start at level C and personal air samples will be collected and analyzed to provide data to determine the appropriate level of protection. The level of protection will be adjusted as appropriate based on the personal air sampling results

** As necessary, based on activity or noise levels (refer to Section 5.3)

Table 7-1
Emergency Response Contacts and Telephone Numbers

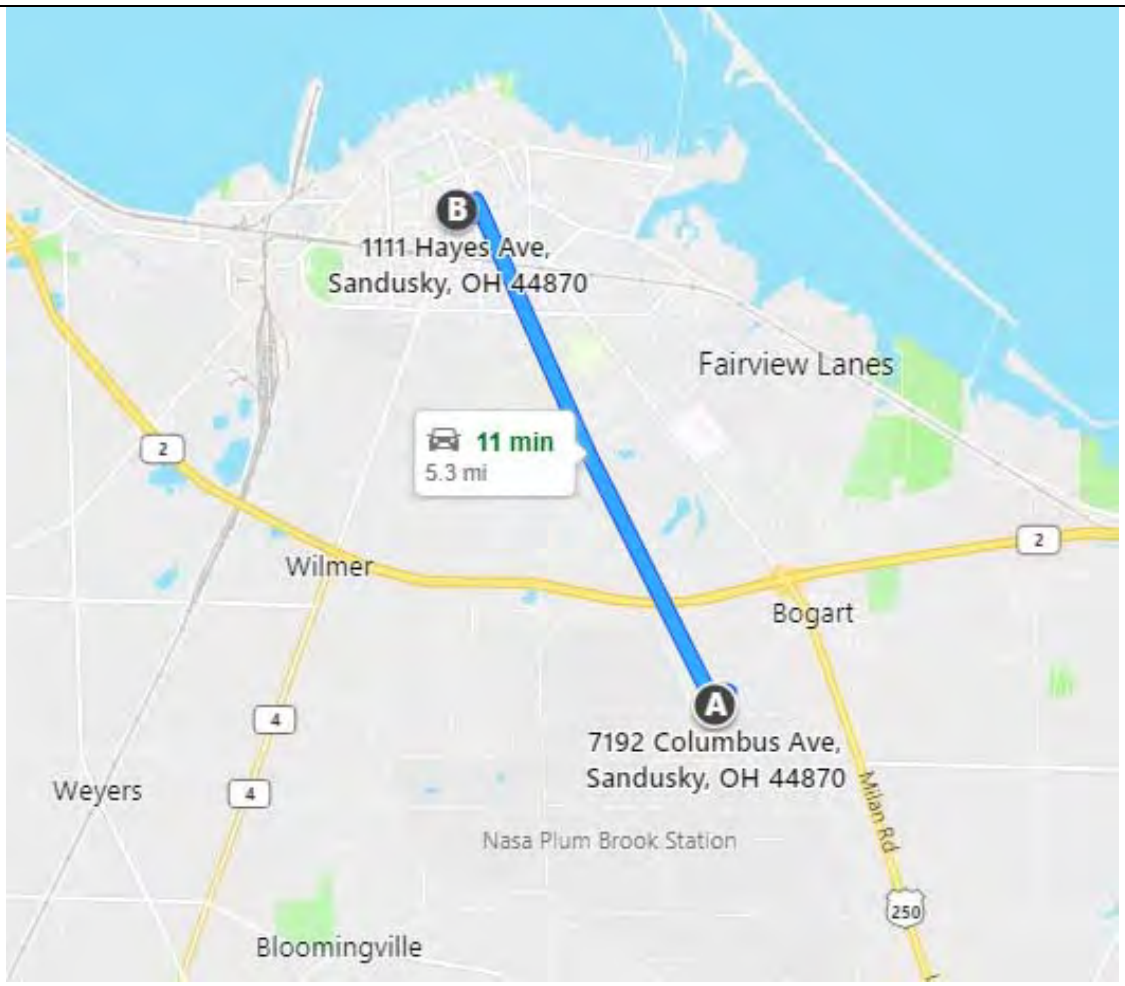
Contact	Telephone Number
Fire Department (NASA PBS Dispatcher)	419-621-3222 (Cell Phone) 911 (NASA Phone)
Police Department (NASA PBS Dispatcher)	419-621-3222 (Cell Phone) 911 (NASA Phone)
EMS, Paramedics (NASA PBS Dispatcher)	419-621-3222 (Cell Phone) 911 (NASA Phone)
Firelands Regional Medical Center 1111Hayes Avenue Sandusky, OH 44870	419-557-7455
Poison Control	800-366-8888

The PBS Utility Surveyor will verify NASA underground drawing records

Ohio One-Call Service (Ohio811), 1-800-362-2764 or 811

FIGURES

NASA Plum Brook Station Firing Range 3 & 4 Sandusky, Ohio	**1-1 Site Map**



↑	1.	Head **northeast** on **Taylor Rd** toward Clark Rd / CR-120	0.2 mi
↰	2.	Turn **left** onto **Clark Rd / CR-120** Pass BP/BP in 2.4 mi	4.7 mi
↰	3.	Turn **left** onto **Campbell St**	0.1 mi
↱	4.	Turn **right** onto **Tyler St**	0.2 mi
↱	5.	Turn **right** onto **OH-4 / Hayes Ave**	223 ft

NASA FR 3 & 4 **Sandusky, Ohio**	**3-1 Hospital Route Map**

Appendix A

Health and Safety Forms

DAILY TAILGATE SAFETY MEETING

Date: _____ Client: _____

Location: _____ Job No.: _____

Meeting conducted by: _____

Details of safety meeting presented (use back of sheet if necessary):

Level of Protection:

Contaminants:

Physical Hazards:

Other:

Permits/Clearances Required:

ATTENDEES:

Printed Name:	Signature:

Printed Name:

Signature:

HEALTH AND SAFETY PLAN (HASP)
ACKNOWLEDGMENT FORM

I have reviewed, understand, and agree to follow the HASP for:

Project Name: _____ Project Number: _____

Printed Name	Signature	Company	Date

HASP AMENDMENT FORM

Amendment Number: _____ Date Effective: _____

Date: _____Client: _____

Location: _____ Job No.: _____

Type of amendment:

- ☐ Change of text in SSHP
- ☐ Addition of form
- ☐ Addition of new activity and hazard analysis
- ☐ Deletion of form
- ☐ Other:

Details of amendment (attach appropriate document/documentation):

Approved by: _____ Date: _____
Project Manager

Approved by: _____ Date: _____
Site Safety Officer

HEAVY EQUIPMENT DAILY INSPECTION CHECKLIST

Project Name:	Project Number:	Client:
Project:	Contractor:	Contract No.: Subcontract No.
Equipment Description:	Model No.(s):	Serial No.(s):

CHECKLIST	OK	Not OK	N/A
1. Fuel			
2. Lubrication, engine oil			
3. Brakes			
4. Tires, tracks			
5. Air systems			
6. Horn			
7. Safety guards			
8. Mirrors			
9. Steering mechanism			
10. Cooling water			
11. Operation controls			
12. Lights and reflectors			
13. Windshield wipers, defroster			
14. Backup alarm			
15. Fire extinguisher			
16. Seat belts			
17. Filters (air, oil, fuel, hydraulic)			
18. Lift arm and bucket			
19. Grab handles			
20. Steps (tread, no slip hazards)			
21. Parking brake			
22. General condition			
Remarks:			
Certification Signature of Certified Operator		Date	

HEAVY EQUIPMENT INITIAL INSPECTION CHECKLIST

Project Name:	Project Number:	Client:
Project:	Contractor:	Contract No.: Subcontract No.
Type and Make of Equipment	Model	Serial No.

CHECKLIST	Yes	No	N/A
1. Are adequate and serviceable fire extinguishers provided? (09.E.01 through 09.E.03)			
2. Are all wire rope cables in good condition? (15.B.01 and 15.B.02)			
3. Are wire rope, sockets, splices, thimbles, and clips and adequate and properly applied? (15.B.03 through 15.B.08)			
4. Are hooks, safety nooks, shackles, rings, etc., in good condition? (?)			
5. Are necessary platforms, foot-walks, etc., provided? (22.A.01 and 22.A.02)			
6. Are access steps, platforms, etc., provided with non-slip surfaces? (21.A.13)			
7. Is operator protected against the elements, falling or flying objects, swinging loads, and similar hazards? (16.B.10, 16.B.11, and 21.A.11)			
8. Are all glasses in operator's compartment safety glass and in good repair? (16.B.10 and 18.A.07)			
9. Is suitable access provided at lubrication points? (16.B.13)			
10. Do all modifications, extensions, replacement parts, and/or repairs to equipment maintain the same factor of safety as original designed equipment? (16.A.18)			
11. Are drums for load lines equipped with at least one positive holding device, applied directly to the motor shaft or some part of the train gear? (?)			
12. Is there sufficient cable to allow three full wraps of cable on drums at all working positions? (16.C.10)			
13. Are adequate headlights, taillights, and turn signals provided and are they in proper operating condition (16.A.07 and 18.A.02 through 18.A.04)			
14. Are all approved brakes on wheeled equipment and in good operating condition? (16.A.07, 18.A.02, and 18.A.05)			
15. Do windshields have wipers in proper operating condition? (16.A.07, 18.A.02, and 18.A.06)			

CHECKLIST	Yes	No	N/A
16. Are rear view mirrors provided? (18.A.02 and 18.A.06)			
17. Are operating levers equipped with latch and other devices to prevent accidental starting? (18.A.10)			
18. Is engine equipped with power-operated starting device in operative condition? (18.A.06)			
19. Do all pressure vessels have valid inspection certificates? (20.A.03)			
20. Are reverse signal alarms on equipment? (16.B.01)			
21. Are belts, gears, shafts, electrical contacts, etc., adequately guarded? (16.B.03)			
22. Are all hot pipes and surfaces suitably guarded? (16.B.03)			
23. Are fuel tanks located so that spills or overflows will not come in contact with engine or exhaust? (16.B.04)			
24. Are exhausts and discharges so directed as not to endanger workmen or obstruct view of operator? (16.B.05)			
25. Are guards in place on equipment with drop type skip pans? (16.B.03)			
26. Are adequate seats provided for all riders? (16.A.07 and 18.C.01)			
27. Are tires in serviceable condition? Are testing/inspections documented? (18.A.02)			
28. Are steering linkage and tie rod in good operating condition? Are testing/inspections documented? (18.A.02)			
29. Are dump bodies provided with holding device or other suitable device for locking body in raised position? (18.A.10)			
30. Are tailgate dumping devices so arranged that operator will be in the clear while dumping loads? (18.A.10)			
31. Are trip handles provided on tailgates to facilitate handling? (18.A.10)			
32. Is the air hose free from leaks or defects? (? 20.B.03)			
33. Are safety lashing for quick make-up type connections provided? (20.A.16)			
34. Is an acceptable spark arrestor installed and working? (?)			
35. Do heating devices comply with references? (?)			
36. Does welding equipment comply with code requirements? (10.A.10 and 10.E.01)			
37. Is equipment adequately grounded? (10.E.04 and 10.E.07)			
38. Do electrical components comply with code? (10.E.01)			
39. Are required pressure, temperature, or relief gages and valves installed and operable? (20.A.10 through 20.A.13 and 20.B.02)			
40. Are approved seat belts and roll-over protection provided? (16.B.08, 16.B.12, and 18.B.02)			
41. Is recommended preventive maintenance being followed? (16.A.08 and 18.A.02)			

CHECKLIST	Yes	No	N/A
42. Do helicopter cranes meet construction requirements (16.J.01)			
43. Does hydraulic equipment meet special safety conditions (? 11.H.08, 11.H.09, and 13.A.09)			
44. Is concrete equipment fitted with adequate safety devices? (27.A.04)			
45. Are elevating and rotating work platforms in conformance with ANSI A92.2? (22.K.01)			
46. Do conveyors, cableways, and related equipment conform to ANSI 320.01? (?)			
47. Are pile drivers equipped with all appropriate safety devices? (16.L)			
48. Do material hoists conform to ANSI A10.5? (16.K.01)			
49. Do passenger elevators conform to ANSI A10.4? Do temporary hoists conform to ANSI A10.22: (21.H)			
50. Do hand and power tools comply with applicable ANSI standards (13.A through 13.G)			
51. Is high voltage sign posted? (?)			
52. Is equipment fitted with positive stops for rotation when near power lines? (11.E and 16.D.06)			
53. Is there any visible evidence of damage to boom? (16.C.12 and Appendix H)			
54. Is the boom position indicator operating and visible to operator? (16.D.01 and 16.D.04)			
55. Have all operators had a current physical examination? (1.C and 16.C.04)			
56. Is braking equipment capable of effectively braking, lowering, and safely holding a load of at least the full rated load as required? (?)			

Remarks:

Certification: I hereby certify that this item of equipment is in good operating condition and that it meets all above requirements except as noted in the remarks.

_____ _____
Signature of Competent Mechanic Date

_____ _____
Signature of Superintendent/Quality Control Engineer Date

INCIDENT INVESTIGATION REPORT

*** MUST BE COMPLETED WITHIN 72 HOURS ***

Project Name: _____ **Project Number:** _____

Investigation Date: _____ **Date of Incident:** _____

Employee Name: _____

Supervisor Name: _____

Location of Incident: _____

Incident Classification

Injury	**First Aid**	**Vehicle**	**Chargeable**	**DOT**	**DOT Vehicle**
	OSHA Recordable		**Non-Chargeable**		**DOT Reportable**
	Lost Workday				
	Restricted Workday	**Near Miss**		**General Liability**	

Description (Provide facts, describe how incident occurred, provide diagram (on back) or photos)

Analysis 1 (What unsafe acts or conditions contributed to the incident?)

Analysis 2 (What systematic or management deficiencies contributed to incident?)

Corrective Action(s) (List corrective action items, responsible person, scheduled completion date)

Witnesses (Attach statements or indicate why unavailable)

Investigated By _____ **Print Name:** _____ **Signature:** _____ **Date:**

Project Manager _____ **Print Name:** _____ **Signature:** _____ **Date:**

(Attach Additional Pages if Needed)

INTRUSIVE ACTIVITIES PERMIT

Permit Number: _____

Project Name: _____ **Project Number: _____**

Clearance is permitted for intrusive activity at: _____

The attached map indicates the limits of the permitted intrusive activity. The area __has __has not been staked or clearly marked.

Utilities Locate Service Reference Number: _____

Limits of Work Permitted		
Description of permitted work:		
Specific location of permitted work:		
Precautions or comments:		
Date Clearance Permitted:	**Date Clearance Terminated:**	
Request Initiated By:	**Phone No.**	**Organization**

Permission to proceed with intrusive activity granted:

_____ _____

Field Supervisor/Project Manager Date

Permission to proceed with intrusive activity granted:

_____ _____

Site Safety and Health Officer Date

I agree to perform work within the limits of this permit:

_____ _____

Supervisor/Foreman/Contractor Date

SAFETY EQUIPMENT DAILY INSPECTION CHECKLIST

Project Name:	Project Number:	Client:
Project:	Contractor:	Contract No.: Subcontract No.

CHECKLIST	Yes	No	N/A
1. Are adequate and serviceable fire extinguishers provided?			
2. Are fire extinguishers present at assigned locations?			
3. Is access to each fire extinguisher clear of obstructions?			
4. Are fire extinguishers fully charged; are locking pins in place?			
5. Are eye wash stations present at assigned locations?			
6. Are eye wash stations filled with water and in sanitary condition?			
7. Is access to each eye wash station clear of obstructions?			
8. Are first aid kits present on site?			
9. Does each first aid kit contain the proper items – compresses, bandages, adhesive tape, eye dressings, ice packs, gauze, etc.?			
10. Are emergency spill supplies/kits available on site?			
11. Have air monitoring instruments been properly calibrated?			
12. Is the required PPE available on site?			
13. Has the PPE been inspected for defects or damage?			
14. Are flammable chemicals (not in use) stored in an approved cabinet?			
15. Are Material Safety Data Sheets available on site for operational chemicals?			
16. Is a bloodborne pathogens exposure kit available on site?			
17. Is cold, potable water available to employees?			
18. Are ear plugs or muffs available to personnel?			

Remarks:

Certification

_____ _____

Signature of Site Safety & Health Officer Date

SITE ENTRY LOG

Date:_____ Client: _____

Location: _____ Job No.: _____

Name	Company	Time In	Time Out

SUPERVISOR'S EMPLOYEE INJURY REPORT

This report is to be initiated by the employee's supervisor. Please answer all questions completely. This report must be forwarded to the appropriate health and safety representative within 24 HOURS of the injury/illness.

EMPLOYEE

Injured Name _____ Sex _____ S.S. No. _____ Birth Date _____

Home Address _____

City _____ State _____ Zip _____ Phone ( ) _____

Job Title _____ Hire Date _____ Hourly Wage _____

SUPERVISOR

Date of Incident _____ Time _____ Time Reported _____ To Whom? _____

Project/Location Name _____ Address _____

Project No. _____ Time Shift Began _____ Did the Employee Leave Work ☐ No ☐ Yes When _____

Has employee returned to work? ☐ No ☐ Yes When _____ Did employee miss a regularly scheduled shift? ☐ No ☐ Yes

Doctor/Hospital Name _____ Address _____

Witness Name(s) _____ Statement Attached? ☐ No ☐ Yes

Nature of Injury _____ Exact Body Part _____

Medial Attention: ☐ None ☐ First Aid On Site ☐ Doctor's Office ☐ Hospital ER ☐ Hospitalized

Job Assignment at Time of Incident _____

Describe Incident _____

What Unsafe Condition and/or Act Contributed to the Incident? _____

What Corrective Action Has Been Taken to Prevent Recurrence? _____

Supervisor _____ _____ _____
(Print) Signature Date

MANAGER

Comments on Incident and Corrective Action _____

Project/Location Mgr. _____ _____ _____
(Print) Signature Date

HEALTH AND SAFETY

Concur With Action Taken ☐ No ☐ Yes Remarks _____

OSHA Classification:
☐ First Aid ☐ Recordable, No Lost/Restricted Workdays ☐ Recordable, Lost Workdays ☐ Recordable, Restricted Activity ☐ Fatality

Days Away From Work _____ Days Restricted Work _____

All injuries/illnesses requiring outside medical treatment must be reported to Corporate Human Resources Office at (913) 814-9994.

Workers' Compensation Claim Number (if applicable) _____

Health and Safety Representative:

_____ _____ _____
(Print) Signature Date

Appendix B

Activity Hazard Analyses (AHAs)

General Site Work and Oversight Activities
Activity Hazard Analysis (AHA 01)

Activity/Work Task: **General Site Work and Oversight Activities**	Overall Risk Assessment Code (RAC) (of the highest hazard): **L**
Project Location: NASA Plum Brook Station, Sandusky, Ohio	
Contract Number:	
Date Prepared: 11/01/18	
Prepared by (Name/Title): Carl Shaw	
Reviewed by (Name/Title): Jeremy Soenen	
Notes: (Field Notes, Review Comments, etc.) **Call NASA PBS Emergency Dispatch for all emergencies** **419-621-3222**	

Risk Assessment Code (RAC) Matrix

Severity	Probability: Frequent	Likely	Occasional	Seldom	Unlikely
Catastrophic	E	E	H	H	M
Critical	E	H	H	M	L
Marginal	H	M	M	L	L
Negligible	M	L	L	L	L

Step 1: Determine and enter RAC codes for each **"Hazard"** with safety **"Controls"** (E, H, M, or L)

"Probability" is the likelihood to cause an incident, near miss, or accident and identified as: Frequent, Likely, Occasional, Seldom or Unlikely.

"Severity" is the outcome/degree if an incident, near miss, or accident did occur and identified as: Catastrophic, Critical, Marginal, or Negligible

Step 2: Use the highest individual RAC of the Hazards + Controls below as the overall RAC for the Activity, and enter at the top of the AHA sheet.

RAC Chart

- E = Extremely High Risk
- H = High Risk
- M = Moderate Risk
- L = Low Risk

Job Steps	Hazards	Controls	RAC
General site work, set-up, preparation and administration activities, including, but not limited to: • Equipment delivery, receipt, and inspection • Layout site work zones • Installation temporary facilities • Prepare equipment decontamination area • Decontaminate equipment • Site inspection and oversight activities • Clear utilities • Waste Disposal • Removal of trailers and conex boxes	General	**General:** • Wear protective leather gloves as necessary • Wear safety glasses • Wear hard hats • Wear steel-toed footwear • Wear high-visibility construction vests • Wear hearing protection as necessary when ambient noise levels become elevated • Ensure that fire extinguishers are available to personnel • Provide fire extinguishers (at least 10# ABC) inside site office trailer • Inspect the jobsite daily for the presence of required PPE and safety equipment (see checklists contained in HASP) • Smoking shall only be permitted in approved areas • Place signs or barricades to protect overhead power lines • Clear utilities before excavating for rock entrance	L
	Heavy lifting	**Heavy Lifting**:	L

General Site Work and Oversight Activities
Activity Hazard Analysis (AHA 01)

• Office trailer removal • Removal of landscape supplies		• No individual employee is permitted to lift any object that weighs over 40 pounds • Proper lifting techniques shall be used • Multiple employees or the use of mechanical lifting devices are required for lifting objects over the 40-pound limit	
	Vehicular traffic	**Vehicular Traffic**: • Personnel working on or near roads shall wear high visibility vests and only remain on road long enough to complete work. • Personnel walking along roadway shall stay off roadway as far as possible and walk on the side facing traffic. • Implement traffic control provisions – i.e. barricades, signs, lane closures, flagmen, etc. – as necessary for the given work area • Do not drive or generate dust in areas of the site that are not along the perimeter of the site where the fence is being installed	**L**
	Chemical exposure (general)	**Chemical Exposure (General)**: • Physical contact with contaminated media or hazardous chemicals shall be avoided • Personal protective equipment use is required when contact is possible/probable • Personnel who sustain skin contact shall immediately wash the affected area with soap and water (eyes should be irrigated for 15 minutes with potable water) and report the incident to the SSHO	**L**
	Fire	**Fire**: • Smoking shall not be permitted in regulated areas • Fire extinguishers shall be available on-site	**L**
	Slips, trips, falls	**Slips, trips, and falls:** • Implement good housekeeping practices – keep the area free of materials, scrap, and debris • Electrical extension cords and electrical wiring shall be kept clear of walking and working areas and/or covered or otherwise secured	**L**

General Site Work and Oversight Activities
Activity Hazard Analysis (AHA 01)

		• Clean up spills immediately • Provide adequate illumination • Do not jump from equipment or elevated surfaces	
	Work from heights (ladders and lifts)	**Work from heights (ladders and lifts):** • Maintain three points of contact when ascending/descending ladders • Face the ladder, and use at least one hand to grasp the ladder when climbing • Don't carry objects while climbing • Don't overreach from a ladder • Straight or extension ladders shall be 1 foot out for every 4 feet up • For extension ladders, provide at least 3 ft of extension above the top point of support • Ensure ladder footings are secure • Inspect ladders prior to each use • Ladders found to be defective shall be taken out of service and tagged accordingly	**L**
	Hand injuries	**Hand Injuries**: • Items to be handled shall be inspected for sharp edges prior to being handled • Personnel shall wear leather gloves when handling sharp materials • Personnel shall be aware of and avoid pinch point hazards.	**L**
	Insect/animal bites	**Insects / Animal Bites**: • Review injury potential with workers • Wear PPE and tape joints to keep insects away from the skin • Use protective insect repellents containing DEET to limit insect bites • Treat clothing with permethrin to discourage ticks • Check limbs/body for insects/ insect bites before showering • Notify SSHO of flu-like symptoms	**L**
	Contact dermatitis and poison ivy	**Contact Dermatitis**: • Wear long-sleeved shirts/trousers or Tyvek coveralls to avoid skin contact with plants or other skin irritants	**L**

General Site Work and Oversight Activities
Activity Hazard Analysis (AHA 01)

		• Identify and review poisonous plants with workers • Avoid unnecessary clearing of plant/vegetation areas • Cover vegetation with plastic (Visqueen) where survey position raises exposure potential • Apply protective cream/lotion to exposed skin to prevent poison ivy or similar reactions • Identify workers who are known to contract poison ivy	
	Cold stress	**Cold Stress** • Follow procedures outlined in the SSHP • Wear warm clothes and boots • Wear layers of clothing • Avoid sweating by adding or removing layers of clothing, as necessary • Protect the head, face, and hands from cold and wind exposure • Take adequate breaks in a warm area, as needed	**L**
	Heat stress	**Heat stress:** • Acclimatize workers to hot working conditions • Provide plenty of liquids to replace the body fluids lost by perspiration • Provide personal cooling devices • Conduct strenuous field operations in the early morning if possible • Rotate personnel to various job duties • Establish adequate work/rest cycles • Monitor heart rate and/or body temperature as appropriate	**L**
	Miscellaneous site activity	**Miscellaneous Site Activity**: • When possible, personnel shall avoid areas that have hazardous activities in progress • When access must be gained in busy areas, the foremen of the activities in the area shall be notified prior to surveying in the area • High visibility vests shall be worn when working in areas with high vehicular or heavy equipment traffic	**L**

General Site Work and Oversight Activities
Activity Hazard Analysis (AHA 01)

Equipment to be Used	Training Requirements & Competent or Qualified Personnel name(s)	Inspection Requirements
Personal protective equipment (PPE) as listed below • Leather gloves • Hard hats • Steel-toed footwear • Fire extinguisher • High visibility vests • Hearing protection • Tyvek pants or coverall (Level D-Modified and Level C) • Half-face air purifying respirator (Level C)	• Inspect the job site daily for appropriate PPE and safety equipment • Inspect PPE prior to use	• Attend site safety orientation at the start of the project • Attend daily tailgate safety meetings prior to commencing work. • Review Emergency Response Plan, including facility-specific evaluation routes and location of severe weather shelter areas. • Review hazard communication requirements, including applicable SDSs. • Heavy equipment operators shall be properly trained

General Safety Equipment Inspection Checklist

1. Are adequate and serviceable fire extinguishers provided?
2. Are fire extinguishers present at assigned locations?
3. Is access to each fire extinguisher clear of obstructions?
4. Are fire extinguishers fully charged; are locking pins in place?
5. Are eye wash stations present at assigned locations?
6. Are eye wash stations filled with water and in sanitary condition?
7. Is access to each eye wash station clear of obstructions?
8. Are first aid kits present on site?
9. Does each first aid kit contain the proper items – compresses, bandages, adhesive tape, eye dressings, ice packs, gauze, etc.?
10. Are emergency spill supplies/kits available on site?
11. Have air monitoring instruments been properly calibrated?
12. Is the required PPE available on site?
13. Has the PPE been inspected for defects or damage?
14. Are flammable chemicals (not in use) stored in an approved cabinet?
15. Are Safety Data Sheets available on site for operational chemicals?
16. Is a bloodborne pathogens exposure kit available on site?
17. Is cold, potable water available to employees?
18. Are heat stress monitoring instruments (i.e. thermometers) available and ready for use?
19. Are sanitation facilities (i.e. hand wash) and supplies available on site?
20. Are toilet facilities clean?

General Site Work and Oversight Activities
Activity Hazard Analysis (AHA 01)

General Site Work and Oversight Activities
Activity Hazard Analysis (AHA 01)

ACTIVITY HAZARD ANALYSIS ACKNOWLEDGEMENT:

By signing below, I am confirming that I have reviewed the contents of this AHA, including the description of the relevant hazards, safe work practices and hazard control measures, recommended personal protective equipment, inspection requirements, and training requirements. As such, I understand and concur with the AHA and will comply with the health and safety standards and protocols referenced herein. I further understand that work activities must immediately be discontinued if an imminent danger exists, any change in the scope of work occurs that could affect worker health and safety, new hazards are identified, existing hazards cannot be adequately controlled, and/or any change in work conditions occurs that could adversely impact worker health and safety.

Printed Name	Signature	Date

The AHA shall be reviewed and modified as necessary to address changing site conditions, operations, or change of competent/qualified persons

EM 385 2008 EDITION

On-site Treatment of Contaminated Material
Activity Hazard Analysis (AHA 06)

Activity/Work Task: **On-site Treatment of Contaminated Material**	Overall Risk Assessment Code (RAC) (of the highest hazard): **L**
Project Location: NASA Plum Brook Station, Sandusky, Ohio	
Contract Number:	
Date Prepared: 01-20-2020	
Prepared by (Name/Title):Carl Shaw	
Reviewed by (Name/Title): Jeremy Soenen	
Notes: (Field Notes, Review Comments, etc.) **Call NASA PBS Emergency Dispatch for all emergencies** **419-621-3222**	

Risk Assessment Code (RAC) Matrix

Severity	Probability: Frequent	Likely	Occasional	Seldom	Unlikely
Catastrophic	E	E	H	H	M
Critical	E	H	H	M	L
Marginal	H	M	M	L	L
Negligible	M	L	L	L	L

Step 1: Determine and enter RAC codes for each **"Hazard"** with safety **"Controls"** (E, H, M, or L)

"Probability" is the likelihood to cause an incident, near miss, or accident and identified as: Frequent, Likely, Occasional, Seldom or Unlikely.

"Severity" is the outcome/degree if an incident, near miss, or accident did occur and identified as: Catastrophic, Critical, Marginal, or Negligible

Step 2: Use the highest individual RAC of the Hazards + Controls below as the overall RAC for the Activity, and enter at the top of the AHA sheet.

RAC Chart

- E = Extremely High Risk
- H = High Risk
- M = Moderate Risk
- L = Low Risk

Job Steps	Hazards	Controls	RAC
• Excavating shallow soil, pond and ditch sediment, firing range backstop berms, and construction debris piles • In some cases, direct loading the excavated material into dump trucks for transport and disposal • In other cases, piling the excavated material for on-site treatment to bring TCLP levels below the hazardous threshold	**General Hazards**	**General hazards:** • Wear protective leather gloves as necessary. • Wear safety glasses. • Wear hard hats. • Wear safety-toe footwear. • Wear hearing protection as necessary. • Wear high-visibility construction vests. • Ensure that fire extinguishers are available to personnel. • Provide fire extinguishers (at least 10# ABC) inside the cabs of heavy construction equipment. • Inspect the jobsite daily for the presence of required PPE and safety equipment (see checklist items below). • Smoking shall only be permitted in approved areas.	
	Excavation hazards (general)	**Excavation hazards (shallow excavations < 4 ft bgs):** • Obtain NASA's GRC Excavation Permit before starting any excavation activity	**L**

On-site Treatment of Contaminated Material
Activity Hazard Analysis (AHA 06)

		• Document the existence of underground pipes, electrical equipment, telephone, gas lines, etc. prior to excavating. • Operations will be suspended and ignition sources eliminated if a hazardous atmosphere is suspected or confirmed.	
	Overhead power lines	**Overhead power lines:** • Place signs or barricades to protect overhead power lines • Equipment operators must remain aware of overhead power lines and maintain safe clearances - use spotters when necessary. • In accordance with OSHA standards (29 CFR 1926.550 and 1910.33), a minimum clearance of 10 feet must be maintained between mechanical equipment and energized overhead power lines. This clearance distance must be increased by 4 inches for every 10 kV over 50 kV. If it is necessary to approach closer than 10 feet from a power line, one of the two following options will be implemented in accordance with the OSHA standard: (1) the line will be de-energized and grounded, or (2) an insulating barrier will be erected to prevent contact with the line. • During operations near overhead power lines, one person involved in the operation (or the SSHO) will be assigned the duty of "spotter" to visually monitor the operation and provide timely warning to equipment operators in the event the minimum clearance distance is violated. In accordance with OSHA standards, the spotter will be positioned "so as to be able to visually monitor the clearance between the equipment and power lines."	**L**
	Intrusive activities	**Intrusive activities:** • Before any intrusive activity begins, positive steps will be taken to determine the locations of underground utilities. • The Arrowhead designee shall contact Ohio 811 to notify	**L**

On-site Treatment of Contaminated Material
Activity Hazard Analysis (AHA 06)

		them of intent to initiate intrusive activity at the property location. This notification is to be made a minimum of two working days prior to the initiation of intrusive activity. • The Arrowhead designee will ensure that underground utilities have been located and marked on the ground (using stakes, flags, and/or spray paint). • Potholing will be completed to verify the location and depth of marked utilities at appropriate intervals and at locations where known utilities are observed to be running into the ground. • Personnel shall always be alert for marking tape, wires, pipes, previously disturbed soils, crushed stone or sand bedding/backfill, discolored soil, and other indications of the presence of buried utility lines.	
	Heavy construction equipment	**Heavy construction equipment:** • Only trained/qualified personnel shall be permitted to operate heavy construction / earthmoving equipment. • Wear safety belts. • Unless the operator gives an “all clear” signal, ground personnel are not permitted to approach heavy construction equipment in operation. • Ground personnel shall not position themselves between heavy construction equipment and a stationary object. • Ground personnel working near heavy construction equipment shall wear high visibility vests. • Inspect equipment when it arrives and daily before starting work. • Equipment found to be defective shall be taken out of service and tagged accordingly. • Keep loose clothing and hair away from moving parts of heavy equipment, and avoid wearing jewelry.	**L**

On-site Treatment of Contaminated Material
Activity Hazard Analysis (AHA 06)

		• Operate equipment in accordance with the manufacturer's instructions and recommendations, as presented in equipment-specific O&M manuals. • Shut down and lock out heavy equipment to prevent operation while repairs, adjustments, or preventative maintenance tasks are being performed. • No guard or device will be removed from machinery or made ineffective except while performing repairs, preventative maintenance, or adjustments, and then only after the power has been shut off. All guards and devices will be replaced immediately after completion of the work and before power is restored.	
	Open excavations	**Open excavations:** • Open trenches will be inspected by the qualified person daily and whenever conditions change • Open trenches (in progress of being excavated) shall be covered, secured, and barricaded when work is not in progress.	**L**
	Dust	**Dust**: • Action level for respirable dust in the Target Area for Firing Ranges 3 and 4 is **0.34 mg/m^3** • Action level for respirable dust in the Shooting Area for Firing Range 3 is **0.21 mg/m^3** • Action level for respirable dust in Shooting Area for Firing Range 4 is **visible dust** • Personnel shall avoid working in elevated dust environments. • Personnel will stand up-wind of dust-generating activities • Dust monitoring procedures and action levels for dust can be found in the HASP. Level of PPE may be modified by SSO based on site conditions • Minimize contaminated soil free-fall from excavation equipment (e.g., excavators)	**L**

On-site Treatment of Contaminated Material
Activity Hazard Analysis (AHA 06)

		• Spray water on exposed soil during excavation, taking care to avoid overspraying • Cover stockpiles with plastic sheeting • Spray water on haul roads • Suspend or restrict work activities when dust levels become elevated or when the wind speed is excessive	
	General Safety Hazards: • Fire • Noise • Heavy lifting • Slips, trips, falls • Hand injuries • Insect/animal bites/poisonous plants • Weather • Heat stress • Cold stress	**Fire:** • Smoking is not allowed on site • Fire extinguishers shall be available on-site **Noise:** • Personnel shall wear hearing protection, as necessary, to reduce exposures to below the NASA and OSHA limit of 82dB **Heavy Lifting:** • Proper lifting techniques shall be used • No individual employee is permitted to lift any object that weighs over 40 pounds • Multiple employees or the use of mechanical lifting devices are required for lifting objects over the 40-pound limit **Slip / Trip / Fall:** • Keep work areas clear and maintain housekeeping • Personnel shall not jump from equipment or elevated surfaces • Personnel shall avoid walking on rough or slippery terrain • Personnel working at heights greater than six feet shall utilize fall protection (full body harness with lanyard) **Hand Injuries:**	L

On-site Treatment of Contaminated Material
Activity Hazard Analysis (AHA 06)

		• Items to be handled shall be inspected for sharp edges prior to being handled • Personnel shall wear leather gloves when handling sharp materials • Personnel shall be aware of and avoid pinch point hazards **Insects / Animal Bites / Poisonous Plants:** • Review injury potential with workers • Wear PPE and tape joints to keep insects away from the skin • Use protective insect repellents containing DEET to limit insect bites • Treat clothing with permethrin to discourage ticks • Check limbs/body for insects/ insect bites before showering • Notify SSHO of flu-like symptoms • Wear long-sleeved shirts/trousers or Tyvek coveralls to avoid skin contact with plants or other skin irritants • Identify and review poisonous plants with workers • Avoid unnecessary clearing of plant/vegetation areas • Identify workers who are known to contract poison ivy **Weather:** • Weather conditions will be monitored. • Operations will cease during high wind or electrical storms or when electrical storms are imminent. **Heat Stress:** • Follow procedures outlined in the SSHP • Drink ample quantities of water • Wear sunscreen • Protect the head and face from direct sun exposure • Perform self-monitoring of heart rate	

On-site Treatment of Contaminated Material
Activity Hazard Analysis (AHA 06)

		• Take adequate breaks in a cool / shaded area **Cold Stress**: • Follow procedures outlined in the SSHP • Wear warm clothes and boots • Wear layers of clothing • Avoid sweating by adding or removing layers of clothing, as necessary • Protect the head, face, and hands from cold and wind exposure • Take adequate breaks in a warm area, as needed	

Equipment to be Used	Training Requirements & Competent or Qualified Personnel name(s)	Inspection Requirements
• Excavator • Wheel loader • Skid steer loader • Off-road dump trucks • On-road dump trucks • Personal protective equipment (PPE) • Work gloves • Hard hats • Safety-toe footwear • Safety glasses • High visibility vests • Hearing protection, as needed • Eyewash station • Fire extinguisher • Hand tools • Air monitoring (aerosol monitor) • Tyvek pants or coveralls (Level D-Modified or Level C) • Half-face air purifying respirator (Level C)	• 40-Hour HAZWOPER training and associated annual 8-Hour updates • Attend site safety orientation at the start of the project • Attend daily tailgate safety meetings prior to commencing work. • Review Arrowhead Emergency Response Plan, including facility-specific evacuation routes and location of severe weather shelter areas. • Review hazard communication requirements, including applicable SDSs. • Heavy equipment operators shall be properly trained, certified, and/or licensed for the specific piece of equipment as required	• Intrusive activities clearance request form completed • Inspect the job site daily for appropriate PPE and safety equipment (see checklist items below) • Inspect PPE prior to use • Inspect/mark areas of intrusive work for the presence of underground utility lines • Inspect heavy construction equipment upon receipt • Inspect heavy equipment daily • Inspect conditions associated with trenches/excavations daily

On-site Treatment of Contaminated Material
Activity Hazard Analysis (AHA 06)

General Safety Equipment Inspection Checklist

1. Are adequate and serviceable fire extinguishers provided?
2. Are fire extinguishers present at assigned locations?
3. Is access to each fire extinguisher clear of obstructions?
4. Are fire extinguishers fully charged; are locking pins in place?
5. Are eye wash stations present at assigned locations?
6. Are eye wash stations filled with water and in sanitary condition?
7. Is access to each eye wash station clear of obstructions?
8. Are first aid kits present on site?
9. Does each first aid kit contain the proper items – compresses, bandages, adhesive tape, eye dressings, ice packs, gauze, etc.?
10. Are emergency spill supplies/kits available on site?
11. Have air monitoring instruments been properly calibrated?
12. Is the required PPE available on site?
13. Has the PPE been inspected for defects or damage?
14. Are flammable chemicals (not in use) stored in an approved cabinet?
15. Are Safety Data Sheets available on site for operational chemicals?
16. Is a bloodborne pathogens exposure kit available on site?
17. Is cold, potable water available to employees?
18. Are sanitation facilities (i.e. hand wash) and supplies available on site?
19. Are toilet facilities clean?

On-site Treatment of Contaminated Material
Activity Hazard Analysis (AHA 06)

ACTIVITY HAZARD ANALYSIS ACKNOWLEDGEMENT:

By signing below, I am confirming that I have reviewed the contents of this AHA, including the description of the relevant hazards, safe work practices and hazard control measures, recommended personal protective equipment, inspection requirements, and training requirements. As such, I understand and concur with the AHA and will comply with the health and safety standards and protocols referenced herein. I further understand that work activities must immediately be discontinued if an imminent danger exists, any change in the scope of work occurs that could affect worker health and safety, new hazards are identified, existing hazards cannot be adequately controlled, and/or any change in work conditions occurs that could adversely impact worker health and safety.

Printed Name	Signature	Date

The AHA shall be reviewed and modified as necessary to address changing site conditions, operations, or change of competent/qualified persons

EM 385 2008 EDITION

Decontamination
Hazard Analysis (AHA 04)

Activity/Work Task: **Decontamination**	Overall Risk Assessment Code (RAC) (of the highest hazard): **L**
Project Location: NASA Plum Brook Station, Sandusky, Ohio	
Contract Number:	
Date Prepared: 05-15-19	
Prepared by (Name/Title):Carl Shaw	
Reviewed by (Name/Title): Jeremy Soenen	
Notes: (Field Notes, Review Comments, etc.) **Call NASA PBS Emergency Dispatch for all emergencies** **419-621-3222**	

Risk Assessment Code (RAC) Matrix

Severity	Probability: Frequent	Likely	Occasional	Seldom	Unlikely
Catastrophic	E	E	H	H	M
Critical	E	H	H	M	L
Marginal	H	M	M	L	L
Negligible	M	L	L	L	L

Step 1: Determine and enter RAC codes for each **"Hazard"** with safety **"Controls"** (E, H, M, or L)

"Probability" is the likelihood to cause an incident, near miss, or accident and identified as: Frequent, Likely, Occasional, Seldom or Unlikely.

"Severity" is the outcome/degree if an incident, near miss, or accident did occur and identified as: Catastrophic, Critical, Marginal, or Negligible

Step 2: Use the highest individual RAC of the Hazards + Controls below as the overall RAC for the Activity, and enter at the top of the AHA sheet.

RAC Chart

- E = Extremely High Risk
- H = High Risk
- M = Moderate Risk
- L = Low Risk

Job Steps	Hazards	Controls	RAC
Decontamination, including: • Decontamination of personnel including doffing and disposal of disposable PPE, washing non-disposable PPE, washing face and hands, and hygiene. • Decontamination of equipment including dry decontamination by removing impacted soil from bucket, tracks, etc. using a shovel and broom/brush; and wet decontamination using water with non-phosphate detergent and a brush.	**General Hazards**	**General hazards:** • Wear protective leather gloves as necessary. • Wear safety glasses. • Wear hard hats. • Wear safety-toe footwear. • Wear hearing protection as necessary. • Wear high-visibility construction vests. • Ensure that fire extinguishers are available to personnel. • Provide fire extinguishers (at least 10# ABC) inside the cabs of heavy construction equipment. • Inspect the jobsite daily for the presence of required PPE and safety equipment (see checklist items below). • Smoking shall only be permitted in approved areas.	
	Decontamination (personnel)	**Personnel decontamination:** • Establish a contaminant reduction zone (CRZ) between	

Decontamination
Hazard Analysis (AHA 04)

		the exclusion zone and the support zone. Equip the CRZ with decontamination items necessary for the task (e.g., boot wash, garbage bag, hand wipes, etc.) • Remove PPE in the following order: respirator (if used) disposable coverall (if used), boots, and gloves • Dispose of disposable PPE items • Before removing gloves, wash soiled work boots with water and a brush as needed. A water filled pressurized spray tank can be used to provide water for the boot wash • Remove gloves and use hand wipes on hands and face as needed • Wash and rinse hands and face on a regular basis • Shower regularly • Launder work clothing regularly • Avoid distributing / transporting contaminated media to clean areas • Boot wash and rinse water will be dumped onto the ground and allowed to infiltrate	
	Decontamination (equipment)	**Equipment decontamination:** • Equipment used to excavate contaminated soil will be dry decontaminated using shovels and brooms prior to moving the equipment from a contaminated area to a clean area. • Perform wet decontamination prior to demobilizing equipment from the site • Perform wet decontamination prior to doing repair work to equipment • Wet decontamination will generally consist of spraying with a low volume, high pressure washer. • Control the placement of the power washer hose and lay hose out in a way to minimize obstructions or knots • Wash corner spaces at an angle to minimize back spray • Never aim nozzle towards people or yourself • Be aware of others working around the washing area	**L**

Decontamination
Hazard Analysis (AHA 04)

		• Never change washing tip while machine is running • Never use anything to secure the trigger in the 'ON' position • Do not perform other tasks while holding the pressure washer gun • In the event of a hose tangle, set the wand down while managing the hose • A "decontamination pad" will be constructed (using plastic sheeting, lumber, hay bales, etc.) at the support area to promote the collection / recovery of rise water. • At the conclusion the field work, all equipment will be thoroughly decontaminated prior to being returned to vendors. • The SSO or Site Supervisor will inspect all equipment leaving the site for adequacy of decontamination.	
	Dust	**Dust**: • Personnel will avoid working in elevated dust environments. • When possible, stand up-wing of dust generating operations such as dry decontamination. • Dust monitoring procedures and action levels for dust can be found in the HASP. Level of PPE may be modified by SSO based on site conditions • While performing dry decontamination, minimize material free-fall of contaminated soil from excavation equipment (e.g., excavator bucket) • Drive slowly while on the site to minimize dust generation • Suspend or restrict work activities when dust levels become elevated or when the wind speed is excessive	**L**
	General Safety Hazards: • Fire	**Fire:** • Smoking is not allowed on site	**L**

Decontamination
Hazard Analysis (AHA 04)

	• Noise • Heavy lifting • Slips, trips, falls • Hand injuries • Insect/animal bites/poisonous plants • Weather • Heat stress • Cold stress	• Fire extinguishers shall be available on-site **Noise:** • Personnel shall wear hearing protection, as necessary, to reduce exposures to below the NASA and OSHA limit of 82dB **Heavy Lifting:** • Proper lifting techniques shall be used • No individual employee is permitted to lift any object that weighs over 40 pounds • Multiple employees or the use of mechanical lifting devices are required for lifting objects over the 40-pound limit **Slip / Trip / Fall:** • Keep work areas clear and maintain housekeeping • Personnel shall not jump from equipment or elevated surfaces • Personnel shall avoid walking on rough or slippery terrain • Personnel working at heights greater than six feet shall utilize fall protection (full body harness with lanyard) **Hand Injuries:** • Items to be handled shall be inspected for sharp edges prior to being handled • Personnel shall wear leather gloves when handling sharp materials • Personnel shall be aware of and avoid pinch point hazards **Insects / Animal Bites / Poisonous Plants:** • Review injury potential with workers	

Decontamination
Hazard Analysis (AHA 04)

		• Wear PPE and tape joints to keep insects away from the skin • Use protective insect repellents containing DEET to prevent insect bites • Treat clothing with permethrin to discourage ticks • Check limbs/body for insects/ insect bites before showering • Notify SSHO of flu-like symptoms • Wear long-sleeved shirts/trousers or Tyvek coveralls to avoid skin contact with plants or other skin irritants • Identify and review poisonous plants with workers • Avoid unnecessary clearing of plant/vegetation areas • Identify workers who are known to contract poison ivy **Weather:** • Weather conditions shall be monitored. • Operations shall cease during high wind or electrical storms or when electrical storms are imminent. **Heat Stress:** • Follow procedures outlined in the SSHP • Drink ample quantities of water • Wear sunscreen • Protect the head and face from direct sun exposure • Perform self-monitoring of heart rate • Take adequate breaks in a cool, shaded area **Cold Stress**: • Follow procedures outlined in the SSHP • Wear warm clothes and boots • Wear layers of clothing • Avoid sweating by adding or removing layers of clothing, as necessary	

Decontamination
Hazard Analysis (AHA 04)

		• Protect the head, face, and hands from cold and wind exposure • Take adequate breaks in a warm area, as needed	

Equipment to be Used	Training Requirements & Competent or Qualified Personnel name(s)	Inspection Requirements
• Pressure washer • Personal protective equipment (PPE) • Rain suit • Waterproof gloves • Hard hats • Waterproof safety-toe footwear • Splash goggles or visor (as necessary) • High visibility vests • Hearing protection (as needed) • Eyewash station • Fire extinguisher • Air monitoring (dust monitor)	• 40-hour HAZWOPER training and 8-hour Refresher • Attend site safety orientation at the start of the project • Attend daily tailgate safety meetings prior to commencing work. • Review Arrowhead Emergency Response Plan, including facility-specific evacuation routes and location of severe weather shelter areas. • Review hazard communication requirements, including applicable SDSs. • Heavy equipment operators shall be properly trained, certified, and/or licensed for the specific piece of equipment as required	• Intrusive activities clearance request form completed • Inspect the job site daily for appropriate PPE and safety equipment (see checklist items below) • Inspect PPE prior to use • Inspect/mark areas of intrusive work for the presence of underground utility lines • Inspect heavy construction equipment upon receipt • Inspect heavy equipment daily • Inspect conditions associated with trenches/excavations daily

General Safety Equipment Inspection Checklist

1. Are adequate and serviceable fire extinguishers provided?
2. Are fire extinguishers present at assigned locations?
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4. Are fire extinguishers fully charged; are locking pins in place?
5. Are eye wash stations present at assigned locations?
6. Are eye wash stations filled with water and in sanitary condition?
7. Is access to each eye wash station clear of obstructions?
8. Are first aid kits present on site?
9. Does each first aid kit contain the proper items – compresses, bandages, adhesive tape, eye dressings, ice packs, gauze, etc.?
10. Are emergency spill supplies/kits available on site?
11. Have air monitoring instruments been properly calibrated?

Decontamination
Hazard Analysis (AHA 04)

12. Is the required PPE available on site?
13. Has the PPE been inspected for defects or damage?
14. Are flammable chemicals (not in use) stored in an approved cabinet?
15. Are Safety Data Sheets available on site for operational chemicals?
16. Is a bloodborne pathogens exposure kit available on site?
17. Is cold, potable water available to employees?
18. Are sanitation facilities (i.e. hand wash) and supplies available on site?
19. Are toilet facilities clean?

Decontamination
Hazard Analysis (AHA 04)

ACTIVITY HAZARD ANALYSIS ACKNOWLEDGEMENT:

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Printed Name	Signature	Date

The AHA shall be reviewed and modified as necessary to address changing site conditions, operations, or change of competent/qualified persons

EM 385 2008 EDITION

On-site Treatment of Contaminated Material
Activity Hazard Analysis (AHA 06)

Activity/Work Task: **On-site Treatment of Contaminated Material**	Overall Risk Assessment Code (RAC) (of the highest hazard): **L**
Project Location: NASA Plum Brook Station, Sandusky, Ohio	
Contract Number:	
Date Prepared: 01-20-2020	
Prepared by (Name/Title):Carl Shaw	
Reviewed by (Name/Title): Jeremy Soenen	
Notes: (Field Notes, Review Comments, etc.) **Call NASA PBS Emergency Dispatch for all emergencies** **419-621-3222**	

Risk Assessment Code (RAC) Matrix

Severity	Probability: Frequent	Likely	Occasional	Seldom	Unlikely
Catastrophic	E	E	H	H	M
Critical	E	H	H	M	L
Marginal	H	M	M	L	L
Negligible	M	L	L	L	L

Step 1: Determine and enter RAC codes for each **"Hazard"** with safety **"Controls"** (E, H, M, or L)

"Probability" is the likelihood to cause an incident, near miss, or accident and identified as: Frequent, Likely, Occasional, Seldom or Unlikely.

"Severity" is the outcome/degree if an incident, near miss, or accident did occur and identified as: Catastrophic, Critical, Marginal, or Negligible

Step 2: Use the highest individual RAC of the Hazards + Controls below as the overall RAC for the Activity, and enter at the top of the AHA sheet.

RAC Chart

- E = Extremely High Risk
- H = High Risk
- M = Moderate Risk
- L = Low Risk

Job Steps	Hazards	Controls	RAC
Treating previously excavated soil, sediment, and berm material that is hazardous, per TCLP analysis, by mixing with a powdered chemical to bring the TCLP level down to non-hazardous range prior to loading and transporting to the landfill for disposal. The mixing will be done using an excavator bucket to add the powdered chemical to the excavated material and then using the excavator bucket to stir the combined material until thoroughly mixed.	**General Hazards**	**General hazards:** • Wear protective leather gloves as necessary. • Wear safety glasses. • Wear hard hats. • Wear safety-toe footwear. • Wear hearing protection as necessary. • Wear high-visibility construction vests. • Ensure that fire extinguishers are available to personnel. • Provide fire extinguishers (at least 10# ABC) inside the cabs of heavy construction equipment. • Inspect the jobsite daily for the presence of required PPE and safety equipment (see checklist items below). • Smoking shall only be permitted in approved areas.	
	Treatment hazards (general)	**Treatment hazards:** Personnel not need in treatment operations should stay out of the area when equipment is working. If it is necessary for ground	**L**

On-site Treatment of Contaminated Material
Activity Hazard Analysis (AHA 06)

		personnel to enter the area, observe the following safety precautions: • Personnel needed to assist in hooking the bags of treatment chemical should make eye contact with the operator before approaching the area. • Use proper hand signals to communicate with the operator • Stay clear of Supersacks when they are being positioned and when the contents is being dumped onto the stockpile	
	Overhead power lines	**Overhead power lines:** If possible, perform treatment activities in areas of the site that do not have overhead power lines present. If treatment activities are performed in areas with overhead utilities, use the following precautions to protect overhead utilities: • Equipment operators must remain aware of overhead power lines and maintain safe clearances - use spotters when necessary. • In accordance with OSHA standards (29 CFR 1926.550 and 1910.33), a minimum clearance of 10 feet must be maintained between mechanical equipment and energized overhead power lines. This clearance distance must be increased by 4 inches for every 10 kV over 50 kV. If it is necessary to approach closer than 10 feet from a power line, one of the two following options will be implemented in accordance with the OSHA standard: (1) the line will be de-energized and grounded, or (2) an insulating barrier will be erected to prevent contact with the line. • During operations near overhead power lines, one person involved in the operation (or the SSHO) will be assigned the duty of "spotter" to visually monitor the operation and provide timely warning to equipment operators in the event the minimum clearance distance is violated. In accordance with OSHA standards, the spotter will be positioned "so as to be able to visually monitor the	**L**

On-site Treatment of Contaminated Material
Activity Hazard Analysis (AHA 06)

		clearance between the equipment and power lines."	
	Underground utilities	**Underground utilities:** If possible, conduct treatment activities in areas of the site that do not have underground utilities present. To endure that there are no underground utilities present, or if present, to protect any underground utilities present, conduct the following: • Before any intrusive activity begins, tank positive steps to determine the locations of underground utilities. • The Arrowhead designee shall contact Ohio 811 to notify them of intent to initiate intrusive activity at the property location. This notification is to be made a minimum of two working days prior to the initiation of treatment activity. • The Arrowhead designee will ensure that underground utilities have been located and marked on the ground (using stakes, flags, and/or spray paint). • Potholing will be completed to verify the location and depth of marked utilities at appropriate intervals and at locations where known utilities are observed to be running into the ground. • Personnel shall always be alert for marking tape, wires, pipes, previously disturbed soils, crushed stone or sand bedding/backfill, discolored soil, and other indications of the presence of buried utility lines.	**L**
	Heavy construction equipment	**Heavy construction equipment:** • Only trained/qualified personnel shall be permitted to operate heavy construction / earthmoving equipment. • Wear safety belts. • Unless the operator gives an "all clear" signal, ground personnel are not permitted to approach heavy construction equipment in operation. • Ground personnel shall not position themselves between heavy construction equipment and a stationary object.	**L**

On-site Treatment of Contaminated Material
Activity Hazard Analysis (AHA 06)

		• Ground personnel working near heavy construction equipment shall wear high visibility vests. • Inspect equipment when it arrives and daily before starting work. • Equipment found to be defective shall be taken out of service and tagged accordingly. • Keep loose clothing and hair away from moving parts of heavy equipment, and avoid wearing jewelry. • Operate equipment in accordance with the manufacturer's instructions and recommendations, as presented in equipment-specific O&M manuals. • Shut down and lock out heavy equipment to prevent operation while repairs, adjustments, or preventative maintenance tasks are being performed. • No guard or device will be removed from machinery or made ineffective except while performing repairs, preventative maintenance, or adjustments, and then only after the power has been shut off. All guards and devices will be replaced immediately after completion of the work and before power is restored.	
	Stockpiles	**Stockpiles:** • Cover stockpiled treatment chemicals with tarps or poly sheeting when not in use. Secure the tarp or poly sheeting with sandbags or similar • Cover the contaminated/treated material stockpile with tarps or poly sheeting when not in use. Secure the tarp or poly sheeting with sandbags or similar • Wear PPE when tarping the contaminated/treated material stockpile • Place adequate sandbags or similar weights around the perimeter of the tarp/poly sheeting and at any seams to minimize the chance that the tarp/poly sheeting will be blown off the pile during high winds	**L**

On-site Treatment of Contaminated Material
Activity Hazard Analysis (AHA 06)

	Dust	**Dust**: • Action level for respirable dust in the Target Area for Firing Ranges 3 and 4 is 0.34 mg/m3 • Action level for respirable dust in the Shooting Area for Firing Range 3 is 0.21 mg/m3 • Action level for respirable dust in Shooting Area for Firing Range 4 is visible dust • Personnel shall avoid working in elevated dust environments. • Personnel will stand up-wind of dust-generating activities • Dust monitoring procedures and action levels for dust can be found in the HASP. Level of PPE may be modified by SSO based on site conditions • Minimize contaminated soil free-fall from excavation equipment (e.g., excavators) • Spray water on exposed soil during excavation, taking care to avoid overspraying • Cover stockpiles with plastic sheeting • Spray water on haul roads • Suspend or restrict work activities when dust levels become elevated or when the wind speed is excessive	**L**
	General Safety Hazards: • Fire • Noise • Heavy lifting • Slips, trips, falls • Hand injuries • Insect/animal bites/poisonous plants • Weather • Heat stress • Cold stress	**Fire:** • Smoking is not allowed on site • Fire extinguishers shall be available on-site **Noise:** • Personnel shall wear hearing protection, as necessary, to reduce exposures to below the NASA and OSHA limit of 82dB **Heavy Lifting:** • Proper lifting techniques shall be used	**L**

On-site Treatment of Contaminated Material
Activity Hazard Analysis (AHA 06)

		• No individual employee is permitted to lift any object that weighs over 40 pounds • Multiple employees or the use of mechanical lifting devices are required for lifting objects over the 40-pound limit **Slip / Trip / Fall:** • Keep work areas clear and maintain housekeeping • Personnel shall not jump from equipment or elevated surfaces • Personnel shall avoid walking on rough or slippery terrain • Personnel working at heights greater than six feet shall utilize fall protection (full body harness with lanyard) **Hand Injuries:** • Items to be handled shall be inspected for sharp edges prior to being handled • Personnel shall wear leather gloves when handling sharp materials • Personnel shall be aware of and avoid pinch point hazards **Insects / Animal Bites / Poisonous Plants:** • Review injury potential with workers • Wear PPE and tape joints to keep insects away from the skin • Use protective insect repellents containing DEET to limit insect bites • Treat clothing with permethrin to discourage ticks • Check limbs/body for insects/ insect bites before showering • Notify SSHO of flu-like symptoms • Wear long-sleeved shirts/trousers or Tyvek coveralls to avoid skin contact with plants or other skin irritants	

On-site Treatment of Contaminated Material
Activity Hazard Analysis (AHA 06)

		• Identify and review poisonous plants with workers • Avoid unnecessary clearing of plant/vegetation areas • Identify workers who are known to contract poison ivy **Weather:** • Weather conditions will be monitored. • Operations will cease during high wind or electrical storms or when electrical storms are imminent. **Heat Stress:** • Follow procedures outlined in the SSHP • Drink ample quantities of water • Wear sunscreen • Protect the head and face from direct sun exposure • Perform self-monitoring of heart rate • Take adequate breaks in a cool / shaded area **Cold Stress**: • Follow procedures outlined in the SSHP • Wear warm clothes and boots • Wear layers of clothing • Avoid sweating by adding or removing layers of clothing, as necessary • Protect the head, face, and hands from cold and wind exposure • Take adequate breaks in a warm area, as needed	

Equipment to be Used	Training Requirements & Competent or Qualified Personnel name(s)	Inspection Requirements
• Excavator • Personal protective equipment (PPE) • Work gloves • Hard hats	• 40-Hour HAZWOPER training and associated annual 8-Hour updates • Attend site safety orientation at the start of the project	• Inspect the job site daily for appropriate PPE and safety equipment (see checklist items below) • Inspect PPE prior to use • Inspect heavy construction equipment upon receipt

On-site Treatment of Contaminated Material
Activity Hazard Analysis (AHA 06)

• Safety-toe footwear • Safety glasses • High visibility vests • Hearing protection, as needed • Eyewash station • Fire extinguisher • Hand tools • Air monitoring (aerosol monitor) • Tyvek pants or coveralls (Level D-Modified or Level C) • Half-face air purifying respirator (Level C)	• Attend daily tailgate safety meetings prior to commencing work. • Review Arrowhead Emergency Response Plan, including facility-specific evacuation routes and location of severe weather shelter areas. • Review hazard communication requirements, including applicable SDSs. • Heavy equipment operators shall be properly trained, certified, and/or licensed for the specific piece of equipment as required	• Inspect heavy equipment daily

General Safety Equipment Inspection Checklist

1. Are adequate and serviceable fire extinguishers provided?
2. Are fire extinguishers present at assigned locations?
3. Is access to each fire extinguisher clear of obstructions?
4. Are fire extinguishers fully charged; are locking pins in place?
5. Are eye wash stations present at assigned locations?
6. Are eye wash stations filled with water and in sanitary condition?
7. Is access to each eye wash station clear of obstructions?
8. Are first aid kits present on site?
9. Does each first aid kit contain the proper items – compresses, bandages, adhesive tape, eye dressings, ice packs, gauze, etc.?
10. Are emergency spill supplies/kits available on site?
11. Have air monitoring instruments been properly calibrated?
12. Is the required PPE available on site?
13. Has the PPE been inspected for defects or damage?
14. Are flammable chemicals (not in use) stored in an approved cabinet?
15. Are Safety Data Sheets available on site for operational chemicals?
16. Is a bloodborne pathogens exposure kit available on site?
17. Is cold, potable water available to employees?
18. Are sanitation facilities (i.e. hand wash) and supplies available on site?
19. Are toilet facilities clean?

On-site Treatment of Contaminated Material
Activity Hazard Analysis (AHA 06)

ACTIVITY HAZARD ANALYSIS ACKNOWLEDGEMENT:

By signing below, I am confirming that I have reviewed the contents of this AHA, including the description of the relevant hazards, safe work practices and hazard control measures, recommended personal protective equipment, inspection requirements, and training requirements. As such, I understand and concur with the AHA and will comply with the health and safety standards and protocols referenced herein. I further understand that work activities must immediately be discontinued if an imminent danger exists, any change in the scope of work occurs that could affect worker health and safety, new hazards are identified, existing hazards cannot be adequately controlled, and/or any change in work conditions occurs that could adversely impact worker health and safety.

Printed Name	Signature	Date

The AHA shall be reviewed and modified as necessary to address changing site conditions, operations, or change of competent/qualified persons

EM 385 2008 EDITION

Loading Contaminated Material
Activity Hazard Analysis (AHA 07)

Activity/Work Task: **Loading Contaminated Material**	Overall Risk Assessment Code (RAC) (of the highest hazard): **L**
Project Location: NASA Plum Brook Station, Sandusky, Ohio	
Contract Number:	
Date Prepared: 01-20-2020	
Prepared by (Name/Title):Carl Shaw	
Reviewed by (Name/Title): Jeremy Soenen	
Notes: (Field Notes, Review Comments, etc.) **Call NASA PBS Emergency Dispatch for all emergencies** **419-621-3222**	

Risk Assessment Code (RAC) Matrix

Severity	Probability: Frequent	Likely	Occasional	Seldom	Unlikely
Catastrophic	E	E	H	H	M
Critical	E	H	H	M	L
Marginal	H	M	M	L	L
Negligible	M	L	L	L	L

Step 1: Determine and enter RAC codes for each **"Hazard"** with safety **"Controls"** (E, H, M, or L)

"Probability" is the likelihood to cause an incident, near miss, or accident and identified as: Frequent, Likely, Occasional, Seldom or Unlikely.

"Severity" is the outcome/degree if an incident, near miss, or accident did occur and identified as: Catastrophic, Critical, Marginal, or Negligible

Step 2: Use the highest individual RAC of the Hazards + Controls below as the overall RAC for the Activity, and enter at the top of the AHA sheet.

RAC Chart

- E = Extremely High Risk
- H = High Risk
- M = Moderate Risk
- L = Low Risk

Job Steps	Hazards	Controls	RAC
Loading soil, sediment, berm material, or construction debris using the following methods: • Directly into on-road dump trucks for transportation to the disposal facility • Into off-road dump trucks for transport to a stockpile • From the stockpile into on-road dump trucks for transport to the disposal facility	**General Hazards**	**General hazards:** • Wear protective leather gloves as necessary. • Wear safety glasses. • Wear hard hats. • Wear safety-toe footwear. • Wear hearing protection as necessary. • Wear high-visibility construction vests. • Ensure that fire extinguishers are available to personnel. • Provide fire extinguishers (at least 10# ABC) inside the cabs of heavy construction equipment. • Inspect the jobsite daily for the presence of required PPE and safety equipment (see checklist items below). • Smoking shall only be permitted in approved areas.	
	Loading hazards (general)	**Loading hazards:** Ground personnel not needed in loading operations should stay out of the area when equipment is working. If it is necessary for	**L**

Loading Contaminated Material
Activity Hazard Analysis (AHA 07)

		ground personnel to enter the area, observe the following safety precautions: • Personnel should make eye contact with the operator before approaching the area • Use proper hand signals to communicate with the operator • Stay clear of the swing radius	
	Overhead power lines	**Overhead power lines:** If possible, perform treatment activities in areas of the site that do not have overhead power lines present. If treatment activities are performed in areas with overhead utilities, use the following precautions to protect overhead utilities: • Equipment operators must remain aware of overhead power lines and maintain safe clearances - use spotters when necessary. • In accordance with OSHA standards (29 CFR 1926.550 and 1910.33), a minimum clearance of 10 feet must be maintained between mechanical equipment and energized overhead power lines. This clearance distance must be increased by 4 inches for every 10 kV over 50 kV. If it is necessary to approach closer than 10 feet from a power line, one of the two following options will be implemented in accordance with the OSHA standard: (1) the line will be de-energized and grounded, or (2) an insulating barrier will be erected to prevent contact with the line. • During operations near overhead power lines, one person involved in the operation (or the SSHO) will be assigned the duty of "spotter" to visually monitor the operation and provide timely warning to equipment operators in the event the minimum clearance distance is violated. In accordance with OSHA standards, the spotter will be positioned "so as to be able to visually monitor the clearance between the equipment and power lines."	**L**

Loading Contaminated Material
Activity Hazard Analysis (AHA 07)

	Underground utilities	**Underground utilities:** If possible, conduct treatment activities in areas of the site that do not have underground utilities present. To endure that there are no underground utilities present, or if present, to protect any underground utilities present, conduct the following: • Before any intrusive activity begins, tank positive steps to determine the locations of underground utilities. • The Arrowhead designee shall contact Ohio 811 to notify them of intent to initiate intrusive activity at the property location. This notification is to be made a minimum of two working days prior to the initiation of treatment activity. • The Arrowhead designee will ensure that underground utilities have been located and marked on the ground (using stakes, flags, and/or spray paint). • Potholing will be completed to verify the location and depth of marked utilities at appropriate intervals and at locations where known utilities are observed to be running into the ground. • Personnel shall always be alert for marking tape, wires, pipes, previously disturbed soils, crushed stone or sand bedding/backfill, discolored soil, and other indications of the presence of buried utility lines.	**L**
	Heavy construction equipment	**Heavy construction equipment:** • Only trained/qualified personnel shall be permitted to operate heavy construction / earthmoving equipment. • Wear safety belts. • Unless the operator gives an “all clear” signal, ground personnel are not permitted to approach heavy construction equipment in operation. • Ground personnel shall not position themselves between heavy construction equipment and a stationary object. • Ground personnel working near heavy construction equipment shall wear high visibility vests.	**L**

Loading Contaminated Material
Activity Hazard Analysis (AHA 07)

		• Inspect equipment when it arrives and daily before starting work. • Equipment found to be defective shall be taken out of service and tagged accordingly. • Keep loose clothing and hair away from moving parts of heavy equipment, and avoid wearing jewelry. • Operate equipment in accordance with the manufacturer's instructions and recommendations, as presented in equipment-specific O&M manuals. • Shut down and lock out heavy equipment to prevent operation while repairs, adjustments, or preventative maintenance tasks are being performed. • No guard or device will be removed from machinery or made ineffective except while performing repairs, preventative maintenance, or adjustments, and then only after the power has been shut off. All guards and devices will be replaced immediately after completion of the work and before power is restored.	
	Stockpiles (if used)	**Stockpiles:** • Cover stockpiled treatment chemicals with tarps or poly sheeting when not in use. Secure the tarp or poly sheeting with sandbags or similar • Cover the contaminated/treated material stockpile with tarps or poly sheeting when not in use. Secure the tarp or poly sheeting with sandbags or similar • Wear PPE when tarping the contaminated/treated material stockpile • Place adequate sandbags or similar weights around the perimeter of the tarp/poly sheeting and at any seams to minimize the chance that the tarp/poly sheeting will be blown off the pile during high winds	**L**
	Dust	**Dust**:	**L**

Loading Contaminated Material
Activity Hazard Analysis (AHA 07)

		• Action level for respirable dust in the Target Area for Firing Ranges 3 and 4 is 0.34 mg/m3 • Action level for respirable dust in the Shooting Area for Firing Range 3 is 0.21 mg/m3 • Action level for respirable dust in Shooting Area for Firing Range 4 is visible dust • Personnel shall avoid working in elevated dust environments. • Personnel will stand up-wind of dust-generating activities • Dust monitoring procedures and action levels for dust can be found in the HASP. Level of PPE may be modified by SSO based on site conditions • Minimize contaminated soil free-fall from excavation equipment (e.g., excavators) • Spray water on exposed soil during excavation, taking care to avoid overspraying • Cover stockpiles with plastic sheeting • Spray water on haul roads • Suspend or restrict work activities when dust levels become elevated or when the wind speed is excessive	
	General Safety Hazards: • Fire • Noise • Heavy lifting • Slips, trips, falls • Hand injuries • Insect/animal bites/poisonous plants • Weather • Heat stress • Cold stress	**Fire:** • Smoking is not allowed on site • Fire extinguishers shall be available on-site **Noise:** • Personnel shall wear hearing protection, as necessary, to reduce exposures to below the NASA and OSHA limit of 82dB **Heavy Lifting:** • Proper lifting techniques shall be used • No individual employee is permitted to lift any object that weighs over 40 pounds	**L**

Loading Contaminated Material
Activity Hazard Analysis (AHA 07)

		• Multiple employees or the use of mechanical lifting devices are required for lifting objects over the 40-pound limit **Slip / Trip / Fall:** • Keep work areas clear and maintain housekeeping • Personnel shall not jump from equipment or elevated surfaces • Personnel shall avoid walking on rough or slippery terrain • Personnel working at heights greater than six feet shall utilize fall protection (full body harness with lanyard) **Hand Injuries:** • Items to be handled shall be inspected for sharp edges prior to being handled • Personnel shall wear leather gloves when handling sharp materials • Personnel shall be aware of and avoid pinch point hazards **Insects / Animal Bites / Poisonous Plants:** • Review injury potential with workers • Wear PPE and tape joints to keep insects away from the skin • Use protective insect repellents containing DEET to limit insect bites • Treat clothing with permethrin to discourage ticks • Check limbs/body for insects/ insect bites before showering • Notify SSHO of flu-like symptoms • Wear long-sleeved shirts/trousers or Tyvek coveralls to avoid skin contact with plants or other skin irritants • Identify and review poisonous plants with workers • Avoid unnecessary clearing of plant/vegetation areas	

Loading Contaminated Material
Activity Hazard Analysis (AHA 07)

		• Identify workers who are known to contract poison ivy **Weather:** • Weather conditions will be monitored. • Operations will cease during high wind or electrical storms or when electrical storms are imminent. **Heat Stress:** • Follow procedures outlined in the SSHP • Drink ample quantities of water • Wear sunscreen • Protect the head and face from direct sun exposure • Perform self-monitoring of heart rate • Take adequate breaks in a cool / shaded area **Cold Stress**: • Follow procedures outlined in the SSHP • Wear warm clothes and boots • Wear layers of clothing • Avoid sweating by adding or removing layers of clothing, as necessary • Protect the head, face, and hands from cold and wind exposure • Take adequate breaks in a warm area, as needed	

Equipment to be Used	Training Requirements & Competent or Qualified Personnel name(s)	Inspection Requirements
• Excavator • Personal protective equipment (PPE) • Work gloves • Hard hats • Safety-toe footwear • Safety glasses	• 40-Hour HAZWOPER training and associated annual 8-Hour updates • Attend site safety orientation at the start of the project • Attend daily tailgate safety meetings prior to commencing work.	• Inspect the job site daily for appropriate PPE and safety equipment (see checklist items below) • Inspect PPE prior to use • Inspect heavy construction equipment upon receipt • Inspect heavy equipment daily

Loading Contaminated Material
Activity Hazard Analysis (AHA 07)

• High visibility vests • Hearing protection, as needed • Eyewash station • Fire extinguisher • Hand tools • Air monitoring (aerosol monitor)	• Review Arrowhead Emergency Response Plan, including facility-specific evacuation routes and location of severe weather shelter areas. • Review hazard communication requirements, including applicable SDSs. • Heavy equipment operators shall be properly trained, certified, and/or licensed for the specific piece of equipment as required	

General Safety Equipment Inspection Checklist

1. Are adequate and serviceable fire extinguishers provided?
2. Are fire extinguishers present at assigned locations?
3. Is access to each fire extinguisher clear of obstructions?
4. Are fire extinguishers fully charged; are locking pins in place?
5. Are eye wash stations present at assigned locations?
6. Are eye wash stations filled with water and in sanitary condition?
7. Is access to each eye wash station clear of obstructions?
8. Are first aid kits present on site?
9. Does each first aid kit contain the proper items – compresses, bandages, adhesive tape, eye dressings, ice packs, gauze, etc.?
10. Are emergency spill supplies/kits available on site?
11. Have air monitoring instruments been properly calibrated?
12. Is the required PPE available on site?
13. Has the PPE been inspected for defects or damage?
14. Are flammable chemicals (not in use) stored in an approved cabinet?
15. Are Safety Data Sheets available on site for operational chemicals?
16. Is a bloodborne pathogens exposure kit available on site?
17. Is cold, potable water available to employees?
18. Are sanitation facilities (i.e. hand wash) and supplies available on site?
19. Are toilet facilities clean?

Loading Contaminated Material
Activity Hazard Analysis (AHA 07)

ACTIVITY HAZARD ANALYSIS ACKNOWLEDGEMENT:

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Printed Name	Signature	Date

The AHA shall be reviewed and modified as necessary to address changing site conditions, operations, or change of competent/qualified persons

EM 385 2008 EDITION

Backfill and Site Restoration
Activity Hazard Analysis (AHA 08)

Activity/Work Task: **Backfill and Site Restoration**	Overall Risk Assessment Code (RAC) (of the highest hazard): **L**
Project Location: NASA Plum Brook Station, Sandusky, Ohio	
Contract Number:	
Date Prepared: 01-20-2020	
Prepared by (Name/Title): Carl Shaw	
Reviewed by (Name/Title): Michael Britsch	
Notes: (Field Notes, Review Comments, etc.) **Call NASA PBS Emergency Dispatch for all emergencies** **419-621-3222**	

Risk Assessment Code (RAC) Matrix

Severity	Probability: Frequent	Likely	Occasional	Seldom	Unlikely
Catastrophic	E	E	H	H	M
Critical	E	H	H	M	L
Marginal	H	M	M	L	L
Negligible	M	L	L	L	L

Step 1: Determine and enter RAC codes for each **"Hazard"** with safety **"Controls"** (E, H, M, or L)

"Probability" is the likelihood to cause an incident, near miss, or accident and identified as: Frequent, Likely, Occasional, Seldom or Unlikely.

"Severity" is the outcome/degree if an incident, near miss, or accident did occur and identified as: Catastrophic, Critical, Marginal, or Negligible

Step 2: Use the highest individual RAC of the Hazards + Controls below as the overall RAC for the Activity, and enter at the top of the AHA sheet.

RAC Chart

- E = Extremely High Risk
- H = High Risk
- M = Moderate Risk
- L = Low Risk

Job Steps	Hazards	Controls	RAC
• Placement, compaction, and grading of clean backfill materials (sub-soil and top soil) • Gravel placement, if needed • Removal of temporary orange construction fencing, if needed • Seed and hydromulch	**General Hazards**	**General hazards:** • Wear protective leather gloves as necessary. • Wear safety glasses. • Wear hard hats. • Wear safety-toe footwear. • Wear hearing protection as necessary. • Wear high-visibility construction vests. • Ensure that fire extinguishers are available to personnel. • Provide fire extinguishers (at least 10# ABC) inside the cabs of heavy construction equipment. • Inspect the jobsite daily for the presence of required PPE and safety equipment (see checklist items below). • Smoking is not allowed on site.	L
	Overhead power lines	**Overhead power lines:** • Equipment operators must remain aware of overhead power lines and maintain safe clearances - use spotters	L

Backfill and Site Restoration
Activity Hazard Analysis (AHA 08)

		when necessary. • A site layout plan shall be completed prior to mobilizing heavy equipment. The plan shall identify all overhead and underground hazards. • Before drilling equipment is moved, the travel route shall be surveyed for overhead and terrain hazards. The mast must be lowered before transporting equipment. • In accordance with OSHA standards (29 CFR 1926.550 and 1910.33), a minimum clearance of 10 feet must be maintained between mechanical equipment and energized overhead power lines. This clearance distance must be increased by 4 inches for every 10 kV over 50 kV. If it necessary to approach closer than 10 feet from a power line, one of the two following options will be implemented in accordance with the OSHA standard: (1) the line will be will be de-energized and grounded, or (2) an insulating barrier will be erected to prevent contact with the line. The barrier must be rated for the voltage of the line to be guarded. These options, if needed, will be implemented by the applicable utility company. • During operations near overhead power lines, one person involved in the operation (or the SSHO) will be assigned the duty of "observer" to visually monitor the operation and provide timely warning to equipment operators in the event the minimum clearance distance is violated. In accordance with OSHA standards, the observer will be positioned "so as to be able to visually monitor the clearance between the equipment and power lines." The observer cannot be assigned other duties that would interfere with the ability to provide safety oversight and time warnings.	
	Heavy construction equipment and dump trucks	**Heavy construction equipment:** • Only trained/qualified personnel shall be permitted to operate heavy construction / earthmoving equipment.	**L**

Backfill and Site Restoration
Activity Hazard Analysis (AHA 08)

		• Backup alarms must be operational. • Wear safety belts. • Unless the operator gives an “all clear” signal, ground personnel shall not be permitted to approach heavy construction equipment in operation. • Ground personnel shall not position themselves between heavy construction equipment and a stationary object. • Ground personnel shall not work behind the skid steer while it is operating. • Ground personnel working near heavy construction equipment shall wear high visibility vests. • Spotters shall assist trucks when backing is necessary. • Rigging shall be inspected before each use. • Rigging found to be unsafe shall be taken out of service and tagged accordingly. • Inspect equipment daily (see checklist items below; also, refer to Arrowhead’s Heavy Equipment Initial Inspection Checklist and Daily Inspection Checklist). • Equipment found to be defective shall be taken out of service and tagged accordingly. • Keep loose clothing and hair away from moving parts of heavy equipment, and avoid wearing jewelry. • Operate equipment in accordance with the manufacturer’s instructions and recommendations, as presented in equipment-specific O&M manuals. • Shut down and lock out heavy equipment to prevent operation while repairs, adjustments, or preventative maintenance tasks are being performed. • No guard or device will be removed from machinery, or made ineffective except while performing repairs, preventative maintenance, or adjustments, and then only after the power has been shut off; all guards and devices will be replaced immediately after completion of the work and before power is restored.	

Backfill and Site Restoration
Activity Hazard Analysis (AHA 08)

		• Equipment shall be inspected regularly to check for unusual noises, loose connections, vibrations, misalignment, etc. that may be indicative of malfunction. • All components of heavy equipment that have a direct bearing on the safety of the operation shall be inspected at the beginning of each shift and when possible, observed during operation. • Equipment shall not be used if it is not in a safe operating condition. • A copy of the equipment operating manual shall be available at the job site. **Dump Trucks:** • Dump trucks entering a residential property shall maintain a line of site with a ground person during backing activities. • Ground personnel shall direct trucks with hand gestures and verbal communication. • Ground personnel shall guide trucks backing into properties to prevent property damage, personal injury, and loss of control.	
	General Safety Hazards: • Fire • Noise • Heavy lifting • Slips, trips, falls • Hand injuries • Insect/animal bites/poisonous plants • Weather • Heat stress • Cold stress	**Fire:** • Smoking is not allowed on site • Fire extinguishers shall be available on-site **Noise:** • Personnel shall wear hearing protection, as necessary, to reduce exposures to below the NASA and OSHA limit of 82dB **Heavy Lifting:** • Proper lifting techniques shall be used	L

Backfill and Site Restoration
Activity Hazard Analysis (AHA 08)

		• No individual employee is permitted to lift any object that weighs over 40 pounds • Multiple employees or the use of mechanical lifting devices are required for lifting objects over the 40-pound limit **Slip / Trip / Fall:** • Keep work areas clear and maintain housekeeping • Personnel shall not jump from equipment or elevated surfaces • Personnel shall avoid walking on rough or slippery terrain • Personnel working at heights greater than six feet shall utilize fall protection (full body harness with lanyard) **Hand Injuries:** • Items to be handled shall be inspected for sharp edges prior to being handled • Personnel shall wear leather gloves when handling sharp materials • Personnel shall be aware of and avoid pinch point hazards **Insects / Animal Bites / Poisonous Plants:** • Review injury potential with workers • Wear PPE and tape joints to keep insects away from the skin • Use protective insect repellents containing DEET to prevent insect bites • Treat clothing with permethrin to discourage ticks • Check limbs/body for insects/ insect bites before showering • Notify SSHO of flu-like symptoms • Wear long-sleeved shirts/trousers or Tyvek coveralls to avoid skin contact with plants or other skin irritants	

Backfill and Site Restoration
Activity Hazard Analysis (AHA 08)

		• Identify and review poisonous plants with workers • Avoid unnecessary clearing of plant/vegetation areas • Identify workers who are known to contract poison ivy **Weather:** • Weather conditions shall be monitored. • Operations shall cease during high wind or electrical storms or when electrical storms are imminent. **Heat Stress:** • Follow procedures outlined in the SSHP • Drink ample quantities of water • Wear sunscreen • Protect the head and face from direct sun exposure • Perform self-monitoring of heart rate • Take adequate breaks in a cool / shaded area **Cold Stress**: • Follow procedures outlined in the SSHP • Wear warm clothes and boots • Wear layers of clothing • Avoid sweating by adding or removing layers of clothing, as necessary • Protect the head, face, and hands from cold and wind exposure • Take adequate breaks in a warm area, as needed	

Equipment to be Used	Training Requirements & Competent or Qualified Personnel name(s)	Inspection Requirements
• Skid-steer loader • Compaction equipment, as needed (i.e. walk-behind pad foot roller, walk behind plate compactor)	• Attend site safety orientation at the start of the project • Attend daily tailgate safety meetings prior to commencing work.	• Intrusive activities clearance request form completed • Inspect the job site daily for appropriate PPE and safety equipment (see checklist items below) • Inspect hand and power tools prior to use (see checklist

Backfill and Site Restoration
Activity Hazard Analysis (AHA 08)

• Dump trucks • Trash pump • Personal protective equipment (PPE) • Leather gloves • Hard hats • Safety-toe footwear • Splash goggles (as necessary) • Eyewash station • Fire extinguisher • High visibility vests • Hand tools • Air monitoring (aerosol monitor) • Hearing protection • Tyvek pants or coveralls (Level D-Modified or Level C) • Half-face air purifying respirator (Level C)	• Review Arrowhead Emergency Response Plan, including facility-specific evacuation routes and location of severe weather shelter areas. • Review hazard communication requirements, including applicable SDSs. • Heavy equipment operators shall be properly trained, certified, and/or licensed for the specific piece of equipment as required	items below) • Inspect ladders prior to use • Inspect PPE prior to use • Inspect/mark areas of intrusive work for the presence of underground utility lines; complete Utility Clearance Form) • Inspect heavy construction equipment upon receipt (see Heavy Equipment Initial Inspection Checklist) • Inspect heavy equipment daily (see checklist items below; also, see Heavy Equipment Daily Inspection Checklist) • Inspect conditions associated with trenches/excavations daily (see Trench / Excavation Checklist)

General Safety Equipment Inspection Checklist

1. Are adequate and serviceable fire extinguishers provided?
2. Are fire extinguishers present at assigned locations?
3. Is access to each fire extinguisher clear of obstructions?
4. Are fire extinguishers fully charged; are locking pins in place?
5. Are eye wash stations present at assigned locations?
6. Are eye wash stations filled with water and in sanitary condition?
7. Is access to each eye wash station clear of obstructions?
8. Are first aid kits present on site?
9. Does each first aid kit contain the proper items – compresses, bandages, adhesive tape, eye dressings, ice packs, gauze, etc.?
10. Are emergency spill supplies/kits available on site?
11. Have air monitoring instruments been properly calibrated?
12. Is the required PPE available on site?
13. Has the PPE been inspected for defects or damage?
14. Are flammable chemicals (not in use) stored in an approved cabinet?
15. Are Safety Data Sheets available on site for operational chemicals?
16. Is a bloodborne pathogens exposure kit available on site?
17. Is cold, potable water available to employees?
18. Are heat stress monitoring instruments (i.e. thermometers) available and ready for use?
19. Are sanitation facilities (i.e. hand wash) and supplies available on site?
20. Are toilet facilities clean?

Backfill and Site Restoration
Activity Hazard Analysis (AHA 08)

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Printed Name	Signature	Date

The AHA shall be reviewed and modified as necessary to address changing site conditions, operations, or change of competent/qualified persons

EM 385 2008 EDITION

Surveying
Activity Hazard Analysis (AHA 10)

Activity/Work Task: **Surveying**	Overall Risk Assessment Code (RAC) (of the highest hazard): **L**
Project Location: NASA Plum Brook Station, Sandusky, Ohio	
Contract Number:	
Date Prepared: 01-20-2020	
Prepared by (Name/Title): Carl Shaw	
Reviewed by (Name/Title): Michael Britsch	
Notes: (Field Notes, Review Comments, etc.) **Call NASA PBS Emergency Dispatch for all emergencies** **419-621-3222**	

Risk Assessment Code (RAC) Matrix

Severity	Probability: Frequent	Likely	Occasional	Seldom	Unlikely
Catastrophic	E	E	H	H	M
Critical	E	H	H	M	L
Marginal	H	M	M	L	L
Negligible	M	L	L	L	L

Step 1: Determine and enter RAC codes for each **"Hazard"** with safety **"Controls"** (E, H, M, or L)

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"Severity" is the outcome/degree if an incident, near miss, or accident did occur and identified as: Catastrophic, Critical, Marginal, or Negligible

Step 2: Use the highest individual RAC of the Hazards + Controls below as the overall RAC for the Activity, and enter at the top of the AHA sheet.

RAC Chart

- E = Extremely High Risk
- H = High Risk
- M = Moderate Risk
- L = Low Risk

Job Steps	Hazards	Controls	RAC
Site surveying activities, to include: • Establish horizontal and vertical control • Pre-excavation topographic survey • Post-excavation topographic survey for measurement of excavation volume • Post-common backfill topographic survey for measurement of common backfill volume • Post-topsoil topographic survey for measurement of topsoil volume	**Miscellaneous Site Activity**	**Miscellaneous Site Activity**: • When possible, personnel shall avoid areas that have hazardous activities in progress. • When access must be gained in busy areas, the foremen of the activities in the area shall be notified prior to surveying in the area. • High visibility vests shall be worn when working in areas with high vehicular or heavy equipment traffic. • Avoid contact with contaminated soil	L
	Heavy lifting	**Heavy Lifting**:	

Surveying
Activity Hazard Analysis (AHA 10)

		• Proper lifting techniques shall be used. • No individual employee is permitted to lift any object that weighs over 40 pounds. • Multiple employees or the use of mechanical lifting devices are required for lifting objects over the 40-pound limit.	
	Intrusive activities	**Intrusive Activities**: • Follow procedure for Intrusive Activities Permit. • Underground utilities shall be located and marked prior to driving stakes, posts, benchmarks, etc.	**L**
	Motor vehicles	**Struck by Vehicles**: • Personnel working on or near roads shall wear high visibility vests and only remain on road long enough to complete work. • Personnel walking along roadway shall stay off roadway as far as possible and walk on the side facing traffic.	**L**
	Traffic control	**Traffic Control**: • Personnel shall not control traffic unless the SSHO has been contacted and the necessary safety provisions (barricades, signs, lane closures, flagmen, etc.) are in place.	**L**
	General Safety Hazards: • Fire • Noise • Heavy lifting • Slips, trips, falls • Hand injuries • Insect/animal bites/poisonous	**Fire:** • Smoking is not allowed on site • Fire extinguishers shall be available on-site **Noise:** • Personnel shall wear hearing protection, as necessary, to reduce exposures to below the NASA and OSHA limit of 82dB	**L**

Surveying
Activity Hazard Analysis (AHA 10)

	plants • Weather • Heat stress • Cold stress	**Heavy Lifting:** • Proper lifting techniques shall be used • No individual employee is permitted to lift any object that weighs over 40 pounds • Multiple employees or the use of mechanical lifting devices are required for lifting objects over the 40-pound limit **Slip / Trip / Fall:** • Keep work areas clear and maintain housekeeping • Personnel shall not jump from equipment or elevated surfaces • Personnel shall avoid walking on rough or slippery terrain • Personnel working at heights greater than six feet shall utilize fall protection (full body harness with lanyard) **Hand Injuries:** • Items to be handled shall be inspected for sharp edges prior to being handled • Personnel shall wear leather gloves when handling sharp materials • Personnel shall be aware of and avoid pinch point hazards **Insects / Animal Bites / Poisonous Plants:** • Review injury potential with workers • Wear PPE and tape joints to keep insects away from the skin • Use protective insect repellents containing DEET to prevent insect bites • Treat clothing with permethrin to discourage ticks • Check limbs/body for insects/ insect bites before showering • Notify SSHO of flu-like symptoms • Wear long-sleeved shirts/trousers or Tyvek coveralls to avoid skin contact with plants or other skin irritants	

Surveying
Activity Hazard Analysis (AHA 10)

		• Identify and review poisonous plants with workers • Avoid unnecessary clearing of plant/vegetation areas • Identify workers who are known to contract poison ivy **Weather:** • Weather conditions shall be monitored. • Operations shall cease during high wind or electrical storms or when electrical storms are imminent. **Heat Stress:** • Follow procedures outlined in the SSHP • Drink ample quantities of water • Wear sunscreen • Protect the head and face from direct sun exposure • Perform self-monitoring of heart rate • Take adequate breaks in a cool / shaded area **Cold Stress**: • Follow procedures outlined in the SSHP • Wear warm clothes and boots • Wear layers of clothing • Avoid sweating by adding or removing layers of clothing, as necessary • Protect the head, face, and hands from cold and wind exposure • Take adequate breaks in a warm area, as needed	

Equipment to be Used	Training Requirements & Competent or Qualified Personnel name(s)	Inspection Requirements

Surveying
Activity Hazard Analysis (AHA 10)

• Personal protective equipment (PPE) as listed below • Nitrile gloves • Leather gloves • Hard hats • Safety-toe footwear • Disposable boot covers • Fire extinguisher • High visibility vests • Hearing protection	• Inspect the job site daily for appropriate PPE and safety equipment • Inspect PPE prior to use	• Attend site safety orientation at the start of the project • Attend daily tailgate safety meetings prior to commencing work. • Review Emergency Response Plan, including facility-specific evaluation routes and location of severe weather shelter areas. • Review hazard communication requirements, including applicable SDSs. • Heavy equipment operators shall be properly trained,

General Safety Equipment Inspection Checklist

1. Are adequate and serviceable fire extinguishers provided?
2. Are fire extinguishers present at assigned locations?
3. Is access to each fire extinguisher clear of obstructions?
4. Are fire extinguishers fully charged; are locking pins in place?
5. Are eye wash stations present at assigned locations?
6. Are eye wash stations filled with water and in sanitary condition?
7. Is access to each eye wash station clear of obstructions?
8. Are first aid kits present on site?
9. Does each first aid kit contain the proper items – compresses, bandages, adhesive tape, eye dressings, ice packs, gauze, etc.?
10. Are emergency spill supplies/kits available on site?
11. Have air monitoring instruments been properly calibrated?
12. Is the required PPE available on site?
13. Has the PPE been inspected for defects or damage?
14. Are flammable chemicals (not in use) stored in an approved cabinet?
15. Are Safety Data Sheets available on site for operational chemicals?
16. Is a bloodborne pathogens exposure kit available on site?
17. Is cold, potable water available to employees?
18. Are heat stress monitoring instruments (i.e. thermometers) available and ready for use?
19. Are sanitation facilities (i.e. hand wash) and supplies available on site?
20. Are toilet facilities clean?

Surveying
Activity Hazard Analysis (AHA 10)

ACTIVITY HAZARD ANALYSIS ACKNOWLEDGEMENT:

By signing below, I am confirming that I have reviewed the contents of this AHA, including the description of the relevant hazards, safe work practices and hazard control measures, recommended personal protective equipment, inspection requirements, and training requirements. As such, I understand and concur with the AHA and will comply with the health and safety standards and protocols referenced herein. I further understand that work activities must immediately be discontinued if an imminent danger exists, any change in the scope of work occurs that could affect worker health and safety, new hazards are identified, existing hazards cannot be adequately controlled, and/or any change in work conditions occurs that could adversely impact worker health and safety.

Printed Name	Signature	Date

The AHA shall be reviewed and modified as necessary to address changing site conditions, operations, or change of competent/qualified persons
EM 385 2008 EDITION

Appendix C

Safety Data Sheets (SDSs)

To be assembled into a binder at the site

Safety Data Sheet

Section 1: Identification of the Substance/Mixture and of the Company/Undertaking

1.1 Product identifier

Product Name • **Asbestos, Chrysotile**

Synonyms • Chrysotile Asbestos; Serpentine chrysotile; White asbestos

Product Code • 02107A-AB; 02701-AB; 02740A-AB; 02740-AB

1.2 Relevant identified uses of the substance or mixture and uses advised against

Relevant identified use(s) • Laboratory standard in the microscopy laboratory

1.3 Details of the supplier of the safety data sheet

Manufacturer • SPI Supplies Division Structure Probe, Inc.

206 Garfield Ave.
West Chester, PA 19380
United States
http://www.2spi.com
SDS@2spi.com

Telephone (General) • 1-(610)-436-5400

1.4 Emergency telephone number

Manufacturer • 1-(800)-424-9300 - Chemtrec

Manufacturer • 1-(703)-741-5970 - Worldwide

Section 2: Hazards Identification

EU/EEC

According to: Regulation (EC) No 1272/2008 (CLP)/REACH 1907/2006 [amended by 2015/830]

2.1 Classification of the substance or mixture

CLP • Carcinogenicity 1A - H350
Specific Target Organ Toxicity Repeated Exposure 1 - H372

2.2 Label Elements

CLP

DANGER

Hazard statements • H350 - May cause cancer.
H372 - Causes damage to organs through prolonged or repeated exposure.

Precautionary statements

Prevention • P201 - Obtain special instructions before use.
P202 - Do not handle until all safety precautions have been read and understood.
P260 - Do not breathe dust.
P264 - Wash thoroughly after handling.

P270 - Do not eat, drink or smoke when using this product.
P281 - Use personal protective equipment as required.

Response • P308+P313 - IF exposed or concerned: Get medical advice/attention.
P314 - Get medical advice/attention if you feel unwell.

Storage/Disposal • P405 - Store locked up.
P501 - Dispose of content and/or container in accordance with local, regional, national, and/or international regulations.

2.3 Other Hazards

CLP • According to Regulation (EC) No. 1272/2008 (CLP) this material is considered hazardous.

United States (US)

According to: OSHA 29 CFR 1910.1200 HCS

2.1 Classification of the substance or mixture

OSHA HCS 2012 • Carcinogenicity 1A
Specific Target Organ Toxicity Repeated Exposure 1

2.2 Label elements

OSHA HCS 2012

DANGER

Hazard statements • May cause cancer.
Causes damage to organs through prolonged or repeated exposure.

Precautionary statements

Prevention • Obtain special instructions before use.
Do not handle until all safety precautions have been read and understood.
Do not breathe dust.
Wash thoroughly after handling.
Do not eat, drink or smoke when using this product.
Wear protective gloves/protective clothing/eye protection/face protection.

Response • IF exposed or concerned: Get medical advice/attention.
Get medical advice/attention if you feel unwell.

Storage/Disposal • Store locked up.
Dispose of content and/or container in accordance with local, regional, national, and/or international regulations.

2.3 Other hazards

OSHA HCS 2012 • Under United States Regulations (29 CFR 1910.1200 - Hazard Communication Standard), this product is considered hazardous.

Section 3 - Composition/Information on Ingredients

3.1 Substances

Composition					
Chemical Name	**Identifiers**	**%**	**LD50/LC50**	**Classifications According to Regulation/Directive**	**Comments**
Asbestos, chrysotile	**CAS:**12001-29-5 **EU Index:**650-013-00-6	> 99.99%	NDA	**EU CLP:** Annex VI, Table 3.1: Carc. 1A, H350; STOT RE 1, H372 ** **OSHA HCS 2012:** Carc. 1A; STOT RE 1 (Lungs)	NDA

3.2 Mixtures

- Material does not meet the criteria of a mixture.

Section 4 - First Aid Measures

4.1 Description of first aid measures

Inhalation
- Move victim to fresh air. Give artificial respiration if victim is not breathing. Administer oxygen if breathing is difficult. If signs/symptoms continue, get medical attention.

Skin
- Wash skin with soap and water. Flush with copious amounts of water for 15 minutes.

Eye
- In case of contact with substance, immediately flush eyes with running water for at least 20 minutes. Get medical attention immediately.

Ingestion
- Obtain medical attention immediately if ingested.

4.2 Most important symptoms and effects, both acute and delayed

- Refer to Section 11 - Toxicological Information.

4.3 Indication of any immediate medical attention and special treatment needed

Notes to Physician
- All treatments should be based on observed signs and symptoms of distress in the patient. Consideration should be given to the possibility that overexposure to materials other than this product may have occurred.

Section 5 - Firefighting Measures

5.1 Extinguishing media

Suitable Extinguishing Media
- Water, Foam, Dry Chemical.

Unsuitable Extinguishing Media
- No data available

5.2 Special hazards arising from the substance or mixture

Unusual Fire and Explosion Hazards
- Negligible fire and explosion hazard. Toxic gases and asbestos particulate may be released in a fire.

Hazardous Combustion Products
- No data available

5.3 Advice for firefighters

- Wear positive pressure self-contained breathing apparatus (SCBA).
  Structural firefighters' protective clothing will only provide limited protection.

Section 6 - Accidental Release Measures

6.1 Personal precautions, protective equipment and emergency procedures

Personal Precautions
- Ventilate enclosed areas. Do not walk through spilled material. Wear appropriate personal protective equipment, avoid direct contact.

Emergency Procedures
- As an immediate precautionary measure, isolate spill or leak area for at least 25 meters (75 feet) in all directions. Keep unauthorized personnel away.

6.2 Environmental precautions

- Avoid run off to waterways and sewers.

6.3 Methods and material for containment and cleaning up

Containment/Clean-up
- Avoid generating dust.

Measures Use HEPA vacuum wet methods when feasible.
Carefully shovel or sweep up spilled material and place in suitable container.

6.4 Reference to other sections

- Refer to Section 8 - Exposure Controls/Personal Protection and Section 13 - Disposal Considerations.

Section 7 - Handling and Storage

7.1 Precautions for safe handling

Handling

- Use only with adequate ventilation. Minimize dust generation and accumulation. Wear appropriate personal protective equipment, avoid direct contact. Do not breathe dust. Avoid contact with skin, eyes, and clothing. Wash thoroughly with soap and water after handling and before eating, drinking, or using tobacco.

7.2 Conditions for safe storage, including any incompatibilities

Storage

- Store in well-sealed container in cool, dry area in accordance with all current regulations and standards.

7.3 Specific end use(s)

- This item is not being offered for clinical or diagnostic applications, agricultural uses or for human or animal consumption. Refer to Section 1.2 - Relevant identified uses.

Section 8 - Exposure Controls/Personal Protection

8.1 Control parameters

Exposure Limits/Guidelines		
	Result	**OSHA**
Asbestos, chrysotile (12001-29-5)	TWAs	0.1 fiber/cm3 TWA

8.2 Exposure controls

Engineering Measures/Controls

- Adequate ventilation systems as needed to control concentrations of airborne contaminants below applicable threshold limit values. Ensure that dust handling systems (such as exhaust ducts, dust collectors, vessels and processing equipment) are designed in a manner to prevent the escape of dust into the work area (i.e., there is not leakage from the equipment).

Personal Protective Equipment

Respiratory

- For limited exposure use an N95 dust mask. For prolonged exposure use an air-purifying respirator with high efficiency particulate air (HEPA) filters. Follow the OSHA respirator regulations found in 29 CFR 1910.134 or European Standard EN 149. Use a NIOSH/MSHA or European Standard EN 149 approved respirator if exposure limits are exceeded or symptoms are experienced.

Eye/Face

- Wear safety goggles.

Skin/Body

- Wear appropriate gloves. Wear long sleeves and/or protective coveralls.

Environmental Exposure Controls

- Controls should be engineered to prevent release to the environment, including procedures to prevent spills, atmospheric release and release to waterways. Follow best practice for site management and disposal of waste.

Additional Protection Measures

- An eyewash station and emergency shower must be available to the work station.

Key to abbreviations

NIOSH = National Institute of Occupational Safety and Health
OSHA = Occupational Safety and Health Administration
TWA = Time-Weighted Averages are based on 8h/day, 40h/week exposures

Section 9 - Physical and Chemical Properties

9.1 Information on Basic Physical and Chemical Properties

Material Description			
Physical Form	Solid	Appearance/Description	White, gray, greenish, or yellowish, odorless, fibrous solid.
Color	White, gray, greenish, or yellowish.	Odor	Odorless
Odor Threshold	Data lacking		
General Properties			
Boiling Point	Data lacking	Melting Point/Freezing Point	> 500 °C(> 932 °F)
Decomposition Temperature	1000 °C(1832 °F)	pH	Data lacking
Specific Gravity/Relative Density	2.2-2.6 g/cc	Water Solubility	Data lacking
Viscosity	Data lacking	Explosive Properties	Data lacking
Oxidizing Properties:	Data lacking		
Volatility			
Vapor Pressure	Data lacking	Vapor Density	Data lacking
Evaporation Rate	Data lacking		
Flammability			
Flash Point	Data lacking	UEL	Data lacking
LEL	Data lacking	Autoignition	Data lacking
Flammability (solid, gas)	Data lacking		
Environmental			
Octanol/Water Partition coefficient	Data lacking		

9.2 Other Information

- No additional physical and chemical parameters noted.

Section 10: Stability and Reactivity

10.1 Reactivity

- No dangerous reaction known under conditions of normal use.

10.2 Chemical stability

- Stable under normal temperatures and pressures.

10.3 Possibility of hazardous reactions

- Hazardous polymerization will not occur.

10.4 Conditions to avoid

- Avoid generating dust.

10.5 Incompatible materials

- Strong oxidizers, strong acids, and bases.

10.6 Hazardous decomposition products

- None known.

Section 11 - Toxicological Information

11.1 Information on toxicological effects

Components		
Asbestos, chrysotile (> 99.99%)	12001-29-5	**Multi-dose Toxicity:** Inhalation-Hamster TCLo • 30 mg/m³ 6 Hour(s) 78 Week(s)-Intermittent; *Lungs, Thorax, or Respiration*:**Fibrosis (interstitial)**; *Lungs, Thorax, or Respiration*:**Changes in lung weight**; Inhalation-Rat TCLo • 8210 µg/m³ 6 Hour(s) 20 Day(s)-Intermittent; *Lungs, Thorax, or Respiration*:**Fibrosis (interstitial)**; **Tumorigen / Carcinogen:** Ingestion/Oral-Rat TDLo • 7100 mg/kg 39 Week(s)-Continuous; *Tumorigenic*:**Carcinogenic by RTECS criteria**; *Liver*:**Tumors**; *Kidney, Ureter, and Bladder*:**Kidney tumors**; Inhalation-Man TCLo • 400 mppcf 1 Year(s)-Continuous; *Tumorigenic*:**Carcinogenic by RTECS criteria**; *Lungs, Thorax, or Respiration*:**Fibrosis, focal (pneumoconiosis)**; *Lungs, Thorax, or Respiration*:**Tumors**; Inhalation-Rat TCLo • 11 mg/m³ 26 Week(s)-Intermittent; *Tumorigenic*:**Carcinogenic by RTECS criteria**; *Lungs, Thorax, or Respiration*:**Tumors**

GHS Properties	Classification
Acute toxicity	**EU/CLP** • Data lacking **OSHA HCS 2012** • Data lacking
Skin corrosion/Irritation	**EU/CLP** • Data lacking **OSHA HCS 2012** • Data lacking
Serious eye damage/Irritation	**EU/CLP** • Data lacking **OSHA HCS 2012** • Data lacking
Skin sensitization	**EU/CLP** • Data lacking **OSHA HCS 2012** • Data lacking
Respiratory sensitization	**EU/CLP** • Data lacking **OSHA HCS 2012** • Data lacking
Aspiration Hazard	**EU/CLP** • Data lacking **OSHA HCS 2012** • Data lacking
Carcinogenicity	**EU/CLP** • Carcinogenicity 1A; May cause cancer **OSHA HCS 2012** • Carcinogenicity 1A
Germ Cell Mutagenicity	**EU/CLP** • Data lacking **OSHA HCS 2012** • Data lacking
Toxicity for Reproduction	**EU/CLP** • Data lacking **OSHA HCS 2012** • Data lacking
STOT-SE	**EU/CLP** • Data lacking **OSHA HCS 2012** • Data lacking
STOT-RE	**EU/CLP** • Specific Target Organ Toxicity Repeated Exposure 1 **OSHA HCS 2012** • Specific Target Organ Toxicity Repeated Exposure 1

Potential Health Effects

Inhalation

Acute (Immediate)

- Exposure to dust may cause irritation. Processes such as cutting, grinding, crushing, or impact may result in generation of excessive amounts of airborne dusts in the workplace. Nuisance dust may affect the lungs but reactions are typically reversible.

Chronic (Delayed)

- Overexposure to breathing asbestos may cause asbestosis, pulmonary fibrosis, mesothelioma, other lung disorders or cancer. All types of asbestos are known to cause inflammatory changes in lungs and pleurae. However, there is experimental and epidemiologic evidence that there may be differences in the potential of different asbestos types to produce disease. It has been suggested that crocidolite has greatest potential to produce disease; chrysotile, the smallest; with amosite occupying an intermediate position.

Skin

Acute (Immediate)

- Exposure to dust may cause mechanical irritation.

Chronic (Delayed) • No data available

Eye

Acute (Immediate) • Exposure to dust may cause mechanical irritation. Excessive concentrations of nuisance dust in the workplace may reduce visibility and may cause unpleasant deposits in eyes.

Chronic (Delayed) • No data available

Ingestion

Acute (Immediate) • Excessive concentrations of nuisance dust in the workplace may cause mechanical irritation to mucous membranes.

Chronic (Delayed) • No data available

Carcinogenic Effects • Repeated and prolonged exposure may cause cancer.

Carcinogenic Effects				
	CAS	OSHA	IARC	NTP
Asbestos, chrysotile	12001-29-5	Specifically Regulated Carcinogen	Group 1-Carcinogenic	Known Human Carcinogen

Key to abbreviations

TC = Toxic Concentration

TD = Toxic Dose

Section 12 - Ecological Information

12.1 Toxicity

• Material data lacking.

12.2 Persistence and degradability

• Material data lacking.

12.3 Bioaccumulative potential

• Material data lacking.

12.4 Mobility in Soil

• Material data lacking.

12.5 Results of PBT and vPvB assessment

• No PBT and vPvB assessment has been conducted.

12.6 Other adverse effects

• No studies have been found.

Section 13 - Disposal Considerations

13.1 Waste treatment methods

Product waste • Dispose of content and/or container in accordance with local, regional, national, and/or international regulations.

Packaging waste • Dispose of content and/or container in accordance with local, regional, national, and/or international regulations.

Section 14 - Transport Information

	14.1 UN number	14.2 UN proper shipping name	14.3 Transport hazard class(es)	14.4 Packing group	14.5 Environmental hazards
DOT	UN2590	Asbestos, chrysotile	9	III	NDA
IMO/IMDG	UN2590	ASBESTOS, CHRYSOTILE	9	III	NDA
IATA/ICAO	UN2590	White Asbestos (Chrysotile)	9	III	NDA

14.6 Special precautions for user
- None specified.

14.7 Transport in bulk according to Annex II of Marpol and the IBC Code
- Data lacking.

Section 15 - Regulatory Information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

SARA Hazard Classifications
- Chronic

Inventory						
Component	**CAS**	**Canada DSL**	**Canada NDSL**	**EU EINECS**	**EU ELNICS**	**TSCA**
Asbestos, chrysotile	12001-29-5	No	No	No	No	No

Canada

Labor

Canada - WHMIS 1988 - Classifications of Substances

• Asbestos, chrysotile	12001-29-5	D2A

Canada - WHMIS 1988 - Ingredient Disclosure List

• Asbestos, chrysotile	12001-29-5	0.1 %

Environment

Canada - CEPA - Priority Substances List

• Asbestos, chrysotile	12001-29-5	Not Listed

United States

Labor

U.S. - OSHA - Process Safety Management - Highly Hazardous Chemicals

• Asbestos, chrysotile	12001-29-5	Not Listed

U.S. - OSHA - Specifically Regulated Chemicals

• Asbestos, chrysotile	12001-29-5	1.0 fiber/cm3 Excursion Limit (See 29 CFR 1910.1001, 30 min); 0.1 fiber/cm3 TWA

Environment

U.S. - CAA (Clean Air Act) - 1990 Hazardous Air Pollutants

• Asbestos, chrysotile	12001-29-5	Not Listed

U.S. - CERCLA/SARA - Hazardous Substances and their Reportable Quantities

• Asbestos, chrysotile	12001-29-5	Not Listed

U.S. - CERCLA/SARA - Radionuclides and Their Reportable Quantities

• Asbestos, chrysotile	12001-29-5	Not Listed
U.S. - CERCLA/SARA - Section 302 Extremely Hazardous Substances EPCRA RQs		
• Asbestos, chrysotile	12001-29-5	Not Listed
U.S. - CERCLA/SARA - Section 302 Extremely Hazardous Substances TPQs		
• Asbestos, chrysotile	12001-29-5	Not Listed
U.S. - CERCLA/SARA - Section 313 - Emission Reporting		
• Asbestos, chrysotile	12001-29-5	Not Listed
U.S. - CERCLA/SARA - Section 313 - PBT Chemical Listing		
• Asbestos, chrysotile	12001-29-5	Not Listed

United States - California

Environment

U.S. - California - Proposition 65 - Carcinogens List		
• Asbestos, chrysotile	12001-29-5	Not Listed
U.S. - California - Proposition 65 - Developmental Toxicity		
• Asbestos, chrysotile	12001-29-5	Not Listed
U.S. - California - Proposition 65 - Maximum Allowable Dose Levels (MADL)		
• Asbestos, chrysotile	12001-29-5	Not Listed
U.S. - California - Proposition 65 - No Significant Risk Levels (NSRL)		
• Asbestos, chrysotile	12001-29-5	Not Listed
U.S. - California - Proposition 65 - Reproductive Toxicity - Female		
• Asbestos, chrysotile	12001-29-5	Not Listed
U.S. - California - Proposition 65 - Reproductive Toxicity - Male		
• Asbestos, chrysotile	12001-29-5	Not Listed

15.2 Chemical Safety Assessment

- No Chemical Safety Assessment has been carried out.

Section 16 - Other Information

Revision Date
- 19/December/2016

Preparation Date
- 14/January/2016

Disclaimer/Statement of Liability
- Caution! Do not use SPI Supplies products or materials in applications involving implantation within the body; direct or indirect contact with the blood pathway; contact with bone, tissue, tissue fluid, or blood; or prolonged contact with mucous membranes. Products offered by SPI Supplies are not designed or manufactured for use in implantation in the human body or in contact with internal body fluids or tissues. SPI Supplies will not provide to customers making devices for such applications any notice, certification, or information necessary for such medical device use required by US FDA (Food and Drug Administration) regulation or any other statute. SPI Supplies and Structure Probe, Inc. make no representation, promise, express warranty or implied warranty concerning the suitability of these materials for use in implantation in the human body or in contact with internal body tissues of fluids. The information and recommendations set forth above are taken from sources believed to be accurate as of the date hereof, however SPI Supplies and Structure Probe, Inc. make no warranty with respect to the accuracy of the information or the

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Key to abbreviations

NDA = No Data Available

SAFETY DATA SHEET

SDS ID NO.: 0290MAR019
Revision Date: 06/01/2016

1. IDENTIFICATION

Product Name: Marathon Petroleum No. 2 Ultra Low Sulfur Diesel

Synonym: No. 2 Ultra Low Sulfur Diesel 15 ppm Sulfur Max; Ultra Low Sulfur Diesel No. 2 15 ppm Sulfur Max; Ultra Low Sulfur Diesel No. 2 15 ppm Sulfur Max with Polar Plus; No. 2 Diesel, Motor Vehicle Use, Undyed; No. 2 Diesel, Motor Vehicle Use, Undyed, with Polar Plus; ULSD No. 2 Diesel 15 ppm Sulfur Max; ULSD No. 2 Diesel 15 ppm Sulfur Max with Polar Plus; No. 2 MV 15 Diesel; No. 2 MV 15 Diesel with Polar Plus; No. 2 Ultra Low Sulfur Diesel Dyed 15 ppm Sulfur Max; Ultra Low Sulfur Diesel No. 2 Dyed 15 ppm Sulfur Max; Ultra Low Sulfur Diesel No. 2 Dyed 15 ppm Sulfur Max with Polar Plus; No. 2 Diesel, Tax Exempt-Motor Vehicle Use, Dyed; No. 2 Diesel, Tax Exempt-Motor Vehicle Use, Dyed, with Polar Plus; ULSD No. 2 Diesel Dyed 15 ppm Sulfur Max; ULSD No. 2 Diesel Dyed 15 ppm Sulfur Max, with Polar Plus; No. 2 MV 15 Diesel Dyed; No. 2 Low Sulfur Diesel (TxLED); No. 2 MV 15 Diesel Dyed, with Polar Plus; No. 2 NRLM 15 Diesel Dyed; No.2 NRLM Diesel Dyed; No. 2 MV 500 ppm TxLED; No.2 Low Emission Low Sulfur Diesel; No. 2 Low Sulfur Diesel (TxLED) 500 ppm Sulfur Max; No. 2 Heating Oil 5000 NMA Unmarked; NEMA No. 2 Heating Oil; Heating Oil, No. 2 Low Sulfur 5000 ppm; No. 2 Ultra Low Sulfur Diesel Dyed with <6% Renewable Diesel Fuel; Ultra Low Sulfur No. 2 Diesel Dyed with <6% Renewable Diesel Fuel; No. 2 Diesel Dyed with <6% Renewable Diesel Fuel 15 ppm Sulfur Max; No. 2 Ultra Low Sulfur Diesel with <6% Renewable Diesel Fuel; Ultra Low Sulfur No. 2 Diesel with <6% Renewable Diesel Fuel; No. 2 Diesel with <6% Renewable Diesel Fuel 15 ppm Sulfur Max; Garyville Export Diesel; Export Diesel, Garyville; Diesel Fuel, Export Garyville; #2 Motor Vehicle ULSD 15 ppm with 0-5% Renewable Diesel; Marathon No. 2 ULSD with 0-5% Renewable Fuel with R100; Marathon No. 2 ULSD with 0-5% Renewable Fuel with R99; No. 2 Heating Oil 2000 ppm Sulfur Max, Clear (Undyed) Unmarked;Ultra Low Sulfur Heating Oil 15 ppm Sulfur Max, Clear (Undyed) Unmarked; ULS Heating Oil 15 ppm Clear (Undyed) Unmarked; ULS HO 15 ppm CLR; Ultra-Low Sulfur Heating Oil (<= 15ppm, Undyed); No. 2 Heating Oil 2000 ppm Sulfur Max, Dyed Unmarked; No. 2 Heating Oil 2000 ppm Sulfur Max, Dyed Marked; Ultra Low Sulfur Heating Oil 15 ppm Sulfur Max, Dyed Unmarked; Ultra Low Sulfur Heating Oil 15 ppm Sulfur Max, Dyed Marked;15 ppm Sulfur Heating Oil Grade 67; 0291MAR019; 0306MAR019; 0308MAR019; 0334MAR019; 0335MAR019; 0336MAR019; 0337MAR019; 0340MAR019;

Chemical Family: Complex Hydrocarbon Substance

Recommended Use: Fuel.
Restrictions on Use: All others.

Manufacturer, Importer, or Responsible Party Name and Address:

MARATHON PETROLEUM COMPANY LP
539 South Main Street
Findlay, OH 45840

SDS information: 1-419-421-3070

Emergency Telephone: 1-877-627-5463

2. HAZARD IDENTIFICATION

Classification

OSHA Regulatory Status
This chemical is considered hazardous by the 2012 OSHA Hazard Communication Standard (29 CFR 1910.1200)

Flammable liquids	Category 3
Acute toxicity - Inhalation (Dusts/Mists)	Category 4
Skin corrosion/irritation	Category 2
Carcinogenicity	Category 2
Specific target organ toxicity (single exposure)	Category 3
Specific target organ toxicity (repeated exposure)	Category 2
Aspiration toxicity	Category 1
Acute aquatic toxicity	Category 2
Chronic aquatic toxicity	Category 2

Hazards Not Otherwise Classified (HNOC)
Static accumulating flammable liquid

Label elements

EMERGENCY OVERVIEW

Danger

FLAMMABLE LIQUID AND VAPOR
May accumulate electrostatic charge and ignite or explode
May be fatal if swallowed and enters airways
Harmful if inhaled
Causes skin irritation
May cause respiratory irritation
May cause drowsiness or dizziness
Suspected of causing cancer
May cause damage to organs (thymus, liver, bone marrow) through prolonged or repeated exposure
Toxic to aquatic life with long lasting effects

Appearance Yellow to Red Liquid **Physical State** Liquid **Odor** Hydrocarbon

Precautionary Statements - Prevention
Obtain special instructions before use
Do not handle until all safety precautions have been read and understood
Keep away from heat/sparks/open flames/hot surfaces. - No smoking
Keep container tightly closed
Ground/bond container and receiving equipment
Use only non-sparking tools.
Use explosion-proof electrical/ventilating/lighting/equipment
Take precautionary measures against static discharge
Do not breathe mist/vapors/spray
Use only outdoors or in a well-ventilated area
Wear protective gloves/protective clothing/eye protection/face protection
Wash hands and any possibly exposed skin thoroughly after handling
Avoid release to the environment

Precautionary Statements - Response
IF exposed or concerned: Get medical attention
IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower
If skin irritation occurs: Get medical attention
Wash contaminated clothing before reuse
IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing
Call a POISON CENTER or doctor if you feel unwell
IF SWALLOWED: Immediately call a POISON CENTER or doctor
Do NOT induce vomiting
In case of fire: Use water spray, fog or regular foam for extinction
Collect spillage

Precautionary Statements - Storage
Store in a well-ventilated place. Keep container tightly closed
Keep cool
Store locked up

Precautionary Statements - Disposal
Dispose of contents/container at an approved waste disposal plant

3. COMPOSITION/INFORMATION ON INGREDIENTS

No. 2 Ultra Low Sulfur Diesel is a complex mixture of paraffins, cycloparaffins, olefins and aromatic hydrocarbon chain lengths predominantly in the range of eleven to twenty carbons. May contain up to 5% Renewable Diesel. May contain small amounts of dye and other additives (<0.15%) which are not considered hazardous at the concentration(s) used. May contain a trace amount of benzene (<0.01%). Contains a trace amount of sulfur (<0.0015%)

Composition Information:

Name	CAS Number	% Concentration
No. 2 Diesel Fuel	68476-34-6	50-100
Kerosine, Petroleum	8008-20-6	0-50
Alkanes, C10-C20 branched and linear	928771-01-1	0-5
Naphthalene	91-20-3	0.3-2.6

All concentrations are percent by weight unless material is a gas. Gas concentrations are in percent by volume.

4. FIRST AID MEASURES

First Aid Measures

General Advice: In case of accident or if you feel unwell, seek medical advice immediately (show directions for use or safety data sheet if possible).

Inhalation: Remove to fresh air. If not breathing, institute rescue breathing. If breathing is difficult, ensure airway is clear, give oxygen and continue to monitor. If heart has stopped, immediately begin cardiopulmonary resuscitation (CPR). Keep affected person warm and at rest. GET IMMEDIATE MEDICAL ATTENTION.

Skin Contact: Immediately wash exposed skin with plenty of soap and water while removing contaminated clothing and shoes. May be absorbed through the skin in harmful amounts. Get medical attention if irritation persists. Any injection injury from high pressure equipment should be evaluated immediately by a physician as potentially serious (See NOTES TO PHYSICIAN).

Place contaminated clothing in closed container until cleaned or discarded. If clothing is to be laundered, inform the person performing the operation of contaminant's hazardous properties. Destroy contaminated, non-chemical resistant footwear.

Eye Contact: Flush immediately with large amounts of water for at least 15 minutes. Eyelids should be held away from the eyeball to ensure thorough rinsing. Gently remove contacts while flushing. Get medical attention if irritation persists.

Ingestion: Do not induce vomiting because of danger of aspirating liquid into lungs, causing serious damage and chemical pneumonitis. If spontaneous vomiting occurs, keep head below hips, or if patient is lying down, turn body and head to side to prevent aspiration and monitor for breathing difficulty. Never give anything by mouth to an unconscious person. Keep affected person warm and at rest. GET IMMEDIATE MEDICAL ATTENTION.

Most important signs and symptoms, both short-term and delayed with overexposure

Adverse Effects: Irritating to the skin and mucous membranes. Symptoms may include redness, itching, and inflammation. May cause nausea, vomiting, diarrhea, and signs of nervous system depression: headache, drowsiness, dizziness, loss of coordination, disorientation and fatigue. Aspiration hazard. May cause coughing, chest pains, shortness of breath, pulmonary edema and/or chemical pneumonitis. Repeated or prolonged skin contact may cause drying, reddening, itching and cracking. Prolonged or repeated exposure may cause adverse effects to the thymus, liver, and bone marrow.

Indication of any immediate medical attention and special treatment needed

Notes To Physician: INHALATION: This material (or a component) sensitizes the myocardium to the effects of sympathomimetic amines. Epinephrine and other sympathomimetic drugs may initiate cardiac arrhythmias in individuals exposed to this material. Administration of sympathomimetic drugs should be avoided.

SKIN: Leaks or accidents involving high-pressure equipment may inject a stream of material through the skin and initially produce an injury that may not appear serious. Only a small puncture wound may appear on the skin surface but, without proper treatment and depending on the nature, original pressure, volume, and location of the injected material, can compromise blood supply to an affected body part. Prompt surgical debridement of the wound may be necessary to prevent irreversible loss of function and/or the affected body part. High pressure injection injuries may be SERIOUS SURGICAL EMERGENCIES.

INGESTION: This material represents a significant aspiration and chemical pneumonitis hazard. Induction of emesis is not recommended.

5. FIRE-FIGHTING MEASURES

Suitable extinguishing media

For small fires, Class B fire extinguishing media such as CO2, dry chemical, foam (AFFF/ATC) or water spray can be used. For large fires, water spray, fog or foam (AFFF/ATC) can be used. Firefighting should be attempted only by those who are adequately trained and equipped with proper protective equipment.

Unsuitable extinguishing media
Do not use straight water streams to avoid spreading fire.

Specific hazards arising from the chemical
This product has been determined to be a flammable liquid per the OSHA Hazard Communication Standard and should be handled accordingly. May accumulate electrostatic charge and ignite or explode. Vapors may travel along the ground or be moved by ventilation and ignited by many sources such as pilot lights, sparks, electric motors, static discharge, or other ignition sources at locations distant from material handling. Flashback can occur along vapor trail. For additional fire related information, see NFPA 30 or the Emergency Response Guidebook 128.

Hazardous combustion products
Smoke, carbon monoxide, and other products of incomplete combustion.

Explosion data
Sensitivity to Mechanical Impact No.
Sensitivity to Static Discharge Yes.

Special protective equipment and precautions for firefighters
Firefighters should wear full protective clothing and positive-pressure self-contained breathing apparatus (SCBA) with a full face-piece, as appropriate. Avoid using straight water streams. Water spray and foam (AFFF/ATC) must be applied carefully to avoid frothing and from as far a distance as possible. Avoid excessive water spray application. Keep surrounding area cool with water spray from a distance and prevent further ignition of combustible material. Keep run-off water out of sewers and water sources.

Additional firefighting tactics
FIRES INVOLVING TANKS OR CAR/TRAILER LOADS: Fight fire from maximum distance or use unmanned hose holders or monitor nozzles. Cool containers with flooding quantities of water until well after the fire is out. Do not direct water at source of leak or safety devices; icing may occur. Withdraw immediately in case of rising sound from venting safety devices or discoloration of tank. ALWAYS stay away from tanks engulfed in fire. For massive fire, use unmanned hose holders or monitor nozzles: if this is impossible, withdraw from area and let fire burn.

EVACUATION: Consider initial downwind evacuation for at least 1000 feet. If tank, rail car or tank truck is involved in a fire, ISOLATE for 5280 feet (1 mile) in all directions; also, consider initial evacuation of 5280 feet (1 mile) in all directions.

NFPA	Health 1	Flammability 2	Instability 0	Special Hazard -

6. ACCIDENTAL RELEASE MEASURES

Personal precautions:	Keep public away. Isolate and evacuate area. Shut off source if safe to do so. Eliminate all ignition sources. All contaminated surfaces will be slippery.
Protective equipment:	Use personal protection measures as recommended in Section 8.
Emergency procedures:	Advise authorities and National Response Center (800-424-8802) if the product has entered a water course or sewer. Notify local health and pollution control agencies, if appropriate.
Environmental precautions:	Avoid release to the environment. Avoid subsoil penetration.
Methods and materials for containment:	Contain liquid with sand or soil. Prevent spilled material from entering storm drains, sewers, and open waterways.
Methods and materials for cleaning up:	Use suitable absorbent materials such as vermiculite, sand, or clay to clean up residual liquids. Recover and return free product to proper containers. When recovering free liquids ensure all equipment is grounded and bonded. Use only non-sparking tools.

7. HANDLING AND STORAGE

Safe Handling Precautions:

NEVER SIPHON THIS PRODUCT BY MOUTH. Use appropriate grounding and bonding practices. Static accumulating flammable liquid. Bonding and grounding may be insufficient to eliminate the hazard from static electricity. Do not expose to heat, open flames, strong oxidizers or other sources of ignition. Vapors may travel along the ground or be moved by ventilation. Flashback may occur along vapor trails. No smoking. Use only non-sparking tools. Avoid breathing fumes, gas, or vapors. Use only with adequate ventilation. Avoid repeated and prolonged skin contact. Use personal protection measures as recommended in Section 8. Exercise good personal hygiene including removal of soiled clothing and prompt washing with soap and water. Do not cut, drill, grind or weld on empty containers since explosive residues may remain. Refer to applicable EPA, OSHA, NFPA and consistent state and local requirements.

Hydrocarbons are basically non-conductors of electricity and can become electrostatically charged during mixing, filtering, pumping at high flow rates or loading and transfer operations. If this charge reaches a sufficiently high level, sparks can form that may ignite the vapors of flammable liquids. Sudden release of hot organic chemical vapors or mists from process equipment operating under elevated temperature and pressure, or sudden ingress of air into vacuum equipment may result in ignition of vapors or mists without the presence of obvious ignition sources. Nozzle spouts must be kept in contact with the containers or tank during the entire filling operation.

Portable containers should never be filled while in or on a motor vehicle or marine craft. Containers should be placed on the ground. Static electric discharge can ignite fuel vapors when filling non-grounded containers or vehicles on trailers. The nozzle spout must be kept in contact with the container before and during the entire filling operation. Use only approved containers.

A buildup of static electricity can occur upon re-entry into a vehicle during fueling especially in cold or dry climate conditions. The charge is generated by the action of dissimilar fabrics (i.e., clothing and upholstery) rubbing across each other as a person enters/exits the vehicle. A flash fire can result from this discharge if sufficient flammable vapors are present. Therefore, do not get back in your vehicle while refueling.

Cellular phones and other electronic devices may have the potential to emit electrical charges (sparks). Sparks in potentially explosive atmospheres (including fueling areas such as gas stations) could cause an explosion if sufficient flammable vapors are present. Therefore, turn off cellular phones and other electronic devices when working in potentially explosive atmospheres or keep devices inside your vehicle during refueling.

High-pressure injection of any material through the skin is a serious medical emergency even though the small entrance wound at the injection site may not initially appear serious. These injection injuries can occur from high-pressure equipment such as paint spray or grease or guns, fuel injectors, or pinhole leaks in hoses or hydraulic lines and should all be considered serious. High pressure injection injuries may be SERIOUS SURGICAL EMERGENCIES (See First Aid Section 4).

Storage Conditions:

Store in properly closed containers that are appropriately labeled and in a cool, well-ventilated area. Do not store near an open flame, heat or other sources of ignition.

Incompatible Materials

Strong oxidizing agents.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Name	ACGIH TLV	OSHA PELS:	OSHA - Vacated PELs	NIOSH IDLH
No. 2 Diesel Fuel 68476-34-6	100 mg/m^3 TWA Skin - potential significant contribution to overall exposure by the cutaneous route	-	-	-

Kerosine, Petroleum 8008-20-6	200 mg/m³ TWA Skin - potential significant contribution to overall exposure by the cutaneous route	-	-	-
Alkanes, C10-C20 branched and linear 928771-01-1	-	-	-	-
Naphthalene 91-20-3	10 ppm TWA Skin - potential significant contribution to overall exposure by the cutaneous route	TWA: 10 ppm TWA: 50 mg/m³	10 ppm TWA 50 mg/m³ TWA 15 ppm STEL 75 mg/m³ STEL	250 ppm

Notes: The manufacturer has voluntarily elected to provide exposure limits contained in OSHA's 1989 air contaminants standard in its SDSs, even though certain of those exposure limits were vacated in 1992.

Engineering measures: Local or general exhaust required in an enclosed area or with inadequate ventilation. Use mechanical ventilation equipment that is explosion-proof.

Personal protective equipment

Eye protection: Use goggles or face-shield if the potential for splashing exists.

Skin and body protection: Wear neoprene, nitrile or PVA gloves to prevent skin contact. Glove suitability is based on workplace conditions and usage. Contact the glove manufacturer for specific advice on glove selection and breakthrough times.

Respiratory protection: Use a NIOSH approved organic vapor chemical cartridge or supplied air respirators when there is the potential for airborne exposures to exceed permissible exposure limits or if excessive vapors are generated. Observe respirator assigned protection factors (APFs) criteria cited in federal OSHA 29 CFR 1910.134. Self-contained breathing apparatus should be used for fire fighting.

Hygiene measures: Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin, eyes and clothing.

9. PHYSICAL AND CHEMICAL PROPERTIES

Information on basic physical and chemical properties

Physical State	Liquid
Appearance	Yellow to Red Liquid
Color	Yellow to Red
Odor	Hydrocarbon
Odor Threshold	No data available.

Property	**Values (Method)**
Melting Point / Freezing Point	No data available.
Initial Boiling Point / Boiling Range	154-366 °C / 310-691 °F (ASTM D86)
Flash Point	58-76 °C / 136-168 °F (ASTM D93)
Evaporation Rate	No data available.
Flammability (solid, gas)	Not applicable.
Flammability Limit in Air (%):	
Upper Flammability Limit:	No data available.
Lower Flammability Limit:	No data available.
Explosion limits:	No data available.
Vapor Pressure	No data available.
Vapor Density	No data available.
Specific Gravity / Relative Density	0.82-0.86 (ASTM D4052)
Water Solubility	No data available.
Solubility in other solvents	No data available.

Partition Coefficient	No data available.
Decomposition temperature	No data available.
pH:	Not applicable
Autoignition Temperature	No data available.
Kinematic Viscosity	1.90-3.32 cSt @ 40°C (ASTM D445)
Dynamic Viscosity	No data available.
Explosive Properties	No data available.
VOC Content (%)	No data available.
Density	No data available.
Bulk Density	Not applicable.

10. STABILITY AND REACTIVITY

Reactivity The product is non-reactive under normal conditions.

Chemical stability The material is stable at 70°F, 760 mmHg pressure.

Possibility of hazardous reactions None under normal processing.

Hazardous polymerization Will not occur.

Conditions to avoid Excessive heat, sources of ignition, open flame.

Incompatible Materials Strong oxidizing agents.

Hazardous decomposition products None known under normal conditions of use.

11. TOXICOLOGICAL INFORMATION

Potential short-term adverse effects from overexposures

Inhalation Harmful if inhaled. May cause irritation of respiratory tract. May cause drowsiness or dizziness. Breathing high concentrations of this material in a confined space or by intentional abuse can cause irregular heartbeats which can cause death.

Eye contact Exposure to vapor or contact with liquid may cause mild eye irritation, including tearing, stinging, and redness.

Skin contact Causes skin irritation. Effects may become more serious with repeated or prolonged contact. May be absorbed through the skin in harmful amounts.

Ingestion May be fatal if swallowed or vomited and enters airways. May cause irritation of the mouth, throat and gastrointestinal tract.

Acute toxicological data

Name	Oral LD50	Dermal LD50	Inhalation LC50
No. 2 Diesel Fuel 68476-34-6	> 5000 mg/kg (Rat)	> 2000 mg/kg (Rabbit)	>1 - <5 mg/L (Rat) 4 h
Kerosine, Petroleum 8008-20-6	> 5000 mg/kg (Rat)	> 2000 mg/kg (Rabbit)	> 5.28 mg/L (Rat) 4 h
Alkanes, C10-C20 branched and linear 928771-01-1	-	-	>1 - <5 mg/l (Rat) 4 h
Naphthalene 91-20-3	490 mg/kg (Rat)	> 2000 mg/kg (Rabbit)	> 340 mg/m^3 (Rat) 1 h

Delayed and immediate effects as well as chronic effects from short and long-term exposure

MIDDLE DISTILLATES, PETROLEUM: Long-term repeated (lifetime) skin exposure to similar materials has been reported to result in an increase in skin tumors in laboratory rodents. The relevance of these findings to humans is not clear at this time. Altered mental state, drowsiness, peripheral motor neuropathy, irreversible brain damage (so-called Petrol Sniffer's Encephalopathy), delirium, seizures, and sudden death have been reported from repeated overexposure to some hydrocarbon solvents, naphthas, and gasoline.

MIDDLE DISTILLATES WITH CRACKED STOCKS: Light cracked distillates have been shown to be carcinogenic in animal tests and have tested positive with in vitro genotoxicity tests. Repeated dermal exposures to high concentrations in test animals resulted in reduced litter size and litter weight, and increased fetal resorptions at maternally toxic doses. Dermal exposure to high concentrations resulted in severe skin irritation with weight loss and some mortality. Inhalation exposure to high concentrations resulted in respiratory tract irritation, lung changes/infiltration/accumulation, and reduction in lung function.

ISOPARAFFINS: Studies in laboratory animals have shown that long-term exposure to similar materials (isoparaffins) can cause kidney damage and kidney cancer in male laboratory rats. However, in-depth research indicates that these findings are unique to the male rat, and that these effects are not relevant to humans.

NAPHTHALENE: Severe jaundice, neurotoxicity (kernicterus) and fatalities have been reported in young children and infants as a result of hemolytic anemia from overexposure to naphthalene. Persons with glucose 6-phosphate dehydrogenase (G6PD) deficiency are more prone to the hemolytic effects of naphthalene. Adverse effects on the kidney have been reported in persons overexposed to naphthalene but these effects are believed to be a consequence of hemolytic anemia, and not a direct effect. Hemolytic anemia has been observed in laboratory animals exposed to naphthalene. Laboratory rodents exposed to naphthalene vapor for 2 years (lifetime studies) developed non-neoplastic and neoplastic tumors and inflammatory lesions of the nasal and respiratory tract. Cataracts and other adverse effects on the eye have been observed in laboratory animals exposed to high levels of naphthalene. Findings from a large number of bacterial and mammalian cell mutation assays have been negative. A few studies have shown chromosomal effects (elevated levels of Sister Chromatid Exchange or chromosomal aberrations) in vitro. Naphthalene has been classified as Possibly Carcinogenic to Humans (2B) by IARC, based on findings from studies in laboratory animals.

DIESEL EXHAUST: The combustion of diesel fuels produces gases including carbon monoxide, carbon dioxide, oxides of nitrogen and/or sulfur, and hydrocarbons that can be irritating and hazardous with overexposure. Long-term occupational overexposure to diesel exhaust and diesel exhaust particulate matter has been associated with an increased risk of respiratory disease, including lung cancer, and is characterized as a “known human carcinogen” by the International Agency for Research on Cancer (IARC), as “a reasonably anticipated human carcinogen” by the National Toxicology Program, and as “likely to be carcinogenic to humans” by the EPA, based upon animal and occupational exposure studies. However, uncertainty exists with these classifications because of deficiencies in the supporting occupational exposure/epidemiology studies, including reliable exposure estimates. Lifetime animal inhalation studies with pulmonary overloading exposure concentrations of diesel exhaust emissions have produced tumors and other adverse health effects. However, in more recent long-term animal inhalation studies of diesel exhaust emissions, no increase in tumor incidence and in fact a substantial reduction in adverse health effects along with significant reductions in the levels of hazardous material emissions were observed and are associated with fuel composition alterations coupled with new technology diesel engines.

Adverse effects related to the physical, chemical and toxicological characteristics

Signs and Symptoms Irritating to the skin and mucous membranes. Symptoms may include redness, itching, and inflammation. May cause nausea, vomiting, diarrhea, and signs of nervous system depression: headache, drowsiness, dizziness, loss of coordination, disorientation and fatigue. Aspiration hazard. May cause coughing, chest pains, shortness of breath, pulmonary edema and/or chemical pneumonitis. Repeated or prolonged skin contact may cause drying, reddening, itching and cracking. Prolonged or repeated exposure may cause damage to organs.

Sensitization Not expected to be a skin or respiratory sensitizer.

Mutagenic effects None known.

Carcinogenicity Suspected of causing cancer.

Cancer designations are listed in the table below

Name	ACGIH (Class)	IARC (Class)	NTP	OSHA
No. 2 Diesel Fuel 68476-34-6	Confirmed animal carcinogen (A3)	Not Classifiable (3)	Not Listed	Not Listed
Kerosine, Petroleum 8008-20-6	Confirmed animal carcinogen (A3)	Not Classifiable (3)	Not Listed	Not Listed
Alkanes, C10-C20 branched and linear 928771-01-1	Not Listed	Not Listed	Not Listed	Not Listed
Naphthalene 91-20-3	Confirmed animal carcinogen (A3)	Possible human carcinogen (2B)	Reasonably anticipated to be a human carcinogen	Not Listed

Reproductive toxicity None known.

Specific Target Organ Toxicity (STOT) - single exposure Respiratory system. Central nervous system.

Specific Target Organ Toxicity (STOT) - repeated exposure Thymus. Liver. Bone marrow.

Aspiration hazard May be fatal if swallowed or vomited and enters airways.

12. ECOLOGICAL INFORMATION

Ecotoxicity This product should be considered toxic to aquatic organisms, with the potential to cause long lasting adverse effects in the aquatic environment.

Name	Algae/aquatic plants	Fish	Toxicity to Microorganisms	Crustacea
No. 2 Diesel Fuel 68476-34-6	-	96-hr LC50 = 35 mg/l Fathead minnow (flow-through)	-	48-hr EL50 = 6.4 mg/l Daphnia magna
Kerosine, Petroleum 8008-20-6	72-hr EL50 = 5.0-11 mg/l Algae	96-hr LL50 = 18-25 mg/l Fish	-	48-hr EL50 = 1.4-21 mg/l Invertebrates
Alkanes, C10-C20 branched and linear 928771-01-1	-	-	-	-
Naphthalene 91-20-3	-	96-hr LC50 = 0.91-2.82 mg/l Rainbow trout (static) 96-hr LC50 = 1.99 mg/l Fathead minnow (static)	-	48-hr LC50 = 1.6 mg/l Daphnia magna

Persistence and degradability Expected to be inherently biodegradable.

Bioaccumulation Has the potential to bioaccumulate.

Mobility in soil May partition into air, soil and water.

Other adverse effects No information available.

13. DISPOSAL CONSIDERATIONS

Description of Waste Residues
This material may be a flammable liquid waste.

Safe Handling of Wastes
Handle in accordance with applicable local, state, and federal regulations. Use personal protection measures as required. Use appropriate grounding and bonding practices. Use only non-sparking tools. Do not expose to heat, open flames, strong oxidizers or other sources of ignition. No smoking.

Disposal of Wastes / Methods of Disposal
The user is responsible for determining if any discarded material is a hazardous waste (40 CFR 262.11). Dispose of in accordance with federal, state and local regulations.

Methods of Contaminated Packaging Disposal
Empty containers should be completely drained and then discarded or recycled, if possible. Do not cut, drill, grind or weld on empty containers since explosive residues may be present. Dispose of in accordance with federal, state and local regulations.

14. TRANSPORT INFORMATION

DOT (49 CFR 172.101):

UN Proper Shipping Name:	Fuel Oil, No. 2
UN/Identification No:	NA 1993
Transport Hazard Class(es):	3
Packing Group:	III

TDG (Canada):

UN Proper Shipping Name:	Diesel Fuel
UN/Identification No:	UN 1202
Transport Hazard Class(es):	3
Packing Group:	III

15. REGULATORY INFORMATION

US Federal Regulatory Information:

US TSCA Chemical Inventory Section 8(b): This product and/or its components are listed on the TSCA Chemical Inventory.

EPA Superfund Amendment & Reauthorization Act (SARA):

SARA Section 302: This product does not contain any component(s) included on EPA's Extremely Hazardous Substance (EHS) List.

Name	CERCLA/SARA - Section 302 Extremely Hazardous Substances and TPQs
No. 2 Diesel Fuel	NA
Kerosine, Petroleum	NA
Alkanes, C10-C20 branched and linear	NA
Naphthalene	NA

SARA Section 304: This product may contain component(s) identified either as an EHS or a CERCLA Hazardous substance which in case of a spill or release may be subject to SARA reporting requirements:

Name	Hazardous Substances RQs
No. 2 Diesel Fuel	NA
Kerosine, Petroleum	NA

Alkanes, C10-C20 branched and linear	NA
Naphthalene	100 lb final RQ 45.4 kg final RQ

SARA: The following EPA hazard categories apply to this product:

Acute Health Hazard
Fire Hazard
Chronic Health Hazard

SARA Section 313: This product may contain component(s), which if in exceedance of the de minimus threshold, may be subject to the reporting requirements of SARA Title III Section 313 Toxic Release Reporting (Form R).

Name	CERCLA/SARA 313 Emission reporting:
No. 2 Diesel Fuel	None
Kerosine, Petroleum	None
Alkanes, C10-C20 branched and linear	None
Naphthalene	0.1 % de minimis concentration

State and Community Right-To-Know Regulations:
The following component(s) of this material are identified on the regulatory lists below:

No. 2 Diesel Fuel

Louisiana Right-To-Know:	Not Listed
California Proposition 65:	Not Listed
New Jersey Right-To-Know:	SN 2444
Pennsylvania Right-To-Know:	Not Listed
Massachusetts Right-To Know:	Not Listed
Florida Substance List:	Not Listed
Rhode Island Right-To-Know:	Not Listed
Michigan Critical Materials Register List:	Not Listed
Massachusetts Extraordinarily Hazardous Substances:	Not Listed
California - Regulated Carcinogens:	Not Listed
Pennsylvania RTK - Special Hazardous Substances:	Not Listed
New Jersey - Special Hazardous Substances:	Not Listed
New Jersey - Environmental Hazardous Substances List:	SN 2444 TPQ: 10000 lb (Under N.J.A.C. 7:1G, environmental hazardous substances in mixtures such as gasoline or new and used petroleum oil may be reported under these categories)
Illinois - Toxic Air Contaminants:	Not Listed
New York - Reporting of Releases Part 597 - List of Hazardous Substances:	Not Listed

Kerosine, Petroleum

Louisiana Right-To-Know:	Not Listed
California Proposition 65:	Not Listed
New Jersey Right-To-Know:	SN 1091
Pennsylvania Right-To-Know:	Present
Massachusetts Right-To Know:	Present
Florida Substance List:	Not Listed
Rhode Island Right-To-Know:	Not Listed
Michigan Critical Materials Register List:	Not Listed
Massachusetts Extraordinarily Hazardous Substances:	Not Listed
California - Regulated Carcinogens:	Not Listed
Pennsylvania RTK - Special Hazardous Substances:	Not Listed
New Jersey - Special Hazardous Substances:	Not Listed
New Jersey - Environmental Hazardous Substances List:	SN 1091 TPQ: 10000 lb (Under N.J.A.C. 7:1G, environmental hazardous substances in mixtures such as gasoline or new and used petroleum oil may be reported under these categories)
Illinois - Toxic Air Contaminants:	Not Listed

New York - Reporting of Releases Part 597 - List of Hazardous Substances:	Not Listed
Alkanes, C10-C20 branched and linear	
Louisiana Right-To-Know:	Not Listed
California Proposition 65:	Not Listed
New Jersey Right-To-Know:	Not Listed
Pennsylvania Right-To-Know:	Not Listed
Massachusetts Right-To Know:	Not Listed
Florida Substance List:	Not Listed
Rhode Island Right-To-Know:	Not Listed
Michigan Critical Materials Register List:	Not Listed
Massachusetts Extraordinarily Hazardous Substances:	Not Listed
California - Regulated Carcinogens:	Not Listed
Pennsylvania RTK - Special Hazardous Substances:	Not Listed
New Jersey - Special Hazardous Substances:	Not Listed
New Jersey - Environmental Hazardous Substances List:	Not Listed
Illinois - Toxic Air Contaminants:	Not Listed
New York - Reporting of Releases Part 597 - List of Hazardous Substances:	Not Listed
Naphthalene	
Louisiana Right-To-Know:	Not Listed
California Proposition 65:	Carcinogen, initial date 4/19/02
New Jersey Right-To-Know:	SN 1322 SN 3758
Pennsylvania Right-To-Know:	Environmental hazard Present (particulate)
Massachusetts Right-To Know:	Present
Florida Substance List:	Not Listed
Rhode Island Right-To-Know:	Toxic; Flammable
Michigan Critical Materials Register List:	Not Listed
Massachusetts Extraordinarily Hazardous Substances:	Not Listed
California - Regulated Carcinogens:	Not Listed
Pennsylvania RTK - Special Hazardous Substances:	Not Listed
New Jersey - Special Hazardous Substances:	Carcinogen
New Jersey - Environmental Hazardous Substances List:	SN 1322 TPQ: 500 lb (Reportable at the de minimis quantity of >0.1%)
Illinois - Toxic Air Contaminants:	Present
New York - Reporting of Releases Part 597 - List of Hazardous Substances:	100 lb RQ (air); 1 lb RQ (land/water)

Canada DSL/NDSL Inventory: This product and/or its components are listed either on the Domestic Substances List (DSL) or are exempt.

Canadian Regulatory Information: This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations and the (M)SDS contains all the information required by the Controlled Products Regulations.

Name	Canada - WHMIS: Classifications of Substances:	Canada - WHMIS: Ingredient Disclosure:
No. 2 Diesel Fuel	B3,D2A,D2B	0.1%
Kerosine, Petroleum	B3,D2B	1%
Alkanes, C10-C20 branched and linear	B3,D2A,D2B	0.1%
Naphthalene	B4,D2A	0.1%

Note: Not applicable.

16. OTHER INFORMATION

Prepared By Toxicology and Product Safety

Revision Date: 06/01/2016

Revision Note:

Disclaimer

The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information is intended as guidance for safe handling, use, processing, storage, transportation, accidental release, clean-up and disposal and is not considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text.

Safety Data Sheet

This safety data sheet complies with the requirements of: 2012 OSHA Hazard Communication Standard (29CFR 1910.1200)

Product name PYRO-CHEM ABC Multipurpose Dry Chemical Stored Pressure Extinguisher

1. Identification

1.1. Product Identifier

Product name PYRO-CHEM ABC Multipurpose Dry Chemical Stored Pressure Extinguisher

1.2. Other means of identification

Product code 074011
UN/ID no UN1044
Synonyms None
Chemical Family No information available

1.3. Recommended use of the chemical and restrictions on use

Recommended use No information available
Uses advised against Consumer use

1.4. Details of the Supplier of the Safety Data Sheet

Company Name Tyco Fire Protection Products
One Stanton Street
Marinette, WI 54143-2542
Telephone: 715-735-7411

Contact point Product Stewardship at 1-715-735-7411
E-mail address psra@tycofp.com

1.5. Emergency Telephone Number

Emergency telephone CHEMTREC 800-424-9300 or 703-527-3887

2. Hazards Identification

Classification

OSHA Regulatory Status

This chemical is considered hazardous by the 2012 OSHA Hazard Communication Standard (29 CFR 1910.1200)

Gases Under Pressure - Compressed Gas

2.2. Label Elements

Signal Word

WARNING

hazard statements

Contains gas under pressure; may explode if heated

Precautionary Statements

Storage
Protect from sunlight. Store in a well-ventilated place.

2.3. Hazards Not Otherwise Classified (HNOC)

Not Applicable.

2.4. OTHER INFORMATION

Unknown Acute Toxicity 5.6208% of the mixture consists of ingredient(s) of unknown toxicity

3. Composition/information on Ingredients

3.1. Mixture

The following component(s) in this product are considered hazardous under applicable OSHA(USA)

Chemical name	CAS No	weight-%
Ammonium sulfate, technical	7783-20-2	7 - 13
Attapulgite	12174-11-7	1 - 5
Calcium carbonate	471-34-1	1 - 5

4. First aid measures

4.1. Description of first aid measures

Eye Contact Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. If eye irritation persists: Get medical advice/attention.

Skin contact Wash skin with soap and water. Get medical attention if irritation develops and persists.

Inhalation If experiencing respiratory symptoms: Call a POISON CENTER or doctor.

Ingestion If swallowed: Call a POISON CENTER or doctor/physician if you feel unwell.

4.2. Most Important Symptoms and Effects, Both Acute and Delayed

Symptoms None known.

4.3. Indication of Any Immediate Medical Attention and Special Treatment Needed

Note to physicians Treat symptomatically.

5. Fire-fighting measures

5.1. Suitable Extinguishing Media

Product is extinguishing agent. Use extinguishing measures that are appropriate to local circumstances and the surrounding environment.

5.2. Unsuitable Extinguishing Media
None.

5.3. Specific Hazards Arising from the Chemical
Containers may explode when heated. Ruptured cylinders may rocket.

5.4. Explosion Data
Sensitivity to Mechanical Impact None.
Sensitivity to Static Discharge None.

5.5. Protective Equipment and Precautions for Firefighters
As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective gear.

6. Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

Personal Precautions Provide adequate ventilation. Avoid creating dust. Avoid breathing dust/fume/gas/mist/vapors/spray.

For emergency responders Use personal protection recommended in Section 8.

6.2. Environmental Precautions

Environmental Precautions See Section 12 for additional Ecological Information.

6.3. Methods and material for containment and cleaning up

Methods for Containment Stop leak if you can do it without risk. If sweeping of a contaminated area is necessary use a dust suppressing agent which does not react with product.

Methods for Cleaning Up Clean up material with vacuum equipped with HEPA filter. Use water as dust suppressant if necessary. Following product recovery, flush area with water.

7. Handling and Storage

7.1. Precautions for Safe Handling

Advice on safe handling Avoid generation of dust. Do not breathe dust/fume/gas/mist/vapors/spray. Use with local exhaust ventilation. Use personal protective equipment as required. Wash thoroughly after handling.

Do not drag, slide or roll extinguishers. Do not drop extinguishers or permit them to strike against each other. Refer to NFPA-10 Standard for Portable Fire Extinguishers and OSHA 1910.157 Portable Extinguishers regarding requirements for inspection, maintenance and training.

7.2. Conditions for safe storage, including any incompatibilities

Storage Conditions Store in a well-ventilated place. Keep cool. Keep container tightly closed. Guard against dust accumulation of material. Use care in handling/storage. Pressurized extinguishers should be properly stored and secured to prevent falling or being knocked over.

Incompatible Materials Strong acids.

8. Exposure Controls/Personal Protection

8.1. Control Parameters

Exposure guidelines

Chemical name	ACGIH TLV	OSHA PEL	NIOSH IDLH
Attapulgite 12174-11-7	TWA: 1 mg/m³ respirable fraction	-	-
Calcium carbonate 471-34-1	-	-	TWA: 10 mg/m³ total dust TWA: 5 mg/m³ respirable dust

ACGIH (American Conference of Governmental Industrial Hygienists) OSHA (Occupational Safety and Health Administration of the US Department of Labor): NIOSH IDLH Immediately Dangerous to Life or Health

8.2. Appropriate Engineering Controls

Engineering controls Showers
Eyewash stations
Ventilation systems.

8.3. Individual protection measures, such as personal protective equipment

Eye/Face Protection Wear safety glasses with side shields (or goggles).

Skin and Body Protection No special precautions are needed in handling this material.

Respiratory Protection In case of insufficient ventilation, wear suitable respiratory equipment.

Ventilation Use local exhaust or general dilution ventilation to control exposure with applicable limits

8.4. General hygiene considerations

Do not eat, drink or smoke when using this product. Handle in accordance with good industrial hygiene and safety practice.

9. Physical and Chemical Properties

9.1. Information on basic physical and chemical properties

Physical State powder
Odor odorless **Color** Yellow
odor threshold No data available

Property	VALUES	Remarks • Method
pH	No data available	
Melting point/freezing point	No data available	
Boiling point / boiling range	No data available	
Flash Point	No data available	
Evaporation Rate	No data available	
flammability (solid, gas)	No data available	
Flammability limit in air		

Upper flammability limit:	No data available
Lower flammability limit:	No data available
Vapor Pressure	No data available
Vapor Density	No data available
Specific gravity	No data available
Water Solubility	No data available
Solubility in Other Solvents	No data available
Partition coefficient	No data available
Autoignition Temperature	No data available
Decomposition Temperature	No data available
Kinematic viscosity	No data available

10. Stability and Reactivity

10.1. Chemical Stability

Stable under recommended storage conditions.

10.2. Reactivity

No data available

10.3. Possibility of hazardous reactions

Hazardous polymerization does not occur.

hazardous polymerization	Hazardous polymerization does not occur.

10.4. Conditions to Avoid

None known based on information supplied.

10.5. Incompatible Materials

Strong acids.

10.6. Hazardous decomposition products

Carbon oxides. Nitrogen oxides (NOx).

11. Toxicological Information

11.1. Information on Likely Routes of Exposure

Product information

INHALATION	May cause irritation of respiratory tract.
Eye Contact	May cause irritation.
Skin contact	May cause irritation.

INGESTION Ingestion may cause irritation to mucous membranes.

Acute Toxicity

Chemical name	Oral LD50	dermal LD50	Inhalation LC50
Ammonium sulfate, technical 7783-20-2	= 2000 mg/kg (Rat)	-	-
Calcium carbonate 471-34-1	= 6450 mg/kg (Rat)	-	-

11.2. Information on Toxicological Effects

Symptoms No information available.

11.3. Delayed and immediate effects as well as chronic effects from short and long-term exposure

sensitization No information available.

Germ Cell Mutagenicity No information available

carcinogenicity Attapulgite (palygorskite fibers) is a hydrated magnesium aluminum silicate. Long palygorskite (attapulgite) fibers (>5 micrometers) are possibly carcinogenic to humans (Group 2B). Short palygorskite (attapulgite) fibers (<5 micrometers) cannot be classified as to their carcinogenicity to humans (Group 3). The attapulgite present in this product contains fibers 0.5-2.5 um range, so would be considered by IARC as Group 3.

Chemical name	ACGIH	IARC	NTP	OSHA
Attapulgite 12174-11-7	-	Group 3	-	-

IARC (International Agency for Research on Cancer)
Not classifiable as a human carcinogen

Reproductive Toxicity No information available.

STOT - Single Exposure No information available.

STOT - Repeated Exposure No information available.

Target organ effects EYES, Respiratory System, skin.

Aspiration Hazard No information available.

11.4. Numerical Measures of Toxicity - Product information

The following values are calculated based on chapter 3.1 of the GHS document

ATEmix (oral) 16260 mg/kg

ATEmix (dermal) 9942 mg/kg

12. Ecological Information

12.1. ecotoxicity

Not classified

0.03348% of the mixture consists of components(s) of unknown hazards to the aquatic environment

Chemical name	Algae/aquatic plants	Fish	Crustacea

Ammonium sulfate, technical 7783-20-2	-	LC50 96 h 460 - 1000 mg/L Leuciscus idus static; LC50 96 h 123 - 128 mg/L Poecilia reticulata semi-static; LC50 96 h = 126 mg/L Poecilia reticulata; LC50 96 h > 100 mg/L Pimephales promelas; LC50 96 h 32.2 - 41.9 mg/L Oncorhynchus mykiss flow-through; LC50 96 h 5.2 - 8.2 mg/L Oncorhynchus mykiss static; LC50 96 h = 18 mg/L Cyprinus carpio; LC50 96 h = 480 mg/L Brachydanio rerio flow-through; LC50 96 h = 420 mg/L Brachydanio rerio semi-static; LC50 96 h = 250 mg/L Brachydanio rerio	LC50 48 h = 14 mg/L Daphnia magna; EC50 24 h = 423 mg/L Daphnia magna
Silicic Acid/silica gel, Amorphous 7631-86-9	EC50 72 h = 440 mg/L Pseudokirchneriella subcapitata	LC50 96 h = 5000 mg/L Brachydanio rerio static	EC50 48 h = 7600 mg/L Ceriodaphnia dubia

12.2. Persistence and Degradability
No information available.

12.3. Bioaccumulation
No information available.

Chemical name	Partition coefficient
Ammonium sulfate, technical 7783-20-2	-5.1

12.4. Other Adverse Effects
No information available

13. Disposal Considerations

13.1. Waste Treatment Methods

Disposal of wastes This material, as supplied, is not a hazardous waste according to Federal regulations (40 CFR 261). This material could become a hazardous waste if it is mixed with or otherwise comes in contact with a hazardous waste, if chemical additions are made to this material, or if the material is processed or otherwise altered. Consult 40 CFR 261 to determine whether the altered material is a hazardous waste. Consult the appropriate state, regional, or local regulations for additional requirements.

Contaminated Packaging Do not reuse container. Pressurized container: Do not pierce or burn, even after use.

14. Transport Information

DOT

UN/ID no UN1044
Description UN1044, Fire extinguishers, 2.2
Proper Shipping Name Fire extinguishers

Hazard class	2.2
Special Provisions	18, 110
Emergency Response Guide Number	126

TDG

UN/ID no	UN1044
Description	UN1044, Fire extinguishers, 2.2
Proper Shipping Name	Fire extinguishers
Hazard class	2.2

MEX

UN/ID no	UN1044
Description	UN1044, Fire extinguishers, 2.2
Proper Shipping Name	Fire extinguishers
Hazard class	2.2

ICAO (air)

UN/ID no	UN1044
Description	UN1044, Fire extinguishers, 2.2
Proper Shipping Name	Fire extinguishers
Hazard class	2.2
Special Provisions	A19

IATA

UN/ID no	UN1044
Description	UN1044, Fire extinguishers, 2.2
Proper Shipping Name	Fire extinguishers
Hazard class	2.2
ERG Code	2L
Special Provisions	A19

IMDG

UN/ID no	UN1044
Description	UN1044, Fire extinguishers, 2.2
Proper Shipping Name	Fire extinguishers
Hazard class	2.2
EmS-No	F-C, S-V
Special Provisions	225

15. Regulatory Information

15.1. International Inventories

TSCA	Complies
DSL/NDSL	Complies
ENCS	Does not comply
IECSC	Complies
KECL	Does not comply
PICCS	Complies
AICS	Complies

Legend:

TSCA - United States Toxic Substances Control Act Section 8(b) Inventory
DSL/NDSL - Canadian Domestic Substances List/Non-Domestic Substances List
ENCS - Japan Existing and New Chemical Substances
IECSC - China Inventory of Existing Chemical Substances
KECL - Korean Existing and Evaluated Chemical Substances
PICCS - Philippines Inventory of Chemicals and Chemical Substances
AICS - Australian Inventory of Chemical Substances

15.2. US Federal Regulations

SARA 313

Section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 (SARA). This product contains a chemical or chemicals which are subject to the reporting requirements of the Act and Title 40 of the Code of Federal Regulations, Part 372

Chemical name	SARA 313 - Threshold Values %
Ammonium dihydrogen phosphate - 7722-76-1	1.0
Ammonium sulfate, technical - 7783-20-2	1.0

SARA 311/312 Hazard Categories

Acute Health Hazard	No
Chronic health hazard	No
Fire Hazard	No
Sudden Release of Pressure Hazard	Yes
Reactive Hazard	No

CWA (Clean Water Act)

This product does not contain any substances regulated as pollutants pursuant to the Clean Water Act (40 CFR 122.21 and 40 CFR 122.42)

CERCLA

This material, as supplied, does not contain any substances regulated as hazardous substances under the Comprehensive Environmental Response Compensation and Liability Act (CERCLA) (40 CFR 302) or the Superfund Amendments and Reauthorization Act (SARA) (40 CFR 355). There may be specific reporting requirements at the local, regional, or state level pertaining to releases of this material

15.3. US State Regulations

California Proposition 65

Classification only applies to Attapulgite with fibers >5 um. This product contains Attapulgite with fibers <5 um.

Chemical name	California Proposition 65
Attapulgite - 12174-11-7	Carcinogen
Quartz - 14808-60-7	Carcinogen

U.S. State Right-to-Know Regulations

This product does not contain any substances regulated by state right-to-know regulations

Chemical name	New Jersey	Massachusetts	Pennsylvania
Silicic Acid/silica gel, Amorphous 7631-86-9	X	X	X
Magnesium carbonate 546-93-0	X	X	-
Quartz 14808-60-7	X	X	X

16. Other information, including date of preparation of the last revision

NFPA	**Health Hazards** 0	**flammability** 0	**Instability** 0	**Physical and chemical properties** -
HMIS	**Health Hazards** 0	**flammability** 0	**Physical Hazards** 3	**Personal Protection** X

Revision date 25-May-2015

Revision note

No information available

Disclaimer

The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text.

End of Safety Data Sheet

SAFETY DATA SHEET

SDS ID NO.: 0127MAR019
Revision Date: 06/01/2016

1. IDENTIFICATION

Product Name: Marathon Petroleum Gasoline - All Grades

Synonym: Gasoline; Regular Unleaded Gasoline; Conventional Regular Unleaded Gasoline; Mid Grade Unleaded Gasoline; Conventional Mid Grade Unleaded Gasoline; Premium Unleaded Gasoline; Conventional Premium Unleaded Gasoline; Sub-Octane Gasoline; Regular RBOB; Super RBOB; Premium RBOB; RBOB; Reformulated Blend Stock For Oxygenated Blending; 84 Octane Gasoline; CBOB; Premium CBOB; Conventional Blend Stock for Oxygenate Blending; Recreational Gasoline; Recreational Gasoline; Recreational Unleaded Gasoline; 89 Recreational Gasoline; Brand 89 Recreational Gasoline; 7.0 Max RVP 89 Recreational Gasoline; BR 7.0 Max RVP 89 Recreational Gasoline; 90 Recreational Gasoline; 90 Marina Gasoline; Brand 91 Recreational Gasoline; 91 Recreational Gasoline; 91 Marina Gasoline; 90 Octane Midgrade Gasoline with No Ethanol; 0125MAR019; 0126MAR019; 0134MAR019; 0313MAR019; 0314MAR019

Chemical Family: Complex Hydrocarbon Substance

Recommended Use: Fuel.
Restrictions on Use: All others.

Manufacturer, Importer, or Responsible Party Name and Address:

MARATHON PETROLEUM COMPANY LP
539 South Main Street
Findlay, OH 45840

SDS information: 1-419-421-3070

Emergency Telephone: 1-877-627-5463

2. HAZARD IDENTIFICATION

Classification

OSHA Regulatory Status
This chemical is considered hazardous by the 2012 OSHA Hazard Communication Standard (29 CFR 1910.1200)

Flammable liquids	Category 1
Skin corrosion/irritation	Category 2
Germ cell mutagenicity	Category 1B
Carcinogenicity	Category 1B
Reproductive toxicity	Category 2
Specific target organ toxicity (single exposure)	Category 3
Aspiration toxicity	Category 1
Acute aquatic toxicity	Category 2
Chronic aquatic toxicity	Category 2

Hazards Not Otherwise Classified (HNOC)

Static accumulating flammable liquid

Label elements

EMERGENCY OVERVIEW

Danger

EXTREMELY FLAMMABLE LIQUID AND VAPOR
May accumulate electrostatic charge and ignite or explode
May be fatal if swallowed and enters airways
Causes skin irritation
May cause respiratory irritation
May cause drowsiness or dizziness
May cause genetic defects
May cause cancer
Suspected of damaging fertility or the unborn child
Toxic to aquatic life with long lasting effects

Appearance Clear yellow liquid **Physical State** Liquid **Odor** Hydrocarbon

Precautionary Statements - Prevention
Obtain special instructions before use
Do not handle until all safety precautions have been read and understood
Keep away from heat/sparks/open flames/hot surfaces. - No smoking
Keep container tightly closed
Ground/bond container and receiving equipment
Use explosion-proof electrical/ventilating/lighting/equipment
Use only non-sparking tools.
Take precautionary measures against static discharge
Avoid breathing mist/vapors/spray
Use only outdoors or in a well-ventilated area
Wear protective gloves/protective clothing/eye protection/face protection
Wash hands and any possibly exposed skin thoroughly after handling
Avoid release to the environment

Precautionary Statements - Response
IF exposed or concerned: Get medical attention
IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower
If skin irritation occurs: Get medical attention
Wash contaminated clothing before reuse
IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing
Call a POISON CENTER or doctor if you feel unwell
IF SWALLOWED: Immediately call a POISON CENTER or doctor
Do NOT induce vomiting
In case of fire: Use water spray, fog or regular foam for extinction
Collect spillage

Precautionary Statements - Storage
Store in a well-ventilated place. Keep container tightly closed
Keep cool
Store locked up

Precautionary Statements - Disposal
Dispose of contents/container at an approved waste disposal plant

3. COMPOSITION/INFORMATION ON INGREDIENTS

Gasoline is a complex combination of hydrocarbons consisting of paraffins, cycloparaffins, aromatic and olefinic hydrocarbons having molecular chains ranging in length from four to ten carbons. May contain small amounts of dye and other additives (>0.02%) which are not considered hazardous at the concentrations used.

Composition Information:

Name	CAS Number	% Concentration
Gasoline	86290-81-5	100
Heptane (mixed isomers)	142-82-5	2.5-26
Pentane (mixed isomers)	78-78-4	6.5-19
Butane (mixed isomers)	106-97-8	0.5-14
Hexane Isomers (other than n-Hexane)	107-83-5	2-12
Toluene	108-88-3	3-9.5
Xylene (mixed isomers)	1330-20-7	3.5-9.5
n-Hexane	110-54-3	0.1-4.5
Cumene	98-82-8	0-4
1,2,4 Trimethylbenzene	95-63-6	1-4
Ethylbenzene	100-41-4	0.5-2.5
Benzene	71-43-2	0.1-1.5
Cyclohexane	110-82-7	0-1.5
Octane	111-65-9	0-1.5
1,2,3-trimethylbenzene	526-73-8	0-1
Naphthalene	91-20-3	0.1-0.5

All concentrations are percent by weight unless material is a gas. Gas concentrations are in percent by volume.

4. FIRST AID MEASURES

First Aid Measures

General Advice: In case of accident or if you feel unwell, seek medical advice immediately (show directions for use or safety data sheet if possible).

Inhalation: Remove to fresh air. If not breathing, institute rescue breathing. If breathing is difficult, ensure airway is clear, give oxygen and continue to monitor. If heart has stopped, immediately begin cardiopulmonary resuscitation (CPR). Keep affected person warm and at rest. If symptoms occur get medical attention.

Skin Contact: Immediately wash exposed skin with plenty of soap and water while removing contaminated clothing and shoes. May be absorbed through the skin in harmful amounts. Get medical attention if irritation persists. Any injection injury from high pressure equipment should be evaluated immediately by a physician as potentially serious (See NOTES TO PHYSICIAN).

Place contaminated clothing in closed container until cleaned or discarded. If clothing is to be laundered, inform the person performing the operation of contaminant's hazardous properties. Destroy contaminated, non-chemical resistant footwear.

Eye Contact: Flush immediately with large amounts of water for at least 15 minutes. Eyelids should be held away from the eyeball to ensure thorough rinsing. Gently remove contacts while flushing. Get medical attention if irritation persists.

Ingestion: Do not induce vomiting because of danger of aspirating liquid into lungs, causing serious damage and chemical pneumonitis. If spontaneous vomiting occurs, keep head below hips, or if patient is lying down, turn body and head to side to prevent aspiration and monitor for breathing difficulty. Never give anything by mouth to an unconscious person. Keep affected person warm and at rest. GET IMMEDIATE MEDICAL ATTENTION.

Most important signs and symptoms, both short-term and delayed with overexposure

Adverse Effects: Irritating to the skin and mucous membranes. Symptoms may include redness, itching, and inflammation. May cause nausea, vomiting, diarrhea, and signs of nervous system depression: headache, drowsiness, dizziness, loss of coordination, disorientation and fatigue. Aspiration hazard. May cause coughing, chest pains, shortness of breath, pulmonary edema and/or chemical pneumonitis. Repeated or prolonged skin contact may cause drying, reddening, itching and cracking.

Indication of any immediate medical attention and special treatment needed

Notes To Physician: INHALATION: This material (or a component) sensitizes the myocardium to the effects of sympathomimetic amines. Epinephrine and other sympathomimetic drugs may initiate cardiac arrhythmias in individuals exposed to this material. Administration of sympathomimetic drugs should be avoided.

SKIN: Leaks or accidents involving high-pressure equipment may inject a stream of material through the skin and initially produce an injury that may not appear serious. Only a small puncture wound may appear on the skin surface but, without proper treatment and depending on the nature, original pressure, volume, and location of the injected material, can compromise blood supply to an affected body part. Prompt surgical debridement of the wound may be necessary to prevent irreversible loss of function and/or the affected body part. High pressure injection injuries may be SERIOUS SURGICAL EMERGENCIES.

INGESTION: This material represents a significant aspiration and chemical pneumonitis hazard. Induction of emesis is not recommended.

5. FIRE-FIGHTING MEASURES

Suitable extinguishing media
For small fires, Class B fire extinguishing media such as CO2, dry chemical, foam (AFFF/ATC) or water spray can be used. For large fires, water spray, fog or foam (AFFF/ATC) can be used. Firefighting should be attempted only by those who are adequately trained and equipped with proper protective equipment.

Unsuitable extinguishing media
Do not use straight water streams to avoid spreading fire.

Specific hazards arising from the chemical
This product has been determined to be an extremely flammable liquid per the OSHA Hazard Communication Standard and should be handled accordingly. May accumulate electrostatic charge and ignite or explode. Vapors may travel along the ground or be moved by ventilation and ignited by many sources such as pilot lights, sparks, electric motors, static discharge, or other ignition sources at locations distant from material handling. Flashback can occur along vapor trail. For additional fire related information, see NFPA 30 or the Emergency Response Guidebook 128.

Hazardous combustion products
Smoke, carbon monoxide, and other products of incomplete combustion.

Explosion data
Sensitivity to Mechanical Impact No.
Sensitivity to Static Discharge Yes.

Special protective equipment and precautions for firefighters
Firefighters should wear full protective clothing and positive-pressure self-contained breathing apparatus (SCBA) with a full face-piece, as appropriate. Avoid using straight water streams. Water may be ineffective in extinguishing low flash point fires, but can be used to cool exposed surfaces. Avoid excessive water spray application. Water spray and foam (AFFF/ATC) must be applied carefully to avoid frothing and from as far a distance as possible. Keep run-off water out of sewers and water sources.

Additional firefighting tactics
FIRES INVOLVING TANKS OR CAR/TRAILER LOADS: Fight fire from maximum distance or use unmanned hose holders or monitor nozzles. Cool containers with flooding quantities of water until well after the fire is out. Do not direct water at source of leak or safety devices; icing may occur. Withdraw immediately in case of rising sound from venting safety devices or discoloration of tank. ALWAYS stay away from tanks engulfed in fire. For massive fire, use unmanned hose holders or monitor nozzles: if this is impossible, withdraw from area and let fire burn.

EVACUATION: Consider initial downwind evacuation for at least 1000 feet. If tank, rail car or tank truck is involved in a fire, ISOLATE for 5280 feet (1 mile) in all directions; also, consider initial evacuation of 5280 feet (1 mile) in all directions.

NFPA	Health 1	Flammability 3	Instability 0	Special Hazard -

6. ACCIDENTAL RELEASE MEASURES

Personal precautions:	Keep public away. Isolate and evacuate area. Shut off source if safe to do so. Eliminate all ignition sources.
Protective equipment:	Use personal protection measures as recommended in Section 8.
Emergency procedures:	Advise authorities and National Response Center (800-424-8802) if the product has entered a water course or sewer. Notify local health and pollution control agencies, if appropriate.
Environmental precautions:	Avoid release to the environment. Avoid subsoil penetration. Ethanol in gasoline phase seperates in contact with water. Monitor downstream for dissolved ethanol or other appropriate indicators.
Methods and materials for containment:	Contain liquid with sand or soil. Prevent spilled material from entering storm drains, sewers, and open waterways.
Methods and materials for cleaning up:	Use suitable absorbent materials such as vermiculite, sand, or clay to clean up residual liquids. Recover and return free product to proper containers. When recovering free liquids ensure all equipment is grounded and bonded. Use only non-sparking tools.

7. HANDLING AND STORAGE

Safe Handling Precautions:

NEVER SIPHON THIS PRODUCT BY MOUTH. Use appropriate grounding and bonding practices. Static accumulating flammable liquid. Bonding and grounding may be insufficient to eliminate the hazard from static electricity. Do not expose to heat, open flames, strong oxidizers or other sources of ignition. Vapors may travel along the ground or be moved by ventilation. Flashback may occur along vapor trails. No smoking. Use only non-sparking tools. Avoid contact with skin, eyes and clothing. Avoid breathing fumes, gas, or vapors. Use only with adequate ventilation. Avoid repeated and prolonged skin contact. Use personal protection measures as recommended in Section 8. Exercise good personal hygiene including removal of soiled clothing and prompt washing with soap and water. Do not cut, drill, grind or weld on empty containers since explosive residues may remain. Refer to applicable EPA, OSHA, NFPA and consistent state and local requirements.

Hydrocarbons are basically non-conductors of electricity and can become electrostatically charged during mixing, filtering, pumping at high flow rates or loading and transfer operations. If this charge reaches a sufficiently high level, sparks can form that may ignite the vapors of flammable liquids. Sudden release of hot organic chemical vapors or mists from process equipment operating under elevated temperature and pressure, or sudden ingress of air into vacuum equipment may result in ignition of vapors or mists without the presence of obvious ignition sources. Nozzle spouts must be kept in contact with the containers or tank during the entire filling operation.

Portable containers should never be filled while in or on a motor vehicle or marine craft. Containers should be placed on the ground. Static electric discharge can ignite fuel vapors when filling non-grounded containers or vehicles on trailers. The nozzle spout must be kept in contact with the container before and during the entire filling operation. Use only approved containers.

A buildup of static electricity can occur upon re-entry into a vehicle during fueling especially in cold or dry climate conditions. The charge is generated by the action of dissimilar fabrics (i.e., clothing and upholstery) rubbing across each other as a person enters/exits the vehicle. A flash fire can result from this discharge if sufficient flammable vapors are present. Therefore, do not get back in your vehicle while refueling.

Cellular phones and other electronic devices may have the potential to emit electrical charges (sparks). Sparks in potentially explosive atmospheres (including fueling areas such as gas stations) could cause an explosion if sufficient flammable vapors are present. Therefore, turn off cellular phones and other electronic devices when working in potentially explosive atmospheres or keep devices inside your vehicle during refueling.

High-pressure injection of any material through the skin is a serious medical emergency even though the small entrance wound at the injection site may not initially appear serious. These injection injuries can occur from high-pressure equipment such as paint spray or grease or guns, fuel injectors, or pinhole leaks in hoses or hydraulic lines and should all be considered serious. High pressure injection injuries may be SERIOUS SURGICAL EMERGENCIES (See First Aid Section 4).

Storage Conditions:

Store in properly closed containers that are appropriately labeled and in a cool, well-ventilated area. Do not store near an open flame, heat or other sources of ignition.

Incompatible Materials

Strong oxidizing agents.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Name	ACGIH TLV	OSHA PELS:	OSHA - Vacated PELs	NIOSH IDLH
Gasoline 86290-81-5	300 ppm TWA 500 ppm STEL	-	300 ppm TWA 900 mg/m^3 TWA 500 ppm STEL 1500 mg/m^3 STEL	-

Heptane (mixed isomers) 142-82-5	400 ppm TWA 500 ppm STEL	TWA: 500 ppm TWA: 2000 mg/m³	400 ppm TWA 1600 mg/m³ TWA 500 ppm STEL 2000 mg/m³ STEL	750 ppm
Pentane (mixed isomers) 78-78-4	1000 ppm TWA	-	-	-
Butane (mixed isomers) 106-97-8	1000 ppm STEL	-	800 ppm TWA 1900 mg/m³ TWA	-
Hexane Isomers (other than n-Hexane) 107-83-5	500 ppm TWA 1000 ppm STEL	-	500 ppm TWA 1800 mg/m³ TWA 1000 ppm STEL 3600 mg/m³ STEL	-
Toluene 108-88-3	20 ppm TWA	TWA: 200 ppm Ceiling: 300 ppm	100 ppm TWA 375 mg/m³ TWA 150 ppm STEL 560 mg/m³ STEL	500 ppm
Xylene (mixed isomers) 1330-20-7	100 ppm TWA 150 ppm STEL	TWA: 100 ppm TWA: 435 mg/m³	100 ppm TWA 435 mg/m³ TWA 150 ppm STEL 655 mg/m³ STEL	900 ppm
n-Hexane 110-54-3	50 ppm TWA Skin - potential significant contribution to overall exposure by the cutaneous route	TWA: 500 ppm TWA: 1800 mg/m³	50 ppm TWA 180 mg/m³ TWA	1100 ppm
Cumene 98-82-8	50 ppm TWA	TWA: 50 ppm TWA: 245 mg/m³ Skin	50 ppm TWA 245 mg/m³ TWA Limit applies to skin	900 ppm
1,2,4 Trimethylbenzene 95-63-6	25 ppm TWA	-	25 ppm TWA 125 mg/m³ TWA	-
Ethylbenzene 100-41-4	20 ppm TWA	TWA: 100 ppm TWA: 435 mg/m³	100 ppm TWA 435 mg/m³ TWA 125 ppm STEL 545 mg/m³ STEL	800 ppm
Benzene 71-43-2	0.5 ppm TWA 2.5 ppm STEL Skin - potential significant contribution to overall exposure by the cutaneous route	TWA: 10 ppm (applies to industry segments exempt from the benzene standard) TWA: 1 ppm STEL: 5 ppm (see 29 CFR 1910.1028)	25 ppm Ceiling 1 ppm TWA 5 ppm STEL	500 ppm
Cyclohexane 110-82-7	100 ppm TWA	TWA: 300 ppm TWA: 1050 mg/m³	300 ppm TWA 1050 mg/m³ TWA	1300 ppm
Octane 111-65-9	300 ppm TWA	TWA: 500 ppm TWA: 2350 mg/m³	300 ppm TWA 1450 mg/m³ TWA 375 ppm STEL 1800 mg/m³ STEL	1000 ppm
1,2,3-trimethylbenzene 526-73-8	25 ppm TWA	-	25 ppm TWA 125 mg/m³ TWA	-
Naphthalene 91-20-3	10 ppm TWA Skin - potential significant contribution to overall exposure by the cutaneous route	TWA: 10 ppm TWA: 50 mg/m³	10 ppm TWA 50 mg/m³ TWA 15 ppm STEL 75 mg/m³ STEL	250 ppm

Notes: The manufacturer has voluntarily elected to provide exposure limits contained in OSHA's 1989 air contaminants standard in its SDSs, even though certain of those exposure limits were vacated in 1992.

Engineering measures: Local or general exhaust required in an enclosed area or when there is inadequate ventilation. Use mechanical ventilation equipment that is explosion-proof.

Personal protective equipment

Eye protection:	Use goggles or face-shield if the potential for splashing exists.
Skin and body protection:	Use nitrile rubber, Viton® or PVA gloves for repeated or prolonged skin exposure. Glove suitability is based on workplace conditions and usage. Contact the glove manufacturer for specific advice on glove selection and breakthrough times.
Respiratory protection:	Use a NIOSH approved organic vapor chemical cartridge or supplied air respirators when there is the potential for airborne exposures to exceed permissible exposure limits or if excessive vapors are generated. Observe respirator assigned protection factors (APFs) criteria cited in federal OSHA 29 CFR 1910.134. Self-contained breathing apparatus should be used for fire fighting.
Hygiene measures:	Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin, eyes and clothing.

9. PHYSICAL AND CHEMICAL PROPERTIES

Information on basic physical and chemical properties

Physical State	Liquid
Appearance	Clear yellow liquid
Color	Yellow
Odor	Hydrocarbon
Odor Threshold	No data available.

Property	**Values (Method)**
Melting Point / Freezing Point	No data available.
Initial Boiling Point / Boiling Range	24-210 °C / 75-410 °F (ASTM D86)
Flash Point	-43 °C / -45 °F
Evaporation Rate	No data available.
Flammability (solid, gas)	Not applicable.
Flammability Limit in Air (%):	
Upper Flammability Limit:	7.6
Lower Flammability Limit:	1.4
Explosion limits:	No data available.
Vapor Pressure	5.5-15 psi (ASTM D4814)
Vapor Density	3-4
Specific Gravity / Relative Density	0.70-0.76
Water Solubility	No data available.
Solubility in other solvents	No data available.
Partition Coefficient	2.13-4.5
Decomposition temperature	No data available.
pH:	Not applicable
Autoignition Temperature	280 °C / 536 °F
Kinematic Viscosity	No data available.
Dynamic Viscosity	No data available.
Explosive Properties	No data available.
VOC Content (%)	100%
Density	No data available.
Bulk Density	Not applicable.

10. STABILITY AND REACTIVITY

Reactivity	The product is non-reactive under normal conditions.
Chemical stability	The material is stable at 70°F, 760 mmHg pressure.
Possibility of hazardous reactions	None under normal processing.
Hazardous polymerization	Will not occur.

Conditions to avoid Excessive heat, sources of ignition, open flame.

Incompatible Materials Strong oxidizing agents.

Hazardous decomposition products None known under normal conditions of use.

11. TOXICOLOGICAL INFORMATION

Potential short-term adverse effects from overexposures

Inhalation May cause irritation of respiratory tract. May cause drowsiness or dizziness. Breathing high concentrations of this material in a confined space or by intentional abuse can cause irregular heartbeats which can cause death.

Eye contact Exposure to vapor or contact with liquid may cause mild eye irritation, including tearing, stinging, and redness.

Skin contact Causes skin irritation. Effects may become more serious with repeated or prolonged contact. May be absorbed through the skin in harmful amounts.

Ingestion May be fatal if swallowed or vomited and enters airways. May cause irritation of the mouth, throat and gastrointestinal tract.

Acute toxicological data

Name	Oral LD50	Dermal LD50	Inhalation LC50
Gasoline 86290-81-5	14000 mg/kg (Rat)	> 2000 mg/kg (Rabbit)	> 5.2 mg/L (Rat) 4 h
Heptane (mixed isomers) 142-82-5	-	3000 mg/kg (Rabbit)	103 g/m^3 (Rat) 4 h
Pentane (mixed isomers) 78-78-4	-	-	450 mg/L (Mouse) 2 h
Butane (mixed isomers) 106-97-8	-	-	658 mg/L (Rat) 4 h
Hexane Isomers (other than n-Hexane) 107-83-5	> 5000 mg/kg (Rat)	-	-
Toluene 108-88-3	> 2000 mg/kg (Rat)	8390 mg/kg (Rabbit)	12.5 mg/L (Rat) 4 h
Xylene (mixed isomers) 1330-20-7	> 2000 mg/kg (Rat)	> 2000 mg/kg (Rabbit)	> 5.04 mg/L (Rat) 4 h
n-Hexane 110-54-3	15000 mg/kg (Rat)	3000 mg/kg (Rabbit)	48000 ppm (Rat) 4 h
Cumene 98-82-8	> 2000 mg/kg (Rat)	> 2000 mg/kg (Rabbit)	> 20 mg/L (Rat) 6 h
1,2,4 Trimethylbenzene 95-63-6	3280 mg/kg (Rat)	> 3160 mg/kg (Rabbit)	18,000 mg/m^3 (Rat) 4 h
Ethylbenzene 100-41-4	> 2000 mg/kg (Rat)	> 2000 mg/kg (Rabbit)	17.2 mg/L (Rat) 4 h
Benzene 71-43-2	> 2000 mg/kg (Rat)	> 5000 mg/kg (Rabbit)	> 20 mg/l (Rat) 4 h
Cyclohexane 110-82-7	> 5000 mg/kg (Rat)	> 2000 mg/kg (Rabbit)	13.9 mg/L (Rat) 4 h
Octane 111-65-9	-	-	118 g/m^3 (Rat) 4 h
1,2,3-trimethylbenzene 526-73-8	-	-	-
Naphthalene 91-20-3	490 mg/kg (Rat)	> 2000 mg/kg (Rabbit)	> 340 mg/m^3 (Rat) 1 h

Delayed and immediate effects as well as chronic effects from short and long-term exposure

NAPHTHAS: In a large epidemiological study on over 15,000 employees at several petroleum refineries and amongst residents located near these refineries, no increased risk of kidney cancer was observed in association with gasoline exposures (a similar material). In a similar study, no increased risk of kidney cancer was observed among petroleum refinery workers, but there was a slight trend in the incidence of kidney cancers among service station employees, especially after a 30-year latency period. Altered mental state, drowsiness, peripheral motor neuropathy, irreversible brain damage (so-called Petrol Sniffer's Encephalopathy), delirium, seizures, and sudden death have been reported from repeated overexposure to some hydrocarbon solvents, naphthas, and gasoline.

ISOPARAFFINS: Studies in laboratory animals have shown that long-term exposure to similar materials (isoparaffins) can cause kidney damage and kidney cancer in male laboratory rats. However, in-depth research indicates that these findings are unique to the male rat, and that these effects are not relevant to humans.

C9 AROMATIC HYDROCARBONS: A developmental inhalation study was conducted in laboratory mice. Increased implantation losses, reduced fetal weights, delayed ossification and an increased incidence of cleft palate were observed at the highest exposure level (1,500 ppm). This exposure level was extremely toxic to pregnant female mice (44% mortality). Reduced fetal body weights were also observed at 500 ppm. A multi-generation reproduction inhalation study was conducted in laboratory rats. Reductions in pup weights, pup weight gain, litter size, and pup survival were observed at 1,500 ppm, an exposure level at which significant maternal toxicity was observed. Reduced pup weight gain was also observed at 500 ppm.

PENTANES: Studies of pentane isomers in laboratory animals indicate exposure to extremely high levels (roughly 10 vol.%) may induce cardiac arrhythmias (irregular heartbeats) which may be serious or fatal.

BUTANES: Studies in laboratory animals indicate exposure to extremely high levels of butanes (1-10 or higher vol.% in air) may cause cardiac arrhythmias (irregular heartbeats) which may be serious or fatal.

TOLUENE: Case studies of persons abusing toluene suggest isolated incidences of adverse effects on the fetus including birth defects. Abuse of toluene at high concentrations (e.g., glue sniffing and solvent abuse) has been associated with adverse effects on the liver, kidney and nervous system, and can cause CNS depression, cardiac arrhythmias, and death. Studies of workers indicate longterm exposure may be related to impaired color vision and hearing. Some studies of workers suggest longterm exposure may be related to neurobehavioral and cognitive changes. Some of these effects have been observed in laboratory animals following repeated exposure to high levels of toluene. Several studies of workers suggest longterm exposure may be related to small increases in spontaneous abortions and changes in some gonadotropic hormones. However, the weight of evidence does not indicate toluene is a reproductive hazard to humans. Studies in laboratory animals indicate some changes in reproductive organs following high levels of exposure, but no significant effects on mating performance or reproduction were observed. Case studies of persons abusing toluene suggest isolated incidences of adverse effects on the fetus including birth defects. Findings in laboratory animals have been largely negative. Positive findings include small increases in minor skeletal and visceral malformations and developmental delays following very high levels of maternal exposure. Studies of workers indicate long-term exposure may be related to effects on the liver, kidney and blood, but these appear to be limited to changes in serum enzymes and decreased leukocyte counts. Adverse effects on the liver, kidney, thymus and nervous system were observed in animal studies following very high levels of exposure. The relevance of these findings to humans is not clear at this time.

XYLENES, ALL ISOMERS: Overexposure to xylene may cause upper respiratory tract irritation, headache, cyanosis, blood serum changes, nervous system damage and narcosis. Effects may be increased by the use of alcoholic beverages. Evidence of liver and kidney impairment were reported in workers recovering from a gross overexposure. Effects from Prolonged or Repeated Exposure: Impaired neurological function was reported

in workers exposed to solvents including xylene. Studies in laboratory animals have shown evidence of impaired hearing following high levels of exposure. Studies in laboratory animals suggest some changes in reproductive organs following high levels of exposure but no significant effects on reproduction were observed. Studies in laboratory animals indicate skeletal and visceral malformations, developmental delays, and increased fetal resorptions following extremely high levels of maternal exposure with evidence of maternal toxicity. The relevance of these observations to humans is not clear at this time. Adverse effects on the liver, kidney, bone marrow (changes in blood cell parameters) were observed in laboratory animals following high levels of exposure. The relevance of these observations to humans is not clear at this time.

1,2,4-TRIMETHYLBENZENE: The following information pertains to a mixture of C9 aromatic hydrocarbons, over 40% of which was composed of 1,2,4-trimethylbenzene. A developmental inhalation study was conducted in laboratory mice. Increased implantation losses, reduced fetal weights, delayed ossification and an increased incidence of cleft palate were observed at the highest exposure level (1,500 ppm). This exposure level was extremely toxic to pregnant female mice (44% mortality). Reduced fetal body weights were also observed at 500 ppm. A multi-generation reproduction inhalation study was conducted in laboratory rats. Reductions in pup weights, pup weight gain, litter size, and pup survival were observed at 1,500 ppm, an exposure level at which significant maternal toxicity was observed. Reduced pup weight gain was also observed at 500 ppm. Embryotoxicity has been reported in studies of laboratory animals. Adverse effects included increased implantation losses, reduced fetal weights, delayed ossification and an increased incidence of cleft palate.<n><n>

N-HEXANE: Long-term or repeated exposure to n-hexane can cause peripheral nerve damage. Initial symptoms are numbness of the fingers and toes. Also, motor weakness can occur in the digits, but may also involve muscles of the arms, thighs and forearms. The onset of these symptoms may be delayed for several months to a year after the beginning of exposure. Testicular atrophy and partial to full loss of the germ cell line were observed in sub-chronic high-dose inhalation studies of laboratory rodents. These effects appeared irreversible. Rodent reproduction studies have shown evidence of reduced fetal weight but no frank malformations.

CUMENE: Overexposure to cumene may cause upper respiratory tract irritation and CNS depression. Studies in laboratory animals indicate evidence of respiratory tract hyperplasia, and adverse effects on the liver, kidney and adrenal glands following high level exposure. The relevance of these findings to humans is not clear at this time. Findings from lifetime laboratory rodent inhalation studies were as follows: In F344/N rats: an increased incidence of renal carcinomas and adenomas, respiratory epithelial adenomas, and interstitial cell adenomas of the testes. In B6C3F1 mice: an increased incidence of carcinomas and adenomas of the bronchi and lung, liver neoplasms, hemangiosarcomas of the spleen, and adenomas of the thyroid.

ETHYLBENZENE: Findings from a 2-year inhalation study in rodents conducted by NTP were as follows: Effects were observed only at the highest exposure level (750 ppm). At this level the incidence of renal tumors was elevated in male rats (tubular carcinomas) and female rats (tubular adenomas). The incidence of tumors was also elevated in male mice (alveolar and bronchiolar carcinomas) and female mice (hepatocellular carcinomas). IARC has classified ethyl benzene as "possibly carcinogenic to humans" (Group 2B). Studies in laboratory animals indicate some evidence of post-implantation deaths following high levels of maternal exposure. The relevance of these findings to humans is not clear at this time. Studies in laboratory animals indicate limited evidence of renal malformations, resorptions, and developmental delays following high levels of maternal exposure with evidence of maternal toxicity. The relevance of these findings to humans is not clear at this time. Studies in laboratory animals have demonstrated evidence of ototoxicity (hearing loss) following exposure levels as low as 300 ppm for 5 days. Studies in laboratory animals indicate some evidence of adverse effects on the liver, kidney, thyroid, and pituitary gland.

BENZENE: Studies of workers exposed to benzene show clear evidence that overexposure can cause cancer and other diseases of the blood forming organs including Acute

Myelogenous Leukemia (AML), and Aplastic Anemia (AA), an often fatal disease. Some studies suggest overexposure to benzene may also be associated with Myelodysplastic Syndrome (MDS). Findings from a case control study of workers exposed to benzene was reported during the 2009 Benzene Symposium in Munich included an increase in Acute Myeloid Leukemias and Non-Hodgkins Lymphoid Neoplasms (NHLN) of the subtype follicular lymphoma (FL) in some occupational categories. Some studies of workers exposed to benzene have shown an association with increased rates of chromosome aberrations in circulating lymphocytes. One study of women workers exposed to benzene suggested a weak association with irregular menstruation. However, other studies of workers exposed to benzene have not demonstrated clear evidence of an effect on fertility or reproductive outcome in humans. Benzene can cross the placenta and affect the developing fetus. Cases of AA have been reported in the offspring of persons severely overexposed to benzene. Studies in laboratory animals indicate that prolonged, repeated exposure to high levels of benzene vapor can cause bone marrow suppression and cancer in multiple organ systems. Studies in laboratory animals show evidence of adverse effects on male reproductive organs following high levels of exposure but no significant effects on reproduction have been observed. Embryotoxicity has been reported in studies of laboratory animals but effects were limited to reduced fetal weight and minor skeletal variations. Benzene has been classified as a proven human carcinogen by OSHA and a Group 1 (Carcinogenic to Humans) material by IARC. The current proposed IARC classification for benzene is summarized as follows: Sufficient evidence for Acute Myeloid Leukemia; limited evidence for Acute Lymphatic Leukemia, Chronic Lymphatic Leukemia, Non-Hodgkin Lymphoma, and Multiple Myeloma.

NAPHTHALENE: Severe jaundice, neurotoxicity (kernicterus) and fatalities have been reported in young children and infants as a result of hemolytic anemia from overexposure to naphthalene. Persons with glucose 6-phosphate dehydrogenase (G6PD) deficiency are more prone to the hemolytic effects of naphthalene. Adverse effects on the kidney have been reported in persons overexposed to naphthalene but these effects are believed to be a consequence of hemolytic anemia, and not a direct effect. Hemolytic anemia has been observed in laboratory animals exposed to naphthalene. Laboratory rodents exposed to naphthalene vapor for 2 years (lifetime studies) developed non-neoplastic and neoplastic tumors and inflammatory lesions of the nasal and respiratory tract. Cataracts and other adverse effects on the eye have been observed in laboratory animals exposed to high levels of naphthalene. Findings from a large number of bacterial and mammalian cell mutation assays have been negative. A few studies have shown chromosomal effects (elevated levels of Sister Chromatid Exchange or chromosomal aberrations) in vitro. Naphthalene has been classified as Possibly Carcinogenic to Humans (2B) by IARC, based on findings from studies in laboratory animals.

CARBON MONOXIDE: is a chemical asphyxiant with no warning properties (such as odor). At 400-500 ppm for 1 hour headache and dyspnea may occur. If activity is increased, symptoms of overexposure may include nausea, irritability, increased respiration, tinnitus, sweating, chest pain, confusion, impaired judgement, dizziness, weakness, drowsiness, ataxia, irregular heart beat, cyanosis and pallor. Levels in excess of 1000 ppm can result in collapse, loss of conciousness, respiratory failure and death. Extremely high concentrations (12,800 ppm) can cause immediate unconsciousness and death in 1-3 minutes. Repeated anoxia can lead to central nervous system damage and peripheral neuropathy, with loss of sensation in the fingers, amnesia, and mental deterioration and possible congestive heart failure. Damage may also occur to the fetus, lung, liver, kidney, spleen, cardiovascular system and other organs.

WHOLLY-VAPORIZED UNLEADED GASOLINE: Lifetime exposure to wholly vaporized unleaded gasoline produced an increased incidence of liver tumors in female mice exposed to the highest exposure concentration (2056 ppm) and α-2 urinary globulin-mediated kidney tumors in male rats. No exposure-related tumors were observed in male mice or female rats. The male-specific rat kidney tumors are not considered relevant to human health. Mice receiving lifetime repeated skin application of various petroleum naphthas exhibited an irritation-dependent increased incidence of skin tumors. Additional studies suggest that these tumors occur through a mechanism that may not be relevant to human health. Epidemiological data from over 18,000 petroleum marketing and distribution workers

showed no increased risk of leukemia, multiple myeloma, or kidney cancer resulting from gasoline exposure. Unleaded gasoline has been identified as possibly carcinogenic to humans (2B) by the International Agency for Research on Cancer (IARC).

COMBUSTION ENGINE EXHAUST: Chronic inhalation studies of gasoline engine exhaust in mice, rats and hamsters did not produce any carcinogenic effects. Condensates/extracts of gasoline engine exhaust produced an increase in tumors compared to controls when testing by skin painting, subcutaneous injection, intratracheal instillation or implantation into the lungs. Gasoline exhaust has been classified as possibly carcinogenic to humans (2B) by the International Agency for Research on Cancer (IARC).

Adverse effects related to the physical, chemical and toxicological characteristics

Signs and Symptoms Irritating to the skin and mucous membranes. Symptoms may include redness, itching, and inflammation. May cause nausea, vomiting, diarrhea, and signs of nervous system depression: headache, drowsiness, dizziness, loss of coordination, disorientation and fatigue. Aspiration hazard. May cause coughing, chest pains, shortness of breath, pulmonary edema and/or chemical pneumonitis. Repeated or prolonged skin contact may cause drying, reddening, itching and cracking.

Sensitization Not expected to be a skin or respiratory sensitizer.

Mutagenic effects May cause genetic defects.

Carcinogenicity May cause cancer.

Cancer designations are listed in the table below

Name	ACGIH (Class)	IARC (Class)	NTP	OSHA
Gasoline 86290-81-5	Confirmed animal carcinogen (A3)	Possible human carcinogen (2B)	Not Listed	Not Listed
Heptane (mixed isomers) 142-82-5	Not Listed	Not Listed	Not Listed	Not Listed
Pentane (mixed isomers) 78-78-4	Not Listed	Not Listed	Not Listed	Not Listed
Butane (mixed isomers) 106-97-8	Not Listed	Not Listed	Not Listed	Not Listed
Hexane Isomers (other than n-Hexane) 107-83-5	Not Listed	Not Listed	Not Listed	Not Listed
Toluene 108-88-3	Not Classifiable (A4)	Not Classifiable (3)	Not Listed	Not Listed
Xylene (mixed isomers) 1330-20-7	Not classifiable (A4)	Not classifiable (3)	Not Listed	Not Listed
n-Hexane 110-54-3	Not Listed	Not Listed	Not Listed	Not Listed
Cumene 98-82-8	Not listed	Possible human carcinogen (2B)	Reasonably anticipated to be a human carcinogen	Not listed
1,2,4 Trimethylbenzene 95-63-6	Not Listed	Not Listed	Not Listed	Not Listed
Ethylbenzene 100-41-4	Confirmed animal carcinogen (A3)	Possible human carcinogen (2B)	Not Listed	Not Listed
Benzene 71-43-2	Confirmed human carcinogen (A1)	Carcinogenic to humans (1)	Known to be human carcinogen	Known carcinogen
Cyclohexane 110-82-7	Not Listed	Not Listed	Not Listed	Not Listed
Octane 111-65-9	Not Listed	Not Listed	Not Listed	Not Listed
1,2,3-trimethylbenzene 526-73-8	Not Listed	Not Listed	Not Listed	Not Listed
Naphthalene 91-20-3	Confirmed animal carcinogen (A3)	Possible human carcinogen (2B)	Reasonably anticipated to be a human carcinogen	Not Listed

Reproductive toxicity Suspected of damaging fertility or the unborn child.

Specific Target Organ Toxicity (STOT) - single exposure Respiratory system. Central nervous system.

Specific Target Organ Toxicity (STOT) - repeated exposure Not classified.

Aspiration hazard May be fatal if swallowed or vomited and enters airways.

12. ECOLOGICAL INFORMATION

Ecotoxicity This product should be considered toxic to aquatic organisms, with the potential to cause long lasting adverse effects in the aquatic environment.

Name	Algae/aquatic plants	Fish	Toxicity to Microorganisms	Crustacea
Gasoline 86290-81-5	72-hr EC50 = 56 mg/l Algae	96-hr LC50 = 11 mg/l Rainbow trout (static)	-	48-hr LC50 = 7.6 mg/l Daphnia magna
Heptane (mixed isomers) 142-82-5	-	96-hr LC50 = 375 mg/L Tilapia	-	-
Pentane (mixed isomers) 78-78-4	-	96-hr LC50 = 3.1 mg/L Rainbow trout	-	48-hr EC50 = >1 - <10 mg/L Daphnia magna
Butane (mixed isomers) 106-97-8	-	-	-	-
Hexane Isomers (other than n-Hexane) 107-83-5	-	-	-	-
Toluene 108-88-3	72-hr EC50 = 12.5 mg/l Algae	96-hr LC50 <= 10 mg/l Rainbow trout	-	48-hr EC50 = 5.46-9.83 mg/l Daphnia magna 48-hr EC50 = 11.5 mg/l Daphnia magna (Static)
Xylene (mixed isomers) 1330-20-7	72-hr EC50 = 11 mg/l Algae	96-hr LC50 = 8 mg/l Rainbow trout	-	48-hr LC50 = 3.82 mg/l Daphnia magna
n-Hexane 110-54-3	-	96-hr LC50 = 2.5 mg/l Fathead minnow	-	-
Cumene 98-82-8	72-hr EC50 = 2.6 mg/l Algae	96-hr LC50 = 6.04-6.61 mg/l Fathead minnow (Flow-through) 96-hr LC50 = 2.7 mg/l Rainbow trout (semi-static)	-	48-hr EC50 = 7.9-14.1 mg/l Daphnia magna (static)
1,2,4 Trimethylbenzene 95-63-6	-	96-hr LC50 = 7.19-8.28 mg/l Fathead minnow (flow-through)	-	48-hr EC50 = 6.14 mg/L Daphnia magna
Ethylbenzene 100-41-4	72-hr EC50 = 1.7-7.6 mg/l Algae	96-hr LC50 = 4 mg/L Rainbow trout	-	48-hr EC50 = 1-4 mg/L Daphnia magna
Benzene 71-43-2	72-hr EC50 = 29 mg/l Algae	96-hr LC50 = 5.3 mg/l Rainbow trout (flow-through)	-	48-hr EC50 = 8.76-15.6 mg/l Daphnia magna (Static)
Cyclohexane 110-82-7	72-hr EC50 = 500 mg/l Algae	96-hr LC50 = 3.96-5.18 mg/l Fathead minnow	-	48-hr EC50 = 1.7-3.5 mg/L Bay shrimp
Octane 111-65-9	-	-	-	48-hr LC50 = 0.38 mg/l Daphnia magna
1,2,3-trimethylbenzene 526-73-8	-	96-hr LC50 = 7.72 mg/l Fathead Minnow (flow-through)	-	-
Naphthalene 91-20-3	-	96-hr LC50 = 0.91-2.82 mg/l Rainbow trout (static) 96-hr LC50 = 1.99 mg/l Fathead minnow (static)	-	48-hr LC50 = 1.6 mg/l Daphnia magna

Persistence and degradability Expected to be inherently biodegradable. The presence of ethanol in this product may impede the biodegradation of benzene, toluene, ethylbenzene and xylene in groundwater, resulting in elongated plumes of these constituents.

Bioaccumulation Has the potential to bioaccumulate.

Mobility in soil May partition into air, soil and water.

Other adverse effects No information available.

13. DISPOSAL CONSIDERATIONS

Description of Waste Residues
This material may be a flammable liquid waste.

Safe Handling of Wastes
Handle in accordance with applicable local, state, and federal regulations. Use personal protection measures as required. Use appropriate grounding and bonding practices. Use only non-sparking tools. Do not expose to heat, open flames, strong oxidizers or other sources of ignition. No smoking.

Disposal of Wastes / Methods of Disposal
The user is responsible for determining if any discarded material is a hazardous waste (40 CFR 262.11). Dispose of in accordance with federal, state and local regulations.

Methods of Contaminated Packaging Disposal
Empty containers should be completely drained and then discarded or recycled, if possible. Do not cut, drill, grind or weld on empty containers since explosive residues may be present. Dispose of in accordance with federal, state and local regulations.

14. TRANSPORT INFORMATION

DOT (49 CFR 172.101):

UN Proper Shipping Name:	Gasoline
UN/Identification No:	UN 1203
Transport Hazard Class(es):	3
Packing Group:	II

TDG (Canada):

UN Proper Shipping Name:	Gasoline
UN/Identification No:	UN 1203
Transport Hazard Class(es):	3
Packing Group:	II

15. REGULATORY INFORMATION

US Federal Regulatory Information:

US TSCA Chemical Inventory Section 8(b): This product and/or its components are listed on the TSCA Chemical Inventory.

EPA Superfund Amendment & Reauthorization Act (SARA):

SARA Section 302: This product does not contain any component(s) included on EPA's Extremely Hazardous Substance (EHS) List.

Name	CERCLA/SARA - Section 302 Extremely Hazardous Substances and TPQs
Gasoline	NA
Heptane (mixed isomers)	NA
Pentane (mixed isomers)	NA
Butane (mixed isomers)	NA
Hexane Isomers (other than n-Hexane)	NA
Toluene	NA
Xylene (mixed isomers)	NA

n-Hexane	NA
Cumene	NA
1,2,4 Trimethylbenzene	NA
Ethylbenzene	NA
Benzene	NA
Cyclohexane	NA
Octane	NA
1,2,3-trimethylbenzene	NA
Naphthalene	NA

SARA Section 304: This product may contain component(s) identified either as an EHS or a CERCLA Hazardous substance which in case of a spill or release may be subject to SARA reporting requirements:

Name	Hazardous Substances RQs
Gasoline	NA
Heptane (mixed isomers)	NA
Pentane (mixed isomers)	NA
Butane (mixed isomers)	NA
Hexane Isomers (other than n-Hexane)	NA
Toluene	1000 lb final RQ 454 kg final RQ
Xylene (mixed isomers)	100 lb final RQ 45.4 kg final RQ
n-Hexane	5000 lb final RQ 2270 kg final RQ
Cumene	5000 lb final RQ 2270 kg final RQ
1,2,4 Trimethylbenzene	NA
Ethylbenzene	1000 lb final RQ 454 kg final RQ
Benzene	10 lb final RQ 4.54 kg final RQ
Cyclohexane	1000 lb final RQ 454 kg final RQ
Octane	NA
1,2,3-trimethylbenzene	NA
Naphthalene	100 lb final RQ 45.4 kg final RQ

SARA: The following EPA hazard categories apply to this product:

Acute Health Hazard
Chronic Health Hazard
Fire Hazard

SARA Section 313: This product may contain component(s), which if in exceedance of the de minimus threshold, may be subject to the reporting requirements of SARA Title III Section 313 Toxic Release Reporting (Form R).

Name	CERCLA/SARA 313 Emission reporting:
Gasoline	None
Heptane (mixed isomers)	None
Pentane (mixed isomers)	None
Butane (mixed isomers)	None
Hexane Isomers (other than n-Hexane)	None
Toluene	1.0 % de minimis concentration
Xylene (mixed isomers)	1.0 % de minimis concentration
n-Hexane	1.0 % de minimis concentration
Cumene	1.0 % de minimis concentration

1,2,4 Trimethylbenzene	1.0 % de minimis concentration
Ethylbenzene	0.1 % de minimis concentration
Benzene	0.1 % de minimis concentration
Cyclohexane	1.0 % de minimis concentration
Octane	None
1,2,3-trimethylbenzene	None
Naphthalene	0.1 % de minimis concentration

State and Community Right-To-Know Regulations:
The following component(s) of this material are identified on the regulatory lists below:

Gasoline

Louisiana Right-To-Know:	Not Listed
California Proposition 65:	Not Listed
New Jersey Right-To-Know:	SN 0957
Pennsylvania Right-To-Know:	Present
Massachusetts Right-To Know:	Present
Florida Substance List:	Not Listed
Rhode Island Right-To-Know:	Not Listed
Michigan Critical Materials Register List:	Not Listed
Massachusetts Extraordinarily Hazardous Substances:	Not Listed
California - Regulated Carcinogens:	Not Listed
Pennsylvania RTK - Special Hazardous Substances:	Not Listed
New Jersey - Special Hazardous Substances:	Carcinogen; Flammable - third degree
New Jersey - Environmental Hazardous Substances List:	SN 0957 TPQ: 10000 lb (Under N.J.A.C. 7:1G, environmental hazardous substances in mixtures such as gasoline or new and used petroleum oil may be reported under these categories)
Illinois - Toxic Air Contaminants:	Present
New York - Reporting of Releases Part 597 - List of Hazardous Substances:	Not Listed

Heptane (mixed isomers)

Louisiana Right-To-Know:	Not Listed
California Proposition 65:	Not Listed
New Jersey Right-To-Know:	SN 1339
Pennsylvania Right-To-Know:	Present
Massachusetts Right-To Know:	Present
Florida Substance List:	Not Listed
Rhode Island Right-To-Know:	Toxic; Flammable
Michigan Critical Materials Register List:	Not Listed
Massachusetts Extraordinarily Hazardous Substances:	Not Listed
California - Regulated Carcinogens:	Not Listed
Pennsylvania RTK - Special Hazardous Substances:	Not Listed
New Jersey - Special Hazardous Substances:	Flammable - third degree
New Jersey - Environmental Hazardous Substances List:	Not Listed
Illinois - Toxic Air Contaminants:	Not Listed
New York - Reporting of Releases Part 597 - List of Hazardous Substances:	Not Listed

Pentane (mixed isomers)

Louisiana Right-To-Know:	Not Listed
California Proposition 65:	Not Listed
New Jersey Right-To-Know:	SN 1064
Pennsylvania Right-To-Know:	Present
Massachusetts Right-To Know:	Present
Florida Substance List:	Not Listed
Rhode Island Right-To-Know:	Not Listed
Michigan Critical Materials Register List:	Not Listed
Massachusetts Extraordinarily Hazardous Substances:	Not Listed

California - Regulated Carcinogens:	Not Listed
Pennsylvania RTK - Special Hazardous Substances:	Not Listed
New Jersey - Special Hazardous Substances:	Flammable - fourth degree
New Jersey - Environmental Hazardous Substances List:	SN 1064 TPQ: 500 lb
Illinois - Toxic Air Contaminants:	Not Listed
New York - Reporting of Releases Part 597 - List of Hazardous Substances:	Not Listed

Butane (mixed isomers)

Louisiana Right-To-Know:	Not Listed
California Proposition 65:	Not Listed
New Jersey Right-To-Know:	SN 0273
Pennsylvania Right-To-Know:	Present
Massachusetts Right-To Know:	Present
Florida Substance List:	Not Listed
Rhode Island Right-To-Know:	Toxic; Flammable
Michigan Critical Materials Register List:	Not Listed
Massachusetts Extraordinarily Hazardous Substances:	Not Listed
California - Regulated Carcinogens:	Not Listed
Pennsylvania RTK - Special Hazardous Substances:	Not Listed
New Jersey - Special Hazardous Substances:	Flammable - fourth degree
New Jersey - Environmental Hazardous Substances List:	SN 0273 TPQ: 500 lb
Illinois - Toxic Air Contaminants:	Not Listed
New York - Reporting of Releases Part 597 - List of Hazardous Substances:	Not Listed

Hexane Isomers (other than n-Hexane)

Louisiana Right-To-Know:	Not Listed
California Proposition 65:	Not Listed
New Jersey Right-To-Know:	SN 1285
Pennsylvania Right-To-Know:	Present
Massachusetts Right-To Know:	Present
Florida Substance List:	Not Listed
Rhode Island Right-To-Know:	Not Listed
Michigan Critical Materials Register List:	Not Listed
Massachusetts Extraordinarily Hazardous Substances:	Not Listed
California - Regulated Carcinogens:	Not Listed
Pennsylvania RTK - Special Hazardous Substances:	Not Listed
New Jersey - Special Hazardous Substances:	Flammable - third degree
New Jersey - Environmental Hazardous Substances List:	Not Listed
Illinois - Toxic Air Contaminants:	Not Listed
New York - Reporting of Releases Part 597 - List of Hazardous Substances:	Not Listed

Toluene

Louisiana Right-To-Know:	Not Listed
California Proposition 65:	Developmental toxicity, initial date 1/1/91 Female reproductive toxicity, initial date 8/7/09
New Jersey Right-To-Know:	SN 1866
Pennsylvania Right-To-Know:	Environmental hazard
Massachusetts Right-To Know:	Present
Florida Substance List:	Not Listed
Rhode Island Right-To-Know:	Toxic (skin); Flammable (skin)
Michigan Critical Materials Register List:	100 lb Annual usage threshold
Massachusetts Extraordinarily Hazardous Substances:	Not Listed
California - Regulated Carcinogens:	Not Listed
Pennsylvania RTK - Special Hazardous Substances:	Not Listed

New Jersey - Special Hazardous Substances:	Flammable - third degree; Teratogen
New Jersey - Environmental Hazardous Substances List:	SN 1866 TPQ: 500 lb
Illinois - Toxic Air Contaminants:	Present
New York - Reporting of Releases Part 597 - List of Hazardous Substances:	1000 lb RQ (air); 1 lb RQ (land/water)

Xylene (mixed isomers)

Louisiana Right-To-Know:	Not Listed
California Proposition 65:	Not Listed
New Jersey Right-To-Know:	SN 2014
Pennsylvania Right-To-Know:	Environmental hazard
Massachusetts Right-To Know:	Present
Florida Substance List:	Not Listed
Rhode Island Right-To-Know:	Toxic (skin); Flammable (skin)
Michigan Critical Materials Register List:	100 lb Annual usage threshold all isomers
Massachusetts Extraordinarily Hazardous Substances:	Not Listed
California - Regulated Carcinogens:	Not Listed
Pennsylvania RTK - Special Hazardous Substances:	Not Listed
New Jersey - Special Hazardous Substances:	Flammable - third degree
New Jersey - Environmental Hazardous Substances List:	SN 2014 TPQ: 500 lb
Illinois - Toxic Air Contaminants:	Present
New York - Reporting of Releases Part 597 - List of Hazardous Substances:	1000 lb RQ (air); 1 lb RQ (land/water)

n-Hexane

Louisiana Right-To-Know:	Not Listed
California Proposition 65:	Not Listed
New Jersey Right-To-Know:	SN 1340
Pennsylvania Right-To-Know:	Present
Massachusetts Right-To Know:	Present
Florida Substance List:	Not Listed
Rhode Island Right-To-Know:	Toxic; Flammable
Michigan Critical Materials Register List:	Not Listed
Massachusetts Extraordinarily Hazardous Substances:	Not Listed
California - Regulated Carcinogens:	Not Listed
Pennsylvania RTK - Special Hazardous Substances:	Not Listed
New Jersey - Special Hazardous Substances:	Flammable - third degree
New Jersey - Environmental Hazardous Substances List:	SN 1340 TPQ: 500 lb
Illinois - Toxic Air Contaminants:	Present
New York - Reporting of Releases Part 597 - List of Hazardous Substances:	1 lb RQ (air); 1 lb RQ (land/water)

Cumene

Louisiana Right-To-Know:	Not Listed
California Proposition 65:	Carcinogen, initial date 4/6/10
New Jersey Right-To-Know:	SN 0542
Pennsylvania Right-To-Know:	Environmental hazard
Massachusetts Right-To Know:	Present
Florida Substance List:	Not Listed
Rhode Island Right-To-Know:	Toxic (skin); Flammable (skin)
Michigan Critical Materials Register List:	Not Listed
Massachusetts Extraordinarily Hazardous Substances:	Not Listed
California - Regulated Carcinogens:	Not Listed
Pennsylvania RTK - Special Hazardous Substances:	Not Listed
New Jersey - Special Hazardous Substances:	Flammable - third degree
New Jersey - Environmental Hazardous Substances List:	SN 0542 TPQ: 500 lb
Illinois - Toxic Air Contaminants:	Present

New York - Reporting of Releases Part 597 - List of Hazardous Substances:	5000 lb RQ (air); 1 lb RQ (land/water)
1,2,4 Trimethylbenzene	
Louisiana Right-To-Know:	Not Listed
California Proposition 65:	Not Listed
New Jersey Right-To-Know:	SN 1929
Pennsylvania Right-To-Know:	Present
Massachusetts Right-To Know:	Present
Florida Substance List:	Not Listed
Rhode Island Right-To-Know:	Toxic
Michigan Critical Materials Register List:	Not Listed
Massachusetts Extraordinarily Hazardous Substances:	Not Listed
California - Regulated Carcinogens:	Not Listed
Pennsylvania RTK - Special Hazardous Substances:	Not Listed
New Jersey - Special Hazardous Substances:	Not Listed
New Jersey - Environmental Hazardous Substances List:	Not Listed
Illinois - Toxic Air Contaminants:	Present
New York - Reporting of Releases Part 597 - List of Hazardous Substances:	Not Listed
Ethylbenzene	
Louisiana Right-To-Know:	Not Listed
California Proposition 65:	Carcinogen, initial date 6/11/04
New Jersey Right-To-Know:	SN 0851
Pennsylvania Right-To-Know:	Environmental hazard
Massachusetts Right-To Know:	Present
Florida Substance List:	Not Listed
Rhode Island Right-To-Know:	Toxic; Flammable
Michigan Critical Materials Register List:	Not Listed
Massachusetts Extraordinarily Hazardous Substances:	Not Listed
California - Regulated Carcinogens:	Not Listed
Pennsylvania RTK - Special Hazardous Substances:	Not Listed
New Jersey - Special Hazardous Substances:	Carcinogen; flammable - Third degree
New Jersey - Environmental Hazardous Substances List:	SN 0851 TPQ: 500 lb
Illinois - Toxic Air Contaminants:	Present
New York - Reporting of Releases Part 597 - List of Hazardous Substances:	1000 lb RQ (air); 1 lb RQ (land/water)
Benzene	
Louisiana Right-To-Know:	Not Listed
California Proposition 65:	Carcinogen, initial date 2/27/87 Developmental toxicity, initial date 12/26/97 Male reproductive toxicity, initial date 12/26/97
New Jersey Right-To-Know:	SN 0197
Pennsylvania Right-To-Know:	Environmental hazard; Special hazardous substance
Massachusetts Right-To Know:	Carcinogen; Extraordinarily hazardous
Florida Substance List:	Not Listed
Rhode Island Right-To-Know:	Toxic (skin); Flammable (skin); Carcinogen (skin)
Michigan Critical Materials Register List:	100 lb Annual usage threshold
Massachusetts Extraordinarily Hazardous Substances:	Carcinogen; Extraordinarily hazardous
California - Regulated Carcinogens:	Not Listed
Pennsylvania RTK - Special Hazardous Substances:	Present
New Jersey - Special Hazardous Substances:	Carcinogen; Flammable - third degree; Mutagen
New Jersey - Environmental Hazardous Substances List:	SN 0197 TPQ: 500 lb
Illinois - Toxic Air Contaminants:	Present
New York - Reporting of Releases Part 597 - List of Hazardous Substances:	10 lb RQ (air); 1 lb RQ (land/water)

Cyclohexane

Louisiana Right-To-Know:	Not Listed
California Proposition 65:	Not Listed
New Jersey Right-To-Know:	SN 0565
Pennsylvania Right-To-Know:	Environmental hazard
Massachusetts Right-To Know:	Present
Florida Substance List:	Not Listed
Rhode Island Right-To-Know:	Toxic; Flammable
Michigan Critical Materials Register List:	Not Listed
Massachusetts Extraordinarily Hazardous Substances:	Not Listed
California - Regulated Carcinogens:	Not Listed
Pennsylvania RTK - Special Hazardous Substances:	Not Listed
New Jersey - Special Hazardous Substances:	Flammable - third degree
New Jersey - Environmental Hazardous Substances List:	SN 0565 TPQ: 500 lb
Illinois - Toxic Air Contaminants:	Not Listed
New York - Reporting of Releases Part 597 - List of Hazardous Substances:	1000 lb RQ (air); 1 lb RQ (land/water)

Octane

Louisiana Right-To-Know:	Not Listed
California Proposition 65:	Not Listed
New Jersey Right-To-Know:	SN 1434
Pennsylvania Right-To-Know:	Present
Massachusetts Right-To Know:	Present
Florida Substance List:	Not Listed
Rhode Island Right-To-Know:	Toxic; Flammable
Michigan Critical Materials Register List:	Not Listed
Massachusetts Extraordinarily Hazardous Substances:	Not Listed
California - Regulated Carcinogens:	Not Listed
Pennsylvania RTK - Special Hazardous Substances:	Not Listed
New Jersey - Special Hazardous Substances:	Flammable - third degree
New Jersey - Environmental Hazardous Substances List:	Not Listed
Illinois - Toxic Air Contaminants:	Not Listed
New York - Reporting of Releases Part 597 - List of Hazardous Substances:	Not Listed

1,2,3-trimethylbenzene

Louisiana Right-To-Know:	Not Listed
California Proposition 65:	Not Listed
New Jersey Right-To-Know:	SN 1929
Pennsylvania Right-To-Know:	Present
Massachusetts Right-To Know:	Present
Florida Substance List:	Not Listed
Rhode Island Right-To-Know:	Toxic
Michigan Critical Materials Register List:	Not Listed
Massachusetts Extraordinarily Hazardous Substances:	Not Listed
California - Regulated Carcinogens:	Not Listed
Pennsylvania RTK - Special Hazardous Substances:	Not Listed
New Jersey - Special Hazardous Substances:	Not Listed
New Jersey - Environmental Hazardous Substances List:	Not Listed
Illinois - Toxic Air Contaminants:	Present
New York - Reporting of Releases Part 597 - List of Hazardous Substances:	Not Listed

Naphthalene

Louisiana Right-To-Know:	Not Listed
California Proposition 65:	Carcinogen, initial date 4/19/02
New Jersey Right-To-Know:	SN 1322 SN 3758

Pennsylvania Right-To-Know:	Environmental hazard Present (particulate)
Massachusetts Right-To Know:	Present
Florida Substance List:	Not Listed
Rhode Island Right-To-Know:	Toxic; Flammable
Michigan Critical Materials Register List:	Not Listed
Massachusetts Extraordinarily Hazardous Substances:	Not Listed
California - Regulated Carcinogens:	Not Listed
Pennsylvania RTK - Special Hazardous Substances:	Not Listed
New Jersey - Special Hazardous Substances:	Carcinogen
New Jersey - Environmental Hazardous Substances List:	SN 1322 TPQ: 500 lb (Reportable at the de minimis quantity of >0.1%)
Illinois - Toxic Air Contaminants:	Present
New York - Reporting of Releases Part 597 - List of Hazardous Substances:	100 lb RQ (air); 1 lb RQ (land/water)

Canada DSL/NDSL Inventory: This product and/or its components are listed either on the Domestic Substances List (DSL) or are exempt.

Canadian Regulatory Information: This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations and the (M)SDS contains all the information required by the Controlled Products Regulations.

Name	Canada - WHMIS: Classifications of Substances:	Canada - WHMIS: Ingredient Disclosure:
Gasoline	B2,D2A,D2B	0.1%
Heptane (mixed isomers)	B2,D2B	1%
Pentane (mixed isomers)	B2	1%
Butane (mixed isomers)	A,B1	1%
Hexane Isomers (other than n-Hexane)	B2	1%
Toluene	B2,D2A,D2B	0.1%
Xylene (mixed isomers)	B2,D2A,D2B	m-, o-isomers 1.0%; p-isomer 0.1%
n-Hexane	B2,D2A,D2B	1%
Cumene	B2,D2A	0.1%
1,2,4 Trimethylbenzene	B3,D2B	1%
Ethylbenzene	B2,D2A,D2B	0.1%
Benzene	B2,D2A,D2B	0.1%
Cyclohexane	B2,D2B	1%
Octane	B2,D2B	1%
1,2,3-trimethylbenzene	B3	1%
Naphthalene	B4,D2A	0.1%

Note: Not applicable.

16. OTHER INFORMATION

Prepared By Toxicology and Product Safety

Revision Date: 06/01/2016

Revision Note:

Revised Sections

The following sections (§) have been updated:
1. IDENTIFICATION
2. HAZARD IDENTIFICATION
3. COMPOSITION/INFORMATION ON INGREDIENTS
4. FIRST AID MEASURES
6. ACCIDENTAL RELEASE MEASURES
7. HANDLING AND STORAGE
8. EXPOSURE CONTROLS/PERSONAL PROTECTION
9. PHYSICAL AND CHEMICAL PROPERTIES
11. TOXICOLOGICAL INFORMATION
12. ECOLOGICAL INFORMATION
15. REGULATORY INFORMATION

Disclaimer

The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information is intended as guidance for safe handling, use, processing, storage, transportation, accidental release, clean-up and disposal and is not considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text.

Safety Data Sheet
according to (EU) 2015 / 830 and OSHA GHS

Revision: February 8, 2016

SECTION 1: Identification of the substance/mixture and of the company/ undertaking

· **1.1 Product identifier**

· **Trade name:** **Super Lube® Multi-Purpose Synthetic Grease with Syncolon® (PTFE)**

· **Article number:** No other identifiers

· **1.2 Relevant identified uses of the substance or mixture and uses advised against**
No further relevant information available.

· **Application of the substance / the mixture** Lubricant

· **1.3 Details of the supplier of the Safety Data Sheet**

· **Manufacturer/Supplier:**
Synco Chemical Corporation
24 DaVinci Dr., P.O. Box 405
Bohemia, NY 11716
Telephone: 631-567-5300
Email: info@super-lube.com

· **1.4 Emergency telephone number:**
CHEMTREC
1-800-424-9300 (US/Canada)
+01 703-527-3887 (International)

SECTION 2: Hazards identification

· **2.1 Classification of the substance or mixture**

· **Classification according to Regulation (EU) No 2015/830**
The product is not classified as hazardous according to OSHA GHS regulations within the United States.
The product is not classified as hazardous according to the CLP regulation.

· **Information concerning particular hazards for human and environment:**
The product does not have to be labelled due to the calculation procedure of the "General Classification guideline for preparations of the EU" in the latest valid version.

· **Classification system:**
The classification is according to the latest editions of the EU-lists, and extended by company and literature data.
The classification is in accordance with the latest editions of international substances lists, and is supplemented by information from technical literature and by information provided by the company.

· **Additional information:**
0 percent of the mixture consists of component(s) of unknown toxicity
There are no other hazards not otherwise classified that have been identified.

· **2.2 Label elements**

· **Labelling according to Regulation (EC) No 1272/2008**
The product is not classified as hazardous according to OSHA GHS regulations within the United States.
This product does not have a classification according to the CLP regulation.

· **Hazard pictograms** Not Regulated

· **Signal word** Not Regulated

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Trade name: Super Lube® Multi-Purpose Synthetic Grease with Syncolon® (PTFE)

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· **Hazard-determining components of labelling:** None.
· **Hazard statements** Not Regulated
· **Precautionary statements** Not Regulated
· **Hazard description:**
· **WHMIS-symbols:** Not hazardous under WHMIS.
· **NFPA ratings (scale 0 - 4)**

Health = 0
Fire = 1
Reactivity = 0

· **HMIS-ratings (scale 0 - 4)**

Health = 0
Fire = 1
Reactivity = 0

· **HMIS Long Term Health Hazard Substances**
None of the ingredients are listed.

· **2.3 Other hazards**
· **Results of PBT and vPvB assessment**
· **PBT:** Not applicable.
· **vPvB:** Not applicable.

SECTION 3: Composition/information on ingredients

· **3.2 Mixtures**
· **Description:** Mixture of substances listed below with nonhazardous additions.

· **Dangerous components:** None in reportable quantities.
· **Additional information:**
For the wording of the listed risk phrases refer to section 16.
For the listed ingredients, the identity and exact percentages are being withheld as a trade secret.

SECTION 4: First aid measures

· **4.1 Description of first aid measures**
· **General information:** No special measures required.
· **After inhalation:** Supply fresh air; consult doctor in case of complaints.
· **After skin contact:**
Immediately wash with water and soap and rinse thoroughly.
If skin irritation is experienced, consult a doctor.
· **After eye contact:**
Rinse opened eye for several minutes under running water.
Remove contact lenses if worn.

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Seek medical treatment in case of complaints.

· **After swallowing:**
Rinse out mouth and then drink plenty of water.
Do not induce vomiting; call for medical help immediately.

· **4.2 Most important symptoms and effects, both acute and delayed**
May cause gastro-intestinal irritation if ingested.
Acne

· **Hazards** No further relevant information available.

· **4.3 Indication of any immediate medical attention and special treatment needed**
No further relevant information available.

SECTION 5: Firefighting measures

· **5.1 Extinguishing media**

· **Suitable extinguishing agents:** Use fire extinguishing methods suitable to surrounding conditions.

· **For safety reasons unsuitable extinguishing agents:** Water with full jet

· **5.2 Special hazards arising from the substance or mixture**
Formation of toxic gases is possible during heating or in case of fire.

· **5.3 Advice for firefighters**

· **Protective equipment:**
Wear self-contained respiratory protective device.
Wear fully protective suit.

· **Additional information** No further relevant information available.

SECTION 6: Accidental release measures

· **6.1 Personal precautions, protective equipment and emergency procedures**
Ensure adequate ventilation
Particular danger of slipping on leaked/spilled product.

· **6.2 Environmental precautions:** Do not allow to enter sewers/ surface or ground water.

· **6.3 Methods and material for containment and cleaning up:**
Absorb with liquid-binding material (sand, diatomite, acid binders, universal binders, sawdust).
Pick up mechanically.
Dispose contaminated material as waste according to item 13.

· **6.4 Reference to other sections**
See Section 7 for information on safe handling.
See Section 8 for information on personal protection equipment.
See Section 13 for disposal information.

SECTION 7: Handling and storage

· **7.1 Precautions for safe handling** Store away from oxidising agents.

· **Information about fire - and explosion protection:** No special measures required.

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Trade name: Super Lube® Multi-Purpose Synthetic Grease with Syncolon® (PTFE)

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· **7.2 Conditions for safe storage, including any incompatibilities**
· **Storage:**
· **Requirements to be met by storerooms and receptacles:**
Avoid storage near extreme heat, ignition sources or open flame.
· **Information about storage in one common storage facility:**
Store away from foodstuffs.
Do not store together with oxidising and acidic materials.
· **Further information about storage conditions:** None.
· **7.3 Specific end use(s)** No further relevant information available.

SECTION 8: Exposure controls/personal protection

· **Additional information about design of technical facilities:** No further data; see item 7.

· **8.1 Control parameters**
· **Ingredients with limit values that require monitoring at the workplace:**
The product does not contain any relevant quantities of materials with critical values that have to be monitored at the workplace.
· **DNELs** No further relevant information available.
· **PNECs** No further relevant information available.
· **Additional information:** The lists valid during the making were used as basis.

· **8.2 Exposure controls**
· **Personal protective equipment:**
· **General protective and hygienic measures:**
The usual precautionary measures are to be adhered to when handling chemicals.
Keep away from foodstuffs, beverages and feed.
Avoid contact with the eyes and skin.
· **Respiratory protection:** Not required under normal conditions of use.
· **Protection of hands:**
Gloves not required under normal conditions of use.
Wear protective gloves to handle contents of damaged or leaking units.
The glove material has to be impermeable and resistant to the product/ the substance/ the preparation.
Selection of the glove material on consideration of the penetration times, rates of diffusion and the degradation.
· **Material of gloves**
The selection of the suitable gloves does not only depend on the material, but also on further marks of quality and varies from manufacturer to manufacturer. As the product is a preparation of several substances, the resistance of the glove material can not be calculated in advance and has therefore to be checked prior to the application.
· **Penetration time of glove material**
The exact break through time has to be found out by the manufacturer of the protective gloves and has to be observed.
· **Eye protection:**

Safety glasses

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· **Body protection:** Not required under normal conditions of use.
· **Limitation and supervision of exposure into the environment** No special requirements.
· **Risk management measures** No special requirements.

SECTION 9: Physical and chemical properties

· **9.1 Information on basic physical and chemical properties**
· **General Information**
· **Appearance:**

Form:	Semi-solid
Colour:	Translucent
· **Odour:**	Mild
· **Odour threshold:**	Not determined.
· **pH-value:**	Not determined.
· **Change in condition**	
Melting point/Melting range:	Not Determined.
Boiling point/Boiling range:	Undetermined.
· **Flash point:**	>220 °C (>428 °F)
· **Flammability (solid, gaseous):**	Not applicable.
· **Auto/Self-ignition temperature:**	Not determined.
· **Decomposition temperature:**	Not determined.
· **Self-igniting:**	Product is not self-igniting.
· **Danger of explosion:**	Product does not present an explosion hazard.
· **Explosion limits:**	
Lower:	Not determined.
Upper:	Not determined.
· **Vapour pressure:**	Not determined.
· **Density at 20 °C (68 °F):**	0,89 g/cm³ (7,427 lbs/gal)
· **Relative density**	Not determined.
· **Vapour density**	Not determined.
· **Evaporation rate**	Not determined.
· **Solubility in / Miscibility with water:**	Not miscible or difficult to mix.
· **Partition coefficient (n-octanol/water):**	Not determined.
· **Viscosity:**	
Dynamic:	Not determined.
Kinematic:	Not determined.

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Trade name: Super Lube® Multi-Purpose Synthetic Grease with Syncolon® (PTFE)

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· **9.2 Other information** No further relevant information available.

SECTION 10: Stability and reactivity

· **10.1 Reactivity**
· **10.2 Chemical stability**
· **Thermal decomposition / conditions to be avoided:**
No decomposition if used and stored according to specifications.
· **10.3 Possibility of hazardous reactions** Reacts with strong acids and oxidising agents.
· **10.4 Conditions to avoid**
Avoid acids.
Excessive heat.
· **10.5 Incompatible materials:** No further relevant information available.
· **10.6 Hazardous decomposition products:** Carbon monoxide and carbon dioxide

SECTION 11: Toxicological information

· **11.1 Information on toxicological effects**
· **Acute toxicity:**
· **LD/LC50 values relevant for classification:** None.
· **Primary irritant effect:**
· **on the skin:** No irritant effect.
· **on the eye:** No irritating effect.
· **Sensitisation:** No sensitising effects known.
· **Subacute to chronic toxicity:** No further relevant information available.
· **Additional toxicological information:**
The product is not subject to classification according to the calculation method of the General EU Classification Guidelines for Preparations as issued in the latest version.
When used and handled according to specifications, the product does not have any harmful effects to our experience and the information provided to us.
May cause acne.
· **Repeated dose toxicity:** No further relevant information available.
· **CMR effects (carcinogenity, mutagenicity and toxicity for reproduction):** See Section 15.

SECTION 12: Ecological information

· **12.1 Toxicity**
· **Aquatic toxicity:** No further relevant information available.
· **12.2 Persistence and degradability** The product is partially biodegradable. Significant residuals remain.
· **12.3 Bioaccumulative potential** No further relevant information available.
· **12.4 Mobility in soil** No further relevant information available.
· **Additional ecological information:**
· **General notes:**
Do not allow undiluted product or large quantities of it to reach ground water, water course or sewage system.

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Safety Data Sheet
according to (EU) 2015 / 830 and OSHA GHS

Revision: February 8, 2016

Trade name: Super Lube® Multi-Purpose Synthetic Grease with Syncolon® (PTFE)

(Contd. of page 6)

Avoid transfer into the environment.
Water hazard class 1 (German Regulation) (Self-assessment): slightly hazardous for water

· **12.5 Results of PBT and vPvB assessment**
· **PBT:** Not applicable.
· **vPvB:** Not applicable.
· **12.6 Other adverse effects** No further relevant information available.

SECTION 13: Disposal considerations

· **13.1 Waste treatment methods**
· **Recommendation**
Smaller quantities can be disposed of with household waste.
Can be burned with household garbage after consulting with the waste disposal facility operator and the pertinent authorities and adhering to the necessary technical regulations.
The user of this material has the responsibility to dispose of unused material, residues and containers in compliance with all relevant local, state and federal laws and regulations regarding treatment, storage and disposal for hazardous and nonhazardous wastes.

· **Uncleaned packaging:**
· **Recommendation:** Disposal must be made according to official regulations.

SECTION 14: Transport information

· **14.1 UN-Number**	
· **DOT, ADR, ADN, IMDG, IATA**	Not Regulated
· **14.2 UN proper shipping name**	
· **DOT, ADR, ADN, IMDG, IATA**	Not Regulated
· **14.3 Transport hazard class(es)**	
· **DOT, ADR, ADN, IMDG, IATA**	
· **Class**	Not Regulated
· **14.4 Packing group**	
· **DOT, ADR, IMDG, IATA**	Not Regulated
· **14.5 Environmental hazards:**	
· **Marine pollutant:**	No
· **14.6 Special precautions for user**	Not applicable.
· **14.7 Transport in bulk according to Annex II of MARPOL73/78 and the IBC Code**	Not applicable.
· **UN "Model Regulation":**	-

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Safety Data Sheet
according to (EU) 2015 / 830 and OSHA GHS

Revision: February 8, 2016

Trade name: Super Lube® Multi-Purpose Synthetic Grease with Syncolon® (PTFE)

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SECTION 15: Regulatory information

· **15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture**
· **United States (USA)**
· **SARA**

· **Section 355 (extremely hazardous substances):**

None of the ingredients are listed.

· **Section 313 (Specific toxic chemical listings):**

None of the ingredients are listed.

· **TSCA (Toxic Substances Control Act):**

All ingredients are listed.

· **Proposition 65 (California):**

· **Chemicals known to cause cancer:**

None of the ingredients is listed.

· **Chemicals known to cause reproductive toxicity for females:**

None of the ingredients are listed.

· **Chemicals known to cause reproductive toxicity for males:**

None of the ingredients are listed.

· **Chemicals known to cause developmental toxicity:**

None of the ingredients are listed.

· **Carcinogenic Categories**

· **EPA (Environmental Protection Agency)**

None of the ingredients are listed.

· **IARC (International Agency for Research on Cancer)**

9002-84-0	Polytetrafluoroethylene	3

· **TLV (Threshold Limit Value established by ACGIH)**

None of the ingredients are listed.

· **NIOSH-Ca (National Institute for Occupational Safety and Health)**

None of the ingredients are listed.

· **Canada**

· **Canadian Domestic Substances List (DSL)**

All ingredients are listed.

· **Canadian Ingredient Disclosure list (limit 0.1%)**

None of the ingredients are listed.

· **Canadian Ingredient Disclosure list (limit 1%)**

None of the ingredients are listed.

· **Other regulations, limitations and prohibitive regulations**
This product has been classified in accordance with hazard criteria of the Controlled Products Regulations and the SDS contains all the information required by the Controlled Products Regulations.

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Safety Data Sheet
according to (EU) 2015 / 830 and OSHA GHS

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Trade name: Super Lube® Multi-Purpose Synthetic Grease with Syncolon® (PTFE)

(Contd. of page 8)

· **Substances of very high concern (SVHC) according to REACH, Article 57**

None of the ingredients are listed.

· **15.2 Chemical safety assessment:** A Chemical Safety Assessment has not been carried out.

SECTION 16: Other information

This information is based on our present knowledge. However, this shall not constitute a guarantee for any specific product features and shall not establish a legally valid contractual relationship.

· **Abbreviations and acronyms:**

ADR: Accord européen sur le transport des marchandises dangereuses par Route (European Agreement concerning the International Carriage of Dangerous Goods by Road)
IMDG: International Maritime Code for Dangerous Goods
DOT: US Department of Transportation
IATA: International Air Transport Association
ACGIH: American Conference of Governmental Industrial Hygienists
EINECS: European Inventory of Existing Commercial Chemical Substances
ELINCS: European List of Notified Chemical Substances
CAS: Chemical Abstracts Service (division of the American Chemical Society)
WHMIS: Workplace Hazardous Materials Information System (Canada)
LC50: Lethal concentration, 50 percent
LD50: Lethal dose, 50 percent

· **Sources**

SDS Prepared by:
ChemTel Inc.
1305 North Florida Avenue
Tampa, Florida USA 33602-2902
Toll Free North America 1-888-255-3924 Intl. +01 813-248-0573
Website: www.chemtelinc.com

SAFETY DATA SHEET

SDS ID NO.: 0298MAR019
Revision Date: 05/22/2015

1. IDENTIFICATION

Product Name: Marathon Petroleum Premium AW II Hydraulic Oil

Synonym: Premium AW II ISO 32 Hydraulic Oil; Premium AW II ISO 46 Hydraulic Oil; Premium AW II ISO 68 Hydraulic Oil; Premium AW II ISO 100 Hydraulic Oil; ISO 32 Premium AW II Hydraulic Oil; ISO 46 Premium AW II Hydraulic Oil; ISO 68 Premium AW II Hydraulic Oil; ISO 100 Premium AW II Hydraulic Oil

Chemical Family: Hydrocarbon Mixture

Recommended Use: Hydraulic Fluid.
Use Restrictions: All others.

Supplier Name and Address:

MARATHON PETROLEUM COMPANY LP
539 South Main Street
Findlay, OH 45840

SDS information: 1-419-421-3070

Emergency Telephone: 1-877-627-5463

2. HAZARD IDENTIFICATION

Classification

OSHA Regulatory Status
This chemical is not considered hazardous by the 2012 OSHA Hazard Communication Standard (29 CFR 1910.1200)

Acute aquatic toxicity	Category 3
Chronic aquatic toxicity	Category 3

Hazards Not Otherwise Classified (HNOC)
Not applicable

Label elements

EMERGENCY OVERVIEW

Harmful to aquatic life with long lasting effects

Appearance Clear Liquid **Physical State** Liquid **Odor** Petroleum

Precautionary Statements - Prevention
Avoid release to the environment

Precautionary Statements - Response
Not applicable

Precautionary Statements - Storage
Not applicable

Precautionary Statements - Disposal
Dispose of contents/container at an approved waste disposal plant

Additional Information
Read label before use. Keep out of reach of children. If medical advice is needed, have product container or label at hand.

3. COMPOSITION/INFORMATION ON INGREDIENTS

Lube oil is a complex mixture of highly refined lubricating base stocks and additives.

Composition Information:

Name	CAS Number	Weight %
Solvent Refined, Hydrotreated Heavy Paraffinic Distillate	64742-54-7	98-99
2,6-di-tert-butylphenol	128-39-2	0.1-1

4. FIRST AID MEASURES

First Aid Measures

General advice In case of accident or if you feel unwell, seek medical advice immediately (show directions for use or safety data sheet if possible).

Inhalation: Remove to fresh air. If not breathing, institute rescue breathing. If breathing is difficult, ensure airway is clear, give oxygen and continue to monitor. If heart has stopped, immediately begin cardiopulmonary resuscitation (CPR). If symptoms occur get medical attention.

Skin Contact: Wash skin with plenty of soap and water. If irritation or other symptoms occur get medical attention. Wash contaminated clothing and clean shoes before reuse. Any injection injury from high pressure equipment should be evaluated immediately by a physician as potentially serious (See NOTES TO PHYSICIAN).

Eye Contact: Flush immediately with large amounts of water for at least 15 minutes. Eyelids should be held away from the eyeball to ensure thorough rinsing. Gently remove contacts while flushing. Get medical attention if irritation persists.

Ingestion: Rinse mouth out with water. If spontaneous vomiting occurs, keep head below hips, or if patient is lying down, turn body and head to side to prevent aspiration and monitor for breathing difficulty. Never give anything by mouth to an unconscious person. Keep affected person warm and at rest. If symptoms develop, seek medical attention.

Most important signs and symptoms, both short-term and delayed with overexposure

Adverse Effects: Preexisting skin conditions and/or respiratory disorders may be aggravated by exposure to this product.

Indication of any immediate medical attention and special treatment needed

NOTES TO PHYSICIAN: SKIN: Leaks or accidents involving high-pressure equipment may inject a stream of material through the skin and initially produce an injury that may not appear serious. Only a small puncture wound may appear on the skin surface but, without proper treatment and depending on the nature, original pressure, volume, and location of the injected material, can compromise blood supply to an affected body part. Prompt surgical debridement of the wound may be necessary to prevent irreversible loss of function and/or the affected body part. High pressure injection injuries may be SERIOUS SURGICAL EMERGENCIES.

5. FIRE-FIGHTING MEASURES

Suitable extinguishing media
For small fires, Class B fire extinguishing media such as CO2, dry chemical, foam (AFFF/ATC) or water spray can be used. For large fires, water spray, fog or foam (AFFF/ATC) can be used. Firefighting should be attempted only by those who are adequately trained and equipped with proper protective equipment.

Unsuitable extinguishing media
Do not use a solid water stream as it may scatter and spread fire.

Specific hazards arising from the chemical
The product is not combustible per the OSHA Hazard Communication Standard, but will ignite and burn at temperatures exceeding the flash point.

Hazardous combustion products
Smoke, carbon monoxide, and other products of incomplete combustion.

Explosion data
Sensitivity to Mechanical Impact No.
Sensitivity to Static Discharge No.

Special protective equipment and precautions for firefighters
Avoid using straight water streams. Water spray and foam (AFFF/ATC) must be applied carefully to avoid frothing and from as far a distance as possible. Avoid excessive water spray application. Use water spray to cool exposed surfaces from as far a distance as possible. Keep run-off water out of sewers and water sources.

NFPA:	Health 1	Flammability 1	Instability 0	Special Hazards -

6. ACCIDENTAL RELEASE MEASURES

Personal Precautions: Keep public away. Isolate and evacuate area. Shut off source if safe to do so.

Protective Equipment: Use personal protection measures as recommended in Section 8.

Emergency Procedures: Advise authorities and National Response Center (800-424-8802) if the product has entered a water course or sewer. Notify local health and pollution control agencies, if appropriate.

Environmental precautions: Avoid release to the environment. Avoid subsoil penetration.

Methods and materials for containment: Prevent further leakage or spillage if safe to do so.

Methods and materials for cleaning up: Use suitable absorbent materials such as vermiculite, sand, or clay to clean up residual liquids. Recover and return free product to proper containers.

7. HANDLING AND STORAGE

Safe Handling Precautions: Avoid contact with skin, eyes and clothing. Do not swallow. Avoid breathing vapors or mists. Use good personal hygiene practices. Wash thoroughly after handling. Use personal protection measures as recommended in Section 8. Do not cut, drill, grind or weld on empty containers since explosive residues may remain. Refer to applicable EPA, OSHA, NFPA and consistent state and local requirements.

High-pressure injection of any material through the skin is a serious medical emergency even though the small entrance wound at the injection site may not initially appear serious. These injection injuries can occur from high-pressure equipment such as paint spray or grease or guns, fuel injectors, or pinhole leaks in hoses or hydraulic lines and should all be considered serious. High pressure injection injuries may be SERIOUS SURGICAL EMERGENCIES (See First Aid Section 4).

Storage Conditions: Store in properly closed containers that are appropriately labeled and in a cool, well-ventilated area. Containers that have been opened must be carefully resealed and kept upright to prevent leakage. Store away from incompatible materials.

Incompatible materials Strong oxidizing agents.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Name	ACGIH TLV	OSHA PELS:	OSHA - Vacated PELs	NIOSH IDLH
Solvent Refined, Hydrotreated Heavy Paraffinic Distillate 64742-54-7	Mineral oil, highly/severely refined, inhalable fraction 5 mg/m^3 TWA	-	-	-
2,6-di-tert-butylphenol 128-39-2	-	-	-	-

Notes: The manufacturer has voluntarily elected to provide exposure limits contained in OSHA's 1989 air contaminants standard in its SDSs, even though certain of those exposure limits were vacated in 1992.

Engineering measures: Local or general exhaust required when using at elevated temperatures that generate vapors or mists.

Personal protective equipment

Eye protection: Use goggles or face-shield if the potential for splashing exists.

Skin and body protection: Wear neoprene, nitrile or PVA gloves to prevent skin contact. Glove suitability is based on workplace conditions and usage. Contact the glove manufacturer for specific advice on glove selection and breakthrough times. Wear appropriate protective clothing.

Respiratory protection: Use an approved organic vapor chemical cartridge or supplied air respirators when material produces vapors that exceed permissible exposure limits or excessive vapors are generated. Observe respirator assigned protection factors (APFs) criteria cited in federal OSHA 29 CFR 1910.134. Self-contained breathing apparatus should be used for fire fighting.

Hygiene measures: Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin, eyes and clothing. Wash hands before breaks and immediately after handling the product.

9. PHYSICAL AND CHEMICAL PROPERTIES

Information on basic physical and chemical properties

Physical State	Liquid
Appearance	Clear Liquid
Color	Clear
Odor	Petroleum
Odor Threshold	No available data.

Property	Values (Method)
Melting Point / Freezing Point	No available data.
Initial Boiling Point / Boiling Range	No available data.
Flash Point	> 220 °C / > 428 °F (Cleveland Open-Cup)
Evaporation Rate	No available data.
Flammability (solid, gas)	Not applicable.
Flammability Limit in Air (%)	
Upper Flammability Limit:	No available data.
Lower Flammability Limit:	No available data.
Vapor Pressure	No available data.
Vapor Density	No available data.
Specific Gravity / Relative Density	0.86-0.88
Water Solubility	No available data.
Solubility in other solvents	No available data.
Partition Coefficient	No available data.
Decomposition temperature:	No available data.
pH:	No available data.
Autoignition Temperature	No available data.
Kinematic Viscosity	≥ 28.8 mm2/s @ 40°C / 104°F (ASTM D445)
Dynamic Viscosity	No available data.
Explosive Properties	No available data.
Softening Point	No available data.
VOC Content (%)	0.12-37.7 (w/w)
Density	No available data.
Bulk Density	Not applicable.

10. STABILITY AND REACTIVITY

Reactivity The product is non-reactive under normal conditions.

Chemical stability Stable under recommended storage conditions.

Possibility of hazardous reactions None under normal processing.

Hazardous polymerization Will not occur.

Conditions to avoid Sources of heat or ignition.

Incompatible materials Strong oxidizing agents.

Hazardous decomposition products None known under normal conditions of use.

11. TOXICOLOGICAL INFORMATION

Potential short-term adverse effects from overexposures

Inhalation Overheating may produce vapors which may cause respiratory irritation, dizziness and nausea.

Eye contact Exposure to vapor or contact with liquid may cause mild eye irritation.

Skin contact Prolonged or repeated exposure may cause dermatitis, folliculitis or oil acne.

Ingestion May cause irritation of the mouth, throat and gastrointestinal tract.

Acute Toxicological data

Name	Oral LD50	Dermal LD50	Inhalation LC50

Solvent Refined, Hydrotreated Heavy Paraffinic Distillate 64742-54-7	> 5000 mg/kg (Rat)	> 2000 mg/kg (Rabbit)	> 5.5 mg/l (Rat) 4 h
2,6-di-tert-butylphenol 128-39-2	> 5000 mg/kg (Rat)	> 10 g/kg (Rabbit)	-

Delayed and immediate effects as well as chronic effects from short and long-term exposure

This product is considered to have a low order of acute and chronic oral and dermal toxicity.

Adverse effects related to the physical, chemical and toxicological characteristics

Signs & Symptoms Repeated or prolonged skin contact may cause drying, reddening, itching and cracking.

Sensitization Not expected to be a skin or respiratory sensitizer.

Mutagenic effects None known.

Carcinogenicity Cancer designations are listed in the table below.

Name	ACGIH (Class)	IARC (Class)	NTP	OSHA
Solvent Refined, Hydrotreated Heavy Paraffinic Distillate 64742-54-7	Mineral oil, poorly/mildly refined Suspected Human Carcinogen (A2) Mineral oil, highly/severely refined, inhalable fraction Not Classifiable (A4)	Mineral oil, untreated or mildly treated Carcinogenic to humans (1) Mineral oil, highly refined Not Classifiable (3)	Mineral oil, poorly/mildly refined Known to be human carcinogen	Not Listed
2,6-di-tert-butylphenol 128-39-2	Not Listed	Not Listed	Not Listed	Not Listed

Reproductive toxicity None known.

Specific Target Organ Toxicity (STOT) - single exposure Not classified.

Specific Target Organ Toxicity (STOT) - repeated exposure Not classified.

Aspiration hazard Not classified.

12. ECOLOGICAL INFORMATION

Ecotoxicity Harmful to aquatic life with long lasting effects.

Name	Algae/aquatic plants	Fish	Toxicity to Microorganisms	Crustacea
Solvent Refined, Hydrotreated Heavy Paraffinic Distillate 64742-54-7	-	96-hr LC50 = 5000 mg/L Rainbow trout	-	48-hr EC50 = 1000 mg/L Daphnia magna
2,6-di-tert-butylphenol 128-39-2	-	-	-	48-hr EC50 = 0.45 mg/l Daphnia magna

Persistence and degradability No information available.

Bioaccummulation Contains component(s) with the potential to bioaccumulate.

Mobility in soil No information available.

Other adverse effects No information available.

13. DISPOSAL CONSIDERATIONS

Description of Waste Residues
No information available.

Safe Handling of Wastes
Handle in accordance with applicable local, state, and federal regulations. Use personal protection measures as required.

Disposal of Wastes / Methods of Disposal
The user is responsible for determining if any discarded material is a hazardous waste (40 CFR 262.11). Dispose of in accordance with federal, state and local regulations.

Methods of Contaminated Packaging Disposal
Empty containers should be completely drained and then discarded or recycled, if possible. Do not cut, drill, grind or weld on empty containers since explosive residues may be present. Dispose of in accordance with federal, state and local regulations.

14. TRANSPORT INFORMATION

DOT (49 CFR 172.101):

UN Proper shipping name:	Not Regulated
UN/Identification No:	Not applicable
Transport Hazard Class(es):	Not applicable
Packing group:	Not applicable

TDG (Canada):

UN Proper shipping name:	Not Regulated
UN/Identification No:	Not applicable
Transport Hazard Class(es):	Not applicable
Packing group:	Not applicable

15. REGULATORY INFORMATION

US Federal Regulatory Information:

US TSCA Chemical Inventory Section 8(b): This product and/or its components are listed on the TSCA Chemical Inventory.

EPA Superfund Amendment & Reauthorization Act (SARA):

SARA Section 302: This product may contain component(s) that have been listed on EPA's Extremely Hazardous Substance (EHS) List:

Name	CERCLA/SARA - Section 302 Extremely Hazardous Substances and TPQs
Solvent Refined, Hydrotreated Heavy Paraffinic Distillate	NA
2,6-di-tert-butylphenol	NA

SARA Section 304: This product may contain component(s) identified either as an EHS or a CERCLA Hazardous substance which in case of a spill or release may be subject to SARA reporting requirements:

Name	CERCLA/SARA - Hazardous Substances and their Reportable Quantities
Solvent Refined, Hydrotreated Heavy Paraffinic Distillate	NA
2,6-di-tert-butylphenol	NA

SARA: The following EPA hazard categories apply to this product:

None

SARA Section 313: This product may contain component(s), which if in exceedance of the de minimus threshold, may be subject to the reporting requirements of SARA Title III Section 313 Toxic Release Reporting (Form R).

Name	CERCLA/SARA 313 Emission reporting:
Solvent Refined, Hydrotreated Heavy Paraffinic Distillate	None
2,6-di-tert-butylphenol	None

State and Community Right-To-Know Regulations:
The following component(s) of this material are identified on the regulatory lists below:

Solvent Refined, Hydrotreated Heavy Paraffinic Distillate

Louisiana Right-To-Know:	Not Listed.
California Proposition 65:	Not Listed.
New Jersey Right-To-Know:	Not Listed.
Pennsylvania Right-To-Know:	Not Listed.
Massachusetts Right-To Know:	Not Listed.
Florida Substance List:	Not Listed.
Rhode Island Right-To-Know:	Not Listed.
Michigan Critical Materials Register List:	Not Listed.
Massachusetts Extraordinarily Hazardous Substances:	Not Listed.
California - Regulated Carcinogens:	Not Listed.
Pennsylvania RTK - Special Hazardous Substances:	Not Listed.
New Jersey - Special Hazardous Substances:	Carcinogen
New Jersey - Environmental Hazardous Substances List:	Not Listed.
Illinois - Toxic Air Contaminants	Present
New York - Reporting of Releases Part 597 - List of Hazardous Substances:	Not Listed.

2,6-di-tert-butylphenol

Louisiana Right-To-Know:	Not Listed.
California Proposition 65:	Not Listed.
New Jersey Right-To-Know:	Not Listed.
Pennsylvania Right-To-Know:	Not Listed.
Massachusetts Right-To Know:	Not Listed.
Florida Substance List:	Not Listed.
Rhode Island Right-To-Know:	Not Listed.
Michigan Critical Materials Register List:	Not Listed.
Massachusetts Extraordinarily Hazardous Substances:	Not Listed.
California - Regulated Carcinogens:	Not Listed.
Pennsylvania RTK - Special Hazardous Substances:	Not Listed.
New Jersey - Special Hazardous Substances:	Not Listed.
New Jersey - Environmental Hazardous Substances List:	Not Listed.
Illinois - Toxic Air Contaminants	Not Listed.
New York - Reporting of Releases Part 597 - List of Hazardous Substances:	Not Listed.

Canada DSL/NDSL Inventory: This product and/or its components are listed either on the Domestic Substances List (DSL) or are exempt.

Canadian Regulatory Information: "This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations and the (M)SDS contains all the information required by the Controlled Products Regulations."

Name	Canada - WHMIS: Classifications of Substances:	Canada - WHMIS: Ingredient Disclosure:
2,6-di-tert-butylphenol	D2B	1%

NOTE: Uncontrolled product according to WHMIS classification criteria.

16. OTHER INFORMATION

Prepared By Toxicology and Product Safety
Revision Date: 05/22/2015

Revision Note:

Disclaimer

The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information is intended as guidance for safe handling, use, processing, storage, transportation, accidental release, clean-up and disposal and is not considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text.

LEAD METAL
SAFETY DATA SHEET

SECTION 1. IDENTIFICATION

Product Identity: Lead Metal

Trade Names and Synonyms: Lead; Pb; Plumbum; Metallic Lead; Inorganic Lead; ASTM B29; TADANAC Lead, Low-Alpha Lead.

Manufacturer:
Teck Metals Ltd.
Trail Operations
Trail, British Columbia
V1R 4L8
Emergency Telephone: 250-364-4214

Supplier:
In U.S.:
Teck American Metal Sales Incorporated
501 North Riverpoint Blvd, Suite 300
Spokane, WA
USA, 99202

Other than U.S.:
Teck Metals Ltd.
#1700 – 11 King Street West
Toronto, Ontario
M5H 4C7

Preparer:
Teck Metals Ltd.
Suite 3300 – 550 Burrard Street
Vancouver, British Columbia
V6C 0B3

Date of Last Review: June 29, 2015.

Date of Last Edit: June 29, 2015.

Product Use: Used as a construction material for tank linings, piping, and equipment used in the manufacture of sulphuric acid and the refining and processing of petroleum; used in x-ray and atomic radiation shielding; used in the manufacture of paint pigments, organic and inorganic lead compounds, lead shot, lead wire for bullets, ballast, and lead solders; used as a bearing metal or alloy; used in the manufacture of storage batteries, ceramics, plastics, and electronic devices; used in the metallurgy of steel and other metals; and used in the form of lead oxide for batteries.

SECTION 2. HAZARDS IDENTIFICATION

CLASSIFICATION:

Health		Physical	Environmental
Acute Toxicity (Oral, Inhalation)	– Does not meet criteria	Does not meet criteria for any Physical Hazard	**Aquatic Toxicity – Short Term (Acute) Category 3**
Skin Corrosion/Irritation	– Does not meet criteria		
Eye Damage/Eye Irritation	– Does not meet criteria		
Respiratory or Skin Sensitization	– Does not meet criteria		
Mutagenicity	– Does not meet criteria		
Carcinogenicity	**– Category 2**		
Reproductive Toxicity	**– Category 1A**		
Specific Target Organ Toxicity Chronic Exposure	**– Category 1**		

LABEL:

Symbols:

Signal Word:

DANGER

Hazard Statements	**Precautionary Statements:**
DANGER! Causes damage to kidneys, blood-forming systems, central nervous system and digestive tract through prolonged or repeated exposure. May damage the unborn child. May cause harm to breast-fed children. Suspected of damaging fertility. Suspected of causing cancer. Harmful to aquatic life.	Obtain special instructions before use. Do not handle until all safety precautions have been read and understood. Wear protective gloves/protective clothing/eye protection. Do not breathe dust or fumes. Wash hands thoroughly after handling. Do not eat, drink or smoke when using this product. If exposed or concerned or you feel unwell: Get medical advice/attention. Avoid release to the environment.

Emergency Overview: A bluish-white to silvery-grey, heavy, soft metal that does not burn in bulk. Finely-divided lead dust clouds are a moderate fire and explosion hazard, however. When heated strongly in air, highly toxic lead oxide fumes can be generated. Inhalation or ingestion of lead may produce both acute and chronic health effects. Possible cancer and reproductive hazard. SCBA and full protective clothing are required for fire emergency response personnel.

Potential Health Effects: Inhalation or ingestion of lead may result in headache, nausea, vomiting, abdominal spasms, fatigue, sleep disturbances, weight loss, anemia and leg, arm, and joint pain. Prolonged exposure may also cause central nervous system damage, hypertension, gastrointestinal disturbances, anemia, kidney dysfunction and possible reproductive effects. Pregnant women should be protected from excessive exposure in order to prevent lead crossing the placental barrier and causing infant neurological disorders. Lead and inorganic lead compounds are listed as an *A3 Carcinogen (Confirmed Animal Carcinogen with Unknown Relevance to Humans)* by the ACGIH. IARC has listed lead compounds as *Group 2A Carcinogens (Probably Carcinogenic to Humans)* while lead metal is listed as *Group 2B (Possibly Carcinogenic to Humans)*. The NTP lists lead and lead compounds as *Reasonably Anticipated to be a Human Carcinogen*. OSHA and the EU does not currently list lead as a human carcinogen (see Toxicological Information, Section 11).

Potential Environmental Effects: Lead metal has relatively low bioavailability; however, compounds which it forms with other elements can be toxic to both aquatic and terrestrial organisms at low concentrations. These compounds can be particularly toxic in the aquatic environment. Lead bioaccumulates in plants and animals in both aquatic and terrestrial environments (see Ecological Information, Section 12).

SECTION 3. COMPOSITION / INFORMATION ON INGREDIENTS

HAZARDOUS COMPONENT	CAS Registry No.	CONCENTRATION (% wgt/wgt)
Lead	7439-92-1	99+%

Note: See Section 8 for Occupational Exposure Guidelines.

SECTION 4. FIRST AID MEASURES

Eye Contact: *Symptoms:* Eye irritation, redness. Gently brush product off face if necessary. Do not rub eye(s). Let the eye(s) water naturally for a few minutes. Look right and left, then up and down. If particle/dust does not dislodge, cautiously rinse eye(s) with lukewarm, gently flowing water for 5 minutes or until particle/dust is removed, while holding eyelid(s) open. If irritation persists, get medical advice/attention. DO NOT attempt to manually remove anything stuck to the eye.

Skin Contact: *Symptoms:* Skin soiling, mild irritation. Gently brush away excess dust. Wash gently and thoroughly with lukewarm, gently flowing water and non-abrasive soap for 5 minutes, or until product is removed. If skin irritation occurs or you feel unwell, get medical advice/attention. *Molten Metal:* Flush contact area to solidify and cool but do not attempt to remove encrusted material or clothing. Cover burns and seek medical attention immediately.

Inhalation: *Symptoms:* Respiratory irritation. Remove source of exposure or move person to fresh air and keep comfortable for breathing. Seek medical attention if you feel unwell.

Ingestion: *Symptoms:* Stomach upset. If you feel unwell or are concerned, get medical advice/attention.

SECTION 5. FIRE FIGHTING MEASURES

Fire and Explosion Hazards: Massive metal is not flammable or combustible. Finely-divided lead dust or powder is a moderate fire hazard and moderate explosion hazard when dispersed in the air at high concentrations and exposed to heat, flame, or other ignition sources. Explosions may also occur upon contact with certain incompatible materials (see Stability and Reactivity, Section 10).

Extinguishing Media: Use any means of extinction appropriate for surrounding fire conditions such as water spray, carbon dioxide, dry chemical, or foam.

Fire Fighting: Do not use direct water streams on fires where molten metal is present, due to the risk of a steam explosion that could potentially eject molten metal uncontrollably. Use a fine water mist on the front-running edge of the spill and on the top of the molten metal to cool and solidify it. If possible, move solid material from fire area or cool material exposed to flame to prevent melting of the metal ingots. Highly toxic lead oxide fumes may evolve in fires. Fire fighters must be fully trained and wear full protective clothing including an approved, self-contained breathing apparatus which supplies a positive air pressure within a full face-piece mask.

SECTION 6. ACCIDENTAL RELEASE MEASURES

Procedures for Cleanup: Control source of spillage if possible to do so safely. Restrict access to the area until completion of clean-up. Clean up spilled material immediately, observing precautions outlined below. Molten metal should be allowed to solidify before cleanup. If solid metal, wear gloves, pick up and return to process. If dust, wear recommended personal protective equipment (see below) and use methods which will minimize dust generation (e.g., vacuum solids). Return uncontaminated spilled material to the process if possible. Place contaminated material in suitable labelled containers for later recovery or disposal. Treat or dispose of waste material in accordance with all local, regional, and national requirements.

Personal Precautions: Persons responding to an accidental release should wear protective clothing, gloves and a respirator (see also Section 8). Close-fitting safety goggles may be necessary in some circumstances to prevent eye contact with dust and fume. Where molten metal is involved, wear heat-resistant gloves and suitable clothing for protection from hot-metal splash as well as a respirator to protect against inhalation of lead fume. Workers should wash and change clothing following cleanup of a lead spill to prevent personal contamination with lead dust.

Environmental Precautions: Lead metal has low bioavailability; however, compounds which it forms with other elements can be toxic to aquatic and terrestrial organisms. Releases of the product to water and soil should be prevented.

SECTION 7. HANDLING AND STORAGE

Store in a DRY, covered area, separate from strong acids, other incompatible materials, active metals and food or feedstuffs. Solid metal suspected of containing moisture should be THOROUGHLY DRIED before being added to a molten bath. Otherwise, entrained moisture could expand explosively and spatter molten metal out of the bath. No special packaging materials are required. Lead metal, in contact with wood or other surfaces, may leave traces of lead particulate that can accumulate over time. Cleaning or disposal of these surfaces requires review to ensure that any effluent or solid waste disposal meets the requirements of regulations in the applicable jurisdiction.

SECTION 8. EXPOSURE CONTROLS / PERSONAL PROTECTION

Occupational Exposure Guidelines:

Component	ACGIH TLV	OSHA PEL	NIOSH REL
Lead	0.05 mg/m^3	0.05 mg/m^3	0.05 mg/m^3

NOTE: OEGs for individual jurisdictions may differ from those given above. Check with local authorities for the applicable OEGs in your jurisdiction.
ACGIH - American Conference of Governmental Industrial Hygienists; OSHA - Occupational Safety and Health Administration; NIOSH - National Institute for Occupational Safety and Health. TLV – Threshold Limit Value, PEL – Permissible Exposure Limit, REL – Recommended Exposure Limit.

NOTE: The selection of the necessary level of engineering controls and personal protective equipment will vary depending upon the conditions of use and the potential for exposure. The following are therefore only general guidelines that may not fit all circumstances. Control measures to consider include:

Ventilation: Use adequate local or general ventilation to maintain the concentration of lead fumes in the working environment well below recommended occupational exposure limits. Supply sufficient replacement air to make up for air removed by the exhaust system. Local exhaust is recommended for melting, casting, welding, grinding, flame cutting or burning, and use of lead powders.

Protective Clothing: Gloves and coveralls or other work clothing are recommended to prevent prolonged or repeated direct skin contact when lead is processed. Appropriate eye protection should be worn where fume or dust is generated. Where hot or molten metal is handled, heat resistant gloves, goggles or face shield, and clothing to protect from radiant heat and hot metal splash should be worn. Safety type boots are recommended.

Respirators: Where lead dust or fumes are generated and cannot be controlled to within acceptable levels by engineering means, use appropriate NIOSH-approved respiratory protection equipment (a 42CFR84 Class N, R or P-100 particulate filter cartridge). When exposure levels are obviously high but the actual concentration is unknown, a self-contained breathing apparatus which supplies a positive air pressure within a full face-piece mask should be worn.

General Hygiene Considerations: Do not eat, drink or smoke in work areas. Thoroughly wash hands before eating, drinking, or smoking in appropriate, designated areas as well as at the end of the workday. A double locker-shower system with separate clean and dirty sides is usually required for lead handling operations to avoid cross-contamination of street clothes. Contaminated clothing should be changed frequently and laundered before each reuse. Inform laundry personnel of contaminants' hazards. Workers should not take dirty work clothes home and launder them with other personal clothing.

SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance: Malleable, bluish-white to silvery-grey solid metal	**Odour:** None	**Odour Threshold:** Not Applicable	**pH:** Not Applicable
Vapour Pressure: (negligible @ 20°C)	**Vapour Density:** Not Applicable	**Melting Point/Range:** 328°C	**Boiling Point/Range:** 1,740°C
Relative Density (Water = 1)**:** 11.34	**Evaporation Rate:** Not Applicable	**Coefficient of Water/Oil Distribution:** Not Applicable	**Solubility:** Insoluble in water
Flash Point: None	**Flammable Limits (LEL/UEL):** Not Flammable	**Auto-ignition Temperature:** None	**Decomposition Temperature:** None

SECTION 10. STABILITY AND REACTIVITY

Stability & Reactivity: Massive metal is stable and not considered reactive under normal temperatures and pressures. Hazardous polymerization or runaway reactions will not occur. Freshly cut or cast lead surfaces tarnish rapidly due to the formation of an insoluble protective layer of basic lead carbonate.

Incompatibilities: Lead reacts vigorously with strong acids (e.g., hot concentrated nitric acid, boiling concentrated hydrochloric acid, etc.), strong oxidizers such as peroxides, chlorates, nitrates and halogen or interhalogen compounds such as chlorine trifluoride. Powdered lead metal in contact with disodium acetylide, chlorine trifluoride, sodium carbide or fused ammonium nitrate poses a risk of explosion. Solutions of sodium azide in contact with lead metal can form lead azide, which is a detonating compound. Vigorous reactions can also occur between molten lead and active metals, such as sodium, potassium, lithium and calcium. A lead-zirconium alloy (10-70% Zr) will ignite when struck with a hammer.

Hazardous Decomposition Products: High temperature operations such as oxy-acetylene cutting or burning, electric arc welding or overheating a molten bath will generate highly toxic lead oxide fume. Lead oxide is highly soluble in body fluids and the particle size of the metal fumes is largely within the respirable size range, which increases the likelihood of inhalation and deposition of the fume within the body.

SECTION 11. TOXICOLOGICAL INFORMATION

General: Lead accumulates in bone and body organs once it enters the body. Elimination from the body is slow. Initial and periodic medical examinations are advised for persons repeatedly exposed to levels at or above the exposure limits of lead dust or fumes. Once lead enters the body, it can affect a variety of organ systems, including the nervous system, kidneys, reproductive system, blood formation, and gastrointestinal system. The primary routes of exposure to lead are inhalation or ingestion of dust and fumes.

Acute:
Skin/Eye: Contact with dust or fume may cause local irritation but would not cause tissue damage.

Inhalation: Exposure to lead dust or fume may cause headache, nausea, vomiting, abdominal spasms, fatigue, sleep disturbances, weight loss, anemia, and pain in legs, arms, and joints. An intense, short-term exposure to lead could cause acute encephalopathy with seizures, coma, and death. However, short-term exposures of this magnitude are unlikely in industry today. Kidney damage, as well as anemia, can occur from acute exposure.

Ingestion: Symptoms due to ingestion of lead dust or fume would be similar to those from inhalation. Other health effects such as metallic taste in the mouth and constipation or bloody diarrhea might also occur.

Chronic:
Prolonged exposure to lead dust and fume may produce many of the symptoms of short-term exposure and may also cause central nervous system damage, gastrointestinal disturbances, anemia, and, rarely, wrist drop. Reduced hemoglobin production has been associated with low lead exposures. Symptoms of central nervous system damage due to moderate lead exposure include fatigue, headaches, tremors and hypertension. Very high lead exposure can result in lead encephalopathy with symptoms of hallucinations, convulsions, and delirium. Kidney dysfunction and possible injury has also been associated with chronic lead poisoning. Chronic over-exposure to lead has been implicated as a causative agent for the impairment of male and female reproductive capacity. Pregnant women should be protected from excessive exposure as lead can cross the placental barrier and unborn children may suffer neurological damage or developmental problems due to excessive lead exposure. Teratogenic and mutagenic effects from exposure to lead have been reported in some studies but not in others. The literature is inconsistent and no firm conclusions can be drawn at this time. Lead and lead compounds are listed as an *A3 Carcinogen (Confirmed Animal Carcinogen with Unknown Relevance to Humans)* by the ACGIH. IARC has listed lead compounds as *Group 2A Carcinogens (Probably Carcinogenic to Humans)* while lead metal is listed as *Group 2B (Possibly Carcinogenic to Humans)*. The NTP lists lead and lead compounds as *Reasonably Anticipated to be a Human Carcinogen*. OSHA and the EU do not currently list lead as a human carcinogen.

Animal Toxicity:

Hazardous Ingredient:	Acute Oral Toxicity:	Acute Dermal Toxicity:	Acute Inhalation Toxicity:
Lead	No Data	No Data	No Data

SECTION 12. ECOLOGICAL INFORMATION

While lead metal is relatively insoluble, its processing or extended exposure in aquatic and terrestrial environments may lead to the release of lead compounds in more bioavailable forms. While lead compounds are not particularly mobile in the aquatic environment, they can be toxic to aquatic organisms, especially fish, at low concentrations. Water hardness, pH and dissolved organic carbon content are three major factors which regulate the degree of lead toxicity. Lead in soil is generally neither very mobile nor bioavailable, as it can become strongly sorbed onto soil particles, increasingly so over time, to a degree related to physical properties of the soil. Lead bioaccumulates in plants and animals in both aquatic and terrestrial environments.

SECTION 13. DISPOSAL CONSIDERATIONS

If material cannot be returned to process or salvage, dispose of in accordance with applicable regulations.

SECTION 14. TRANSPORT INFORMATION

PROPER SHIPPING NAME ..... Not a regulated product in ingot form.
TRANSPORT CANADA AND U.S. DOT CLASSIFICATION ..... Not Applicable

TRANSPORT CANADA AND U.S. DOT PIN ..... Not Applicable
MARINE POLLUTANT..... No
IMO CLASSIFICATION ..... Not Regulated

SECTION 15. REGULATORY INFORMATION

U.S.
Ingredient Listed on TSCA Inventory..... Yes

Hazardous Under Hazard Communication Standard ..... Yes

CERCLA Section 103 Hazardous Substances..... ..... Lead ..... RQ: 10 lbs. (4.54 kg.)*
*reporting not required when diameter of the pieces of solid metal released is equal to or exceeds 100 micrometers (0.004 inches).

EPCRA Section 302 Extremely Hazardous Substance..... No

EPCRA Section 311/312 Hazard Categories ..... Delayed (chronic) health hazard - Carcinogen
Delayed (chronic) health hazard – Reproductive toxin

EPCRA Section 313 Toxic Release Inventory..... Lead CAS No. 7439-92-1
Percent by Weight - At least 99%

SECTION 16. OTHER INFORMATION

Date of Original Issue:	July 23, 1997	**Version:**	01 *(First edition)*
Date of Latest Revision:	June 29, 2015	**Version:**	13

The information in this Safety Data Sheet is based on the following references:

- American Conference of Governmental Industrial Hygienists, 2004, Documentation of the Threshold Limit Values and Biological Exposure Indices, Seventh Edition plus updates.
- American Conference of Governmental Industrial Hygienists, 2015, Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices.
- American Conference of Governmental Industrial Hygienists, Guide to Occupational Exposure Values – 2015.
- Bretherick's Handbook of Reactive Chemical Hazards, 20th Anniversary Edition. (P. G. Urben, Ed), 1995.
- Canadian Centre for Occupational Health and Safety, Hamilton, ON, CHEMINFO Record No. 608 - Lead (Rev. 2009-05).
- European Regulation (EC) No. 1272/2008 on classification, labelling and packaging of substances and mixtures, amending and repealing directives 67/548/EEC and 1999/45/EC, and amending Regulation (EC) No 1907/2006 (REACH).
- Health Canada, SOR/2015-17, Hazardous Products Regulations, 30 January 2015.
- International Agency for Research on Cancer (IARC), Monographs on the Evaluation of the Carcinogenic Risk of Chemicals to Man, 1972 – present, (multi-volume work), World Health Organization, Geneva.
- International Chemical Safety Cards (WHO/IPCS/ILO), ICSC:0052 - Lead.
- Merck & Co., Inc., 2001, The Merck Index, An Encyclopedia of Chemicals, Drugs, and Biologicals, Thirteenth Edition.
- National Library of Medicine, National Toxicology Information Program, Hazardous Substance Data Bank (online version).
- Patty's Toxicology, Fifth Edition, 2001: E. Bingham, B. Cohrssen & C.H. Powell, Ed.
- U.S. Dept. of Health and Human Services, National Institute of Environmental Health Sciences, National Toxicology Program (NTP), 13th Report on Carcinogens, October 2014.
- U.S. Dept. of Health and Human Services, National Institute for Occupational Safety and Health, NIOSH Pocket Guide to Chemical Hazards, on-line edition.
- U.S. Dept. of Health and Human Services, Public Health Service, Agency for Toxic Substances and Disease Registry, Toxicological Profile for Lead, September 2005.
- U.S. Occupational Safety and Health Administration, 1989, Code of Federal Regulations, Title 29, Part 1910.

Notice to Reader
Although reasonable precautions have been taken in the preparation of the data contained herein, it is offered solely for your information, consideration and investigation. Teck American Metal Sales Incorporated and Teck Metals Ltd. extend no warranty and assume no responsibility for the accuracy of the content and expressly disclaim all liability for reliance thereon. This safety data sheet provides guidelines for the safe handling and processing of this product; it does not and cannot advise on all possible situations. Therefore, your specific use of this product should be evaluated to determine if additional precautions are required. Individuals exposed to this product should read and understand this information and be provided pertinent training prior to working with this product.

Safety Data Sheet

RUST-OLEUM CORPORATION
* Trusted Quality Since 1921 *
www.rustoleum.com

1. Identification

Product Name:	PRO LSPR 6PK MARK FLUORESCENT ORANGE	**Revision Date:**	6/5/2015
Product Identifier:	2554838	**Supercedes Date:**	New SDS
Product Use/Class:	Marking Paint/Aerosols		
Supplier:	Rust-Oleum Corporation 11 Hawthorn Parkway Vernon Hills, IL 60061 USA	**Manufacturer:**	Rust-Oleum Corporation 11 Hawthorn Parkway Vernon Hills, IL 60061 USA
Preparer:	Regulatory Department		
Emergency Telephone:	24 Hour Hotline: 847-367-7700		

2. Hazard Identification

Classification

Symbol(s) of Product

Signal Word
Danger

Possible Hazards
60% of the mixture consists of ingredient(s) of unknown acute toxicity

GHS HAZARD STATEMENTS

Flammable Aerosol, category 1	H222	Extremely flammable aerosol.
Acute Toxicity, Dermal, category 4	H312	Harmful in contact with skin.
Germ Cell Mutagenicity, category 1B	H340	May cause genetic defects . Classified as mutagenic Category 1 if one ingredient is present at or above 0.1% Applies to liquids, Solids (w/w units) and gases (v/v). The substance may also have its own exposure limit. Routes of exposure are dependant on ingredient form.
Carcinogenicity, category 1B	H350	May cause cancer. Classified as carcinogenic Category 1 on the basis of epidemiological and/or animal data. Mixtures are classified as carcinogenic when at least 1 ingredient has been classified as carcinogenic and is present at 0.1% or above Routes of exposure are dependant on ingredient form.

GHS LABEL PRECAUTIONARY STATEMENTS

P201	Obtain special instructions before use.
P211	Do not spray on an open flame or other ignition source.
P251	Do not pierce or burn, even after use.
P280	Wear protective gloves/protective clothing/eye protection/face protection.
P281	Use personal protective equipment as required.
P308+P313	IF exposed or concerned: Get medical advice/attention.
P312	Call a POISON CENTER or doctor/physician if you feel unwell.
P410+P412	Protect from sunlight. Do no expose to temperatures exceeding 50°C/ 122°F.

3. Composition/Information On Ingredients

HAZARDOUS SUBSTANCES

Chemical Name	CAS-No.	Wt.% Range	GHS Symbols	GHS Statements
Aliphatic Hydrocarbon	64742-89-8	10-25	GHS08	H304-340-350
Propane	74-98-6	10-25	No Information	No Information
Limestone	1317-65-3	10-25	No Information	No Information
Hydrous Magnesium Silicate	14807-96-6	2.5-10	No Information	No Information
n-Butane	106-97-8	2.5-10	No Information	No Information
Acetone	67-64-1	2.5-10	GHS02-GHS07	H225-319-336
n-Butyl Acetate	123-86-4	2.5-10	GHS02-GHS07	H226-336
Hydrotreated Light Distillate	64742-47-8	2.5-10	GHS06-GHS08	H304-331
Naphtha, Petroleum, Hydrotreated Light	64742-49-0	1.0-2.5	GHS08	H304-340-350
Organoclay	68911-87-5	1.0-2.5	No Information	No Information
Stoddard Solvent	8052-41-3	0.1-1.0	GHS08	H304-340-350-372
Ethylbenzene	100-41-4	0.1-1.0	GHS02-GHS07	H225-332

The text for GHS Hazard Statements shown above (if any) is given in the "16. Other Information" section.

4. First-aid Measures

FIRST AID - EYE CONTACT: Immediately flush eyes with plenty of water for at least 15 minutes holding eyelids open. Get medical attention. Do NOT allow rubbing of eyes or keeping eyes closed.

FIRST AID - SKIN CONTACT: Wash skin with soap and water. Remove contaminated clothing. Get medical attention if irritation develops or persists.

FIRST AID - INHALATION: Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get immediate medical attention. Do NOT use mouth-to-mouth resuscitation. If you experience difficulty in breathing, leave the area to obtain fresh air. If continued difficulty is experienced, get medical assistance immediately.

FIRST AID - INGESTION: Aspiration hazard: Do not induce vomiting or give anything by mouth because this material can enter the lungs and cause severe lung damage. Get immediate medical attention. If swallowed, get medical attention.

5. Fire-fighting Measures

EXTINGUISHING MEDIA: Alcohol Film Forming Foam, Carbon Dioxide, Dry Chemical, Dry Sand, Water Fog

UNUSUAL FIRE AND EXPLOSION HAZARDS: FLASH POINT IS LESS THAN 20°F. EXTREMELY FLAMMABLE LIQUID AND VAPOR!Water spray may be ineffective. Closed containers may explode when exposed to extreme heat due to buildup of steam. Closed containers may explode when exposed to extreme heat. Vapors may form explosive mixtures with air. Vapors can travel to a source of ignition and flash back. Keep containers tightly closed. Isolate from heat, electrical equipment, sparks and open flame. Perforation of the pressurized container may cause bursting of the can. No unusual fire or explosion hazards noted.

SPECIAL FIREFIGHTING PROCEDURES: Water may be used to cool closed containers to prevent pressure buildup and possible autoignition or explosion. Full protective equipment including self-contained breathing apparatus should be used. Evacuate area and fight fire from a safe distance. Use water spray to keep fire-exposed containers cool. Containers may explode when heated.

6. Accidental Release Measures

STEPS TO BE TAKEN IF MATERIAL IS RELEASED OR SPILLED: Contain spilled liquid with sand or earth. DO NOT use combustible materials such as sawdust. Isolate the hazard area and deny entry to unnecessary and unprotected personnel. Remove all sources of ignition, ventilate area and remove with inert absorbent and non-sparking tools. Dispose of according to local, state (provincial) and federal regulations. Do not incinerate closed containers. Ventilate area, isolate spilled material, and remove with inert absorbent. Dispose of contaminated absorbent, container, and unused contents in accordance with local, state, and federal regulations.

7. Handling and Storage

HANDLING: Wash thoroughly after handling. Wash hands before eating. Remove contaminated clothing and launder before reuse. Use only in a well-ventilated area. Use only with adequate ventilation. Follow all MSDS/label precautions even after container is emptied because it may retain product residues. Avoid breathing fumes, vapors, or mist. Avoid contact with eyes, skin and clothing.

STORAGE: Store in a dry, well ventilated place. Keep container tightly closed when not in use. Keep containers tightly closed. Isolate from heat, electrical equipment, sparks and open flame. Contents under pressure. Do not store above 120 ° F. Store large quantities in buildings designed and protected for storage of NFPA Class I flammable liquids. Keep away from heat, sparks, flame and sources of ignition. Contents under pressure. Do not expose to heat or store above 120 ° F. Avoid excess heat. Product should be stored in tightly sealed containers and protected from heat, moisture, and foreign materials.

8. Exposure Controls/Personal Protection

Chemical Name	CAS-No.	Weight % Less Than	ACGIH TLV-TWA	ACGIH TLV-STEL	OSHA PEL-TWA	OSHA PEL-CEILING
Aliphatic Hydrocarbon	64742-89-8	20.0	N.E.	N.E.	N.E.	N.E.
Propane	74-98-6	20.0	1000 ppm	N.E.	1000 ppm	N.E.
Limestone	1317-65-3	20.0	N.E.	N.E.	15 mg/m3	N.E.
Hydrous Magnesium Silicate	14807-96-6	10.0	2 mg/m3	N.E.	N.E.	N.E.
n-Butane	106-97-8	10.0	N.E.	1000 ppm	N.E.	N.E.
Acetone	67-64-1	10.0	500 ppm	750 ppm	1000 ppm	N.E.
n-Butyl Acetate	123-86-4	5.0	150 ppm	200 ppm	150 ppm	N.E.
Hydrotreated Light Distillate	64742-47-8	5.0	N.E.	N.E.	N.E.	N.E.
Naphtha, Petroleum, Hydrotreated Light	64742-49-0	5.0	N.E.	N.E.	N.E.	N.E.
Organoclay	68911-87-5	5.0	N.E.	N.E.	N.E.	N.E.
Stoddard Solvent	8052-41-3	1.0	100 ppm	N.E.	500 ppm	N.E.
Ethylbenzene	100-41-4	1.0	20 ppm	N.E.	100 ppm	N.E.

PERSONAL PROTECTION

ENGINEERING CONTROLS: Use process enclosures, local exhaust ventilation, or other engineering controls to control airborne levels below recommended exposure limits. Use explosion-proof ventilation equipment. Provide general dilution of local exhaust ventilation in volume and pattern to keep TLV of hazardous ingredients below acceptable limits. Prevent build-up of vapors by opening all doors and windows to achieve cross-ventilation.

RESPIRATORY PROTECTION: A respiratory protection program that meets OSHA 1910.134 and ANSI Z88.2 requirements must be followed whenever workplace conditions warrant a respirator's use. A NIOSH/MSHA approved air purifying respirator with organic vapor cartridge or canister may be permissible under certain circumstances where airborne concentrations are expected to exceed exposure limits.

SKIN PROTECTION: Use gloves to prevent prolonged skin contact. Use impervious gloves to prevent skin contact and absorption of this material through the skin. Nitrile or Neoprene gloves may afford adequate skin protection.

EYE PROTECTION: Use safety eyewear designed to protect against splash of liquids.

OTHER PROTECTIVE EQUIPMENT: Refer to safety supervisor or industrial hygienist for further guidance regarding types of personal protective equipment and their applications. Refer to safety supervisor or industrial hygienist for further information regarding personal protective equipment and its application.

HYGIENIC PRACTICES: Wash thoroughly with soap and water before eating, drinking or smoking. Remove contaminated clothing immediately and launder before reuse.

9. Physical and Chemical Properties

Appearance:	Aerosolized Mist	**Physical State:**	Liquid
Odor:	Solvent Like	**Odor Threshold:**	N.E.
Relative Density:	0.871	**pH:**	N.A.
Freeze Point, °C:	N.D.	**Viscosity:**	N.D.
Solubility in Water:	Slight	**Partition Coefficient, n-octanol/ water:**	N.D.
Decompostion Temp., °C:	N.D.		
Boiling Range, °C:	-24 - 537	**Explosive Limits, vol%:**	0.9 - 13.0
Flammability:	Supports Combustion	**Flash Point, °C:**	-96
Evaporation Rate:	Faster than Ether	**Auto-ignition Temp., °C:**	N.D.
Vapor Density:	Heavier than Air	**Vapor Pressure:**	N.D.

(See "Other information" Section for abbreviation legend)

10. Stability and Reactivity

CONDITIONS TO AVOID: Avoid temperatures above 120 °F (49°C)Avoid contact with strong acid and strong bases. Avoid all possible sources of ignition.

INCOMPATIBILITY: Incompatible with strong oxidizing agents, strong acids and strong alkalies.

HAZARDOUS DECOMPOSITION: By open flame, carbon monoxide and carbon dioxide. When heated to decomposition, it emits acrid smoke and irritating fumes. Contains solvents which may form carbon monoxide, carbon dioxide, and formaldehyde.

HAZARDOUS POLYMERIZATION: Will not occur under normal conditions.

STABILITY: This product is stable under normal storage conditions.

11. Toxicological information

EFFECTS OF OVEREXPOSURE - EYE CONTACT: Causes Serious Eye Irritation

EFFECTS OF OVEREXPOSURE - SKIN CONTACT: Substance may cause slight skin irritation. May cause skin irritation. Allergic reactions are possible. Prolonged or repeated contact may cause skin irritation.

EFFECTS OF OVEREXPOSURE - INHALATION: Harmful if inhaled. High gas, vapor, mist or dust concentrations may be harmful if inhaled. Avoid breathing fumes, spray, vapors, or mist. High vapor concentrations are irritating to the eyes, nose, throat and lungs. Prolonged or excessive inhalation may cause respiratory tract irritation.

EFFECTS OF OVEREXPOSURE - INGESTION: Harmful if swallowed. Aspiration hazard if swallowed; can enter lungs and cause damage.

EFFECTS OF OVEREXPOSURE - CHRONIC HAZARDS: May cause central nervous system disorder (e.g., narcosis involving a loss of coordination, weakness, fatigue, mental confusion, and blurred vision) and/or damage. High concentrations may lead to central nervous system effects (drowsiness, dizziness, nausea, headaches, paralysis, and blurred vision) and/or damage. Reports have associated repeated and prolonged occupational overexposure to solvents with permanent brain and nervous system damage. IARC lists Ethylbenzene as a possible human carcinogen (group 2B).

PRIMARY ROUTE(S) OF ENTRY: Eye Contact, Ingestion, Inhalation, Skin Absorption, Skin Contact

ACUTE TOXICITY VALUES

The acute effects of this product have not been tested. Data on individual components are tabulated below:

CAS-No.	Chemical Name	Oral LD50	Dermal LD50	Vapor LC50
64742-89-8	Aliphatic Hydrocarbon	N.I.	3000 mg/kg Rabbit	N.I.
74-98-6	Propane	N.I.	N.I.	658 mg/L Rat
123-86-4	n-Butyl Acetate	N.I.	>17600 mg/kg Rabbit	N.I.
64742-47-8	Hydrotreated Light Distillate	>5000 mg/kg Rat	>2000 mg/kg Rabbit	>5.2 mg/L Rat
64742-49-0	Naphtha, Petroleum, Hydrotreated Light	>5000 mg/kg Rat	>3160 mg/kg Rabbit	N.I.
100-41-4	Ethylbenzene	3500 mg/kg Rat	15354 mg/kg Rabbit	17.2 mg/L Rat

N.I. - No Information

12. Ecological Information

ECOLOGICAL INFORMATION: Product is a mixture of listed components. Product is a mixture of listed components.

13. Disposal Information

DISPOSAL INFORMATION: Dispose of material in accordance to local, state, and federal regulations and ordinances. Do not allow to enter waterways, wastewater, soil, storm drains or sewer systems.

14. Transport Information

	Domestic (USDOT)	International (IMDG)	Air (IATA)	TDG (Canada)
UN Number:	N.A.	1950	1950	N.A.
Proper Shipping Name:	Paint Products in Limited Quantities	Aerosols	Aerosols	Paint Products in Limited Quantities
Hazard Class:	N.A.	2.1	2.1	N.A.
Packing Group:	N.A.	N.A.	N.A.	N.A.
Limited Quantity:	Yes	Yes	Yes	Yes

15. Regulatory Information

U.S. Federal Regulations:

CERCLA - SARA Hazard Category

This product has been reviewed according to the EPA 'Hazard Categories' promulgated under Sections 311 and 312 of the Superfund Amendment and Reauthorization Act of 1986 (SARA Title III) and is considered, under applicable definitions, to meet the following categories:

Fire Hazard, Pressure Hazard, Acute Health Hazard, Chronic Health Hazard

Sara Section 313:

This product contains the following substances subject to the reporting requirements of Section 313 of Title III of the Superfund Amendment and Reauthorization Act of 1986 and 40 CFR part 372:

Chemical Name	CAS-No.
Ethylbenzene	100-41-4

Toxic Substances Control Act:

This product contains the following chemical substances subject to the reporting requirements of TSCA 12(b) if exported from the United States:

No TSCA 12(b) components exist in this product.

16. Other Information

HMIS RATINGS

Health:	2*	**Flammability:**	4	**Physical Hazard:**	0	**Personal Protection:**	X

NFPA RATINGS

Health:	2	**Flammability:**	4	**Instability**	0

VOLATILE ORGANIC COMPOUNDS, g/L: 522

MSDS REVISION DATE: 6/5/2015

REASON FOR REVISION:

Legend: N.A. - Not Applicable, N.E. - Not Established, N.D. - Not Determined

Text for GHS Hazard Statements shown in Section 3 describing each ingredient:

H225	Highly flammable liquid and vapour.
H226	Flammable liquid and vapour.
H304	May be fatal if swallowed and enters airways.
H319	Causes serious eye irritation.
H331	Toxic if inhaled.
H332	Harmful if inhaled.
H336	May cause drowsiness or dizziness.
H340	May cause genetic defects.
H350	May cause cancer.
H372	Causes damage to organs through prolonged or repeated exposure.

Icons for GHS Pictograms shown in Section 3 describing each ingredient:

GHS02

GHS06

GHS07

GHS08

Rust-Oleum Corporation believes, to the best of its knowledge, information and belief, the information contained herein to be accurate and reliable as of the date of this safety data sheet. However, because the conditions of handling, use, and storage of these materials are beyond our control, we assume no responsibility or liability for personal injury or property damage incurred by the use of these materials. Rust-Oleum Corporation makes no warranty, expressed or implied, regarding the accuracy or reliability of the data or results obtained from their use. All materials may present unknown hazards and should be used with caution. The information and recommendations in this material safety data sheet are offered for the users' consideration and examination. It is the responsibility of the user to determine the final suitability of this information and to comply with all applicable international, federal, state, and local laws and regulations.

SAFETY DATA SHEET

SDS ID NO.: 0162MAR019
Revision Date: 05/22/2015

1. IDENTIFICATION

Product Name: Marathon Petroleum Multipower-3 15W-40 Motor Oil

Synonym: Multipower-3 15W-40 Motor Oil; Multipower-3 15W-40 Heavy Duty Motor Oil
Chemical Family: Motor/Lube Oil

Recommended Use: Engine Oil.
Use Restrictions: All others.

Supplier Name and Address:

MARATHON PETROLEUM COMPANY LP
539 South Main Street
Findlay, OH 45840

SDS information: 1-419-421-3070

Emergency Telephone: 1-877-627-5463

2. HAZARD IDENTIFICATION

Classification

OSHA Regulatory Status
This chemical is considered hazardous according to the 2012 OSHA Hazard Communication Standard (29 CFR 1910.1200)

Serious eye damage/eye irritation	Category 2A

Hazards Not Otherwise Classified (HNOC)
Not applicable

Label elements

EMERGENCY OVERVIEW

Warning

Causes serious eye irritation

Appearance Brown Liquid **Physical State** Liquid **Odor** Petroleum

Precautionary Statements - Prevention
Wash hands and any possibly exposed skin thoroughly after handling
Wear eye/face protection

Precautionary Statements - Response
IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
If eye irritation persists: Get medical attention

Precautionary Statements - Storage
Not applicable

Precautionary Statements - Disposal
Not applicable

Additional Information
Read label before use. Keep out of reach of children. If medical advice is needed, have product container or label at hand.

3. COMPOSITION/INFORMATION ON INGREDIENTS

Motor oil is a complex mixture of highly refined lubricating oil base stocks and additives.

Composition Information:

Name	CAS Number	Weight %
Phosphorodithioic acid, mixed O,O-bis(sec-Bu and isooctyl) esters, zinc salts	113706-15-3	1-5
Dinonyl diphenylamine	36878-20-3	1-5
Butene, homopolymer	9003-29-6	1-5
Amines, polyethylenepoly-, reaction products with succinic anhydride polyisobutenyl derivs.	84605-20-9	1-5

4. FIRST AID MEASURES

First Aid Measures

General advice In case of accident or if you feel unwell, seek medical advice immediately (show directions for use or safety data sheet if possible).

Inhalation: Remove to fresh air and keep at rest in a position comfortable for breathing. If symptoms occur get medical attention.

Skin Contact: Wash skin with plenty of soap and water. If irritation or other symptoms occur get medical attention. Wash contaminated clothing and clean shoes before reuse.

Eye Contact: Flush immediately with large amounts of water for at least 15 minutes. Eyelids should be held away from the eyeball to ensure thorough rinsing. Gently remove contacts while flushing. Get medical attention.

Ingestion: Rinse mouth out with water. If spontaneous vomiting occurs, keep head below hips, or if patient is lying down, turn body and head to side to prevent aspiration and monitor for breathing difficulty. Never give anything by mouth to an unconscious person. Keep affected person warm and at rest. If symptoms develop, seek medical attention.

Most important signs and symptoms, both short-term and delayed with overexposure

Adverse Effects: Causes eye irritation. Symptoms may include redness, itching, and inflammation. May cause skin irritation and/or dermatitis. Preexisting skin conditions and/or respiratory disorders may be aggravated by exposure to this product.

Indication of any immediate medical attention and special treatment needed

NOTES TO PHYSICIAN: Treat symptomatically.

5. FIRE-FIGHTING MEASURES

Suitable extinguishing media
For small fires, Class B fire extinguishing media such as CO2, dry chemical, foam (AFFF/ATC) or water spray can be used. For large fires, water spray, fog or foam (AFFF/ATC) can be used. Firefighting should be attempted only by those who are adequately trained and equipped with proper protective equipment.

Unsuitable extinguishing media
Do not use a solid water stream as it may scatter and spread fire.

Specific hazards arising from the chemical
The product is not combustible per the OSHA Hazard Communication Standard, but will ignite and burn at temperatures exceeding the flash point.

Hazardous combustion products
Smoke, carbon monoxide, and other products of incomplete combustion.

Explosion data
Sensitivity to Mechanical Impact No.
Sensitivity to Static Discharge No.

Special protective equipment and precautions for firefighters
Avoid using straight water streams. Water spray and foam (AFFF/ATC) must be applied carefully to avoid frothing and from as far a distance as possible. Avoid excessive water spray application. Use water spray to cool exposed surfaces from as far a distance as possible. Keep run-off water out of sewers and water sources.

NFPA: Health 1 Flammability 1 Instability 0 Special Hazards -

6. ACCIDENTAL RELEASE MEASURES

Personal Precautions: Keep public away. Isolate and evacuate area. Shut off source if safe to do so.

Protective Equipment: Use personal protection measures as recommended in Section 8.

Emergency Procedures: Advise authorities and National Response Center (800-424-8802) if the product has entered a water course or sewer. Notify local health and pollution control agencies, if appropriate.

Environmental precautions: Avoid release to the environment. Avoid subsoil penetration.

Methods and materials for containment: Prevent further leakage or spillage if safe to do so.

Methods and materials for cleaning up: Use suitable absorbent materials such as vermiculite, sand, or clay to clean up residual liquids. Recover and return free product to proper containers.

7. HANDLING AND STORAGE

Safe Handling Precautions: Avoid contact with skin, eyes and clothing. Do not swallow. Avoid breathing vapors or mists. Use good personal hygiene practices. Wash thoroughly after handling. Use personal protection measures as recommended in Section 8. Do not cut, drill, grind or weld on empty containers since explosive residues may remain. Refer to applicable EPA, OSHA, NFPA and consistent state and local requirements.

Lifetime, continuous skin contact with used motor oils has caused skin cancer in laboratory tests. In testing, thorough washing has been found to prevent the development of skin cancer from used motor oil exposure. Avoid excessive skin contact. Exercise good personal hygiene including the removal and washing of soiled clothing and destroy used motor oil contaminated leather shoes/boots.

Storage Conditions: Store in properly closed containers that are appropriately labeled and in a cool, well-ventilated area. Containers that have been opened must be carefully resealed and kept upright to prevent leakage. Store away from incompatible materials.

Incompatible materials Strong oxidizing agents.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Name	ACGIH TLV	OSHA PELS:	OSHA - Vacated PELs	NIOSH IDLH
Phosphorodithioic acid, mixed O,O-bis(sec-Bu and isooctyl) esters, zinc salts 113706-15-3	-	-	-	-
Dinonyl diphenylamine 36878-20-3	-	-	-	-
Butene, homopolymer 9003-29-6	-	-	-	-
Amines, polyethylenepoly-, reaction products with succinic anhydride polyisobutenyl derivs. 84605-20-9	-	-	-	-

Notes: The manufacturer has voluntarily elected to provide exposure limits contained in OSHA's 1989 air contaminants standard in its SDSs, even though certain of those exposure limits were vacated in 1992.

Engineering measures: Local or general exhaust required when using at elevated temperatures that generate vapors or mists.

Personal protective equipment

Eye protection: Use goggles or face-shield if the potential for splashing exists.

Skin and body protection: Wear neoprene, nitrile or PVA gloves to prevent skin contact. Glove suitability is based on workplace conditions and usage. Contact the glove manufacturer for specific advice on glove selection and breakthrough times. Wear appropriate protective clothing.

Respiratory protection: Use an approved organic vapor chemical cartridge or supplied air respirators when material produces vapors that exceed permissible exposure limits or excessive vapors are generated. Observe respirator assigned protection factors (APFs) criteria cited in federal OSHA 29 CFR 1910.134. Self-contained breathing apparatus should be used for fire fighting.

Hygiene measures: Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin, eyes and clothing. Wash hands before breaks and immediately after handling the product.

9. PHYSICAL AND CHEMICAL PROPERTIES

Information on basic physical and chemical properties

Physical State	Liquid
Appearance	Brown Liquid
Color	Brown
Odor	Petroleum
Odor Threshold	No available data.

Property	**Values (Method)**
Melting Point / Freezing Point	No available data.
Initial Boiling Point / Boiling Range	No available data.
Flash Point	> 220 °C / > 428 °F (Cleveland Open-Cup)
Evaporation Rate	No available data.
Flammability (solid, gas)	Not applicable.
Flammability Limit in Air (%)	
Upper Flammability Limit:	No available data.
Lower Flammability Limit:	No available data.
Vapor Pressure	No available data.
Vapor Density	No available data.
Specific Gravity / Relative Density	0.86-0.875
Water Solubility	No available data.
Solubility in other solvents	No available data.
Partition Coefficient	No available data.
Decomposition temperature:	No available data.
pH:	No available data.
Autoignition Temperature	No available data.
Kinematic Viscosity	82 mm2/s @ 40°C / 104°F
Dynamic Viscosity	No available data.
Explosive Properties	No available data.
Softening Point	No available data.
VOC Content (%)	1.7 (w/w)
Density	No available data.
Bulk Density	Not applicable.

10. STABILITY AND REACTIVITY

Reactivity	The product is non-reactive under normal conditions.
Chemical stability	Stable under recommended storage conditions.
Possibility of hazardous reactions	None under normal processing.
Hazardous polymerization	Will not occur.
Conditions to avoid	Sources of heat or ignition.
Incompatible materials	Strong oxidizing agents.
Hazardous decomposition products	None known under normal conditions of use.

11. TOXICOLOGICAL INFORMATION

Potential short-term adverse effects from overexposures

Inhalation	Overheating may produce vapors which may cause respiratory irritation, dizziness and nausea.
Eye contact	Irritating to eyes. May cause reddening and tearing.

Skin contact May cause skin irritation. Prolonged or repeated exposure may cause dermatitis, folliculitis or oil acne.

Ingestion May cause irritation of the mouth, throat and gastrointestinal tract.

Acute Toxicological data

Name	Oral LD50	Dermal LD50	Inhalation LC50
Phosphorodithioic acid, mixed O,O-bis(sec-Bu and isooctyl) esters, zinc salts 113706-15-3	-	-	-
Dinonyl diphenylamine 36878-20-3	-	-	-
Butene, homopolymer 9003-29-6	-	-	-
Amines, polyethylenepoly-, reaction products with succinic anhydride polyisobutenyl derivs. 84605-20-9	-	-	-

Delayed and immediate effects as well as chronic effects from short and long-term exposure

This product is considered to have a low order of acute and chronic oral and dermal toxicity.

USED MOTOR OIL: Lifetime, continuous skin contact with used motor oils has caused skin cancer in laboratory tests. The combustion process produces compounds (polycyclic aromatic hydrocarbons) in motor oils that increase with use and are responsible for the cancer induction. Thorough washing has been found to prevent the development of skin cancer on animals from used motor oil exposure.

ZDDP: Zinc dialkyldithiophosphate (ZDDP) additives are primarily eye and/or skin irritants or corrosives with low acute toxicity via oral, dermal, and inhalation routes of exposure and are not skin sensitizers. In laboratory repeat dose studies by the dermal and oral routes, ZDDPs cause effects only at high doses, primarily due to irritation, in a manner similar to other irritating materials. The weight-of- evidence of genotoxicity testing indicates that ZDDPs are not mutagenic and do not cause larger chromosomal effects.

Adverse effects related to the physical, chemical and toxicological characteristics

Signs & Symptoms Causes eye irritation. Symptoms may include redness, itching, and inflammation. Contact may cause skin dermatitis and/or irritation. Repeated or prolonged skin contact may cause drying, reddening, itching and cracking.

Sensitization Not expected to be a skin or respiratory sensitizer.

Mutagenic effects None known.

Carcinogenicity Cancer designations are listed in the table below.

Name	ACGIH (Class)	IARC (Class)	NTP	OSHA
Phosphorodithioic acid, mixed O,O-bis(sec-Bu and isooctyl) esters, zinc salts 113706-15-3	Not Listed	Not Listed	Not Listed	Not Listed
Dinonyl diphenylamine 36878-20-3	Not Listed	Not Listed	Not Listed	Not Listed
Butene, homopolymer 9003-29-6	Not Listed	Not Listed	Not Listed	Not Listed

Amines, polyethylenepoly-, reaction products with succinic anhydride polyisobutenyl derivs. 84605-20-9	Not Listed	Not Listed	Not Listed	Not Listed

Reproductive toxicity None known.

Specific Target Organ Toxicity (STOT) - single exposure Not classified.

Specific Target Organ Toxicity (STOT) - repeated exposure Not classified.

Aspiration hazard Not classified.

12. ECOLOGICAL INFORMATION

Ecotoxicity

Used motor and/or lube oils can be toxic to birds and fish.

Name	Algae/aquatic plants	Fish	Toxicity to Microorganisms	Crustacea
Phosphorodithioic acid, mixed O,O-bis(sec-Bu and isooctyl) esters, zinc salts 113706-15-3	-	-	-	-
Dinonyl diphenylamine 36878-20-3	-	-	-	-
Butene, homopolymer 9003-29-6	-	-	-	-
Amines, polyethylenepoly-, reaction products with succinic anhydride polyisobutenyl derivs. 84605-20-9	-	-	-	-

Persistence and degradability Not expected to be readily biodegradable.

Bioaccummulation Contains component(s) with the potential to bioaccumulate.

Mobility in soil No information available.

Other adverse effects No information available.

13. DISPOSAL CONSIDERATIONS

Description of Waste Residues
No information available.

Safe Handling of Wastes
Handle in accordance with applicable local, state, and federal regulations. Use personal protection measures as required.

Disposal of Wastes / Methods of Disposal
The user is responsible for determining if any discarded material is a hazardous waste (40 CFR 262.11). Dispose of in accordance with federal, state and local regulations.

Methods of Contaminated Packaging Disposal
Empty containers should be completely drained and then discarded or recycled, if possible. Do not cut, drill, grind or weld on empty containers since explosive residues may be present. Dispose of in accordance with federal, state and local regulations.

14. TRANSPORT INFORMATION

DOT (49 CFR 172.101):

UN Proper shipping name:	Not Regulated
UN/Identification No:	Not applicable
Transport Hazard Class(es):	Not applicable
Packing group:	Not applicable

TDG (Canada):

UN Proper shipping name:	Not Regulated
UN/Identification No:	Not applicable
Transport Hazard Class(es):	Not applicable
Packing group:	Not applicable

15. REGULATORY INFORMATION

US Federal Regulatory Information:

US TSCA Chemical Inventory Section 8(b): This product and/or its components are listed on the TSCA Chemical Inventory.

EPA Superfund Amendment & Reauthorization Act (SARA):

SARA Section 302: This product may contain component(s) that have been listed on EPA's Extremely Hazardous Substance (EHS) List:

Name	CERCLA/SARA - Section 302 Extremely Hazardous Substances and TPQs
Phosphorodithioic acid, mixed O,O-bis(sec-Bu and isooctyl) esters, zinc salts	NA
Dinonyl diphenylamine	NA
Butene, homopolymer	NA
Amines, polyethylenepoly-, reaction products with succinic anhydride polyisobutenyl derivs.	NA

SARA Section 304: This product may contain component(s) identified either as an EHS or a CERCLA Hazardous substance which in case of a spill or release may be subject to SARA reporting requirements:

Name	CERCLA/SARA - Hazardous Substances and their Reportable Quantities
Phosphorodithioic acid, mixed O,O-bis(sec-Bu and isooctyl) esters, zinc salts	NA
Dinonyl diphenylamine	NA
Butene, homopolymer	NA
Amines, polyethylenepoly-, reaction products with succinic anhydride polyisobutenyl derivs.	NA

SARA: The following EPA hazard categories apply to this product:

Acute Health Hazard

SARA Section 313: This product may contain component(s), which if in exceedance of the de minimus threshold, may be subject to the reporting requirements of SARA Title III Section 313 Toxic Release Reporting (Form R).

Name	CERCLA/SARA 313 Emission reporting:
Phosphorodithioic acid, mixed O,O-bis(sec-Bu and isooctyl) esters, zinc salts	None
Dinonyl diphenylamine	None
Butene, homopolymer	None

Amines, polyethylenepoly-, reaction products with succinic anhydride polyisobutenyl derivs.	None

State and Community Right-To-Know Regulations:
The following component(s) of this material are identified on the regulatory lists below:

Phosphorodithioic acid, mixed O,O-bis(sec-Bu and isooctyl) esters, zinc salts

Louisiana Right-To-Know:	Not Listed.
California Proposition 65:	Not Listed.
New Jersey Right-To-Know:	Not Listed.
Pennsylvania Right-To-Know:	Not Listed.
Massachusetts Right-To Know:	Not Listed.
Florida Substance List:	Not Listed.
Rhode Island Right-To-Know:	Not Listed.
Michigan Critical Materials Register List:	Not Listed.
Massachusetts Extraordinarily Hazardous Substances:	Not Listed.
California - Regulated Carcinogens:	Not Listed.
Pennsylvania RTK - Special Hazardous Substances:	Not Listed.
New Jersey - Special Hazardous Substances:	Not Listed.
New Jersey - Environmental Hazardous Substances List:	Not Listed.
Illinois - Toxic Air Contaminants	Not Listed.
New York - Reporting of Releases Part 597 - List of Hazardous Substances:	Not Listed.

Dinonyl diphenylamine

Louisiana Right-To-Know:	Not Listed.
California Proposition 65:	Not Listed.
New Jersey Right-To-Know:	Not Listed.
Pennsylvania Right-To-Know:	Not Listed.
Massachusetts Right-To Know:	Not Listed.
Florida Substance List:	Not Listed.
Rhode Island Right-To-Know:	Not Listed.
Michigan Critical Materials Register List:	Not Listed.
Massachusetts Extraordinarily Hazardous Substances:	Not Listed.
California - Regulated Carcinogens:	Not Listed.
Pennsylvania RTK - Special Hazardous Substances:	Not Listed.
New Jersey - Special Hazardous Substances:	Not Listed.
New Jersey - Environmental Hazardous Substances List:	Not Listed.
Illinois - Toxic Air Contaminants	Not Listed.
New York - Reporting of Releases Part 597 - List of Hazardous Substances:	Not Listed.

Butene, homopolymer

Louisiana Right-To-Know:	Not Listed.
California Proposition 65:	Not Listed.
New Jersey Right-To-Know:	Not Listed.
Pennsylvania Right-To-Know:	Not Listed.
Massachusetts Right-To Know:	Not Listed.
Florida Substance List:	Not Listed.
Rhode Island Right-To-Know:	Not Listed.
Michigan Critical Materials Register List:	Not Listed.
Massachusetts Extraordinarily Hazardous Substances:	Not Listed.
California - Regulated Carcinogens:	Not Listed.
Pennsylvania RTK - Special Hazardous Substances:	Not Listed.
New Jersey - Special Hazardous Substances:	Not Listed.
New Jersey - Environmental Hazardous Substances List:	Not Listed.
Illinois - Toxic Air Contaminants	Not Listed.

New York - Reporting of Releases Part 597 - List of Hazardous Substances:	Not Listed.

Amines, polyethylenepoly-, reaction products with succinic anhydride polyisobutenyl derivs.

Louisiana Right-To-Know:	Not Listed.
California Proposition 65:	Not Listed.
New Jersey Right-To-Know:	Not Listed.
Pennsylvania Right-To-Know:	Not Listed.
Massachusetts Right-To Know:	Not Listed.
Florida Substance List:	Not Listed.
Rhode Island Right-To-Know:	Not Listed.
Michigan Critical Materials Register List:	Not Listed.
Massachusetts Extraordinarily Hazardous Substances:	Not Listed.
California - Regulated Carcinogens:	Not Listed.
Pennsylvania RTK - Special Hazardous Substances:	Not Listed.
New Jersey - Special Hazardous Substances:	Not Listed.
New Jersey - Environmental Hazardous Substances List:	Not Listed.
Illinois - Toxic Air Contaminants	Not Listed.
New York - Reporting of Releases Part 597 - List of Hazardous Substances:	Not Listed.

Canada DSL/NDSL Inventory: This product and/or its components are listed either on the Domestic Substances List (DSL) or are exempt.

Canadian Regulatory Information: "This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations and the (M)SDS contains all the information required by the Controlled Products Regulations."

Name	Canada - WHMIS: Classifications of Substances:	Canada - WHMIS: Ingredient Disclosure:
Phosphorodithioic acid, mixed O,O-bis(sec-Bu and isooctyl) esters, zinc salts	D2B	1%
Butene, homopolymer	Uncontrolled product according to WHMIS classification criteria	

NOTE: Not Applicable.

16. OTHER INFORMATION

Prepared By Toxicology and Product Safety
Revision Date: 05/22/2015

Revision Note:

Disclaimer

The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information is intended as guidance for safe handling, use, processing, storage, transportation, accidental release, clean-up and disposal and is not considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text.

SAFETY DATA SHEET
Floor **Absorbent - CN**

1. PRODUCT AND COMPANY IDENTIFICATION

Product Name: Floor Absorbent - CN

SDS Number: 1006500

Manufacturer:	Oil-Dri Corporation of America 410 North Michigan Avenue Chicago, IL 60611 +1-312-321-1515
TRANSPORTATION EMERGENCY INFORMATION:	Chemtrec +1-800-424-9300 (US and Canada) +1-703-527-3887 (International - Call Collect)

Product Use: Absorbent

Restrictions On Use: Spontaneous combustion can occur when this product is used to high concentrations of chemicals having a high heat of absorption such as olefins, hydrochloric acid, etc.

2. HAZARDS IDENTIFICATION

GHS Classification:

Health: Specific Target Organ Toxicity – Single Exposure Category 3

Environmental: Not Hazardous

Physical: Not Hazardous

GHS Labeling:

Pictogram:

Exclamation mark

WARNING!

H335 May cause respiratory irritation.

Prevention: P261 Avoid breathing dust

P271 Use only outdoors or in a well-ventilated area.

Response: P304 + P340 IF INHALED: Remove person to fresh air and keep comfortable for breathing.

Storage: Store in a dry area.

Disposal: P501 Dispose of contents/container in accordance with all local and national regulations.

3. COMPOSITION/INFORMATION ON INGREDIENTS

Chemical Name	CAS-No./ EINECS-No	%
Fullers Earth (Attapulgite-type clay)	8031-18-3	10-100%
Proprietary Ingredient	Proprietary	10-100%

4. FIRST AID MEASURES

Inhalation: Move to fresh air. If irritation or other symptoms occurs, get medical attention.

Skin contact: No first aid should be needed.

Eye contact: Immediately flush eyes with cool running water, lifting upper and lower lids. If irritation persists or for foreign body in the eye, get medical attention.

Ingestion: If used material is ingested, get medical attention due to possibility of chemical contamination. If large amount of unused material is swallowed, get immediate medical attention.

Most Important symptoms and effects, both acute and delayed: Eye contact may cause mechanical irritation and possible eye injury. May cause mechanical skin and respiratory irritation.

Indication of any immediate medical attention and special treatment needed: No immediate medical attention is required.

5. FIRE-FIGHTING MEASURES

Suitable Extinguishing Media: Use media that is appropriate for surrounding fire; unused product is not combustible.

Specific Hazards Arising from the Chemical: None for unused product.

Special Protective Equipment and Precautions for Fire-fighters: Firefighters should always wear self-contained breathing apparatus and full protective clothing for fires involving chemicals or in confined spaces.

6. ACCIDENTAL RELEASE MEASURES

Personal Precautions, Protective Equipment, and Emergency Procedures: No special equipment is generally required for spill clean-up. For dusty conditions, an approved respiratory may be needed. Refer to Section 8 for additional information.

Environmental Hazards: Report releases as required by local and federal regulations.

Methods and Materials for Containment and Cleaning Up: Sweep up and collect unused material for re-use or disposal. For dusty conditions, an approved respiratory may be needed. Refer to Section 8 for additional information.

7. HANDLING AND STORAGE

Precautions for Safe Handling: Avoid breathing dust. Avoid contact with eyes, skin, and clothing. Wash thoroughly with soap and water after use. If clothing becomes dusty, launder before re-use. Use only with adequate ventilation. Minimize the generation and accumulation of dust. Follow good housekeeping practices to keep surfaces, including areas overhead such as piping, drop ceilings, ductwork, etc. free from settled dust. Dry powders can build static electricity charges when subjected to friction of transfer and in mixing operations.

Conditions for Safe Storage, including any Incompatibilities: Store in a dry area. Keep away from turpentine, hydrofluoric acid, vegetable oil, and other unsaturated organic compounds (such as fish oil), as this may generate heat and/or fire.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

Exposure limit(s)

Chemical Name	Exposure limit(s)
Fullers Earth (Attapulgite-type clay)	15 mg/m3 (total dust) TWA OSHA PEL 5 mg/m3 (respirable dust) TWA OSHA PEL
Proprietary Ingredient	15 mg/m3 (total dust) TWA OSHA PEL 5 mg/m3 (respirable dust) TWA OSHA PEL

Appropriate Engineering Controls: General ventilation is adequate for normal use. If handling produces airborne dust, local exhaust ventilation may be needed.

Individual Protection Measures, such as Personal Protective Equipment:

Eye Protection: Safety glasses or goggles if needed to prevent eye contact.

Skin Protection: None required for normal use.

Respiratory Protection: None required for normal use. For operations where the dust concentration may be excessive, a dust respirator may be used. Follow OSHA regulations in the selection and use of respiratory protection.

9. PHYSICAL AND CHEMICAL PROPERTIES

Property	Value
Appearance:	White to tan granules
Odor Threshold:	Not applicable.
Boiling point/range	Not applicable.
Melting point/range	Not available
Relative density	2.3-2.37
Vapor pressure	Not applicable.
Vapor density (air=1)	Not applicable.
Solubility	Partially soluble
pH	Not applicable.
Partition coefficient (n-octanol/water):	Not available
Evaporation Rate (Butyl acetate=1)	Not applicable.
Viscosity:	Not applicable.
Volatile Organic Carbon Compounds (VOC) (g/L)	Not available
Flashpoint:	Not applicable.
Flammable Limits in Air % by Volume:	LEL (Lower):Not applicable. UEL (Upper): Not applicable.
Autoignition temperature:	Not available
Decomposition temperature:	Not available
Flammability (solid, gas):	Not flammable

10. STABILITY AND REACTIVITY

Reactivity: Not normally reactive.

Chemical Stability: Stable

Possibility of Hazardous Reactions: Spontaneous combustion can occur when this product is used to high concentrations of chemicals having a high heat of absorption such as olefins, hydrochloric acid, etc.

Conditions to Avoid: None.

Incompatible Materials: Turpentine, hydrofluoric acid, vegetable oil, fish oil, unsaturated organic compounds.

Hazardous Decomposition Products: None.

11. TOXICOLOGICAL INFORMATION

Potential Health Effects:

Acute Hazards:

Inhalation: Inhalation of dust may cause irritation to the eyes, nose, throat and respiratory tract.

Skin contact: No known hazard.

Eye contact: Contact may cause mechanical, abrasive irritation with possible injury.

Ingestion: No known hazard.

Chronic Effects: Inhalation of excessive concentrations of any dust, including this material, may lead to lung irritation and/or injury.

Carcinogenicity Listing: None.

Acute Toxicity Values: None.

12. ECOLOGICAL INFORMATION

Ecotoxicity: No data available for the product. No adverse effects on the environment are expected.

Persistence and Degradability: Fuller's Earth is non-degradable.

Bioaccumulative Potential: Not bioaccumulative.

Mobility in Soil: No data available

Other Adverse Effects: None currently known.

13. DISPOSAL CONSIDERATIONS

Dispose in accordance with local, state and federal environmental Regulations. Unused material is suitable for disposal in sanitary landfill. Used material may be subject to regulation, depending on the nature of the material absorbed. Check with appropriate regulatory authority for used material containing hazardous waste.

14. TRANSPORT INFORMATION

US DOT Shipping Description: Not regulated

IATA Shipping Description (Air): Not regulated

Proper Shipping Name: Not regulated

UN Number: Not applicable.

Packing Group: Not applicable.

Labels Required: None.

15. REGULATORY INFORMATION

US Regulations

SARA 311/312 Hazard Categories: Chronic Health

SARA 313 This Product Contains the Following Chemicals Subject to Annual Release Reporting Requirements Under the SARA Section 313 (40 CFR 372): None.

SARA 302 Listed Chemicals: None.

CERCLA: This product is not subject to CERCLA release reporting. Many states have more stringent reporting requirements. Report releases as required by local and state regulations.

California Proposition 65: None.

EPA Toxic Substances Control Act (TSCA): All of the components of this product are listed on the TSCA Inventory or exempted from TSCA.

International Regulations:

EU REACH: Contact Oil Dri for information on REACH status.

Japan MITI: No data available

AICS: No data available

16. OTHER INFORMATION

Date Prepared: 5/29/2015

Revision Summary: May 29, 2015 - Conversion to Hazcom 2012 classification and labeling and format.

HMIS Rating: Health 0* Fire 0 Reactivity 0

0 = Minimal Hazard, 1 = Slight Hazard, 2 = Moderate Hazard, 3 = Serious Hazard, 4 = Severe Hazard

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