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Abstract: Tank 241-AN-101 is the receiver tank for retrieval of several C-Farms waste tanks, including Tanks 241-C-102 and 241-C-111. Tank 241 C 111 received first-cycle decontamination waste from the bismuth phosphate process and Plutonium and Uranium Extraction cladding waste, as well as hydraulic fluid. Three grab samples, 1AN-16-01, 1AN-16-01A, and 1AN-16-01B, were collected at the surface of Tank 241-AN-101 on April 25, 2016, after Tank 241-C-111 retrieval was completed. Floating solids were observed in the three grab samples in the 11A hot cell after the samples were received at the 222-S Laboratory. Routine chemical analyses, solid phase characterization on the floating and settled solids, semivolatile organic analysis mainly on the aqueous phase for identification of degradation products of hydraulic fluids were performed. Investigation of the floating solids is reported..

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Investigation of Tank 241-AN-101 Floating Solids

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Executive Summary

Tank 241-AN-101 is the receiver tank for retrieval of several C-Farms waste tanks, including Tanks 241-C-102 and 241-C-111. Tank 241-C-111 received first-cycle decontamination waste from the bismuth phosphate process and Plutonium and Uranium Extraction cladding waste, as well as hydraulic fluid (i.e., Quintolubric^{®1} 888-46) from leaking sluicers and pumps. Tank 241-C-111 is the most recent retrieval, completed in March 2016.

Three grab samples, 1AN-16-01, 1AN-16-01A, and 1AN-16-01B, were collected at the surface of Tank 241-AN-101 on April 25, 2016, after Tank 241-C-111 retrieval was completed. Floating solids were observed in the three grab samples in the 11A hot cell after the samples were received at the 222-S Laboratory. After a review of photos that were taken at 30 days, the client requested that Process Chemistry perform an investigation of the floating solids.

Quintolubric[®] 888 hydraulic fluid consists mainly of trimethylol propane trioleate plus proprietary additives. Hydraulic fluid decomposes through hydrolysis to form trimethylol propane (water soluble alcohol) and oleic acid, which undergoes saponification to form sodium oleate (soap). Sodium oleate can act as an emulsifier to float the solids to the top.

Floating solids, aqueous liquid, and settled solids were collected from two Tank 241-AN-101 grab samples, 1AN-16-01 and 1AN-16-01B, and submitted for chemical analyses. Solid phase characterization was performed on the floating and settled solids. The third grab sample, 1AN-16-01A, was treated at 77 °C for 100 days for the corrosion study. The heating during the corrosion study caused the floating layer to disperse and sink. Aliquots from the top of the aqueous phase of 1AN-16-01, 1AN-16-01B, and 1AN-16-01A (post corrosion), the center of the aqueous phase of 1AN-16-01 and 1AN-16-01A (post corrosion), and the settled solids of 1AN-16-01A (post corrosion) were collected for semivolatile organic analysis. Samples collection from 1AN-16-01A occurred after the corrosion study and were taken in January 2017.

Polarized light microscopy revealed very few gas bubbles in the floating and settled solids indicating that the generation of gases is not the sole cause of the floating solids. In addition, less natrophosphate and more organics were observed in the floating solids than in the settled solids. Natrophosphate coated with metal-containing materials was more prevalent in the settled solids.

Similar chemical constituents were found in the floating and settled solids, but at different concentration ranges for 1AN-16-01 and 1AN-16-01B. Mass balance calculation revealed some striking differences between the floating and the settled solids: higher percentages of total organic carbon and inorganic species, but lower percentages of phosphate and fluoride (i.e., natrophosphate) in the floating solids than in the corresponding settled solids. The inorganic species included sodium nitrate, sodium nitrite, sodium fluoride sulfate, sodium chloride, and calcium phosphate. The percentage of organic carbon contributed by the small organic acids (including acetate, formate, and oxalate) to the total organic carbon was ~3 - ~6% in the floating and in the settled solids, but was ~42% in the top of the aqueous phase (due to much less total

¹ Quintolubric is a registered trademark of Quaker Chemical Corporation, Conshohocken, Pennsylvania.

organic carbon in the aqueous sample). Although semivolatile organic analysis was not performed in the floating and settled solids of 1AN-16-01 and 1AN-16-01B due to inadequate samples available for the analysis, hydrocarbons were expected to be the main organic species present in the solids.

Semivolatile organic results of the top and the center of the aqueous phase of 1AN-16-01 and the top of the aqueous phase of 1AN-16-01B showed the presence of trace tributyl phosphate and tentatively identified compounds, which were mostly straight- or branched-chain hydrocarbons (in acid form due to low pH methylene chloride extraction). The exceptions were oleic acid (chemical name 9-octadecenoic acid, a degradation product of Quintolubric® 888-46), which was only present in the top of the aqueous phase for both grab samples, and trimethylol propane, also a degraded product of Quintolubric® 888-46, which was only present in the center of the aqueous phase of 1AN-16-01.

A few tentatively identified compounds present in the top and the center of the aqueous phases from the post corrosion of 1AN-16-01A differed from those found in the two non-heated grab samples. The tentatively identified compounds were mostly straight- or branched-hydrocarbons consisting of 2 to 9 carbon (e.g., $C_9H_{16}O_4$). The C-18 oleic acid was not present in the top and the center of the aqueous phase, but trimethylol propane was detected in both aqueous samples. The absence of hydrocarbons and the presence of both degradation products of Quintolubric® 888-46 in the post corrosion settled solids of 1AN-16-01A were noted.

Solids floating on the top of the aqueous layer appeared to be large and smooth-surface aggregates along with smaller grains of natrophosphate. The formation of large rounded aggregates that float may be caused by the complex reactions of sodium oleate, saponification (due to high sodium hydroxide concentration and the presence of organics), adsorption of organics on the solids surface (presence of gibbsite, thermonatrite, and other metal-containing materials), and available surface area for the adsorption of organics. In addition, note that the density of natrophosphate is greater than the density of the aqueous phase.

Disappearance of floating solids and oleic acid in the aqueous phase, elevated concentration of trimethylol propane and oleic acid but disappearance of hydrocarbons in the settled solids, and physical appearance of the settled solids found in the post corrosion 1AN-16-01A sample indicate that the disappearance of floating solids is related to the degradation of Quintolubric® 888-46 and hydrocarbons at higher temperatures.

It is expected that the floating solids in AN-101 will disperse and sink to the bottom, most likely due to the degradation of Quintolubric® 888 and hydrocarbons. The degradation process is slow, but is accelerated by heating. The degradation products of Quintolubric® 888, oleic acid (9-octadecenoic acid) and trimethylol propane, can be detected qualitatively by the methylene chloride extraction method and analyzed by gas chromatography / mass spectrometry. Quantitative measurement can be achieved by establishing a calibration curve and method detection and quantitation limits.

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LIST OF TERMS

Abbreviations and Acronyms

AN-101	Tank 241-AN-101
AES	atomic emission spectrometry
CCB	continuing calibration blank
C-102	Tank 241-C-102
C-111	Tank 241-C-111
DSC	differential scanning calorimetry
EDS	energy dispersive spectroscopy
EQL	estimated quantitation limit
FY	Fiscal Year
GC	gas chromatography
IC	ion chromatography
ICB	initial calibration blank
ICP	inductively coupled plasma
ID	identification
LCS	laboratory control sample
MDL	method detection limit

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MS	mass spectrometry or matrix spike
na	not applicable
ND	not determined
OH	free hydroxide
PCB	polychlorinated biphenyl
PLM	polarized light microscope(py)
PUREX	Plutonium and Uranium Extraction
Q	quarterly or qualifier
QC	quality control
RPD	relative percent difference
RT	retention time
SOAC	small organic acids carbon
SD	standard deviation
SEM	scanning electron microscopy
SPC	solid phase characterization
SVOA	semivolatile organic analysis
TA	thermal analysis
TBP	tributyl phosphate
TGA	thermogravimetric analysis
TIC	total inorganic carbon or tentatively identified compounds
TOC	total organic carbon
WAI	Wastren Advantage, Inc.
WHL	Wastren Advantage, Inc., Hanford Laboratory
%H ₂ O	percent water
XRD	X-ray diffraction

Units

°C	degrees Celsius
gal	gallon
g	gram(s)
in.	inch(es)
L	liter
μCi	microcuries
μg	microgram(s)
M	molarity
mg	milligram
mL	milliliter
min	minute(s)

1 INTRODUCTION

Tank 241-AN-101 (AN-101) is the receiver tank for retrieval of Tanks 241-C-102 (C-102) and 241-C-111 (C-111) which received first-cycle decontamination waste from the bismuth phosphate process and Plutonium and Uranium Extraction (PUREX) cladding waste (RPP-RPT-57458, *Derivation of Best-Basis Inventory for Tank 241-C-102 as of January 1, 2016*, and RPP-RPT-48459, *Derivation of Best-Basis Inventory for Tank 241-C-111 as of April 1, 2016*). The primary constituents in the sludge of Tank 241-C-111 were sodium, nitrate, phosphate, nitrite, uranium, carbonate, iron, and aluminum. The primary radioactive constituents in the C-111 sludge were $^{90}\text{Sr}/^{90}\text{Y}$ and $^{137}\text{Cs}/^{137}\text{mBa}$ (RPP-PLAN-60420, *Process Control Plan for Tank 241-C-111 Heel Waste Retrieval*).

Tank AN-101 contains supernatant liquid, sludge, and saltcake (RPP-RPT-44814, *Derivation of Best-Basis Inventory for Tank 241-AN-101 as of April 1, 2016*). At the time of sampling three grab samples on April 25, 2016, AN-101 had retrieved C-111 waste. Retrieval of C-102 waste was completed in May of 2015, and retrieval of C-111 was completed in March 2016.

It is also known that hydraulic fluid, Quintolubric® 888-46, had been added to C-111 as a result of leaking pumps and failed sluicer hydraulics. As of March 30, 2017, an estimated 680 gal of hydraulic fluid had been released to AN-101.

On April 25, 2016, three grab samples, 1AN-16-01, 1AN-16-01A, and 1AN-16-01B, were collected at the liquid surface of Tank AN-101 according to the instruction provided in RPP-PLAN-60607 (*Tank 241-AN-101 Grab Sampling and Analysis Plan FY16 Q1*). Wastren Advantage, Inc., (WAI) Hanford Laboratory (WHL) personnel observed floating solids in the three grab samples after they were received at the 222-S Laboratory. Following a review of photos taken at 30 days after the samples were received, the client requested that Process Chemistry perform an investigation of the floating solids.

Aliquots of the liquid from the top of the aqueous phase from 1AN-16-01 and 1AN-16-01B, as well as the center of the aqueous phase of 1AN-16-01, and the top and center of the aqueous phase from the post-corrosion study of 1AN-16-01A were collected. In addition, the floating and settled solids of 1AN-16-01 and -01B, as well as the settled solids of the post-corrosion of 1AN-16-01A, were collected for analyses to investigate for a better understanding of the floating solids.

The Quintolubric® 888 series (e.g., Quintolubric® 888-46) is made from trimethylol propane trioleate with trace amounts of additives. It is a neutral compound that has no free carboxylic acid group, does not contain phosphate esters, is insoluble in water, and has a specific gravity of 0.92 (78B00-MAK-08-003, "Criticality Safety Determination of the Use of Quintolubric® 888-46 Hydraulic Fluid in C-109.") The ester of Quintolubric® 888 can be oxidized and/or degraded, resulting in the formation of free fatty acids (i.e., oleic acid, $\text{C}_{18}\text{H}_{34}\text{O}_2$) and other degradation products (e.g., trimethylol propane). The following information is provided by the manufacturer of Quintolubric® 888: the oxidation and/or degradation processes accelerate at higher temperatures, with every 10 °C increase in temperature the reaction rate doubles; water generated

during the use of Quintolubric® 888 sinks to the bottom; and fresh Quintolubric® 888 contains 85-150 mg/kg of phosphorus as an additive (“User Specifications for Quintolubric® 888 Series” [Quaker 2015])

2 SAMPLES

Photos of three AN-101 grab samples were taken by WHL on April 26, 2016, the day after the samples were received at 222-S, and at 30, 37, 44, and 49 days after sample collection (Figures 1 to 4). The two AN-101 grab samples that contained the most floating solids, 1AN-16-01 and 1AN-16-01B, were subsampled for investigation of the floating solids. The third sample, 1AN-16-01A, was used for a corrosion study (RPP-RPT-59951, *Report on the Effect of a Floating Solids Layer in Tank 241-AN-101 on the Corrosion Susceptibility to the Steel Liner*) and was heated 100 days at 77 °C. After the corrosion study, two aqueous samples from the top and the center of the aqueous phase and one sample from the settled solids were collected on January 25, 2017, for semivolatile organic analysis (SVOA) to investigate the present of Quintolubric® 888 and organic compounds.

Three phases were found in all three grab samples: a floating layer of brown solids, a yellow liquid, and brown solids settled on the bottom of the sample jar.

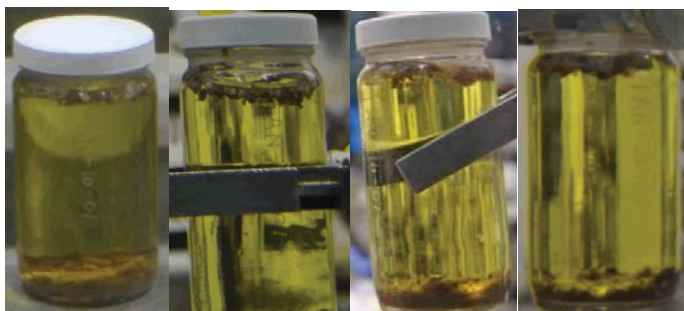


Figure 1. Photos of 1AN-16-01 Taken at 30, 37, 44, and 49 Days after Sample Collection (from Left to Right).

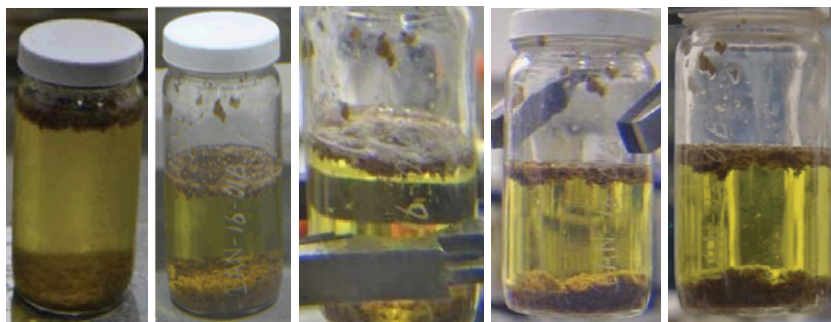


Figure 2. Photos of 1AN-16-01B Taken at 1, 30, 37, 44, and 49 Days after Grab Sample Collection (from Left to Right).

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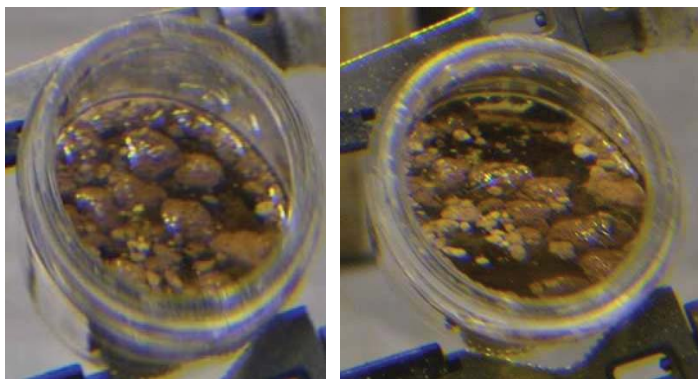


Figure 3. Top View of 1AN-16-01B at 49 Days after Sample Collection.

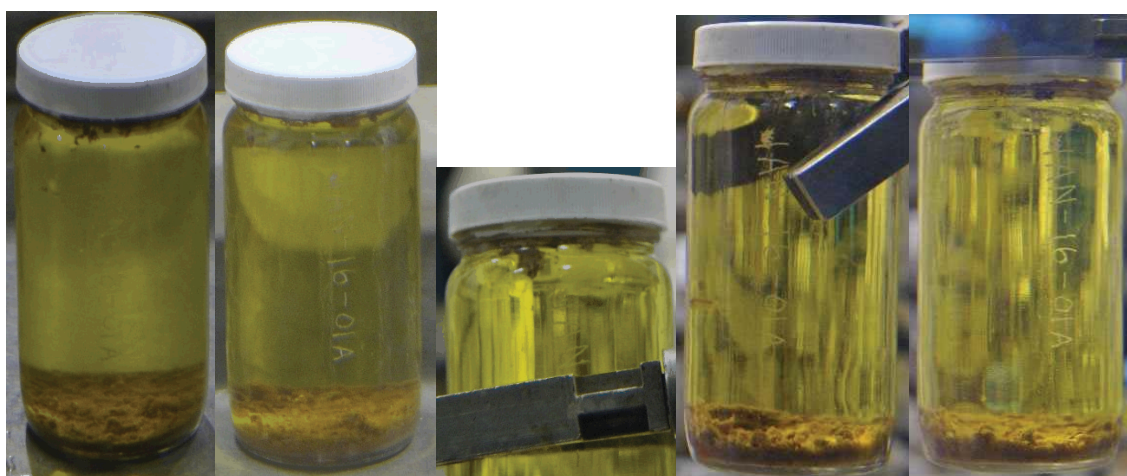


Figure 4. Photos of 1AN-16-01A (for Corrosion Study First) Taken at 1, 30, 37, 44, and 49 Days after Sample Collection (from Left to Right).

Four subsamples were collected from grab samples 1AN-16-01 and 1AN-16-01B on June 16, 2016: the floating solids, the settled solids, the aqueous liquid collected from the center of the sample jar, and the aqueous sample collected at the top of the aqueous phase. The majority of the floating solids were collected from the sample jar using a large spatula, transferred to a pre-weighed 20-mL glass vial, and then re-weighed. An aqueous sample was collected using a disposable pipette, transferred to a pre-weighed 20-mL glass vial, and then re-weighed. The settled solids were collected using a disposable pipette, transferred to a pre-weighed 20-mL glass vial, and then re-weighed. The sample from the top of aqueous phase was collected using a disposable pipette placed near the top of the aqueous phase.

On January 25, 2017, after the corrosion study on 1AN-16-01A, two aqueous samples were collected from the top and the center of the aqueous phase and one solid sample was collected from the settled solids from 1AN-16-01A for SVOA analysis only, in a manner similar to that described in the previous paragraph.

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Table 1. Laboratory Sample Identification Numbers.

Grab Sample	1AN-16-01 (S16T005858)	1AN-16-01B (S16T005862)	1AN-16-01A (Post Corrosion) (S16R000533)
Floating Solids	S16R000241	S16R000252	na
Middle of Aqueous Phase	S16R000242	S16R000253	S17R000002
Settled Solids	S16R000243	S16R000254	S17R000001
Top of Aqueous Phase	S16R000244	S16R000255	S17R000003

Solid phase characterization (SPC), including polarized light microscopy (PLM), scanning electron microscopy/energy dispersive spectroscopy (SEM/EDS), and X-ray diffraction (XRD), was performed on the floating and settled solids of 1AN-16-01 and 1AN-16-01B. Chemical analyses were requested for the aqueous phase and/or solids including anions and small organic acids by ion chromatography (IC), actinides by inductively coupled plasma - mass spectrometry (ICP-MS), density, free hydroxide (OH), metals/elements by ICP atomic emission spectrometry (ICP-AES), pH, percent water (%H₂O) by thermogravimetric analysis (TGA), strontium-90 (^{89/90}Sr) by co-precipitation and gross beta counting, technetium-99 (⁹⁹Tc) by ICP-MS, SVOA by gas chromatography/mass spectrometry (GC/MS), and total inorganic carbon/total organic carbon (TIC/TOC).

Solids samples were extracted for SVOA analysis by the Soxhlet extraction method. Aqueous samples were extracted by the continuous liquid-liquid extraction method. Methylene chloride was used for extraction and was performed under both basic and acidic conditions. Extracts obtained from both methods were placed into a GC/MS for SVOA analysis. Table 2 summarizes the requested analyses for the aqueous samples from the top and the middle of the aqueous phase, and solids samples.

See Appendix A for the sample breakdown diagram.

**Table 2. Analyses Requested in Floating and Settled Solids and in Aqueous Samples.
(2 pages)**

Floating and Settled Solids	Aqueous Samples from the Middle of the Aqueous Phase ¹	Aqueous Samples from the Top of the Aqueous Phase
Anions and Small Organic Acids by IC	Anions and Small Organic Acids by IC	Anions and Small Organic Acids by IC
Actinides by ICP-MS	Actinides by ICP-MS	ND
ND	Density	ND
ND	Free Hydroxide	ND
Metals and Elements by ICP-AES	Metals and Elements by ICP-AES	ND
ND	pH	ND
^{89/90} Sr	^{89/90} Sr	ND
SPC	ND	ND
SVOA ²	SVOA on 1AN-16-01 and 1AN-16-01A	SVOA

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Table 2. Analyses Requested in Floating and Settled Solids and in Aqueous Samples. (2 pages)

Floating and Settled Solids	Aqueous Samples from the Middle of the Aqueous Phase ¹	Aqueous Samples from the Top of the Aqueous Phase
⁹⁹ Tc	⁹⁹ Tc	ND
TIC/TOC	TIC/TOC	TIC/TOC
%H ₂ O by TGA	%H ₂ O by TGA	%H ₂ O by TGA

ND: Not determined.

¹ 1AN-16-01A was excluded for all the analyses except SVOA. All analyses were performed on 1AN-16-01.² Not determined due to inadequate sample for both floating and settled solids of samples 1AN-16-01 and -01B, but was determined on 1AN-16-01A settled solids after a corrosion study (RPP-RPT-59951).

2.1 ANALYSES

Analyses were performed by WHL per their analytical procedures (see Table 3) for anions and small organic acids by IC, actinides by ICP-MS, density (in g/mL), OH (expressed in M), metals/elements by ICP-AES, pH, ^{89/90}Sr, SVOA, ⁹⁹Tc, TIC/TOC by persulfate oxidation and coulometric detection, and percent of water by TGA. Process Chemistry of the 222-S Laboratory performed SPC including PLM, SEM-EDS, and XRD per the applicable procedures listed in Table 3. Balance usage and verification was performed according to ATS-LO-140-008, "Routine Use and Quality Assurance for Analytical Balances at 222-S Laboratory Complex."

Table 3. Analytical and Solid Phase Characterization Procedures. (2 pages)

Analyte(s) or Method	Procedure Number	Procedure Title
Anions and Small Organic Acids	LA-533-166	Ion Chromatographic Analysis of Anions and Small Organic Acids on DIONEX Model ICS 3000
Actinides by ICP-MS	LA-506-103	Determination of Trace Elements and Radionuclides using the Agilent 7500ce Inductively Coupled Plasma-Mass Spectrometer
Density	LA-510-112	Determination of Density for Free Liquid Samples
Free Hydroxide (OH)	LA-211-102	Determination of Free OH/OH ⁺ Using Metrohm Titrando
Metals	LA-505-174	Inductively Coupled Plasma Emission Spectrometric Method for the Thermo Scientific iCAP 6500
pH	LA-212-106	pH Determination of Aqueous Samples
^{89/90} Sr	LA-220-101	High Level Strontium-90 in Aqueous Samples
^{89/90} Sr, Counting	LA-508-124	Operation of the Alpha Beta Counting System Using PC Control and Windows
^{89/90} Sr, Leach of Soil	LA-544-101	Nitric Acid-Hydrochloric Acid Leach of Soil
SVOA, Liquid-Liquid Extraction	LA-523-115	Semivolatiles and PCBs from Aqueous Samples Using Semimicro Continuous Liquid-Liquid Extraction

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Table 3. Analytical and Solid Phase Characterization Procedures. (2 pages)

Analyte(s) or Method	Procedure Number	Procedure Title
SVOA	LA-523-135	Semivolatile Organics by Gas Chromatography/Mass Spectrometry, Based on SW-846, Method 8270D
SVOA, Soxhlet Extraction	LA-523-138	Soxhlet Extraction and Solid Samples for Semivolatile Organic or PCB Analysis
⁹⁹ Tc	LA-506-103	Determination of Trace Elements and Radionuclides using the Agilent 7500ce Inductively Coupled Plasma-Mass Spectrometer
TIC/TOC	LA-342-100	Determination of Carbon by Hot Persulfate Oxidation and Coulometric Detection
%H ₂ O by TGA	LA-514-115	Thermal Stability and Percent Weight Loss Using the TA DSC and TGA
Solid Phase Characterization	Procedure Number	Procedure Title
PLM	ATS-LT-519-107	222-S Laboratory Polarized Light Microscopy
SEM, Preparation	ATS-LT-161-104	SEM Sample Preparation Procedure
SEM	ATS-LT-161-103	222-S Laboratory Technology Procedure for the ASPEX Explorer Scanning Electron Microscope
XRD	ATS-LT-507-103	222-S Laboratory X-Ray Diffractometry (XRD) Using the Rigaku ^{TM2} MiniFlexII

DSC = differential scanning calorimetry

PCB = polychlorinated biphenyl

TA = thermal analysis

3 RESULTS AND DISCUSSIONS

3.1 OBSERVATIONS OF SUBSAMPLES

The amounts of each subsample collected from the grab samples and general descriptions of each subsample are provided in Table 4.

² Rigaku is a trademark of Rigaku Americas Corporation, The Woodlands, Texas.

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Table 4. Description of Floating Solids, Aqueous Phase, and Settled Solids.

Grab Sample	1AN-16-01 (S16T005858)	1AN-16-01B (S16T005862)
Floating Solids	6.1 g	9.8 g
	No apparent bubbles	No apparent bubbles
	Partially covered the top surface of a 250-mL jar	Covered the majority of the top surface area of a 250-mL jar
	Consisted of some light tan (white-like, <~0.02 in. diameter ¹), small, rounded aggregates and medium brown mud-like solids (~0.3 x ~0.5 x ~0.6 in. large aggregates ¹)	Consisted of some light tan (white-like, <~0.02 – ~0.1 in. diameter ¹), small, rounded aggregates and medium brown mud-like solids (~0.4 x ~0.4 x ~0.5 in. large aggregates ¹)
	Light tan aggregates floating on the top	More floating light tan small aggregates than in sample 1AN-16-01
Aqueous Sample from the Middle of the Aqueous Phase	21.8 g	20.2 g
	Major component, clear, brownish yellow liquid	Major component, clear, brownish yellow liquid
Settled Solids ²	8.4 g	8.3 g
	Estimated to be ~5 - ~10% of the entire contents	Estimated to be ~10% of the original contents (note: supernate was removed prior to subsampling)
	Medium brown, fluffy, not compacted, maybe fibrous or vermicular, settled quickly	Medium brown, fluffy, not compacted, maybe fibrous or vermicular, settled quickly
Aqueous Sample from the Top of Aqueous Phase	12.6 g. Clear, brownish yellow liquid	5.2 g. Clear, brownish yellow liquid

¹ Estimated based on the ratio between the size in the photo and the size of the actual container.² Since the samples were all taken from the surface of the tank waste, the settled solids were apparently once floating as well.

3.2 ANALYTICAL RESULTS

Analytical results and quality control (QC) results are provided in Appendix D. A separate discussion of the SVOA analytical analysis is included below.

3.2.1 Semivolatile Organic Analysis

Target analytes are those analytes that have been calibrated by GC/MS using a 5-point calibration curve with the known amounts of each analyte's standard. The tentatively identified compounds (TICs) are compounds whose spectra could not be identified against the National Institute of Standards and Technology mass spectral library or the compounds that are not calibrated against their known standard. Approximately 70 analytes were calibrated. Internal standards and surrogates were included in the QC including blank, laboratory control sample (LCS), duplicate, matrix spike (MS), and samples, in order to quantify and monitor the performance of analytes throughout the extraction, concentration steps, and GC/MS analysis. The following sections discuss the QC results and issues prior to reporting the SVOA results.

3.2.1.1 Surrogate Recovery

There were several unacceptable low acid surrogate recoveries (2-fluorophenol, phenol-d6, and 2,4,6-tribromophenol) in the samples and the associated MS samples, but the surrogate recoveries were acceptable in the blank and LCS. This pattern of the sample and associated MS failure of the surrogate recoveries indicated a matrix effect. The very low recoveries (almost completely eliminated) were due to “nitration” by the sample matrix. This is a known artifact of SVOA acid surrogates with Hanford tank samples. All other sample surrogates, as well as both the acid and base/neutral surrogates for the batch QC, passed the method criteria.

3.2.1.2 Method Blank

All analytes in the blank were below the detection limit.

3.2.1.3 Laboratory Control Sample Recovery

All target compounds were spiked into the LCS. As is typical, many of the LCS compounds were outside the administrative recovery limits (70% – 130%), but were within the statistical control limits, except 1,4 dichlorobenzene (12% recovery, Limit 20% - 78%) due to its higher volatility. The integrity of standard used for the LCS was verified and was found to be within the acceptable limits of 70% - 130% recovery. The low recovery of 1,4-dichlorobenzene was due to losses from the extraction and concentration steps, not from the standard used.

3.2.1.4 Matrix Spike Recovery

Phenols and nitroaniline compounds recovered very low or not at all due to the effect of Hanford tank matrix. These compounds recovered normally in the LCS and un-extracted check standard. Several compounds showed very high MS recoveries including chrysene, di-n-octylphthalate, benzo[b]fluoranthene, benzo[k]fluoranthene, benzo[a]pyrene, indeno[1,2,3-cd]pyrene, dibenzo[a,h]anthracene, and benzo[g,h,i]perylene. The extremely low recovery of the associated internal standard caused the MS recovery results to be unusually high, and, therefore, unreliable. The aforementioned compounds in this paragraph were not present in the samples, except some phenols or nitrophenols.

3.2.1.5 Semivolatile Organic Results

Table 5 summarizes SVOA results including the target compounds and TICs for the three aqueous samples which were either from the top or from the center of the aqueous phase. Only three target analytes, tributyl phosphate (TBP), pentachlorophenol, and bis (2-ethylhexyl) phthalate, were present and at the level near the estimated quantitation limit (EQL). Bis (2-ethylhexyl) phthalate could be a contaminant during the analytical process. Acetic acid and other hydrocarbon-based compounds (e.g., butanoic acid, hexanoic acid, and heptanoic acid) were identified as TICs and were most likely the degradation products of the hydrocarbons that converted to the acid form due to methylene chloride extraction at low pH. Note that the

qualitative acetic results by GC/MS method were much lower than the acetate results determined by the IC (Table 7), possibly due to either low acetate solubility in methylene chloride or loss of acetate during concentration step after methylene chloride extraction.

There were another 15 to 23 unknown TICs (including a few nitrated surrogates). A further evaluation of their spectra was performed. A few more hydrocarbons-based compounds or compounds with speculative identification were identified and are shown in Table 5 and Appendices B and H. The majority of TICs were in the category of various short straight-chained or branched-chained hydrocarbons-based compounds (hydrocarbons in acidic form due to low pH methylene chloride extraction), indicating the presence of oil-based materials.

A C18 compound with one double bond at 16.76 min retention time (RT) was identified as either 9-octadecenoic acid or cis-vaccenic acid (an isomer of oleic acid) and was found in the top of the aqueous phase for both 1AN-16-01 (S16R000250) and 1AN-16-01B (S16R000261), but was not present in the center of the aqueous phase of 1AN-16-01 (S17R000012). Note that only the center of the 1AN-16-01 aqueous phase was analyzed for SVOA, but no SVOA was performed on 1AN-16-01B due to inadequate sample. 9-octadecenoic acid is the chemical name for oleic acid which is a degradation product of Quintolubric® 888 (see Introduction). Trimethylol propane (also named 1,3 propanediol, 2-ethyl, at 10.02 min RT), a degradation product of Quintolubric® 888 (see Introduction), was found in the center of the aqueous phase 1AN-16-01, but was not present in the top of the aqueous phase of 1AN-16-01 and 1AN-16-01B. A few TICs were present in the top of the aqueous phase, but were absent in the middle of the aqueous phase, e.g., TICs at RT 5.58, 6.08, 6.4 were only present in the top of the aqueous and TICs at RT 7.25 and 11.83 were present in the center of the aqueous phase, but were absent in the top of the aqueous phase.

The post corrosion sample 1AN-16-01A was heated at 77 °C for 100 days during the corrosion study; the TICs for RT greater than ~13.5 min, including the 9-octadecenoic acid, were not present in the top and the center of the aqueous phase of 1AN-16-01A (S17R00003 and S17R00002), but trimethylol propane was found in both aqueous samples. Both trimethylol propane and 9-octadecenoic acid were found in the settled solids (S17R000001, the only solids analyzed for SVOA). A few TICs were present in the settled solids, but were not found in the aqueous samples or vice versa. For example, the absence of straight- or branched-chain hydrocarbons in the settled solids was noted. In addition, a few TICs in the settled solids of post corrosion sample were methylated, but not in the aqueous samples. The complete evaluation report for SVOA analysis is provided in Appendices B and H.

3.2.2 Wet Chemistry

Density, free hydroxide, and pH were determined in two aqueous samples (1AN-16-01 and 1AN-16-01B) but not determined in the floating and settled solids due to inadequate samples for analysis. The aqueous sample had 1.197 and 1.194 g/mL density, 37.6 and 38.7 mg/mL (2.2 and 2.3 M) free hydroxide concentration, and pH >13 (Tables 6 and 7). No QC issues were found for wet chemistry results.

Table 5. Results of Semivolatle Analysis. (4 pages).

S16R000250 (1AN-16-01), Top of Aqueous Phase					S17R000012 (1AN-16-01), Center of Aqueous Phase					S16R000261 (1AN-16-01B), Top of Aqueous Phase				
Compounds	µg/L	Q ¹	RT min		Compounds	µg/L	Q ¹	RT min		Compounds	µg/L	Q ¹	RT min	
Tributyl phosphate	472	J ²	13.26		Tributyl phosphate	197	J ²	13.21		Tributyl phosphate	542	J ²	13.26	
Pentachlorophenol	978	J ²	14.4		Pentachlorophenol	266	J ²	14.31		Pentachlorophenol	<228	U ³	14.4	
2,4-Dinitrophenol	<180	U ³	na		2,4-Dinitrophenol	631	J ²	12.24		2,4-Dinitrophenol	<180	U ³	na	
bis(2-Ethylhexyl) phthalate	437	J ²	19.1		na	na	na	na		bis(2-Ethylhexyl) phthalate	<176	U ³	19.1	
Tentatively Identified Compounds (TIC)					Tentatively Identified Compounds (TIC)					Tentatively Identified Compounds (TIC)				
Acetic acid	2880	JNT ⁴	2.75	na	na	na	na	na	na	Acetic acid	1490	JNT ⁴	2.74	na
Trimethyl Oxirane ⁸	2370	JNT ⁴	2.93	na	na	na	na	na	na	na	na	na	na	na
Amylene Hydrate, 75-85-4	na	na	na	Amylene Hydrate	470	JNT ⁴	3.07	na	na	na	na	na	na	na
3-Methyl-2-butanone	860	JNT ⁴	3.23	na	na	na	na	na	na	3-Methyl-2-butanone	1770	JNT ⁴	3.23	na
2-Chloro-2-methyl butane	1520	JNT ⁴	3.3	na	na	0	na	na	na	2-Chloro-2-methyl butane	1600	JNT ⁴	3.30	na
Unknown 1, likely a hydrocarbon alcohol	2040	JNT ⁴	3.46	na	na	0	na	na	na	Unknown 2	2310	JNT ⁴	3.45	na
Unknown 2, co-eluted with the broad peak	4360	JNT ⁴	3.56	na	na	na	na	na	na	Unknown organic acid	na	na	na	na
Propanoic acid, 79-09-4	3000	JNT ⁴	3.62	Propanoic acid	3900	JNT ⁴	3.7	na	na	Propanoic acid	2380	JNT ⁴	3.6	na
na	na	na	na	na	na	na	na	na	na	Unknown 4	1240	JNT ⁴	3.97	na
Dichloronitro methane	780	JNT ⁴	4.22	na	na	na	na	na	na	na	na	na	na	na
Butanoic acid (107-92-6)	5910	JNT ⁴	4.62	Butanoic acid	7000	JNT ⁴	4.69	na	na	Butanoic acid	5720	JNT ⁴	4.59	na
na	na	na	na	na	na	na	na	na	na	Unknown 5	850	JNT ⁴	4.74	na

Table 5. Results of Semivolatile Analysis. (4 pages).

S16R000250 (1AN-16-01), Top of Aqueous Phase		S17R000012 (1AN-16-01), Center of Aqueous Phase		S16R000261 (1AN-16-01B), Top of Aqueous Phase	
Unknown 3, at least two compounds co-eluted	2650 JNT ⁴ 5.36	Unknown 1, a hydrocarbon, spectra similar to RT 5.47	3700 JNT ⁴ 5.33	Unknown 6	1230 JNT ⁴ 5.36
3-Methyl-3-nitrobut-1-ene (180-96-72)	4420 JNT ⁴ 5.51	3-Methyl-3-nitrobut-1-ene (180-96-72)	4600 JNT ⁴ 5.47	3-Methyl-3-nitrobut-1-ene (180-96-72)	2610 JNT ⁴ 5.50
Unknown 5	750 JNT ⁴ 5.58	na	na	Unknown 8	660 JNT ⁴ 5.58
Unknown 6, at least two compounds co-eluted, has pentanoic acid	3370 JNT ⁴ 5.68	Pentanoic acid	3400 JNT ⁴ 5.72	Unknown 9, at least two compounds co-eluted, has pentanoic acid	3410 JNT ⁴ 5.68
3-Methyl-3-nitrobut-1-ene (CAS 1809672)	2370 JNT ⁴ 5.90	3-Methyl-3-nitrobut-1-ene (CAS 1809672)	4300 JNT ⁴ 5.87	3-Methyl-3-nitrobut-1-ene (CAS 1809672)	1560 JNT ⁴ 5.90
Unknown 8, at least two compounds co-eluted	1090 JNT ⁴ 6.08	na	na	Unknown 11	1280 JNT ⁴ 6.08
Unknown 9, partially resolved peak, unknown hydrocarbon	900 JNT ⁴ 6.36	Unknown 5, a hydrocarbon	2600 JNT ⁴ 6.35	Unknown 12, partially resolved peak, unknown hydrocarbon	740 JNT ⁴ 6.36
meso-3,4-Hexanediol (623-55-2)	3870 JNT ⁴ 6.40	na	na	meso-3,4-Hexanediol (623-55-2)	2390 JNT ⁴ 6.40
Unknown 11, at least two compounds co-eluted	1260 JNT ⁴ 6.57	Unknown 6, spectra similar to RT 6.57	2500 JNT ⁴ 6.52	Unknown 14, at least two compounds co-eluted	1210 JNT ⁴ 6.57
Hexanoic acid, at least 3 compounds present	3200 JNT ⁴ 6.8	Unknown 7, spectra similar to RT 6.8 and 6.79	5300 JNT ⁴ 6.78	Hexanoic acid, at least 3 compounds present	3450 JNT ⁴ 6.79
Unknown 12, co-eluted with RT 6.80.	1140 JNT ⁴ 6.82	na	na	Unknown 15, co-eluted with RT 6.80.	860 JNT ⁴ 6.82
na	na	Unknown 8, split peak, present in other sample at RT 7.3	2400 JNT ⁴ 7.25	na	na
	na			na	na

Table 5. Results of Semivolatile Analysis. (4 pages).

S16R000250 (1AN-16-01), Top of Aqueous Phase	2570	JNT ⁴	7.87	S17R000012 (1AN-16-01), Center of Aqueous Phase	2000	JNT ⁴	7.83	S16R000261 (1AN-16-01B), Top of Aqueous Phase	2460	JNT ⁴	7.86
Heptanoic acid, possibly two compounds present				Unknown 9				Heptanoic acid, possibly two compounds present			
2,3,4-Trimethylpentane (565-75-3) or likely a branched hydrocarbon	3150	JNT ⁴	8.58	Unknown 10, only one peak present for RT 8.51 and 8.52				2,3,4-Trimethylpentane (565-75-3) or likely a branched hydrocarbon	2090	JNT ⁴	8.58
na	na	na	na	Unknown 11				na	na	na	na
Unknown 14	2130	JNT ⁴	8.73	na				Unknown 17	2130	JNT ⁴	8.73
A possible split peak, 2-Fluoro-6-nitrophenol (CAS 1526176) is possible, spectra consistent with octadecanoic acid at RT 8.91	4000	JNT ⁴	8.90	Octanoic Acid, 124-07-2 and co-eluting peaks. Nitrated surrogate also present				A possible split peak, 2-Fluoro-6-nitrophenol (CAS 1526176) is possible, spectra consistent with octadecanoic acid at RT 8.91	2990	JNT ⁴	8.90
na	na	na	na	Unknown 12				na	na	na	na
na	na	na	na	Unknown 13				na	na	na	na
Likely a straight chain hydrocarbon (Nonanoic acid, 112-05-0)	1250	JNT ⁴	9.89	na				Straight chain hydrocarbon (Nonanoic acid, 112-05-0)	3840	JNT ⁴	9.89
Unknown 16, at least three compounds co-eluted	1880	JNT ⁴	10.02	na				na	na	na	na
na	na	na	na	1,3-Propanediol, 2-ethyl, 77-99-6				na	na	na	na
Likely a fluorinated nitrophenol (2-Fluoro-4-nitrophenol, 403-19-0), a nitrated surrogate	1440	JNT ⁴	10.67	Similar to RT at 10.67				Fluorinated nitrophenol (2-Fluoro-4-nitrophenol, 403-19-0), a nitrated surrogate	1500	JNT ⁴	10.67

Table 5. Results of Semivolatle Analysis. (4 pages).

S16R000250 (1AN-16-01), Top of Aqueous Phase	S17R000012 (1AN-16-01), Center of Aqueous Phase			S16R000261 (1AN-16-01B), Top of Aqueous Phase		
na	na	na	Unknown 14, a hydrocarbon	na	na	na
Unknown 18, unknown organic	640	JNT ⁴	na	na	na	na
Unknown 19	1680	JNT ⁴	na, not present	Unknown 21	1790	JNT ⁴ 12.45
na	na	na	Azelaic acid	na	na	na
2,6-Dibromo-4-nitro phenol, nitrated surrogate	830	JNT ⁴	Not present	2,6-Dibromo-4-nitro phenol, nitrated surrogate	1240	JNT ⁴ 14.67
Unsubstituted straight-chained hydrocarbon acid (C ₁₈ H ₃₄ O ₂), possible 9-octadecenoic acid or cis-vaccenic acid (506-17-2)	780	JNT ⁴	Not present	Unsubstituted straight-chained hydrocarbon acid (C ₁₈ H ₃₄ O ₂), possible 9-octadecenoic acid or cis-vaccenic acid (CAS 506172)	410	JNT ⁴ 16.75
Unknown 21, same as RT 16.76	1380	JNT ⁴	Not present	Unknown 23, same as RT 16.76	550	JNT ⁴ 16.77
Sum ^{5,6,7,9}	64200		Sum ^{8,9}	Sum ^{5,6,9}	49700	

¹Q: Qualifier

²J: Estimated results. Concentration >the method detection limit, but <the estimated quantitation limit.

³U: Analytes were analyzed for, but were not detected, or were detected below the method detection limit.

⁴JNT: J is an "unknown" constituent reported for an organic analysis. N and T: Applied to compounds identified based on mass spectrometry library search. Tentatively identified compounds are not target compounds, and the results are only an estimate and not quantitative.

⁵The summation excluded compounds at retention time 3.3 min and 3.46 min. Compounds at 3.3 min and 3.46 min were found in the blank too.

⁶Compounds detected in the blank: 2122 µg/L at RT 3.3 min and 2837 µg/L at RT 3.46 min.

⁷Trimethyl oxirane might be a system artifact. The summation excluded trimethyl oxirane.

⁸Amylene hydrate was a stabilizer that was added to the methylene chloride extraction solvent. The summation excluded amylene hydrate.

⁹The summation excluded nitrated surrogates.

3.2.3 Percent of Weight Loss by Thermogravimetric Analysis

The percent weight loss curve (the TGA curves) for the aqueous samples at the top and at the middle of the aqueous phase showed evidence of at least two phases, the first phase below 120 °C, the second below 200 °C. The inflect point was at temperature ~63 °C for the first phase weight loss (largely water) and at ~112 - ~115 °C for the second phase weight loss, with a slower and smaller weight loss (~5%) from ~115 to ~200 °C (the less volatile and some bound water); see S16R000242 as an example (upper graph in Figure 5). The percent weight loss curve for the floating and settled solids showed a different pattern: the inflect temperature was at ~57 °C for the first phase and at ~106 - ~115 °C for the second phase. A larger weight loss (~15%) was noted from ~106 - ~170 °C, with a trace weight loss up to ~300 °C, see S16R000254 as an example (lower graph in Figure 5). The weight loss from ~115 to ~300 °C was due to the organic loss in the samples.

The weight loss curves of 1AN-16-01B floating solids and one settled solids sample shifted to a different temperature range: the inflect temperature was at 71 °C and 62 °C (S16R000252 and S16R000254 duplicate, respectively) for the first phase and at 141 °C and 119 °C for the second phase, which may be due to more iron-, nickel-, calcium-, and uranium-containing materials in these floating solids (1AN-16-01B, see Section 3.3.3).

A pattern and the percent weight loss similar to the aqueous weight loss curve were observed in the 1AN-16-01 floating solids (S16R000241). However, a pattern similar to the solids weight loss curve in its duplicate was also observed, indicating that aqueous was included during the TGA analysis for this floating solid sample (Appendix C).

The percent of weight loss by TGA is provided in Table 6. The mean percent weight loss for the top and the middle of the aqueous phase closely agreed. Excluding the percent weight loss of S16R000241 due to a sampling error for TGA analysis (see the paragraph above), the mean percent weight loss for the floating solids was not significantly different than the percent loss in the settled solids, 72.1% vs. 71.7% (Table 6).

The mean percent weight loss in the solids was less than in the aqueous samples, ~72% vs. ~80%. The difference between TGA values of aqueous and solids, ~8%, is less than might be expected due to the presence of significant amounts of interstitial fluid in the solids.

Although the weight loss, which is caused by the temperature increase up to 250 °C, is assumed to be the loss of free and bound water in the sample, the different weight loss curves between the aqueous and solids may reflect different decomposition of the sample (i.e., solids), and the weight loss due to the presence of organics could not be ruled out. No conclusion can be made regarding the difference in the water content between the floating solids and settled solids due to the small number of observations and difficulty of reproducible sampling technique for the solid samples.

The TGA weight loss curves are provided in Appendix C.

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Table 6. The Percent of Weight Loss by TGA.

Sample ID	Floating Solids	Settled Solids	Top of Aqueous Phase	Middle of Aqueous Phase
1AN-16-01	81.4	69.8	76.1	80.1
1AN-16-01, Duplicate	71.03	na	na	75.7
1AN-16-01B	73.2	70.6	86.5	81.6
1AN-16-01B, Duplicate	na	74.6	78.8	na
Mean	75.2	71.7	80.5	79.1
SD	5.5	2.6	5.4	3.1
Mean ¹	72.1	na	na	na
SD ¹	1.5	na	na	na

ID = identification

Na = not applicable

SD = standard deviation

¹ Excluded 1AN-16-01 floating solids % weight loss

3.3 OTHER CHEMICAL RESULTS

Anions, small organic acids, TIC/TOC, metals, and elements results in the floating solids, aqueous, and settled solids are summarized in Table 7. Comparison of analyte concentrations between the floating solids, the settled solids, and the aqueous phase is provided in Section 3.3.7.

3.3.1 Anions and Small Organic Acid

The majority of QC results were within the acceptable range, except that the continuing calibration blank (CCB), preparation blank, and MS exceeded acceptance criteria in the batch for the floating and settled solids. Thus, applicable qualifiers are flagged with these results (Table 7).

Phosphate concentrations in both solids were much higher (ranging from 11 to 55 mg/g) than in the aqueous samples ~1.6 mg/g (~1.9 mg/mL with 1.197 – 1.194 g/mL density). Fluoride concentrations varied among aqueous, floating, and settled solids, ranging from ~1.8 mg/g (2.1 mg/mL) - 6.9 mg/g. Fluoride also showed higher concentrations in both solids than in the aqueous samples.

Both nitrate and nitrite had similar concentration levels in the aqueous samples, ~25 mg/g (~30 mg/mL) for nitrate and ~14 mg/g (~16.6 mg/mL) for nitrite. Nitrate concentrations ranged from 23 mg/g to 27 mg/g in the floating solids and from 18 to 21 mg/g in the settled solids. The nitrite concentration ranged from 13 to 15 mg/g in the floating solids and 10 to 12 mg/g in the settled solids. Both nitrate and nitrite concentrations were generally higher in the aqueous than in both solids.

Sulfate concentration was similar in the aqueous samples and was higher in the floating solids than in the corresponding settled solids, ~1.7 mg/g (~2 mg/mL) in the aqueous, 1.6 – 1.9 mg/g in

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the floating solids, and 1.3 – 1.5 mg/g in the settled solids. A low level of thiosulfate was found in the 1AN-16-01 floating solids and in the 1AN-16-01B settled solids.

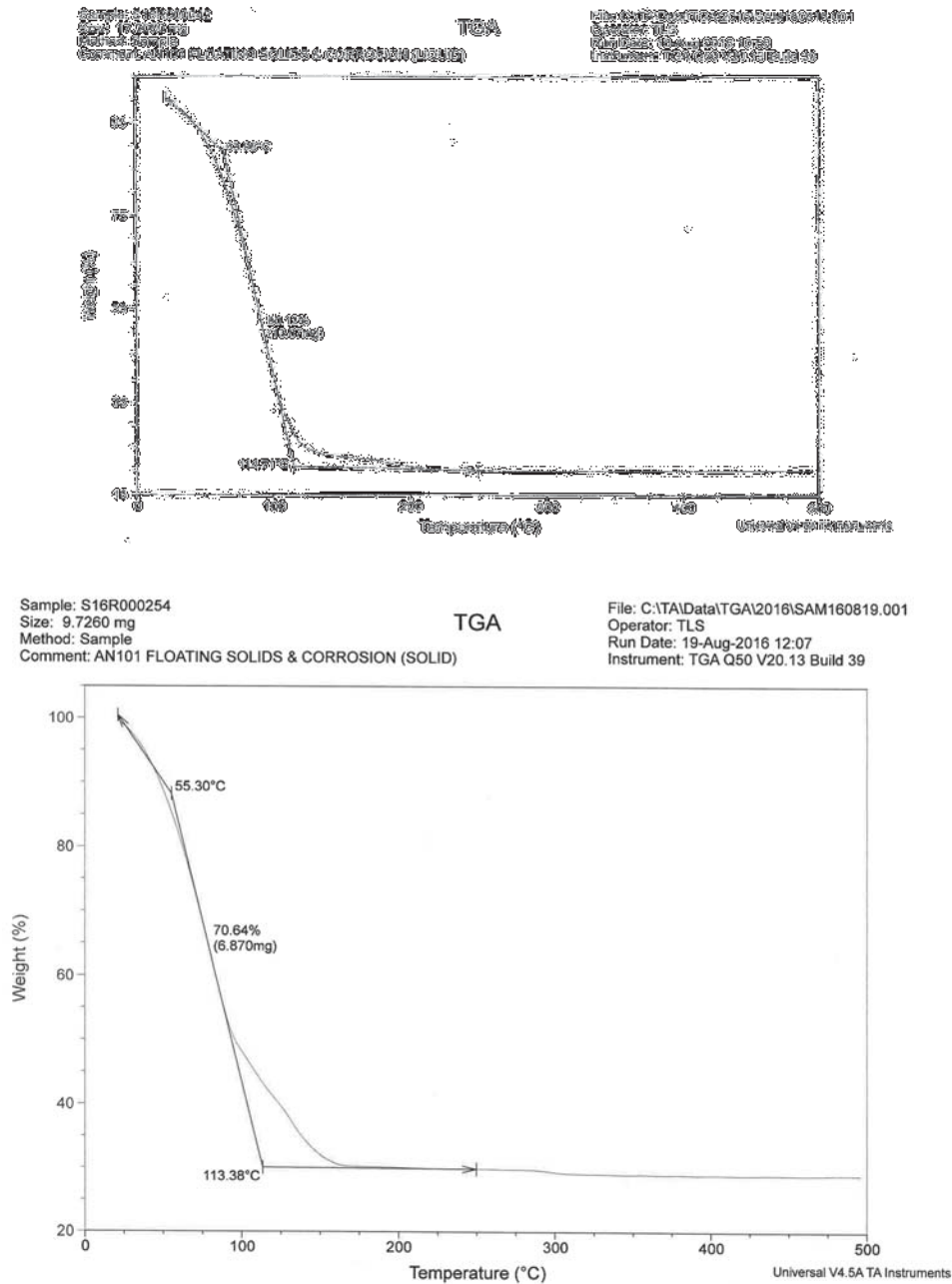


Figure 5. Typical Weight Loss Curve by TGA for the Middle of Aqueous Sample 1AN-16-01 (Upper Graph, S16R000242) and for Settled Solids of 1AN-16-01B (Bottom Graph, S16R000254).

The phosphate to phosphorus concentration ratio, where a value of 3.07 assumed all phosphorus was from phosphate, ranged from 1.78 to 4.71 in both solids and 3.30 to 3.67 in the aqueous samples, indicating more reliable phosphate and phosphorus results in the aqueous samples (Table 7). The wider range of the ratio in the solids may be caused by some unknown analytical error, however, the IC chromatograms did not reveal any apparent error. Quintolubric® 888 contained trace amounts of phosphorus additive, which may explain the lower ratio in the 1AN-16-01B sample, but cannot explain the higher ratio in 1AN-16-01. The phosphorus in 1AN-16-01 may have originated from some non-phosphate salt. The sulfate to sulfur ratio, which should have a value of 3.00, ranged from 2.26 to 3.00 in both solids and was 2.66 to 2.72 in the aqueous samples. The sulfate to sulfur ratio was lower in both solids of 1AN-16-01 than in 1AN-16-01B.

Concentrations of small organic acids (oxalate, acetate, and formate) were in the range of ~0.3 mg/g to ~0.6 mg/g (~0.7 mg/mL) for both aqueous and solids samples. Their values for these three organic acids were estimated as the values were less than or near the quantitation limits. Similar concentrations were observed in the top and the middle of aqueous phase samples for the three small organic acids, ~0.3 mg/mL for formate, ~0.5 mg/mL for acetate, and ~0.68 mg/mL for oxalate. The concentrations of these three small organic acids were slightly higher in the floating solids than in the corresponding settled solids.

3.3.2 Total Inorganic Carbon / Total Organic Carbon

The relative percent difference (RPD) for TOC in the floating solids and its duplicate of 1AN-16-01 (S16R000241) was 76%, 8.24 and 18.3 mg/g for an average of 13.3 mg/g (see Appendix D and Table 7). Recovery of pre-digestion MS was 153% due to the wide variation of TOC concentrations (Appendix D). The TOC concentration was ~5 – ~10X higher in both solids than in the aqueous samples, and it was slightly higher in the floating solids than in the corresponding settled solids, 8.5 to 13.3 mg/g in the floating and 6.3 to ~10.3 mg/g in the settled solids. Similar TOC concentrations between the top and the middle of the aqueous phase were observed, mean 0.92 mg/g (1.11 mg/mL) (much less than in both solids).

The sum of carbons from the small organic acids (SOAC) were ~3 to ~6% of the TOC in the floating and in the settled solids, indicating that the majority of organic carbons in TOC were contributed by other organic species, e.g., hydrocarbons-based compounds (Table 7). The percentage of the total SOAC to TOC was slightly lower in the floating solids than in its corresponding settled solids, indicating a higher concentration of other organic species in the floating solids. The sums of SOAC in the aqueous samples and in both solids were in a similar range, ~0.39 mg/g (~0.47 mg/mL) (Table 7). However, the percentage of the sum of SOAC to TOC was much higher in the aqueous samples than in the solids, ~43% vs. ~3 to ~6%, indicating the larger contribution of hydrocarbons in the floating solids and less TOC in the aqueous samples.

The mean of the TIC concentrations was 3.55 mg/g in both solids and 3.6 mg/g (the mean 4.3 mg/mL) in both aqueous samples. Concentration of TIC was slightly higher in the floating solids than in its corresponding settled solids.

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Table 7. Results of Chemical Analyses (2 pages).

Analyte	Floating Solids S16R000 241 1AN-16- 01	Floating Solids S16R000 252 1AN-16- 01B	Settled Solids S16R000 243 1AN-16- 01	Settled Solids S16R000 254 1AN-16- 01B	Aqueous Phase S16R000 242 1AN-16- 01	Aqueous Phase S16R000 253 1AN-16- 01B	Top of Aqueous Phase S16R000 244 1AN-16- 01	Top of Aqueous Phase S16R000 255 1AN-16- 01B
Analyte	mg/g	mg/g	mg/g	mg/g	mg/mL	mg/mL	mg/mL	mg/mL
Sodium	90.8	97.5	104	99.4	100	96.7	nd	nd
Phosphate	17.3	11.2 ³	55.3	28.4	1.78	1.94	1.66	1.77
Nitrate	22.6	27.4 ⁴	18.2	21.2	29.2	29.4	29.9	29.6
Nitrite	12.6	15.3	10.2	11.8	16.4	16.5	16.7	16.6
TOC	13.3 ^{3,5}	8.5	10.3	6.25	1.11	1.1	1.12	1.09
Aluminum	8.43	10.6	8.32	9.08	8.74	8.47	nd	nd
Phosphorus	3.67	6.29	12.7	11.2	0.54	0.53	nd	nd
TIC	3.52	3.66	3.37	3.38	4.31	4.26	4.36	4.3
Fluoride	3.29	2.97 ³	6.9	4.3	2.12	2.15	2.15	2.15
Sulfate	1.57 ¹	1.88 ¹	1.3 ^{1,2}	1.48 ¹	2.05	2.07	2.09	2.07
Iron	0.77	2.06	1.16	1.65	0.069 ²	0.068 ²	nd	nd
Nickel	0.691	2.06	1.13	1.57	0.006 ²	0.005 ²	nd	nd
Sulfur	0.64 ¹	0.63 ¹	0.57 ¹	0.57 ¹	0.77	0.76	nd	nd
Uranium by ICP-AES	0.339 ²	0.971	0.568 ²	0.731	<0.029	<0.029	nd	nd
Thiosulfate	0.268 ²	<0.024	<0.024	0.255 ²	<0.009	<0.009	<0.009	<0.009
Calcium	0.646 ^{1,2}	1.77 ^{1,2}	1.1 ^{1,2}	1.44 ^{1,2}	<0.12	<0.12	nd	nd
Potassium	0.386 ^{1,2}	0.358 ^{1,2}	0.321 ^{1,2}	0.298 ^{1,2}	0.439	0.428	nd	nd
Silicon	0.302 ¹	0.506 ¹	0.35 ¹	0.421 ¹	0.080 ^{1,2}	0.081 ²	nd	nd
Chromium	0.072 ¹	0.075 ¹	0.065 ¹	0.066 ¹	0.084	0.082	nd	nd
Strontium	0.0073 ²	0.021 ²	0.012 ²	0.018 ²	<0.002	<0.002	nd	nd
Manganese	0.0031 ²	0.0076 ²	0.0047 ²	0.0069 ²	<0.001	<0.001	nd	nd
Chloride	0.401 ¹	0.484 ¹	0.335 ¹	0.394 ¹	0.533	0.536	0.548	0.542
Oxalate	0.473 ^{1,2}	0.568 ^{1,2}	0.387 ^{1,2}	0.44 ^{1,2}	0.67	0.675	0.683	0.681
Acetate	0.412 ^{1,2}	0.482 ^{1,2}	0.334 ^{1,2}	0.413 ^{1,2}	0.504	0.508	0.516	0.51
Formate	0.357 ^{1,2}	0.389 ^{1,2}	0.321 ^{1,2}	0.344 ^{1,2}	0.3 ²	0.303 ²	0.305 ^{1,2}	0.304 ^{1,2}
Sum of SOAC	0.392	0.455	0.327	0.38	0.468	0.472	0.477	0.474
Sum of SOAC /TOC ⁶ , %	2.9	5.3	3.2	6.1	42.1	42.9	42.6	43.5
%H ₂ O	76.2	73.2	69.8	72.6	77.9	81.6	76.1	82.6
Density, g/mL	nd	nd	nd	nd	1.197	1.194	nd	nd
Phosphate / phosphorus	4.71	1.78	4.35	2.54	3.30	3.67	--	--
Sulfate / Sulfur	2.45	3.00	2.26	2.59	2.66	2.72	--	--

¹ B Flag: method/preparation blank exceeded the specified criteria

Table 7. Results of Chemical Analyses (2 pages).

Analyte	Floating Solids	Floating Solids	Settled Solids	Settled Solids	Aqueous Phase	Aqueous Phase	Top of Aqueous Phase	Top of Aqueous Phase
	S16R000	S16R000	S16R000	S16R000	S16R000	S16R000	S16R000	S16R000
	241	252	243	254	242	253	244	255
	1AN-16-01	1AN-16-01B	1AN-16-01	1AN-16-01B	1AN-16-01	1AN-16-01B	1AN-16-01	1AN-16-01B

² J Flag: result >method detection limit, but <the estimated quantitation limit

³ b Flag: failed pre-digestion spike high

⁴ b Flag: failed pre-digestion spike low

⁵ b Flag: relative percent difference >20%

⁶ Sum of SOAC/TOC: The percentage of the sum of acetate-carbon, formate-carbon, and oxalate-carbon / TOC

nd: Not determined due to inadequate solid sample

3.3.3 Metals and Elements

Calcium, chromium, potassium, silicon, and sulfur were detected in the preparation blank, at the level of <EQL but >5% of the sample results; therefore, a B flag was applied (Table 7). The recovery of pre-digestion MS for aluminum, phosphorus, and sodium was high, but was not flagged due to a much higher concentration of these elements in the sample relative to the spike level.

Sodium was the largest constituent compared to other analytes for all floating and settled solids and aqueous samples, ranging from the mean 82 mg/g (the mean 98 mg/mL) in aqueous and from 91 mg/g to 104 mg/g for solids. Aluminum had slightly higher concentration in the solids than in the aqueous samples, ranging from 8.3 - 10.6 mg/g in solids and the mean 7.2 mg/g (the mean 8.6 mg/mL) in the aqueous phase. Phosphorus concentrations ranged from 3.7 - 12.7 mg/g and were much higher in the settled solids than in the floating solids. The phosphorus concentration in the aqueous sample, the mean 0.45 mg/g (0.53 mg/mL), was much lower than in the solids.

Calcium, iron, nickel, and uranium were much higher (~3X higher) in the floating solids of 1AN-16-01B than in the floating solids of 1AN-16-01. The concentrations of these four analytes ranged from 0.97 mg/g for uranium (by ICP-AES) to 2.1 mg/g for iron and nickel in the 1AN-16-01B floating solids while they ranged from 0.34 mg/g for uranium to 0.77 mg/g for iron in the floating solids of 1AN-16-01. The concentrations of these four analytes were slightly higher in the floating solids than in the corresponding settled solids and were either a non-detect (for calcium and uranium) or found at a low level (iron and nickel) in the aqueous samples.

Sulfur and potassium were in the range of ~0.6 mg/g (sulfur) to ~0.35 mg/g (potassium) in the floating and settled solids. Similar concentrations for sulfur and potassium were observed in the aqueous samples, with an average of 0.64 mg/g (the mean 0.77 mg/mL) for sulfur and an average of 0.36 mg/g (the mean 0.43 mg/mL) for potassium. Chromium, strontium, and manganese concentrations were less than 0.1 mg/g. Since the solids were acid digested for the ICP-AES analysis, low silicon values were expected.

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3.3.4 $^{89/90}\text{Sr}$

The concentration of $^{89/90}\text{Sr}$ (expressed as $\mu\text{Ci/g}$ or $\mu\text{Ci/mL}$) was much higher in the floating and in the settled solids than in the aqueous phase (Table 8). Only a trace amount of $^{89/90}\text{Sr}$ was found in the aqueous phase (mean $0.064 \mu\text{Ci/g}$ or mean $0.077 \mu\text{Ci/mL}$). The concentration of $^{89/90}\text{Sr}$ was much higher in the floating solids of 1AN-16-01B than in the floating solids of 1AN-16-01, 107 vs. $45 \mu\text{Ci/g}$, a ~ 2.3 factor higher, which is similar to the higher concentrations of calcium, iron, nickel, and uranium in 1AN-16-01B. The concentration of $^{89/90}\text{Sr}$ was $68 \mu\text{Ci/g}$ in the settled solids of 1AN-16-01B and $50 \mu\text{Ci/g}$ in 1AN-16-01. Quality control results were all acceptable.

3.3.5 ^{99}Tc

The ^{99}Tc concentration ranged from 0.74 to $0.84 \mu\text{g/g}$ in solids and had a mean $0.85 \mu\text{g/g}$ or $1.01 \mu\text{g/mL}$ in the aqueous phase (Table 8). The concentration of ^{99}Tc in the floating solids was slightly higher than in the settled solids. There were no QC issues.

Table 8. Results of Strontium-89/90, Technetium-99, and Actinides.

Analyte	Floating Solids 1AN-16-01	Floating Solids 1AN-16-01B	Settled Solids 1AN-16-01	Settled Solids 1AN-16-01B	Center of Aqueous Phase 1AN-16-01	Center of Aqueous Phase 1AN-16-01B
$^{89/90}\text{Sr}$, $\mu\text{Ci/g}$ or $\mu\text{Ci/mL}$	44.9	107	50.2	67.7	0.0724	0.0812
^{99}Tc , $\mu\text{g/g}$ or $\mu\text{g/mL}$	0.817	0.836	0.77	0.741	0.988	1.04
^{232}Th , $\mu\text{g/g}$ or $\mu\text{g/mL}$	<0.638	$1.41^{2,4}$	<0.639	$1.84^{2,4}$	<0.0016	<0.0016
^{242}Pu , $\mu\text{g/g}$ or $\mu\text{g/mL}$	<0.0258 ¹	<0.0258 ¹	<0.0258 ^{1,5}	<0.0259 ¹	<0.0013	<0.0013
^{233}U , $\mu\text{g/g}$ or $\mu\text{g/mL}$	<0.01 ^{6,7}	<0.01 ^{6,7}	<0.01 ^{6,7}	<0.01 ^{6,7}	<0.00025	<0.00025
^{234}U , $\mu\text{g/g}$ or $\mu\text{g/mL}$	<0.107 ³	$0.215^{3,5}$	<0.107 ³	0.147^3	<0.0011 ^{3,4}	<0.0011 ³
^{235}U , $\mu\text{g/g}$ or $\mu\text{g/mL}$	2.53^6	7.2^6	4.25^6	5.94^6	0.0285	0.028
^{236}U , $\mu\text{g/g}$ or $\mu\text{g/mL}$	<0.107 ³	$0.163^{3,5}$	0.136^3	<0.107 ³	<0.0011 ³	<0.0011 ³
^{238}U , $\mu\text{g/g}$ or $\mu\text{g/mL}$	399	1040	667	860	4.42	4.21
^{237}Np , $\mu\text{g/g}$ or $\mu\text{g/mL}$	0.0102^8	0.0288^8	0.0148^8	0.0264^8	0.000129^8	0.000181^8

¹ Pre-digestion spike high, 176%; all instrument quality control passed

² BJ; B: initial and continuing calibration blanks >minimum detection limit (MDL) but <estimated quantitation limit (EQL); J: >MDL but <EQL

³ IJ; I : indirect; based on ^{235}U calibration curve for quantitation; J: >MDL but <EQL; or IU: I: Indirect and U <MDL

⁴ B Flag: method/preparation blank exceeded the specified criteria

⁵ Duplicate was a non detect or vice versa

⁶ a flag: laboratory control sample outside range

⁷ b flag: matrix spike outside range

⁸ J:>MDL but <EQL

3.3.6 Actinides

Thorium-232 was detected in the initial calibration blank (ICB) and CCB and was flagged (Table 8). The higher recovery of pre-digested ^{242}Pu and a non-detect in the duplicates of each ^{234}U and ^{236}U warranted a flag. Actinides in aqueous phase was either non-detect (^{242}Pu , ^{232}Th , ^{233}U , ^{234}U , and ^{236}U) or at a very low concentration level, e.g., $\sim 4 \mu\text{g/mL}$ ^{238}U , $\sim 0.028 \mu\text{g/mL}$ ^{235}U , and $\sim 0.00015 \mu\text{g/mL}$ ^{237}Np . The highest actinide concentration was in ^{238}U , ranging from 399 – 1040 $\mu\text{g/g}$ in solids. The concentration of ^{235}U was much lower, ranging from 2.5 – 7.2 $\mu\text{g/g}$. The concentration of the sum of ^{235}U and ^{238}U closely agreed with the uranium by ICP-AES (Table 7). The sum of both uranium results was used for the mass balance calculation.

3.3.7 Comparison between Floating and Settled Solids

Similar compositions were found in the floating and settled solids, however, the concentrations of some constituents were different between these two solids.

Table 9 lists the ratio of analyte concentration between the floating solids and the settled solids, between the aqueous and the floating solids, and between the aqueous and the settled solids. If the ratio value is less than one between the floating solids and the settled solids, it indicates the analyte in the floating solids is less than in the settled solids.

Phosphate and fluoride concentrations were much lower in the floating solids than in the settled solids, 30 – 70% of the settled solids, for both 1AN-16-01 and 1AN-16-01B. In contrast, TOC was ~ 30 – 40% higher in the floating solids than in the settled solids. Small organic acids, sulfate, nitrate, and nitrite were also found at higher concentrations in the floating solids than in the settled solids. Aluminum, ^{99}Tc , TIC, and chromium were slightly higher in the floating solids or at a similar level in both solids. Constituents in the floating solids had some variations between 1AN-16-01 and 1AN-16-01B, such as $^{89/90}\text{Sr}$, ^{238}U , iron, calcium, and nickel, thus, there was no consistent pattern for these elements.

The ratio of aqueous to solids for calcium, iron, nickel, $^{89/90}\text{Sr}$, and uranium was less than or near 0.01 indicating these elements remained in the floating or settled solids, but not in the aqueous phase. The ratio of aqueous to solids for phosphate (phosphorus), fluoride, and TOC was less than 1, indicating these analytes are more concentrated in the solids. The ratio of aqueous to solids for sodium and aluminum was near 1. The ratios of aqueous to floating or settled solids for nitrate, nitrite, sulfate, and the small organic solids were higher in the aqueous-to-floating solids than in the aqueous-to-settled solids ratio and are more concentrated in the aqueous phase. Further evaluation is presented in Section 6 of this report.

The last two columns in Table 9 are the ratio of analyte concentration in the floating solids to the aqueous phase for 1AN-16-01 and 1AN-16-01B. The ratios for phosphorus, phosphate, uranium, nickel, $^{89/90}\text{Sr}$, iron, TOC, silicon, and fluoride are greater than one. The ratios for sodium, aluminum, and formate are near one. The ratios for sulfur and the majority of anions, and small organic acids (excluding formate) are slightly less than one.

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Table 9. Ratio of Analyte Concentration in Floating Solids and in Settled Solids and Ratio of Analyte Concentration in Aqueous and in Solids.

Analyte	Floating Solids / Settled Solids		Aqueous / Floating	Aqueous / Settled	Aqueous / Floating	Aqueous / Settled	Floating Solids / Aqueous	
	1AN-16-01	1AN-16-01B	1AN-16-01		1AN-16-01B		1AN-16-01	1AN-16-01B
Phosphorus	0.3	0.6	0.15	0.04	0.08	0.05	6.8	11.9
Phosphate	0.3	0.4	0.10	0.03	0.17	0.07	9.7	5.8
Fluoride	0.5	0.7	0.64	0.31	0.72	0.50	1.6	1.4
Calcium	0.6	1.2	na	na	na	na	na	na
Uranium	0.6	1.3	na	na	na	na	na	na
²³⁸ U	0.6	1.2	0.011	0.007	0.004	0.005	90	247
Strontium	0.6	1.2	na	na	na	na	na	na
Nickel	0.6	1.3	0.009	0.005	0.002	0.003	115	412
Manganese	0.7	1.1	na	na	na	na	na	na
Iron	0.7	1.2	0.09	0.06	0.03	0.04	11.2	30.4
Silicon	0.9	1.2	0.26	0.23	0.16	0.19	3.8	6.2
Sodium	0.9	1.0	1.10	0.96	0.99	0.97	0.9	1.0
^{89/90} Sr	0.9	1.6	0.002	0.001	0.001	0.001	620	1319
Aluminum	1.0	1.2	1.04	1.05	0.80	0.93	1.0	1.3
TIC	1.0	1.1	1.22	1.28	1.16	1.26	0.8	0.9
⁹⁹ Tc	1.1	1.1	1.21	1.28	1.24	1.40	0.8	0.8
Chromium	1.1	1.1	1.16	1.28	1.09	1.24	0.9	0.9
Formate	1.1	1.1	0.84	0.93	0.78	0.88	1.2	1.3
Sulfur	1.1	1.1	1.20	1.34	1.21	1.33	0.8	0.8
Chloride	1.2	1.2	1.33	1.59	1.11	1.36	0.8	0.9
Sulfate	1.2	1.3	1.31	1.58	1.10	1.40	0.8	0.9
Oxalate	1.2	1.3	1.42	1.73	1.19	1.53	0.7	0.8
Acetate	1.2	1.2	1.22	1.51	1.05	1.23	0.8	0.9
Nitrite	1.2	1.3	1.30	1.61	1.08	1.40	0.8	0.9
Nitrate	1.2	1.3	1.29	1.61	1.07	1.38	0.8	0.9
TOC	1.3	1.4	0.08	0.11	0.13	0.18	12.0	7.7

4 SOLID PHASE CHARACTERIZATION

For this study, we examined the two floating solids and two settled solids for samples 1AN-16-01 and 1AN-16-01B. The PLM, SEM/EDS, and XRD reports are provided in Appendices E, F, and G and are summarized in this section.

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4.1 SUMMARY OF POLARIZED LIGHT MICROSCOPY

A few bubbles were seen on two slides prepared from the floating solids (1AN-16-01, S16R000241). A few more air bubbles were noted in S16R000252 (1AN-16-01B, floating solids). Only trace amount of bubbles were observed.

The floating solids from both samples consisted of a yellow liquid with brown and white solids. The white solids resembled round sesame seeds or small grains. There were predominantly more brown solids than white solids, but both types of solids did float in the liquid portion of the sample.

The white solids in the floating solids (1AN-16-01) prepared in mother liquor contained unknown crystals (which were most likely organic in nature based on the fact that they float) and isotropic crystals (which were suspected to be natrophosphate) (Figure 6). The majority of particulates were coated with organic material as shown in the yellow squares in Figure 7.

Settled solids (S16R000243, 1AN-16-01) contained more natrophosphate than the samples with floating solids, particulates which were thought to comprise either metals (possibly iron, nickel, and/or chromium) or organic material, a few unknown anisotropic crystals (which are suspected to be gibbsite based on SEM and XRD data), and very few air bubbles (Figure 8). Similar settled solids were found in 1AN-16-01 (S16R000243) and 1AN-16-01B (S16R000254).

Natrophosphate and gibbsite identified in the floating solids appeared to be aggregated and surrounded with organics (Figure 7). More natrophosphate was found in the settled solids with less organics and also with the presence of iron, nickel, and/or chromium (Figure 8).

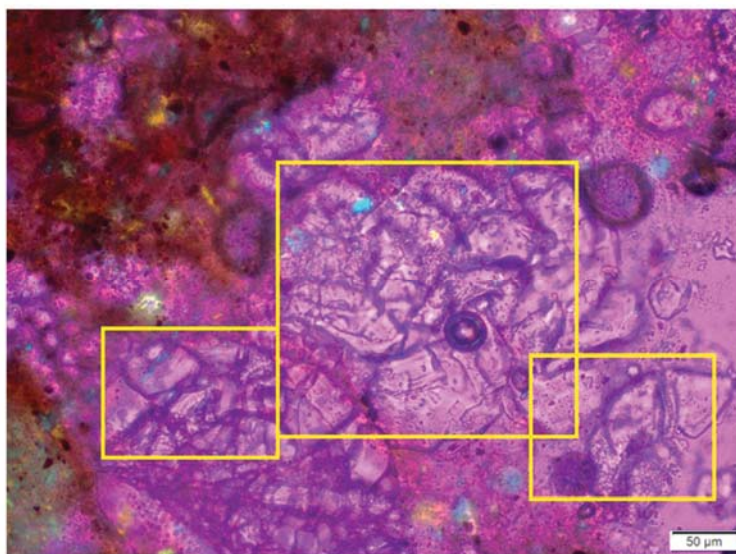


Figure 6. Photo S16R000241d (Floating Solids), Showing Suspect Natrophosphate Isotropic Crystals (Yellow Squares). Black Circle is an Air Bubble.

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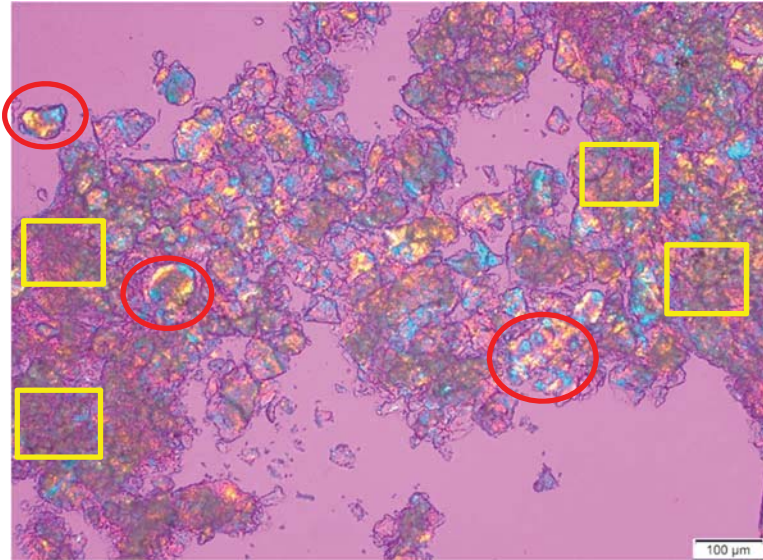


Figure 7. Photo S16R000241i (Floating Solids), Overview Showing the Majority of Particulates Coated with Organic Material (Yellow Squares as Examples) and Low Birefringent Crystals (Red Circles).

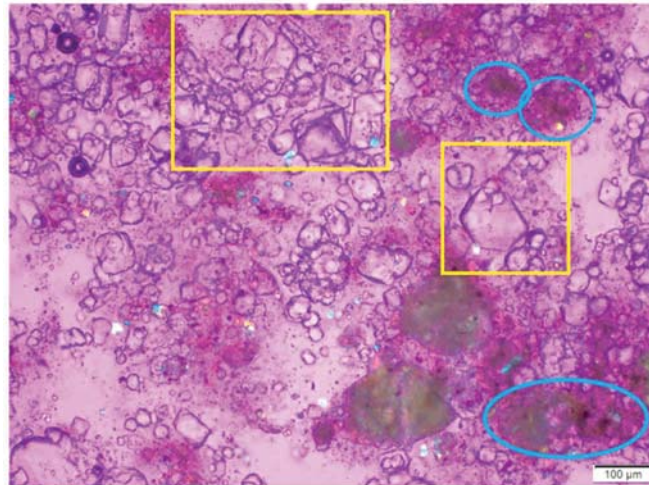


Figure 8. Photo S16R000243a (Settled Solids), Showing Natrophosphate Isotropic Crystals (yellow rectangles) and Particulate Coated with Organic Material (blue circles). Black Circles are Air Bubbles.

4.2 SUMMARY OF SCANNING ELECTRON MICROSCOPE AND ENERGY DISPERSIVE SPECTROSCOPY

Natrophosphate [$\text{Na}_7\text{F}(\text{PO}_4)_2 \cdot 19\text{H}_2\text{O}$], gibbsite [$\text{Al}(\text{OH})_3$], thermonatrite [$\text{Na}_2\text{CO}_3 \cdot \text{H}_2\text{O}$] or natroxalate ($\text{Na}_2\text{C}_2\text{O}_4$), calcium- and phosphate-rich materials, iron- and nickel-containing material, calcium- and silicon-containing materials, and a low level of uranium-containing

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material were present in the floating solids of 1AN-16-01 and 1AN-16-01B (S16R000241 and S16R000252).

The same set of solid phases was present in the settled solids of 1AN-16-01 (S16R000243) and 1AN-16-01B (S16R000254). Etched gibbsite was seen by SEM, indicating that samples were exposed in a caustic environment. Figures 9 to 13 are photos of SEM and EDS for the floating and settled solids.

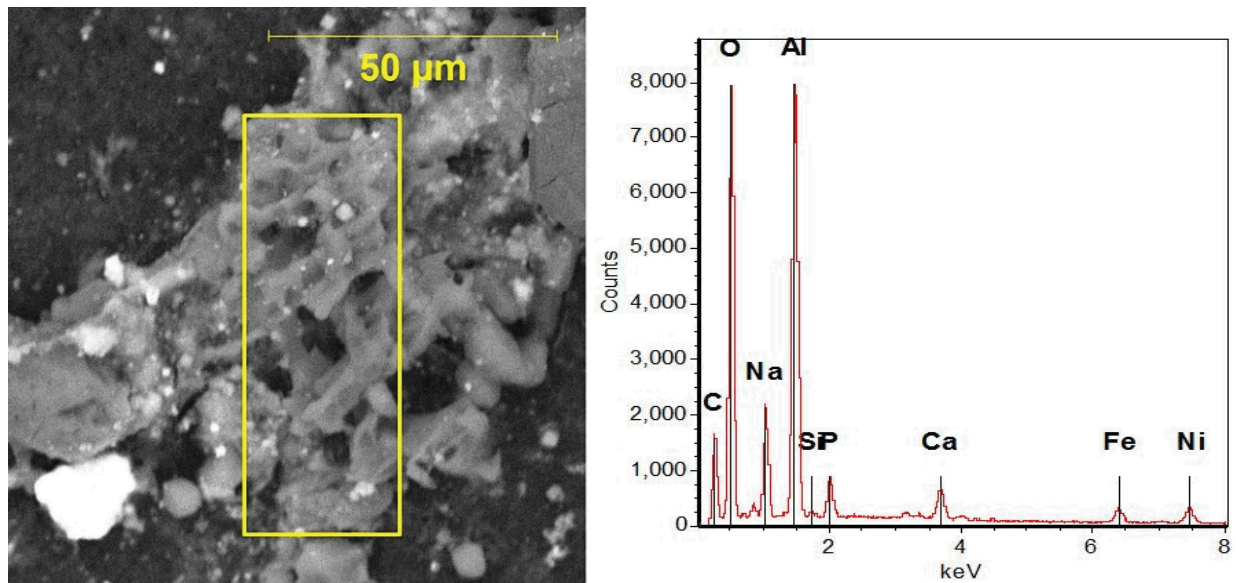


Figure 9. S16R000241 1a/1b (Floating Solids); Area-Scan of Etched Gibbsite Particle; Natrophosphate in Upper Right Corner. The Large Bright Chunk in the Bottom Left is Uranium.

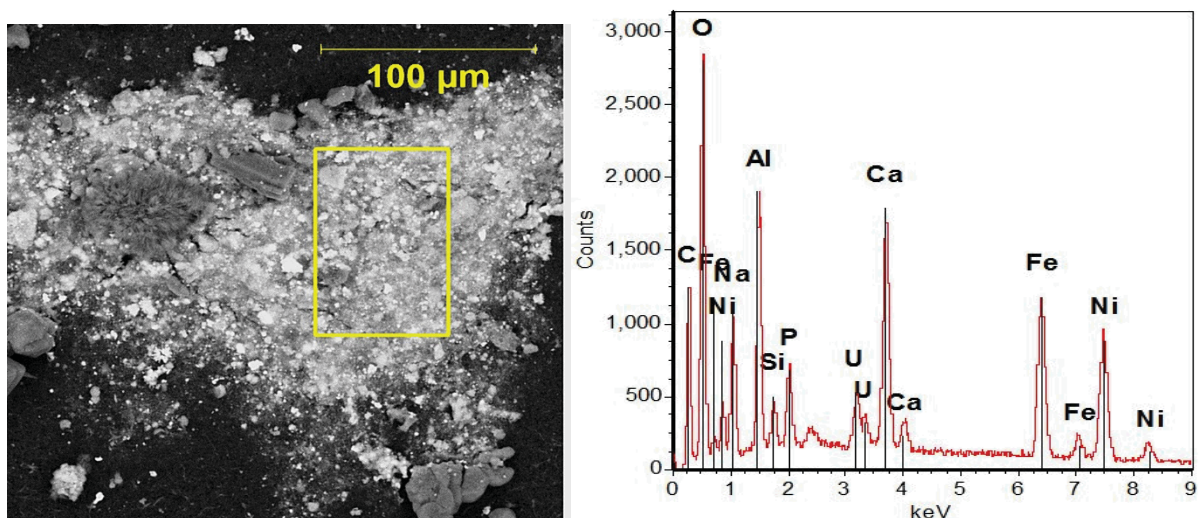


Figure 10. S16R000241 2a/2b (Floating Solids); Area-Scan; The Dark Aggregate of Radiating Needles is Thermonatrite. The Other Dark Particle is Gibbsite.

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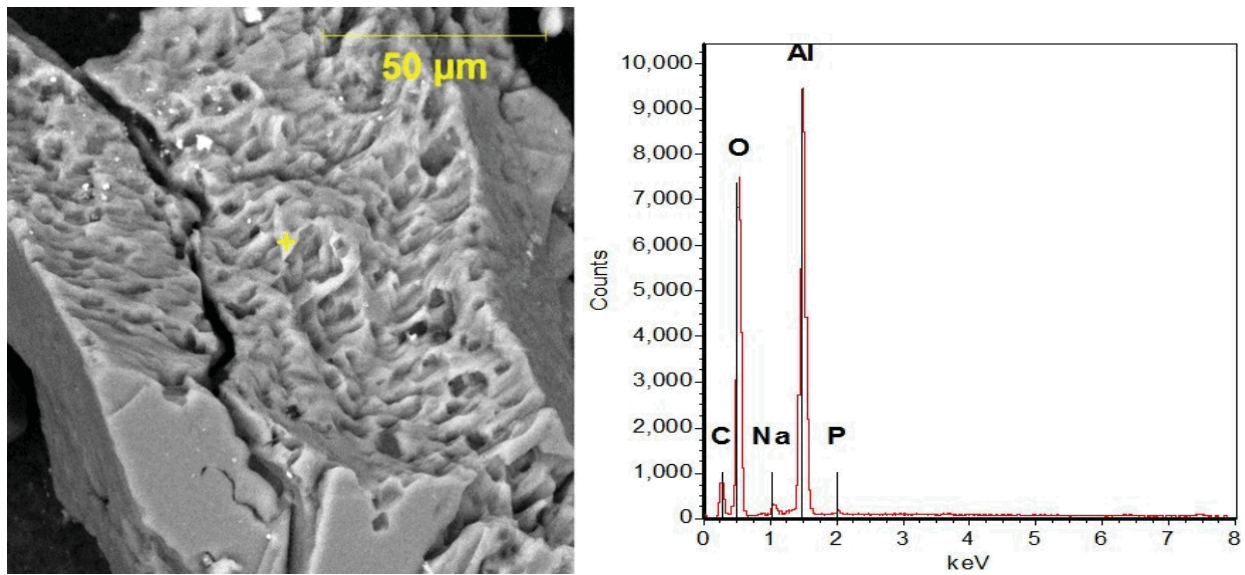


Figure 11. S16R000241 3/3b (Floating Solids); EDS from a Spot Marked with +; Etched Gibbsite.

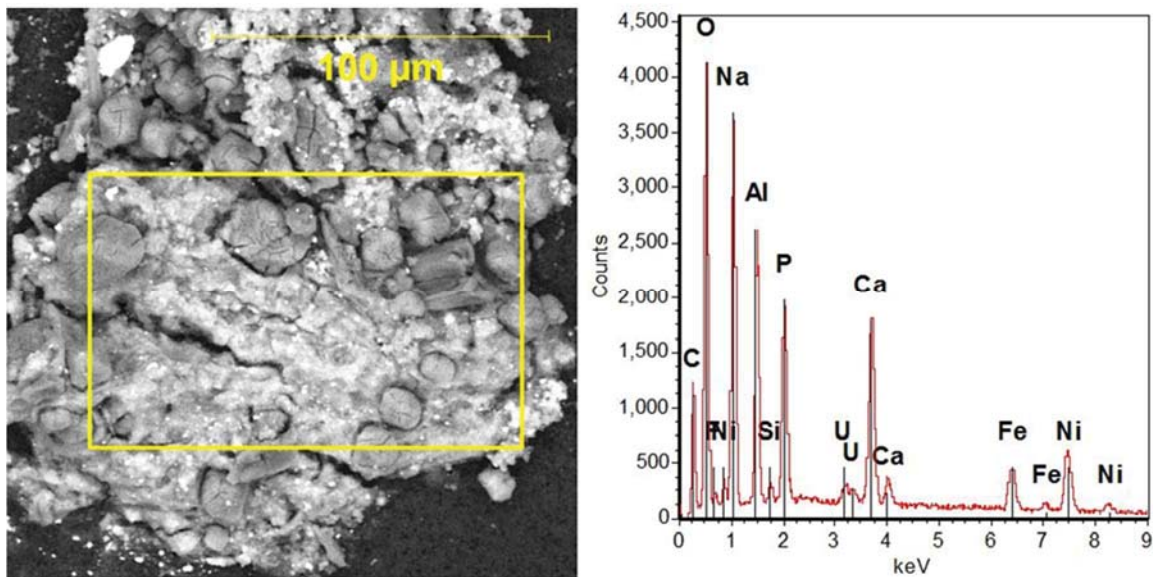


Figure 12. S16R000254 1a/1b (Settled Solids); Area-Scan; Natrophosphate Present with Bright Layer of Various Metals. Bright Particle in Upper Left is Uranium.

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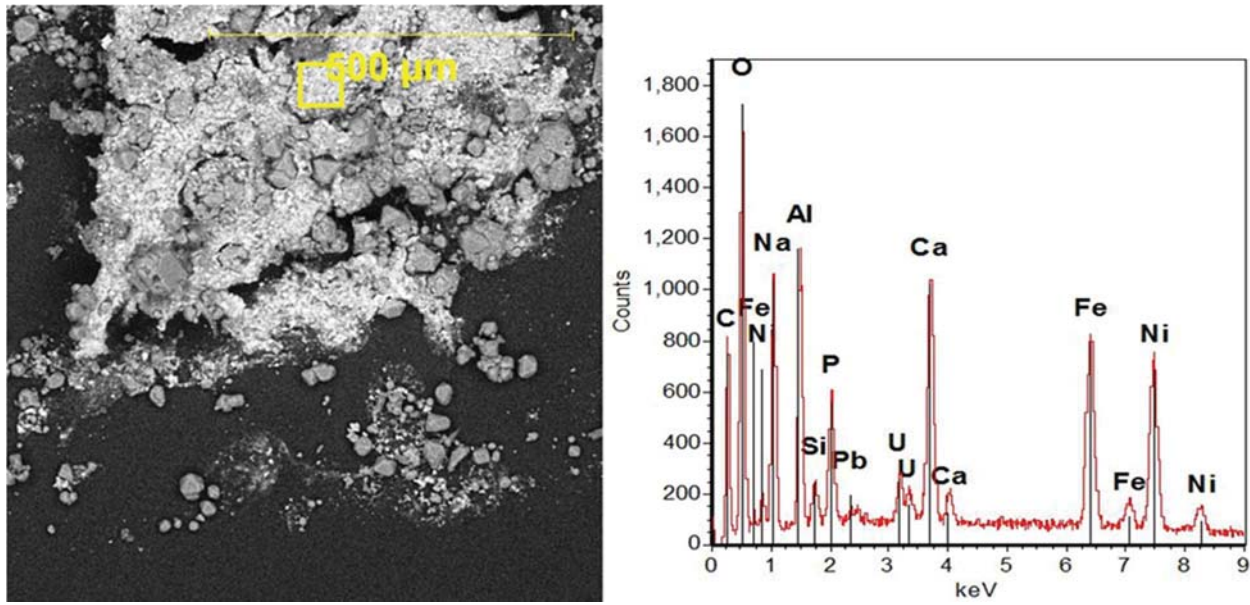


Figure 13. S16R000254 6/6b (Settled Solids); Area-Scan; Natrophosphate with Bright Coating Material. Area Scan of Magnified Coated Material. Bright Coating Contains Same Various Metals as Previously Listed; Iron Concentration is Elevated.

4.3 SUMMARY OF X-RAY DIFFRACTION

Natrophosphate was identified as the only major crystalline phase in the floating solids, 1AN-16-01 (S16R000241) and 1AN-16-01B (S16R000252). Gibbsite was identified as a minor phase in S16R000241 (Figure 14). An aluminum/silicon oxide phase was identified as a minor phase in both floating solids samples. One unidentified peak remained in S16R000241, and one weak diffraction peak remained unidentified in both samples.

Similar diffractogram for the settled solids were found in both 1AN-16-01 (S16R000243) and 1AN-16-01B (S16R000254). Natrophosphate was identified as the only major phase. Gibbsite and iron carbonate hydroxide were identified as a minor phase contribution to the pattern while the aluminum/silicon oxide phase was identified as a barely detectable phase. No peaks remained unidentified. The iron carbonate hydroxide had one unobstructed peak and the remaining peaks in this phase were overlapped with other identified phases (see Appendix G). The elemental signature of this phase was supported by SEM-EDS data.

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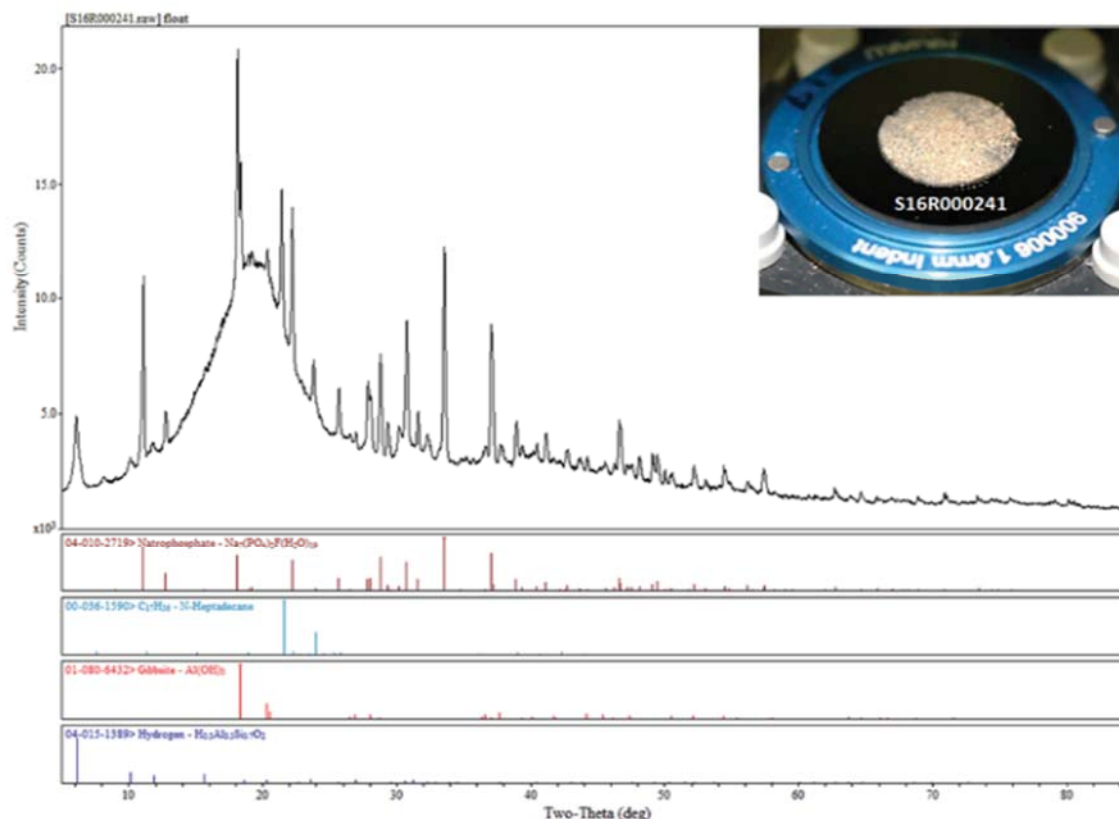


Figure 14. Phase Identification Results for S16R000241.

5 MASS BALANCE

A mass balance is the sum of the majority of chemical species present in a sample, expressed in weight percent. The acceptable mass balance range for the majority of major constituents in a solid sample should be 90 - 105%. If the mass balance values are below 90% or above 105%, the analytical results should be reviewed for errors.

Tables 10 – 13 list the mass balance calculation for the floating and settled solids, information for the calculation, the moles of sodium left, and the percentage of assumed species in the solids. Tables 10 – 13 also include the assumed phases, the concentration of assumed species, molecular weight of the element in the assumed species (the element is in bold typeface), the moles of assumed species, the molecular weight of assumed species (**dehydrated** form), the weight percent, the moles of sodium in the assumed species, and the moles of sodium left in 100 g.

The moles of assumed species were calculated by taking the elemental (or analyte) concentration, dividing by the molecular weight of the element/analyte, dividing by the moles of element/analyte per mole of species, and multiplying by 100.

The weight percent was calculated by taking the analyte concentration in solids, dividing by the molecular weight of the element, dividing by the moles of analyte per mole of species, multiplying by the dehydrated species molecular weight, and multiplying by 100.

The total moles of sodium were calculated by taking the grams of sodium per gram of solid (which can be found in Table 7), dividing by 22.98, and multiplying by 100. This value is located in the first row of the “Moles of Sodium Left” column.

The moles of sodium were calculated by multiplying the moles of assumed species by the number of sodium ions in the assumed species.

The moles of sodium left were calculated by beginning with the total moles of sodium and subtracting the moles of sodium in the assumed species sequentially. The cell marked brownish yellow in the “Moles of Sodium Left” column was the final value of moles of sodium that could not be accounted for by any species present in the solids.

The unaccounted moles of sodium, expressed in $\mu\text{g/g}$, were calculated by taking the unaccounted moles of sodium in 100 g value, multiplying by 22.98, dividing by 100 g, and multiplying by 1,000,000 $\mu\text{g/g}$.

Free hydroxide $[\text{OH}]$ concentration in solids, expressed in g/g , was calculated by taking the free hydroxide concentration in the aqueous, dividing by the density, multiplying by the ratio of solid percent water to aqueous percent water, and dividing by 1,000,000 $\mu\text{g/g}$.

The assumptions for each constituent for the mass balance calculation are outlined below:

- All the H_2O is water
- All the aluminum concentration is used for 100% gibbsite
- All the nitrite is sodium nitrite NaNO_2
- All the NO_3 is from nitrate (NaNO_3) and potassium nitrate (KNO_3)
- All the SO_4 is kogarkoite (Na_3FSO_4)
- All the TIC is thermonatrite ($\text{Na}_2\text{CO}_3 \cdot \text{H}_2\text{O}$) and is in the dehydrated form
- All the PO_4 is the sum of the natrophosphate [$\text{Na}_7\text{F}(\text{PO}_4)_2 \cdot 19\text{H}_2\text{O}$] and calcium phosphate. All natrophosphate is in the dehydrated form.
- All the Fe is hematite (Fe_2O_3)
- All the ^{238}U is $\text{Na}_2\text{U}_2\text{O}_7$
- All the C_2O_4 is natroxalate ($\text{Na}_2\text{C}_2\text{O}_4$)
- All the Cr is grimaldiite (CrOOH)
- All the Cl is NaCl
- All the Ni is $\text{Ni}(\text{O})(\text{OH})$
- All the acetate is sodium acetate (CH_3COONa)
- All the formate is sodium formate (HCOONa)
- All the calcium is calcium phosphate [$\text{Ca}_3(\text{PO}_4)_2$]
- $[\text{OH}]$ is in solids phase
- Hydrocarbon is octanoic acid $\text{C}_8\text{H}_{16}\text{O}_2$ (molecular weight 144 g/mole)
- Molecular weight of TOC is 239 g/mole: the sum of the average molecular weight of three small organic acids (acetate, formate, and oxalate), 95 g/mole, and the molecular weight of octanoic acid, 144 g/mole.

Table 10. Mass Balance and Sodium Distribution in Each Species in Floating Solids 1AN-16-01 (S16R000241).

Assumed Phase	Concentration Assumed Species	Weight Assumed Species	Moles of Assumed Species	Molecular Weight	Weight %	Moles of Sodium	Moles of Sodium Left, 100 g	Percentage Assumed Species in Solids
	g/g	g/mole	mole/100 g	g/mole	%	mole	mole	%
H ₂ O ¹	0.7103	18	3.95	18	71.03	na	0.395	-
Al(OH) ₃	0.00843	26.98	0.031245	78	2.44	0.000	0.395	8.4
NaAl(OH) ₂ CO ₃ ²	0.00000	26.98	0.000000	84	0.00	0.000	0.395	0
NaNO ₂	0.01260	46.01	0.027385	69	1.89	0.027	0.368	6.5
KNO ₃	0.00039	39.10	0.000987	101.1	0.10	0.000	0.368	0.3
NaNO ₃	0.02260	62.01	0.035458	85	3.01	0.035	0.332	10.4
Na ₃ FSO ₄	0.00157	96.01	0.001635	184.1	0.30	0.005	0.327	1.0
Na ₇ F(PO ₄) ₂ ·19H ₂ O ³	0.00298	19	0.015679	369.9	5.80	0.110	0.218	20.0
Fe ₂ O ₃	0.00077	55.8	0.000691	159.6	0.11	0.000	0.218	0.4
Na ₂ U ₂ O ₇ ⁴	0.00040	238	0.000084	634.1	0.05	0.0002	0.217	0.2
Na ₂ C ₂ O ₄	0.00047	88.02	0.000537	134	0.07	0.0011	0.216	0.2
CrOOH	0.00001	52	0.000014	85	0.00	0.000	0.216	0.0
NaCl	0.00040	35.45	0.001131	58.5	0.07	0.001	0.215	0.2
NiOOH	0.00069	58.7	0.001177	91.71	0.11	0.000	0.215	0.4
NaCO ₂ CH ₃	0.00041	59.03	0.000698	82.03	0.06	0.0007	0.215	0.2
NaHCOO	0.00036	45.01	0.000793	68.01	0.05	0.0008	0.214	0.2
Ca ₃ (PO ₄) ₂	0.00065	40.08	0.000537	310	0.17	0.0000	0.214	0.6
Na ₂ CO ₃ -H ₂ O ⁵	0.00352	60.01	0.005866	106	0.62	0.012	0.202	2.1
NaOH	0.02863	17.01	0.168310	40.01	6.73	0.168	0.034	23.2
TOC - Other Organics ^{6,7}	0.01291	12	0.107583	144	15.49	0.108	-0.074	53.5
TOC ⁷	0.01330	12	0.110833	239	26.49	0.111	-	91.4
SUM	-	-	-	-	108	-	-	-

¹ Percent of water based on duplicate of 1AN-16-01 (S16R000241), 71.03%.

² Excluded CO₃ (included in TIC).

³ Calculated based on dehydrated form. Natrophosphate was based on fluoride concentration to improve the sum of weight percent.

⁴ Uranium based on ICP – MS.

⁵ Calculated based on dehydrated form.

⁶ TOC-other organics: molecular weight 144 g/mole of octanoic acid (C₈H₁₆O₂), excluded small organic acids (acetate-carbon, formate-carbon, and oxalate-carbon).

⁷ Molecular weight of TOC assumed to be 239 g/mole (see page 36, last bullet). Not included in the SUM and moles of sodium left calculations.

Table 11. Mass Balance and Sodium Distribution in Each Primary Constituent in Settled Solids of 1AN-16-01 (S16R000243).

Assumed Phase	Concentration Assumed Species	Weight Assumed Species	Moles of Assumed Species	Molecular Weight	Weight %	Moles of Sodium	Moles of Sodium Left, 100 g	Percentage Assumed Species in Solids
	g/g	g/mole	mole/100 g	g/mole	%	mole	mole	%
H ₂ O ¹	0.698	18	3.88	18	69.8	na	0.453	-
Al(OH) ₃	0.00832	26.98	0.030838	78	2.41	0.000	0.453	8.0
NaAl(OH) ₂ CO ₃ ²	0.00000	26.98	0.000000	84	0.00	0.000	0.453	0.0
NaNO ₂	0.01020	46.01	0.022169	69	1.53	0.022	0.430	5.1
KNO ₃	0.00032	39.10	0.000821	101.1	0.08	0.000	0.430	0.3
NaNO ₃	0.01820	62.01	0.028529	85	2.42	0.029	0.402	8.0
Na ₃ FSO ₄	0.00130	96.01	0.001354	184.1	0.25	0.004	0.398	0.8
Na ₇ F(PO ₄) ₂ ·19H ₂ O ³	0.05356	94.97	0.028199	369.9	10.43	0.197	0.200	34.5
Fe ₂ O ₃	0.00116	55.8	0.001039	159.6	0.17	0.000	0.200	0.5
Na ₂ U ₂ O ₇ ⁴	0.00067	238	0.000141	634.1	0.09	0.0003	0.200	0.3
Na ₂ C ₂ O ₄	0.00039	88.02	0.000440	134	0.06	0.001	0.199	0.2
CrOOH	0.00007	52	0.000125	85	0.01	0.000	0.199	0.0
NaCl	0.00034	35.45	0.000945	58.5	0.06	0.001	0.198	0.2
NiOOH	0.00113	58.7	0.001925	91.71	0.18	0.000	0.198	0.6
NaCO ₂ CH ₃	0.00033	59.03	0.000566	82.03	0.05	0.001	0.198	0.2
NaHCOO	0.00032	45.01	0.000713	68.01	0.05	0.001	0.197	0.2
Ca ₃ (PO ₄) ₂	0.00110	40.08	0.000915	310	0.28	0.000	0.197	0.9
Na ₂ CO ₃ -H ₂ O ⁵	0.00337	60.01	0.005616	106	0.60	0.011	0.186	2.0
NaOH	0.02815	17.01	0.165465	40.01	6.62	0.165	0.020	21.9
TOC - Other Organics ^{6,7}	0.00997	12	0.083083	144	11.96	0.083	-0.063	39.6
TOC ⁷	0.01030	12	0.085833	239	20.51	0.086	-	67.9
SUM	-	-	-	-	107	-	-	-

¹ Percent of water based on 1AN-16-01 (S16R000243), 69.8%.

² Excluded CO₃ (included in TIC).

³ Calculated based on dehydrated form. Natrophosphate was based on phosphate concentration excluded calcium phosphate.

⁴ Uranium based on ICP – MS.

⁵ Calculated based on dehydrated form.

⁶ TOC-other organics: molecular weight 144 g/mole of octanoic acid, excluded small organic acids (acetate-carbon, formate-carbon, and oxalate-carbon).

⁷ See page 36, last bullet, for molecular weight of TOC. Not included in the SUM and moles of sodium left calculations.

Table 12. Mass Balance and Sodium Contribution in Floating Solids of 1AN-16-01B (S16R000252).

Assumed Phase	Concentration Assumed Species		Weight Assumed Species		Moles of Assumed Species		Molecular Weight		Weight %		Moles of Sodium		Moles of Sodium Left, 100 g		Percentage Assumed Species in Solids	
	g/g		g/mole		mole/100 g		g/mole		%		mole		mole		%	
H ₂ O ¹	0.732		18		4.07		18		73.2		na		0.424		-	
Al(OH) ₃	0.01060		26.98		0.039288		78		3.06		0.000		0.424		11.4	
NaAl(OH) ₂ CO ₃ ²	0.00000		26.98		0.000000		84		0.00		0.000		0.424		0.0	
NaNO ₂	0.01530		46.01		0.033254		69		2.29		0.033		0.391		8.6	
KNO ₃	0.00036		39.10		0.000916		101.1		0.09		0.000		0.391		0.3	
NaNO ₃	0.02740		62.01		0.043271		85		3.68		0.043		0.348		13.7	
Na ₃ FSO ₄	0.00188		96.01		0.001958		184.1		0.36		0.006		0.342		1.3	
Na ₇ F(PO ₄) ₂ ·19H ₂ O ³	0.00840		94.97		0.004424		369.9		1.64		0.031		0.311		6.1	
Fe ₂ O ₃	0.00206		55.8		0.001846		159.6		0.29		0.000		0.311		1.1	
Na ₂ U ₂ O ₇ ⁴	0.00105		238		0.000220		634.1		0.14		0.0004		0.310		0.5	
Na ₂ C ₂ O ₄	0.00057		88.02		0.000645		134		0.09		0.001		0.309		0.3	
CrOOH	0.00008		52		0.000144		85		0.01		0.000		0.309		0.0	
NaCl	0.00048		35.45		0.001365		58.5		0.08		0.001		0.308		0.3	
NiOOH	0.00206		58.7		0.003509		91.71		0.32		0.000		0.308		1.2	
NaCO ₂ CH ₃	0.00048		59.03		0.000817		82.03		0.07		0.001		0.307		0.2	
NaHCOO	0.00039		45.01		0.000864		68.01		0.06		0.001		0.306		0.2	
Ca ₃ (PO ₄) ₂	0.00177		40.08		0.001472		310		0.46		0.000		0.306		1.7	
Na ₂ CO ₃ ·H ₂ O ⁵	0.00366		60.01		0.006099		106		0.65		0.012		0.294		2.4	
NaOH	0.02870		17.01		0.168724		40.01		6.75		0.169		0.125		25.2	
TOC - Other Organics ^{6,7}	0.00805		12		0.067079		144		9.66		0.067		0.058		36.0	
TOC ⁷	0.00851		12		0.070917		239		16.93		0.071		-		63.2	
SUM	-		-		-		-		103		-		-		-	

¹ Percent of water based on 1AN-16-01B (S16R000252), 73.2%.

² Excluded CO₃ (included in TIC).

³ Calculated based on dehydrated form. Natrophosphate was based on phosphate concentration excluded calcium phosphate.

⁴ Uranium based on ICP – MS.

⁵ Calculated based on dehydrated form.

⁶ TOC-other organics: assumed molecular weight 144 g/mole of octanoic acid, excluded small organic acids. See footnote 6 in Table 11.

⁷ See page 36, last bullet, for molecular weight of TOC. Not included in the SUM and moles of sodium left calculations.

Table 13. Mass Balance and Sodium Contribution to Settled Solids of 1AN-16-01B (S16R000254).

Assumed Phase	Concentration Assumed Species	Weight Assumed Species	Moles of Assumed Species	Molecular Weight	Weight %	Moles of Sodium	Moles of Sodium Left, 100 g	Percentage Assumed Species in Solids
	g/g	g/mole	mole/100 g	g/mole	%	mole	mole	%
H ₂ O ¹	0.726	18	4.03	18	72.6	na	0.433	-
Al(OH) ₃	0.00908	26.98	0.033655	78	2.63	0.000	0.433	9.6
NaAl(OH) ₂ CO ₃ ²	0.00000	26.98	0.000000	84	0.00	0.000	0.433	0.0
NaNO ₂	0.01180	46.01	0.025647	69	1.77	0.026	0.407	6.5
KNO ₃	0.00030	39.10	0.000762	101.1	0.08	0.000	0.407	0.3
NaNO ₃	0.02120	62.01	0.033426	85	2.84	0.033	0.373	10.4
Na ₃ FSO ₄	0.00148	96.01	0.001542	184.1	0.28	0.005	0.369	1.0
Na ₇ F(PO ₄) ₂ · 19H ₂ O ³	0.02612	94.97	0.013754	369.9	5.09	0.096	0.273	18.6
Fe ₂ O ₃	0.00165	55.8	0.001478	159.6	0.24	0.000	0.273	0.9
Na ₂ U ₂ O ₇ ⁴	0.00087	238	0.000182	634.1	0.12	0.0004	0.272	0.4
Na ₂ C ₂ O ₄	0.00044	88.02	0.000500	134	0.07	0.001	0.271	0.2
CrOOH	0.00007	52	0.000127	85	0.01	0.000	0.271	0.0
NaCl	0.00039	35.45	0.001111	58.5	0.07	0.001	0.270	0.2
NiOOH	0.00157	58.7	0.002675	91.71	0.25	0.000	0.270	0.9
NaCO ₂ CH ₃	0.00041	59.03	0.000700	82.03	0.06	0.001	0.269	0.2
NaHCOO	0.00034	45.01	0.000764	68.01	0.05	0.001	0.269	0.2
Ca ₃ (PO ₄) ₂	0.00144	40.08	0.001198	310	0.37	0.000	0.269	1.4
Na ₂ CO ₃ -H ₂ O ⁵	0.00338	60.01	0.005632	106	0.60	0.011	0.257	2.2
NaOH	0.02846	17.01	0.167341	40.01	6.70	0.167	0.090	24.4
TOC – Other Organics ^{6,7}	0.00587	12	0.048917	144	7.04	0.049	0.041	25.7
TOC ⁷	0.00625	12	0.052083	239	12.45	0.052	-	45.4
SUM	-	-	-	-	101	-	-	-

¹ Percent of water based on 1AN-16-01B (S16R000254), 72.6%.

² Excluded CO₃ (included in TIC).

³ Calculated based on dehydrated form. Natrophosphate was based on phosphate concentration excluded calcium phosphate.

⁴ Uranium based on ICP – MS.

⁵ Calculated based on dehydrated form.

⁶ TOC-other organics: assumed molecular weight 144 g/mole (based on octanoic acid, excluded small organic acids. See footnote 6 in Table 11.

⁷ See page 36, last bullet, for molecular weight of TOC. Not included in the SUM and moles of sodium left calculations.

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Table 14. Mass Balance of the Average Aqueous Samples of 1AN-16-01 and 1AN-16-01B.

Assumed Phase	Concentration Assumed Species	Weight Assumed Species	Moles of Assumed Species	Molecular Weight	Weight %
	g/g	g/mole	mole/100 g	g/mole	%
H ₂ O ¹	0.79750	18	4.43	18	79.75
Al(OH) ₃	0.00861	26.98	0.031894	78	2.49
NaNO ₂	0.01645	46.01	0.035753	69	2.47
KNO ₃	0.00043	39.10	0.001109	101.1	0.11
NaNO ₃	0.02930	62.01	0.046142	85	3.92
Na ₃ FSO ₄	0.00206	96.01	0.002146	184.1	0.40
Na ₇ F(PO ₄) ₂ -19H ₂ O ²	0.00178	94.97	0.000937	369.9	0.35
Na ₂ C ₂ O ₄	0.00067	88.02	0.000764	134	0.10
NaCl	0.00053	35.45	0.001508	58.5	0.09
NaCO ₂ CH ₃	0.00051	59.03	0.000857	82.03	0.07
NaHCOO	0.00030	45.01	0.000670	68.01	0.05
Na ₂ CO ₃ -H ₂ O ³	0.00429	60.01	0.007140	106	0.76
NaOH	0.02831	17.01	0.166405	40.01	6.66
TOC - Other Organics ^{4,5}	0.00064	12	0.005292	144	0.76
TOC ⁵	0.00111	12	0.009208	239	2.20
SUM	-	-	-	-	98

¹ Concentration of assumed species based on average of 1AN-16-01 and 1AN-16-01B.² Calculated based on dehydrated form. Natrophosphate was based on phosphate concentration excluding calcium phosphate.³ Calculated based on dehydrated form.⁴ TOC-other organics: assumed molecular weight 144 g/mole (based on octanoic acid, C₈H₁₆O₂), excluded small organic acids.⁵ See page 36, last bullet, for molecular weight of TOC. Not included in the SUM and moles of sodium left calculations.

The unaccounted for sodium was 0.034, 0.02, 0.125, and 0.09 moles/100 g of sodium (can be found in the cell coordinated between the row named “NaOH” and the column named “Moles of Sodium Left, 100 g” in Tables 10 - 13); this converted to 8 and 29 mg/g unaccounted for sodium in the floating solids and 5 and 21 mg/g in the settled solids. The unaccounted for sodium is at least in part the sodium that is associated with the organics.

The assumed constituents after evaporation of aqueous sample, based on the average of the aqueous samples of 1AN-16-01 and 1AN-16-01B, are shown in Table 14. Other than ~80% of water, other constituents, including aluminum, sodium nitrite, sodium nitrate, sodium hydroxide, TIC, and TOC, were present ranging from 0.8% (TIC) to 6.7% weight (sodium hydroxide). Note the much smaller percentage of metal oxides, natrophosphate, and TOC (including both the small organic acids and other organics) in the aqueous samples than in the solids (see the weight % in Tables 10 to 13).

The percentage of selected analyte in the solid phase was calculated by dividing the weight percent (in Tables 10 – 13) of the selected analyte by (100% - percent water) (Tables 10 – 13). Table 15 summarizes the difference between the floating and the settled solids. The percentage of natrophosphate particulate present in the floating solid phase was 20 and 6% of the floating solid phase and was 35 and 19% of the settled solids phase, indicating a higher percentage of

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natrophosphate in the settled solids than in the floating solids. The organic material (e.g., octanoic acid was assumed to be the hydrocarbons for the calculation, see footnote 1 in Table 15) was 36 – 53% of the floating solids and 26 – 40% of the settled solids. Note that TOC as a whole was present in a much higher percentage in the floating solids than in the settled solids, mean 77% vs. 57%, respectively. The inorganic salts, e.g., sodium nitrate, sodium nitrite, thermonatrite, sulfate, and calcium phosphate, were present in higher percentages in the floating solids than in the settled solids, 23% vs. 18%. In summary, TOC, natrophosphate, ^{89/90}Sr, and inorganic salts are the constituents that had major percentage differences in the floating and settled solids.

Table 15. Summary of Floating and Settled Solids Difference.

Floating Solids	Settled Solids
H ₂ O, mean 72% (71 - 73%)	H ₂ O, mean 71% (70 - 73%)
Dissolved and Undissolved Solids, 28%	Dissolved and Undissolved Solids, 29%
Percentage of Constituents in Solids	Percentage of Constituents in Solids
Hydrocarbons¹ , mean 45% (36 - 53%)	Hydrocarbons¹ , mean 33% (26 - 40%)
Small organic acids , mean 0.7% (0.6 - 0.8%)	Small organic acids , mean 0.6% (0.5 - 0.6%)
TOC² , mean 77% (63% - 91%)	TOC² , mean 57% (45% - 68%)
Inorganics³ (IC components) , mean 23% (19 - 26%)	Inorganics³ (IC components) , mean 18% (15 - 20%)
Natrophosphate , mean 13% (6 - 20%)	Natrophosphate , mean 27% (19 - 35%)
Gibbsite , mean 10% (8 - 11%)	Gibbsite , mean 9% (8 - 10%)
Metal Oxides⁴ , mean 1.6% (0.8 - 2.3%)	Metal Oxides⁴ , mean 1.5% (1.2 - 1.8%)
Uranium, mean 0.73 mg/g (0.4 - 1.05 mg/g); mean 0.35% (0.2 - 0.5%)	Uranium, mean 0.77 mg/g (0.67 - 0.87 mg/g); mean 0.36% (0.3 - 0.42%)
Thermonatrite, mean 2.3% (2.1 - 2.4%)	Thermonatrite, mean 2.1% (2.0 - 2.2%)
Calcium phosphate (Ca ₃ (PO ₄) ₂), mean 1.1% (0.6 - 1.7%)	Calcium phosphate (Ca ₃ (PO ₄) ₂), mean 1.15% (0.9 - 1.4%)
^{89/90} Sr, mean 76 µCi/g (45 - 107 µCi/g)	^{89/90} Sr, mean 59 µCi/g (50 - 68 µCi/g)

¹ Hydrocarbon based on octanoic acid, C₈H₁₆O₂ (molecular weight 144 g/mole). The percentage of constituents in solids = mole of assumed species (e.g., octanoic acid) x 144 g/mole / (100 - % water) *100.

² TOC includes small organic acids and other organics (hydrocarbons are the main constituents). Molecular weight of TOC (239 g/mole) is assumed to be the sum of the average molecular weight of small organic acids (95 g/mole) and the molecular weight of octanoic acid (144 g/mole). See the last bullet on page 36.

³ Inorganics include sodium nitrate, potassium nitrate, sodium nitrite, sodium fluoride sulfate, sodium chloride, and calcium phosphate.

⁴ Metal oxides include ferric oxide (Fe₂O₃), nickel oxy hydroxide (NiOOH), and chromium oxide (grimaldiite, CrOOH).

6 CONCLUSION AND DISCUSSIONS

Quintolubric® 888 hydraulic fluid consists mainly of trimethylol propane trioleate plus proprietary additives. Hydraulic fluid decomposes through hydrolysis to form trimethylol propane (water soluble alcohol) and oleic acid, which undergoes saponification to form sodium oleate (soap).

Froth flotation (e.g., floating emulsion) is a process for selectively separating hydrophobic materials from hydrophilic material. Fatty acids and oil have been used as flotation reagents in the mining industry. For example, oil is used to agglomerate pulverized sulfides and buoy them to the surface. Sodium oleate acts as a surfactant and has been used as a collector in the froth flotation process, e.g., flotation of hematite/oleate system (“Flotation Chemistry of Hematite/Oleate System” [Kulkarni and Somasundaran 1980]). One previous study in this laboratory has also shown the formation of a soap layer after mixing Quintolubric® 888 with caustic Tank-241-AN-106 simulant (WRPS-0800035, “Report for Hydraulic Fluid Interaction Study.”)

Chemical and physical reactions that buoy solids to float on the top:

- Saponification: a reaction in which an ester is heated with an alkali, such as sodium hydroxide, producing a free alcohol and an acid salt, especially alkaline hydrolysis of a fat or an oil to make soap. Hydraulic fluid or organics (e.g., hydrocarbons) are the source of esters and react with high sodium hydroxide to form a soap type of salt.
- Adsorption of organic to solids: organics/hydrocarbon adsorbed on sludge phases. Coarse and equal dimensional natrophosphate crystals in the settled solids may have less available surface area for adsorption of organics/hydrocarbon.
- Formation of a floating emulsion due to the presence of sodium oleate/hydraulic fluid. The compound of 9-octadecenoic acid (also known as oleic acid) or cis-vaccenic acid was found in the top aqueous phase by the SVOA analysis. The oleic acid (acidic form) and other acid form of hydrocarbons found by the SVOA analysis was due to the low pH extraction during methylene chloride extraction. Oleic acid would be saponified to form sodium oleate in the high alkaline solution (pH >13), i.e., in the AN-101 aqueous phase. Sodium oleate acts as a surfactant complex for the flotation reaction.
- Strontium: strontium behaves like calcium and precipitates with carbonate to form calcium/strontium carbonate, or with the carboxylate from the fatty acid to form Ca-Sr soap scum. In addition, calcium seems inordinately high in the EDS spectra, suggesting that calcium (in the form of organic salts) is coating particle surfaces.

Organics may act as binding agents. Based on these proposed chemical and physical reactions, complexation of sodium oleate from hydraulic fluid, gibbsite, thermonatrite, strontium, organics, and natrophosphate could form large aggregates with strong buoyancy. The large rounded aggregates floating on the top aqueous phase can be seen in Figure 3. This hypothesis is supported by the disappearance of floating solids and the presence of less binding settled solids in 1AN-16-01A resulting from 100 days at 77 °C during a corrosion study (RPP-RPT-59951) (Figure 15).

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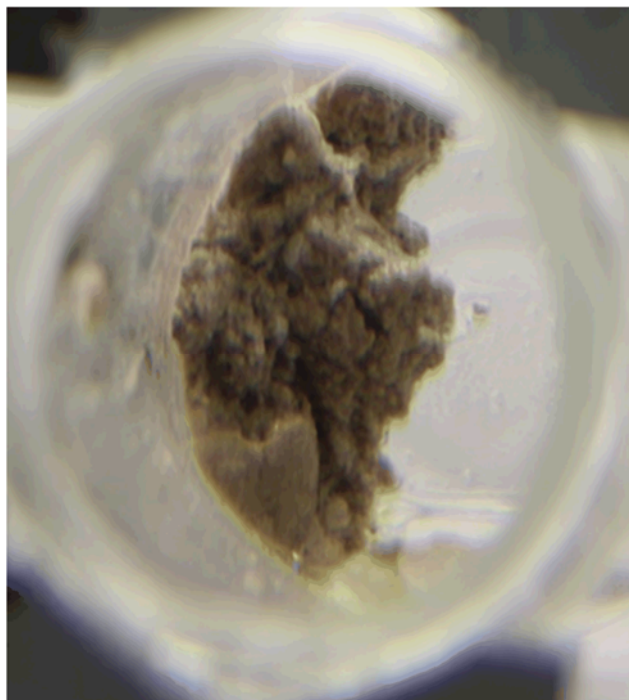


Figure 15. Settled Solids in 1AN-16-01A after 100 Days at 77 °C.

Sample 1AN-16-01A was heated to 77 °C for 100 days for the corrosion study. Oleic acid was not found in the top and the center of aqueous samples of 1AN-16-01A after the post-corrosion study, but trimethylol propane was found in both aqueous samples and also in the settled solids of this post-corrosion sample of 1AN-16-01A (Appendix H), indicating degradation of Quintolubric® 888 by the higher temperatures. The floating solids in 1AN-16-01A during corrosion had disappeared and sunk to the bottom which coincided with the disappearance of oleic acid. In addition, disappearance of the floating solids in the 1AN-16-4SS check sample was observed on March 28, 2017, ~15 months after the sample was collected in December 2015 (Appendix I). Therefore, it is expected that the floating layer in the tank would eventually sink to the bottom and disappear from the top.

The evaluation of SVOA chromatograms showed that the GC/MS method can identify the oleic acid (9-octadecenoic acid) at RT of 16.76 min and trimethylol propane (also named 2-ethyl-1,3-propanediol) at RT of ~10.01 to ~10.08 min. In addition, 9-octadecenoic acid was identified by GC/MS in a Quintolubric® 888 study performed in 2008 (Appendix J). Therefore, the presence of Quintolubric® 888 can be qualitatively identified using the presence of oleic acid and trimethylol propane as indicators, which can be determined by the SVOA method. Quantitative measurement can be achieved by establishing a calibration curve and method detection and quantitation limits.

7 QUALITY CONTROL

All testing carried out under this test plan followed ATS-MP-1032, “222-S Laboratory Quality Assurance Project Plan.” All data entries specified in the test procedure were retained in controlled laboratory notebooks: HNF-N-832-1, “PSEM Instrument Notebook,” HNF-N-710-1, “Rigaku Miniflex II XRD,” HNF-N-395-1, “PLM Sample Log,” and HNF-N-841-1, “Studies of Tank Samples e.g., C-105 Dissolution, AN-101 Floating Solids.” The Solid Phase Characterization Analysis Tracking form documenting the logbooks used for SPC was filed in the project file. Balance verification (for LE-BAL-048) was performed prior to use. Balance verification records are maintained in the Integrated Document Management System.

8 ACKNOWLEDGEMENTS

The authors gratefully acknowledge the following contributors to this project. Their support is much appreciated.

- Liem Dinh, for preparation of polarized light microscopy.
- Dan Hansen for his evaluation of spectra for tentatively identified compounds.
- Doug Kraft, for verification of spreadsheet and preparation of documentation for the SmartPlant Foundation.
- Peggy Puryear, for her editorial support.

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APPENDIX A.

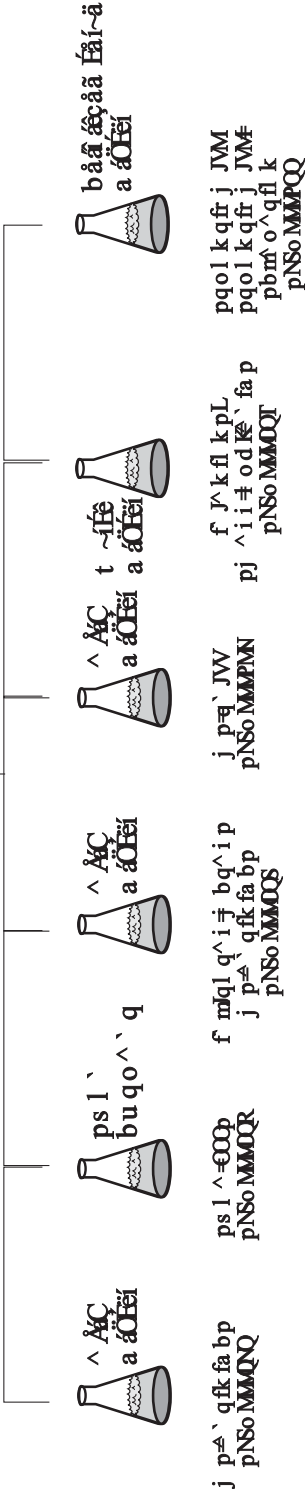
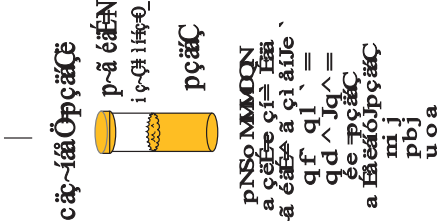
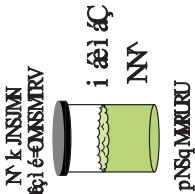
SAMPLE BREAKDOWN DIAGRAM

(6 pages, including cover page)

^kNMN=cil^ qfkd=plifap=C=`loopflk
dê~Ä=p~ãéäÉë=EiáèíáÇF
dê çíèW=OMNSNTRU

m~ÖÉ=N=çÑ=Q

qp` ^ə b d r i ^ q b a ə l o ð m̃ _ ë



k çíèÑë= Üäa æíèW çä Ç Ä fíèíë=ä fÜëçéÇíëÑæçéäó=ëääíBçÜíèíëä Ä çíèÜíë~ä éäí~í ~ä Äíëç~ääèi NÄÄíííÑè~ääíèíë

RPP-RPT-59964

APPENDIX B.**REVIEW OF GAS CHROMATOGRAPHY – MASS SPECTROMETRY FILES FOR
TENTATIVELY IDENTIFIED COMPOUNDS**

(9 pages, including cover page)

REVIEW OF GAS CHROMATOGRAPHY – MASS SPECTROMETRY FILES FOR TENTATIVELY IDENTIFIED COMPOUNDS

A review of two gas chromatographic/mass spectrometer data acquisitions was performed to attempt to further investigate the Tentatively Identified Compounds (TICs) present in data files 2016101409 (OmniLIMS S16R000250) and 2016101412 (OmniLIMS S16R000261) located in batch 161014_AN101 in the WHL share area WHLCompletedBatches\SVOA\Janeway\161014_AN101. The retention time (RT), TIC identification (ID) and formula are the results reported by WHL. The evaluation of each peak follows. Figure 1 is a close up of the chromatogram in file 9. Figure 2 is a comparison of the chromatograms from file 9 and file 12.

File: 2016101409:

RT: 2.75 ID: Acetic acid (CAS # 64197) Formula: C₂H₄O₂

A severely fronted peak is present when the mass spectrometer begins acquiring data, consistent with hydrocarbon acids. A single compound appears to be present. After scan averaging and background subtraction, the spectra is consistent with the ID above.

RT: 2.93 ID: Trimethyl Oxirane (CAS # 5076-19-7)

A very good spectral match.

RT: 3.23 ID: 3-methyl-2-butanone (CAS # 563-80-4)

Spectra not very helpful but likely a hydrocarbon.

RT: 3.30 ID: 2-Chloro-2-methyl-butane (CAS # 594365) Formula: C₅H₁₁Cl

A single peak – the scan data indicates that one compound is present. After scan averaging and background subtraction, the spectra indicates a chlorinated hydrocarbon consistent with the ID above.

RT: 3.46 ID: Unknown

A well-defined peak on top of a large broad peak (likely Propanoic acid). Identification is difficult due to co-elution with large broad peak. Likely a hydrocarbon alcohol. See Fig. 1.

RT: 3.56 ID: Unknown

A small peak on top of a large broad peak (likely Propanoic acid). Identification is difficult due to co-elution issues with the broad peak. See Fig. 1.

RT: 3.62 ID: Not in OmniLIMS

This is a large, broad peak with several smaller co-elution peaks. The large broad peak appears to be Propanoic acid. It isn't clear whether this peak was reported or not from the data provided. A VERY tentative estimate of concentration would be about 3000 ug/L based on the size compared to the peak at RT 4.62. See Fig. 1.

RT: 4.22 ID: Dichloronitro methane (CAS # 7119-89-3)

A very good spectral match. Could also be trichloromethane.

RT: 4.62 ID: Butanoic acid (CAS # 107926) Formula: C₄H₈O₂

A single severely fronted peak, commonly found with hydrocarbon acids. After scan averaging and background subtraction, the spectra is consistent with Butanoic acid. There is a co-eluting peak at RT 4.46 on top of this peak – it was small and not evaluated.

RT: 5.36 ID: Unknown

At least 2 compounds are present. The co-elution makes identification difficult.

RT: 5.51 ID: 3-Methyl-3-nitrobut-1-ene (CAS # 1809672) Formula: C₅H₉NO₂

A single peak – the scan data indicates a single compound is present. The library hit is consistent with the sample spectrum.

RT: 5.68 ID: Unknown

A long, broad peak with at least two compounds present. The main peak has spectra consistent with Pentanoic acid.

RT: 5.90 ID: 3-methyl-3-nitrobut-1-ene (CAS # 1809672) Formula: C₅H₉NO₂

A primary peak with a smaller peak appearing as a tail. The primary peak is a single compound. After scan averaging and background subtraction, the primary ions are M/Z 41 and 69. The 69 may be due to a Br ion. Likely either the identified compound above or a small brominated hydrocarbon.

RT: 6.08 ID: Unknown

At least two compounds are present, making identification difficult.

RT: 6.36 ID: Unknown

Partially resolved peak – unknown hydrocarbon.

RT: 6.40 ID: meso-3,4-Hexanediol (CAS # 623552) Formula: C₆H₁₄O₂

A single peak – the scan data indicates that it is one compound. 5-methyl, 3-Hexanol is a possibility, but there is an extra ion (m/z 76) in the library that isn't in the sample spectra.

RT: 6.57 ID: Unknown

At least two compounds are present, making identification difficult.

RT: 6.80 ID: Hexanoic acid (CAS # 142621) Formula: C₆H₁₂O₂

A long severely fronted peak with at least 3 compounds present. Primary compound spectra is consistent with Hexanoic acid.

RT: 6.82 ID: Unknown

A co-eluting peak with RT 6.80, which makes identification difficult.

RT: 7.87 ID: Heptanoic acid (CAS # 111148) Formula: C₇H₁₄O₂

A severely fronted peak – the scan data indicated possibly two compounds present. The first and predominate peak is also responsible for the severe fronting and is likely Heptanoic acid as indicated above. A minor, later eluting peak at the tail end of the peak is present, but the spectra is too muddled to identify, other than a 43 m/z hydrocarbon fragment.

RT: 8.58 ID: 2,3,4-trimethylpentane (CAS # 565753) Formula: C₈H₁₈

A single fronted peak – the scan data indicated a single compound is present. After scan averaging and background subtraction, the compound is likely a branched hydrocarbon, although not the compound ID'ed above, as the spectra has extra ions not present in the library, and ion ratios are too different.

RT: 8.73 ID: Unknown

A single peak – the scan data indicates that a single compound is present, but there aren't any good library hits. Unclear if it is a hydrocarbon.

RT: 8.90 ID: 2-Fluoro-6-nitrophenol (CAS # 1526176) Formula: C₆H₄FN₂O₃

A possible split peak – at least 2 to 3 compounds may be present after reviewing the scan data. A compound appears to be present at RT 8.87, with a primary ion of 85 and smaller ions at 60 and 73. It is not an aliphatic hydrocarbon – no ID is possible. The spectra at RT 8.90 has a primary ion at 157, but the ion intensities are changing dramatically over the apex of the peak. A possible second compound at RT 8.89 is consistent if the 2-Fluor-6-nitrophenol identified above. At RT 8.91 spectra consistent with octadecanoic was observed. All ID's are speculative, due to the apparent mixture of compounds in the peak.

RT: 9.89 ID: Nonanoic acid (CAS # 112050) Formula: C₉H₁₈O₂

A single, fronted peak – the scan data indicates a single compound is present. After scan averaging and background subtraction, the compound is likely a straight chain hydrocarbon acid consistent with the formula C₉H₁₈O₂. Top hit was also nonanoic acid, as identified above.

RT: 10.02 ID: Unknown

A very broad peak – the scan data indicates at least 3 compounds present, making identification difficult.

RT: 10.67 ID: 2-Fluoro-4-nitrophenol (CAS # 403190) Formula: C₆H₄FN₂O₃

A single, tailing peak – the scan data suggests that a single compound is present. After scan averaging and background subtraction, the compound is likely a fluorinated nitrophenol of some sort. Top hit was the same as the ID above.

RT: 12.3 ID: Unknown

Spectra unclear. No guidance on identify.

RT: 12.45 ID: Unknown

A single peak – scan data indicates that a single compound is present, but the library hits are poor. Unclear if it is a hydrocarbon.

RT: 16.76 ID: cis-Vaccenic acid (CAS # 506172) Formula: C₁₈H₃₄O₂

A split peak – the scan data suggests that it is just one compound. After background subtraction the compound is likely an unsubstituted straight chain hydrocarbon acid of some sort, consistent with the formula C₁₈H₃₄O₂. 9-Octadecenoic acid was the top hit after scan averaging and background subtraction, but the original ID is also a possibility.

RT: 16.78 ID: Unknown

Same as above.

File 2016101412:

RT: 2.74 ID: Acetic acid (CAS # 64197) Formula: C₂H₄O₂

Same as file 9, RT: 2.75.

RT: 3.23 ID: Unknown

A single peak – scan data indicates a single compound. Consistent with library hit for 3-methyl-2-Butanone (CAS # 563804).

RT: 3.30 ID: 2-Chloro-2-methyl-butane (CAS # 594365) Formula: C₅H₁₁Cl

Same as file 9, RT: 3.30.

RT: 3.45 ID: Unknown

Same as file 9, RT: 3.46

RT: 3.60 ID: Unknown

Same as file 9, RT: 3.62

RT: 3.97 ID: Unknown

Same as file 9, RT: 3.97

RT: 4.59 ID: Butanoic acid (CAS # 107926) Formula: C₄H₈O₂

Same as File 9, RT: 4.59.

RT: 5.36 ID: Unknown

Same as file 9, RT: 5.36.

RT: 5.50 ID: 3-methyl-3-nitrobut-1-ene (CAS # 1809672) Formula: C₅H₉NO₂

Same as File 9, RT: 5.51.

RT: 5.68 ID: Unknown

Same as file 9, RT: 5.68

RT: 5.90 ID: 3-methyl-3-nitrobut-1-ene (CAS # 1809672) Formula: C₅H₉NO₂

Same as File 9, RT: 5.90.

RT: 6.08 ID: Unknown

Same as file 9, RT:6.08

RT: 6.40 ID: meso-3,4-Hexanediol (CAS # 623552) Formula: C₆H₁₄O₂

Same as File 9, RT: 6.40.

RT: 6.57 ID: Unknown

Same as file 9, RT: 6.57

RT: 6.79 ID: Hexanoic acid (CAS# 142621) Formula: C₆H₁₂O₂

A severely fronted peak – the scan data indicates a single compound is present. After scan averaging and background subtraction, the spectra is a good match for hexanoic acid. File 9, also had a peak at RT: 6.80 when evaluated was the same as this peak.

RT: 6.82 ID: Unknown

A co-eluting peak with RT 6.80, which makes identification difficult.

RT: 7.86 ID: Heptanoic acid (CAS # 111148) Formula: C₇H₁₄O₂

Same as file 9, RT: 7.87.

RT: 8.58 ID: 2,3,4-trimethylpentane (CAS # 565753) Formula: C₈H₁₈

Same as File 9, RT: 8.58.

RT: 8.73 ID: Unknown

Same as file 9, RT: 8.73

RT: 8.90 ID: 2-Fluoro-6-nitrophenol (CAS # 1526176) Formula: C₆H₄FN₃O

Same as File 9, RT: 8.90.

RT: 9.89 – similar to file 9, RT 9.89.

RT: 10.67 ID: 2-Fluoro-4-nitrophenol (CAS # 403190) Formula: C₆H₄FN₃O

Same as File 9, RT: 10.67.

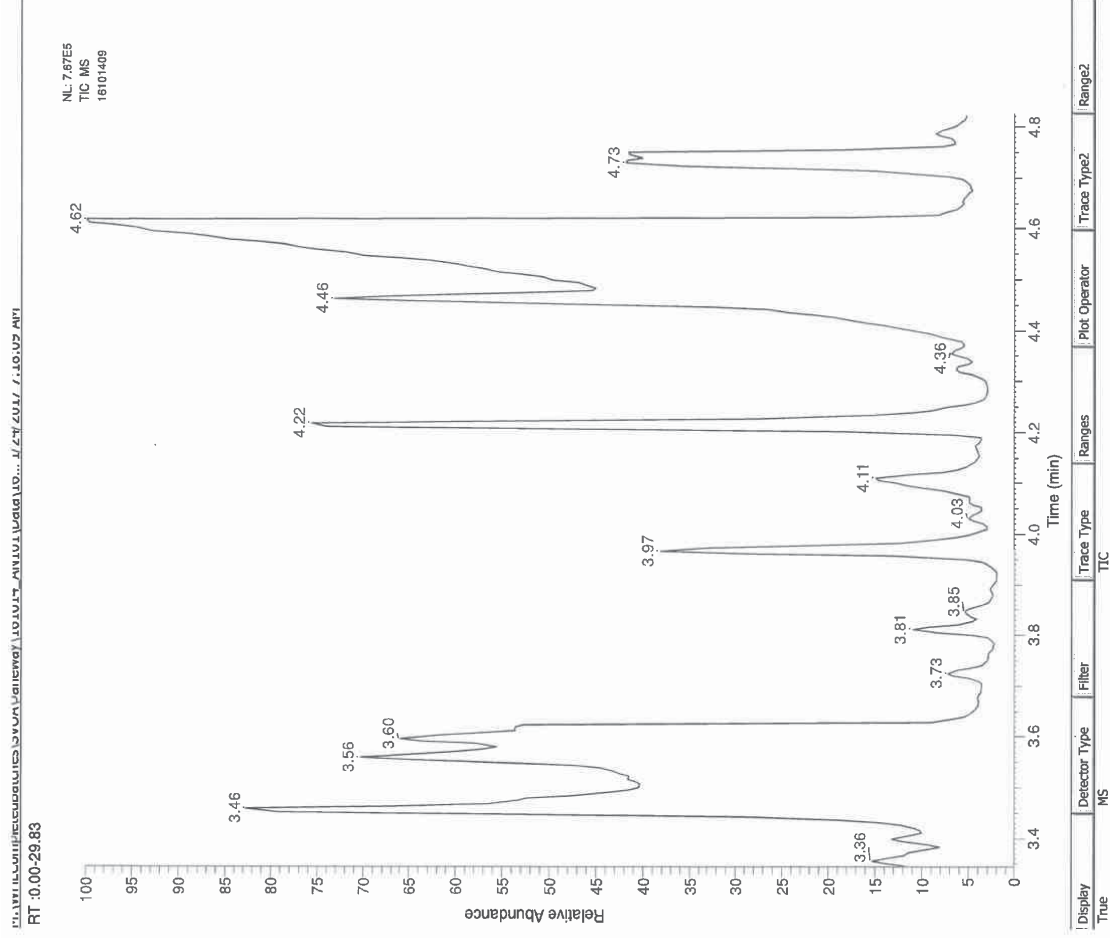
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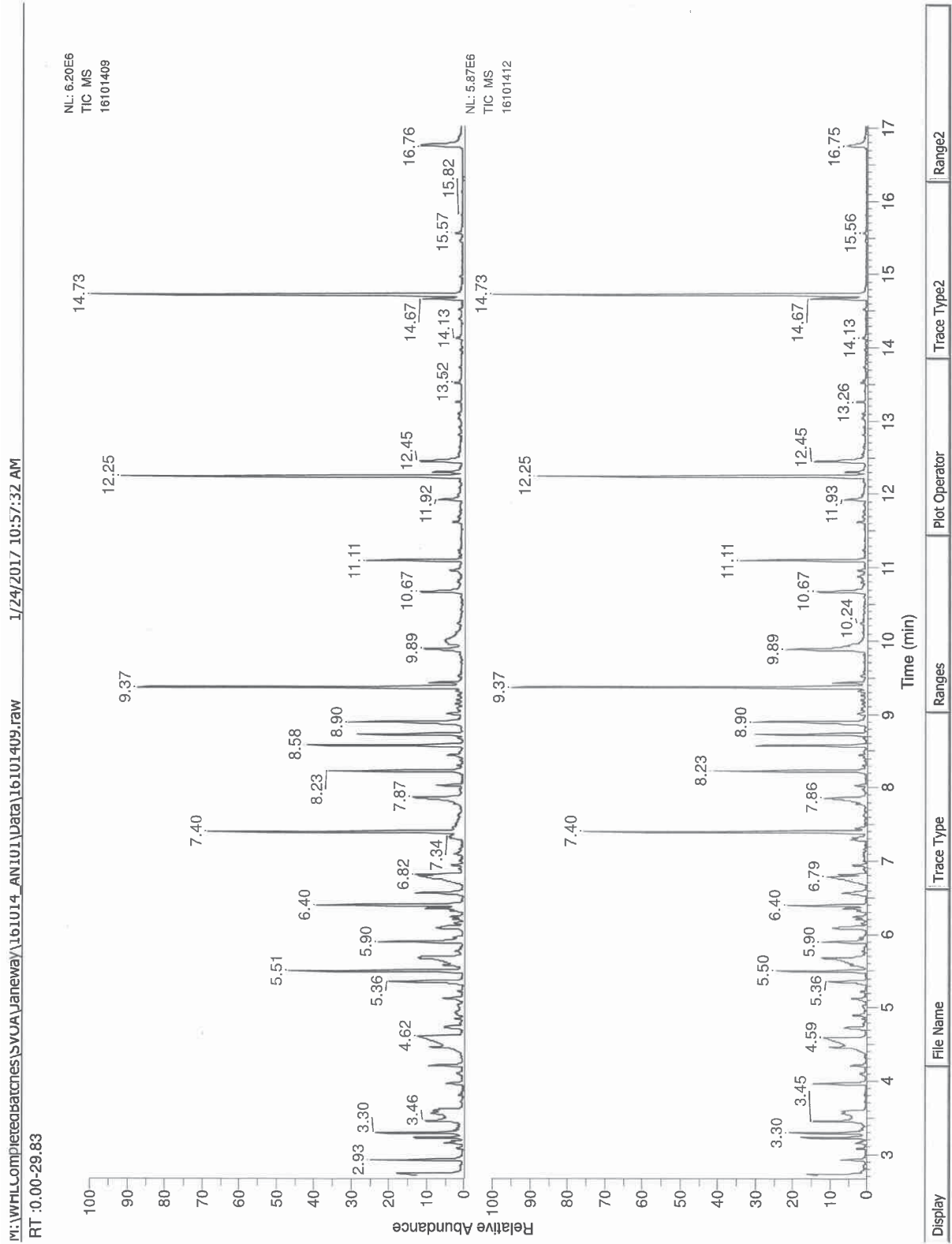
Same as file 9, RT:12.45

RT: 14.67 ID: 2,6-Dibromo-4-nitrophenol (CAS #

Same as file 9, RT:14.67

RT 16.75 was not reported in File 12, but is the same as RT: 16.76 in File 9.





Meznarich, Huei K

To: Meznarich, Huei K
Subject: FW: AN101 TIC analysis for 20161014 data

From: Hansen, Daniel R
Sent: Tuesday, January 31, 2017 11:34 AM
To: Meznarich, Huei K <Huei_K_Meznarich@rl.gov>
Subject: RE: AN101 TIC analysis for 20161014 data

RT: 2.93 ID: trimethyl oxirane, a very good spectral match. Might ask Mark D. – it might be a system artifact??
RT: 3.23 ID: 3-methyl-2-butanone. Spectra not very helpful but likely a hydrocarbon.
RT: 4.22 ID: Dichloronitro methane. A very good spectral match. Could also be trichloromethane.
RT: 12.3 ID: Unknown. Spectra unclear. No guidance on identity.

dan

From: Meznarich, Huei K
Sent: Monday, January 30, 2017 3:46 PM
To: Hansen, Daniel R <Daniel_R_Hansen@rl.gov>
Cc: Meznarich, Huei K <Huei_K_Meznarich@rl.gov>
Subject: RE: AN101 TIC analysis for 20161014 data

Dan:

Thanks.

Figures are very useful.

Looks like there have peaks at retention times, 2.93 min, 3.23 min, 4.22 min, and 12.3 min. Looks like RT at 5.58, could not resolve from RT 5.68.

Should the report include these peaks (the first group)?

Thanks.

Huei

From: Hansen, Daniel R
Sent: Tuesday, January 24, 2017 11:35 AM
To: Meznarich, Huei K
Cc: Frye, Jann M
Subject: AN101 TIC analysis for 20161014 data

Huei – I have edited the report to include more of the peaks. I also included a couple of PDFs. Please let me know if you have any questions.

Thanks,

Daniel R Hansen
Chemist – Organic Studies, 222-S Laboratory
Washington River Protection Solutions, Inc.
Contractor to the US Department of Energy
Work: 509-373-1189 Cell: 509-942-9937

RPP-RPT-59964

APPENDIX C.

WEIGHT LOSS CURVE AND PERCENT OF WEIGHT LOSS BY TGA

(29 pages, including cover page)

8/23/2016 11:24:15AM
CompleteBatch Version 3.0.10
batchreports 3.0.12

LABCORE Completed Batch Report for Batch# 00066109

Analyst: Sooter, Teresa
Instrument: DSC12/TGA11 Analyzer
Method: TGA-TA, LA-514-115 Rev/Mod 7-2
Specification: AN101 FLOATING SOLIDS & CORROSION
Prep Batch: N/A
Batch Comment:

Book#: 69N26A

None

Seq Type	Sample#	Assoc. Sample	RepR	A	* Test	Matrix	Actual	Found	Blank	CTR	Limit (DL/RL/UL)	Unit	Yield	Yield Unit	Flags
Sample Sequence 1															
1 LCS-INST	S1608220065		0 0		%WATER	LIQUID	56.01	57.71			0.01	%	103.04		% Recovery
Sample Sequence 2															
2 SAMPLE	S16R000242		0 0		%WATER	LIQUID	N/A	80.12			0.01	%			
Sample Sequence 3															
3 DUP	S1608220066	S16R000242	0 0		%WATER	LIQUID	80.12	75.72			0.01	%	5.6468		% RPD
Sample Sequence 4															
4 SAMPLE	S16R000253		0 0		%WATER	LIQUID	N/A	81.59			0.01	%			
Sample Sequence 5															
5 SAMPLE	S16R000244		0 0		%WATER	LIQUID	N/A	76.08			0.01	%			

Comments Section:

Data Flagger Status:

Final Page for Batch# 00066109


Reviewer Signature
8/23/16
Date


2nd Review
8/23/16

PC review: Susan Snyder 11/23/2016
QA review: [Signature] 11-22-16

Units shown for QC (BLK/BKG) may not reflect the actual units.

* = Rejected Analyte
N, A = Non-reported Analyte

8/23/2016 11:24:15AM
CompleteBatch Version 3.0.10
batchreports 3.0.12

LABCORE Completed Batch Report for Batch# 00066109

Seq	Sample#	QC Type	Assoc. Sample	Sample Group	Method	Customer Id	Specification	Hold Time/Expiration Date
1	S1608220065	LCS-INST			TGA-TA			
2	S16R000242	SAMPLE		20161758	TGA-TA	Sample 2	AN101 FLOATING SOLIDS & CORROSION	
3	S1608220066	DUP	S16R000242		TGA-TA			
4	S16R000253	SAMPLE		20161758	TGA-TA	Sample 2	AN101 FLOATING SOLIDS & CORROSION	
5	S16R000244	SAMPLE		20161758	TGA-TA	Sample 4	AN101 FLOATING SOLIDS & CORROSION	

Units shown for QC (BLK/BKG) may not reflect the actual units.

* = Rejected Analyte
N, A = Non-reported Analyte

8/22/2016 3:17:35PM
IncompleteBatchShort Version 2.7.29
batchreports 3.0.12

Page: 1

LABCORE Data Entry Template for Batch# 00066109**Analyst:** Sooter, Teresa**Standard ID / Book#:** 69N26A**Instrument:** DSC12/TGA11 Analyzer**Method:** TGA-TA, LA-514-115 Rev/Mod 7-2**Prep Batch:** N/A**Batch Comment:**

None

CACN:200091

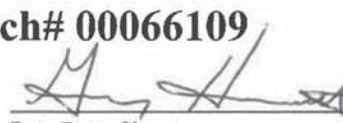
S	Type	Sample	R	A	Matrix	Group#	Project
1	LCS-INST	S1608220065	0		LIQUID		
	Analytes Requested:	%WATER					
2	SAMPLE	S16R000242	0		LIQUID	20161758	AN101 FLOATING SOLIDS & CORROSION
	Analytes Requested:	%WATER					
3	DUP	S1608220066	0		LIQUID		
	Analytes Requested:	%WATER					
4	SAMPLE	S16R000253	0		LIQUID	20161758	AN101 FLOATING SOLIDS & CORROSION
	Analytes Requested:	%WATER					
5	SAMPLE	S16R000244	0		LIQUID	20161758	AN101 FLOATING SOLIDS & CORROSION
	Analytes Requested:	%WATER					

Final Page for Batch# 00066109


Analyst Signature

Date

8/23/16


Data Entry Signature

Date

8-22-16

Data Entry Comments:

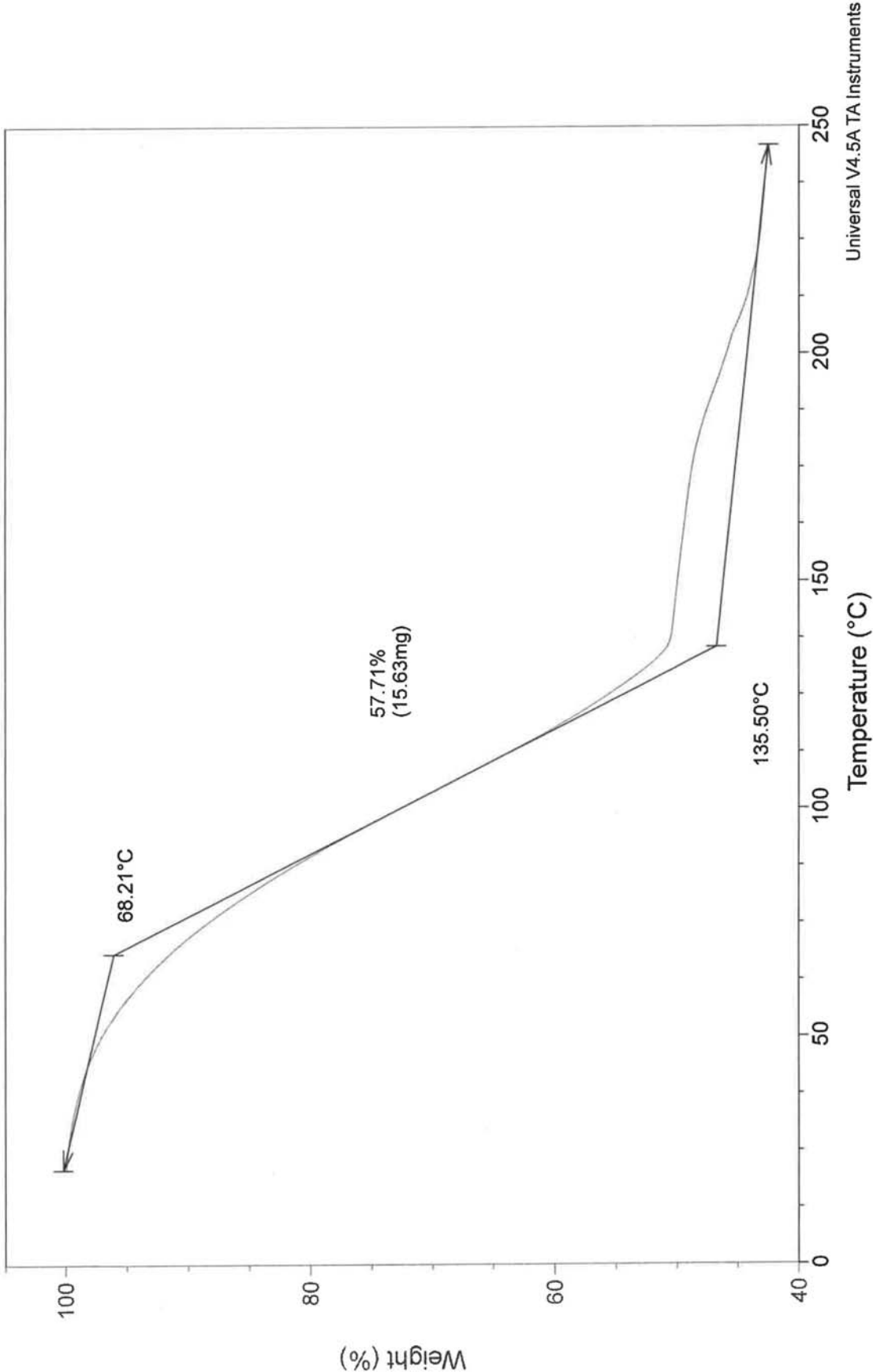
S = Batch Slot Number, R = Retest Number, A = Aliquot Code.

00066109

Sample: TERLIQ STD - 69N26A
Size: 27.0900 mg
Method: Ramp
Comment: AN101 FLOATING SOLIDS & CORROSION (LIQUID)

TGA

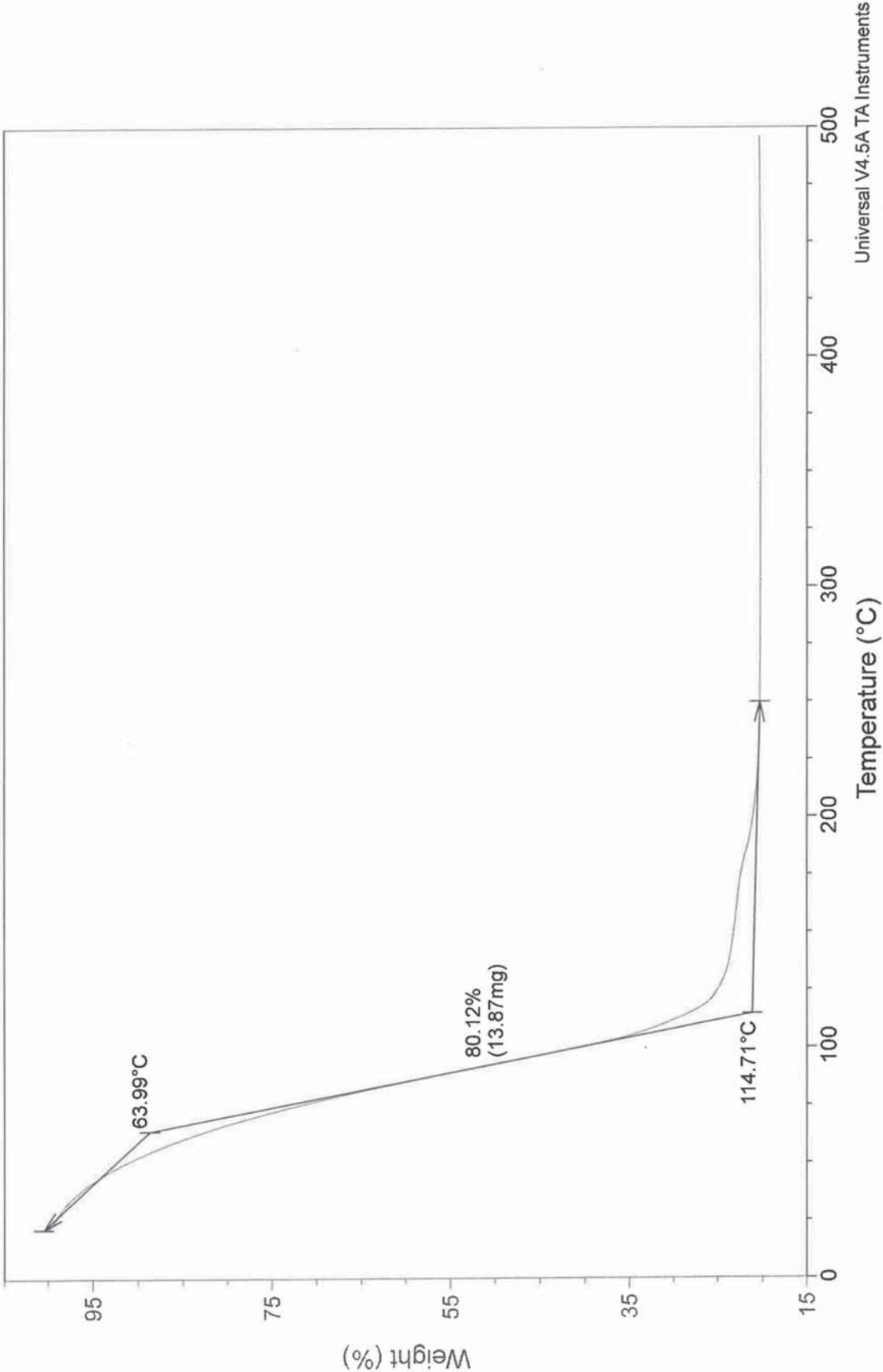
File: C:\TA\Data\TGA\2016\TER160816.001
Operator: TLS
Run Date: 16-Aug-2016 10:04
Instrument: TGA Q50 V20.13 Build 39



Sample: S16R000242
Size: 17.3060 mg
Method: Sample
Comment: AN101 FLOATING SOLIDS & CORROSION (LIQUID)

TGA

File: C:\TA\Data\TGA\2016\SAM160816.001
Operator: TLS
Run Date: 16-Aug-2016 10:56
Instrument: TGA Q50 V20.13 Build 39

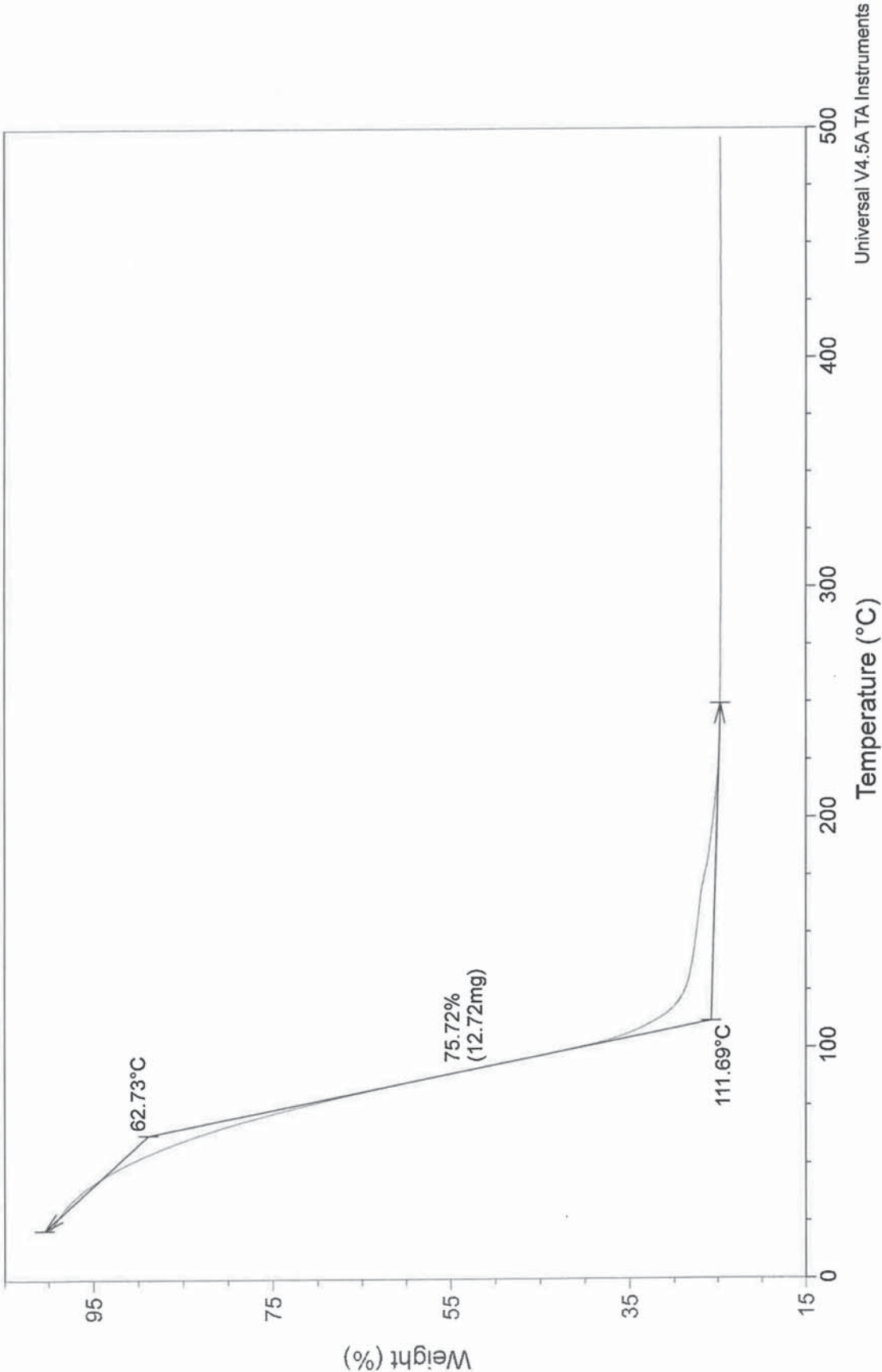


Universal V4.5A TA Instruments

Sample: S16R000242 DUP
Size: 16.8000 mg
Method: Sample
Comment: AN101 FLOATING SOLIDS & CORROSION (LIQUID)

TGA

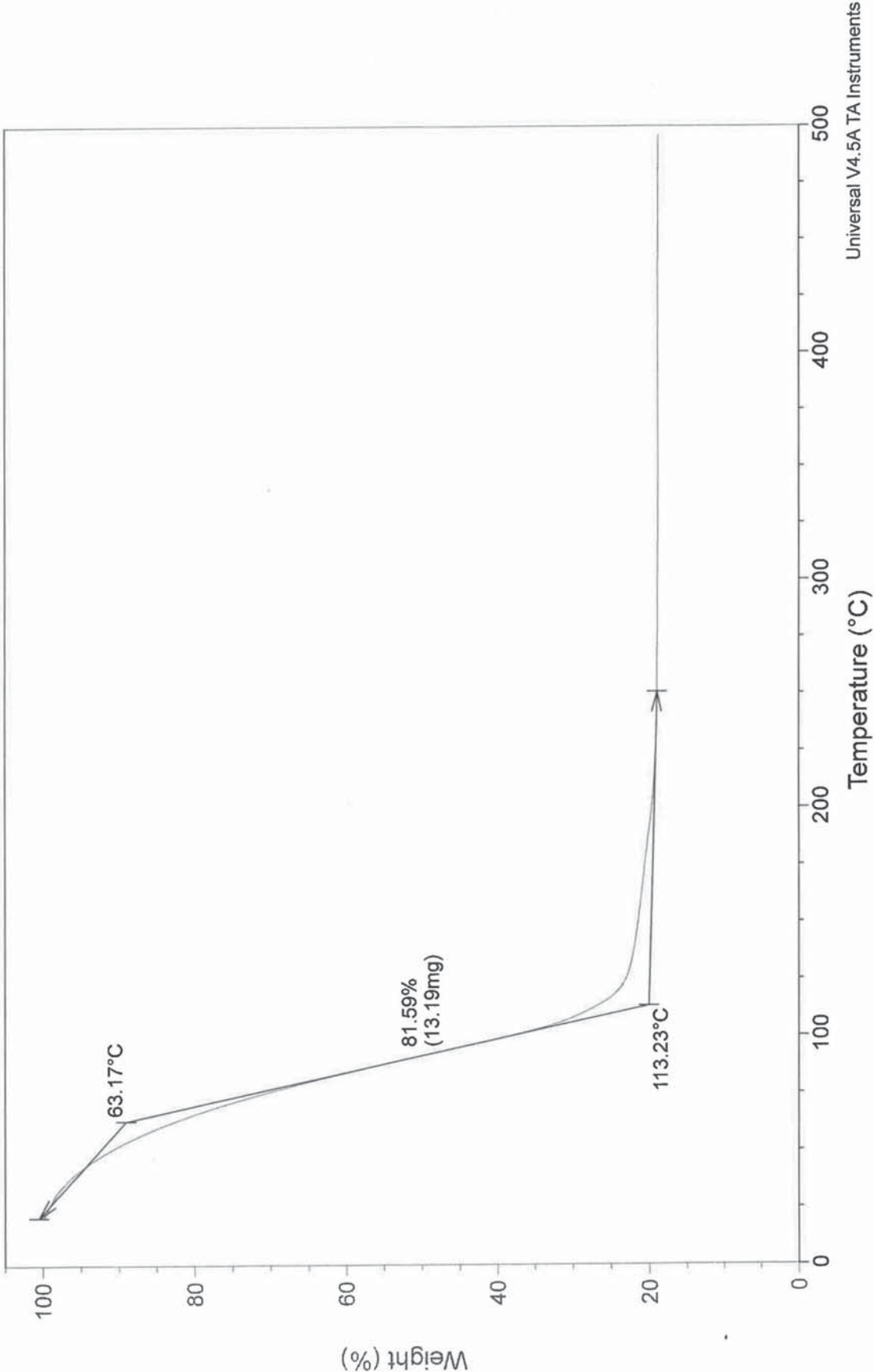
File: C:\TA\Data\TGA\2016\SAM160816.002
Operator: TLS
Run Date: 16-Aug-2016 12:19
Instrument: TGA Q50 V20.13 Build 39



Sample: S16R000253
Size: 16.1700 mg
Method: Sample
Comment: AN101 FLOATING SOLIDS & CORROSION (LIQUID)

TGA

File: C:\TA\Data\TGA\2016\SAM160816.003
Operator: TLS
Run Date: 16-Aug-2016 14:44
Instrument: TGA Q50 V20.13 Build 39

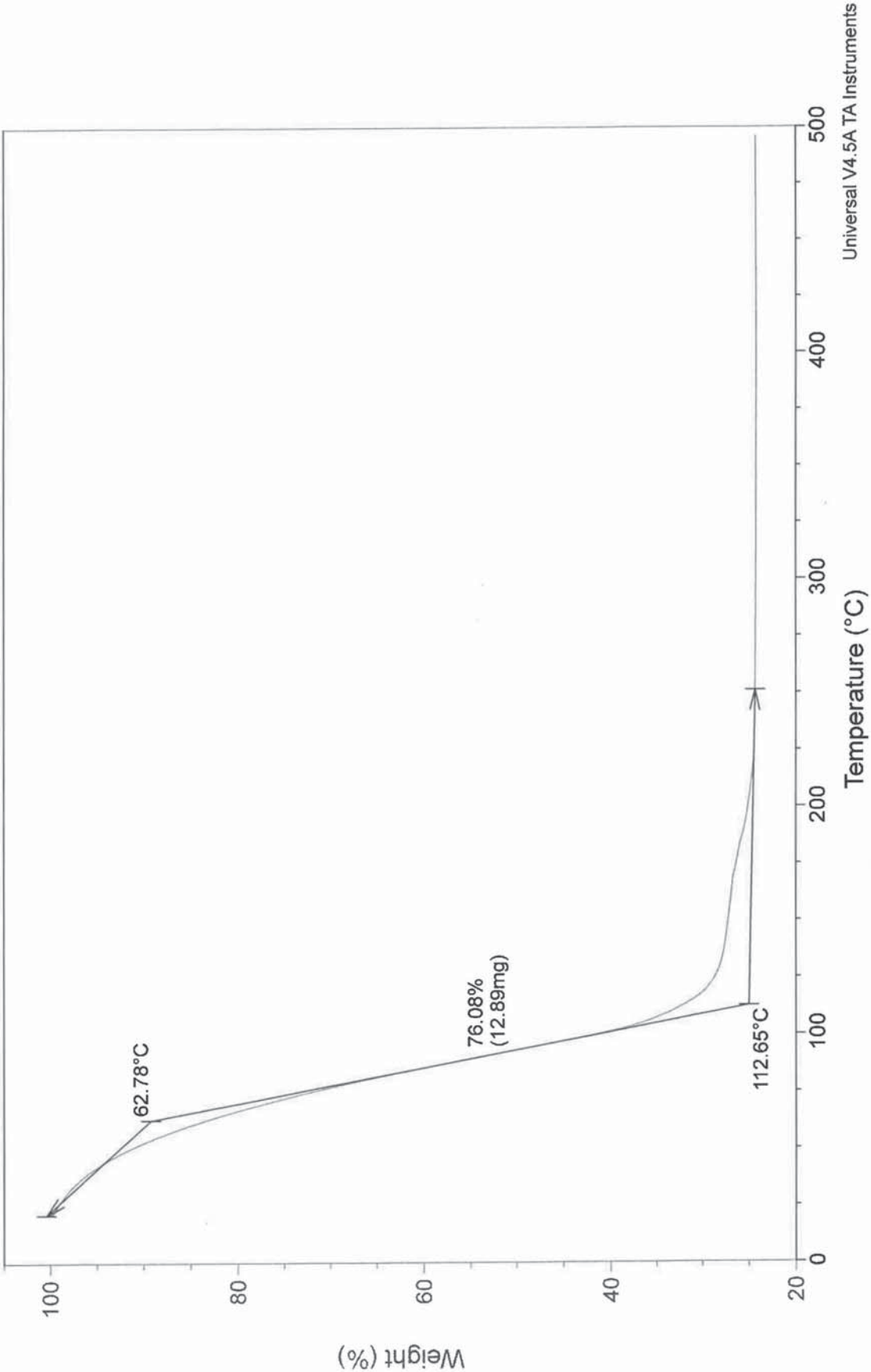


Universal V4.5A TA Instruments

Sample: S16R000244
Size: 16.9440 mg
Method: Sample
Comment: AN101 FLOATING SOLIDS & CORROSION (LIQUID)

TGA

File: C:\TA\Data\TGA\2016\SAM160816.004
Operator: TLS
Run Date: 16-Aug-2016 16:23
Instrument: TGA Q50 V20.13 Build 39



8/23/2016 11:17:29AM
Complete Batch Version 3.0.10
batchreports 3.0.12

LABCORE Completed Batch Report for Batch# 00066106

Book#: 69N26A

Analyst: Sooter, Teresa

Instrument: DSC12/TGA11 Analyzer

Method: TGA-TA, LA-514-115 Rev/Mod 7-2

Specification: AN101 FLOATING SOLIDS & CORROSION

Prep Batch: N/A

Batch Comment:

None

Seq Type	Sample#	Assoc. Sample	RepR	A	* Test	Matrix	Actual	Found	Blank	CTR	Limit (DL/RL/UL)	Unit	Yield	Yield Unit	Flags
Sample Sequence 1															
1	LCS-INST	S1608220059	0	0	%WATER	SOLID	56.01	55.53			0.01	%	99.143		% Recovery
Sample Sequence 2															
2	SAMPLE	S16R000254	0	0	%WATER	SOLID	N/A	70.64			0.01	%			
Sample Sequence 3															
3	DUP	S1608220060	0	0	%WATER	SOLID	70.64	74.59			0.01	%	5.4396		% RPD

Comments Section:

Data Flagger Status:

Final Page for Batch# 00066106


Reviewer Signature
8/23/16
Date


Peer Review
8/23/16
PC review Susan Snyder 11/22/2014
QA review:  11-22-16

Units shown for QC (BLK/BKG) may not reflect the actual units.

* = Rejected Analyte
N, A = Non-reported Analyte

8/23/2016 11:17:29AM
CompleteBatch Version 3.0.10
batchreports 3.0.12

LABCORE Completed Batch Report for Batch# 00066106

Seq	Sample#	QC Type	Assoc. Sample	Sample Group	Method	Customer Id	Specification	Hold Time/Expiration Date
1	S1608220059	LCS-INST			TGA-TA			
2	S16R000254	SAMPLE		20161758	TGA-TA	Sample 3	AN101 FLOATING SOLIDS & CORROSION	
3	S1608220060	DUP	S16R000254		TGA-TA			

Units shown for QC (BLK/BKG) may not reflect the actual units.

* = Rejected Analyte
N, A = Non-reported Analyte

8/22/2016 3:18:08PM
IncompleteBatchShort Version 2.7.29
batchreports 3.0.12

Page: 1

LABCORE Data Entry Template for Batch# 00066106**Analyst:** Sooter, Teresa**Standard ID / Book#:** 69N26A**Instrument:** DSC12/TGA11 Analyzer**Method:** TGA-TA, LA-514-115 Rev/Mod 7-2**Prep Batch:** N/A**Batch Comment:**

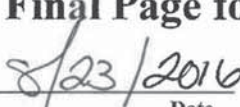
None

CACN:200091

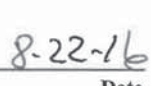
S	Type	Sample	R	A	Matrix	Group#	Project
1	LCS-INST	S1608220059	0		SOLID		
	Analytes Requested:		%WATER				
2	SAMPLE	S16R000254	0		SOLID	20161758	AN101 FLOATING SOLIDS & CORROSION
	Analytes Requested:		%WATER				
3	DUP	S1608220060	0		SOLID		
	Analytes Requested:		%WATER				

Final Page for Batch# 00066106


Analyst Signature


Date


Data Entry Signature


Date

Data Entry Comments:

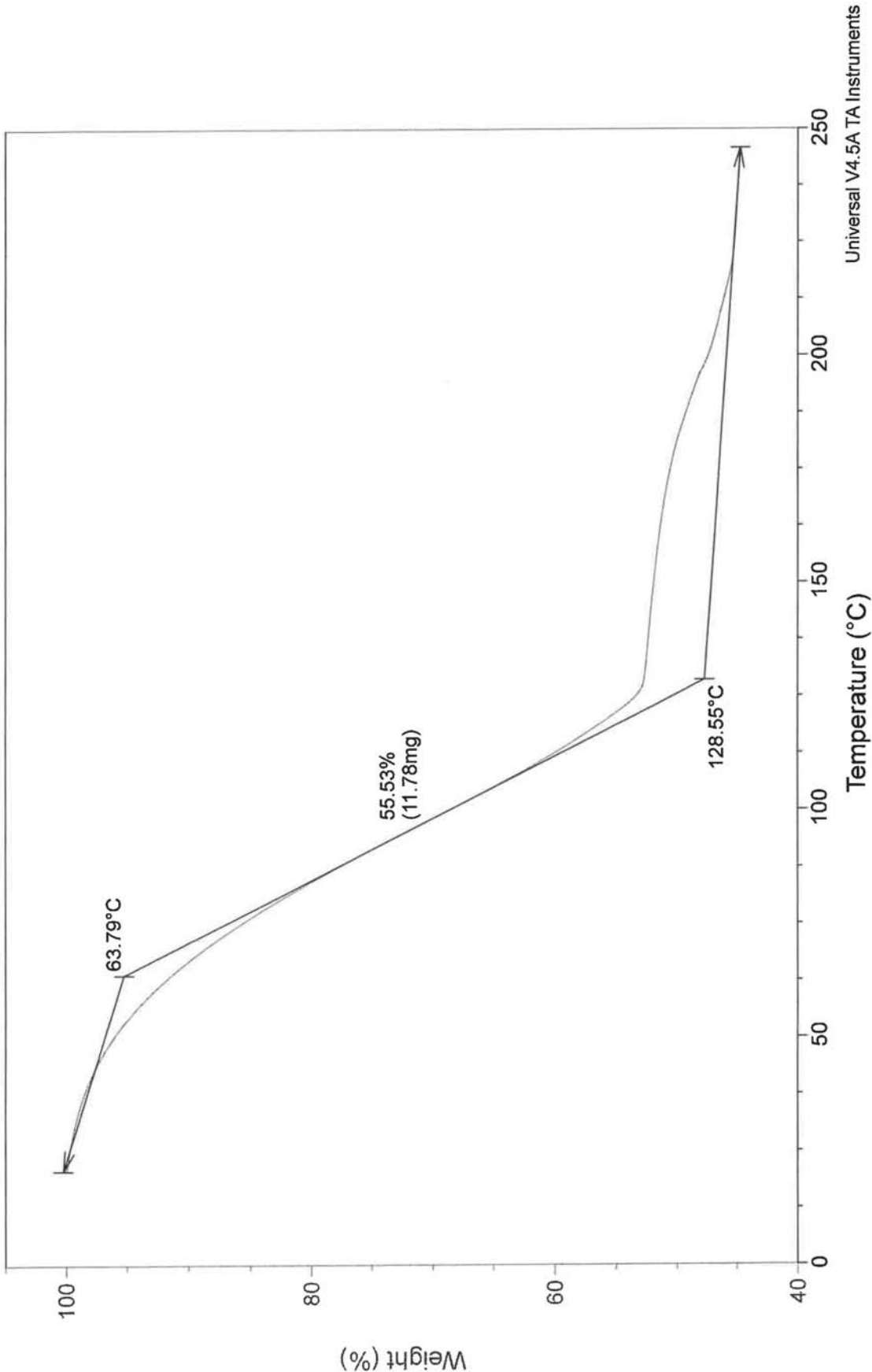
S = Batch Slot Number, R = Retest Number, A = Aliquot Code.

00066106

Sample: TERLIQ STD - 69N26A
Size: 21.2080 mg
Method: Ramp
Comment: AN101 FLOATING SOLIDS & CORROSION (SOLID)

TGA

File: C:\TA\Data\TGA\2016\TER160819.001
Operator: TLS
Run Date: 19-Aug-2016 11:10
Instrument: TGA Q50 V20.13 Build 39

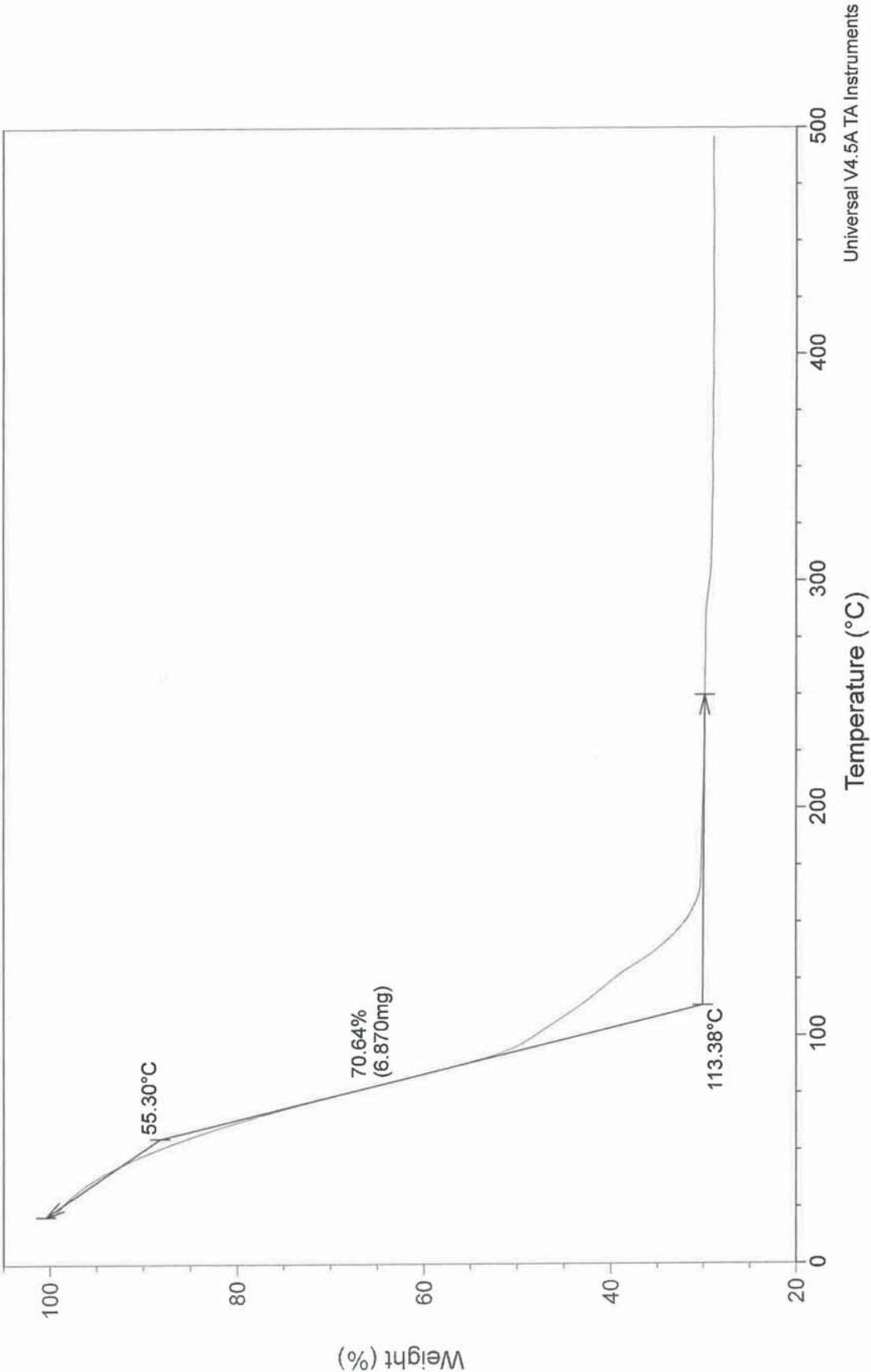


Universal V4.5A TA Instruments

Sample: S16R000254
Size: 9.7260 mg
Method: Sample
Comment: AN101 FLOATING SOLIDS & CORROSION (SOLID)

TGA

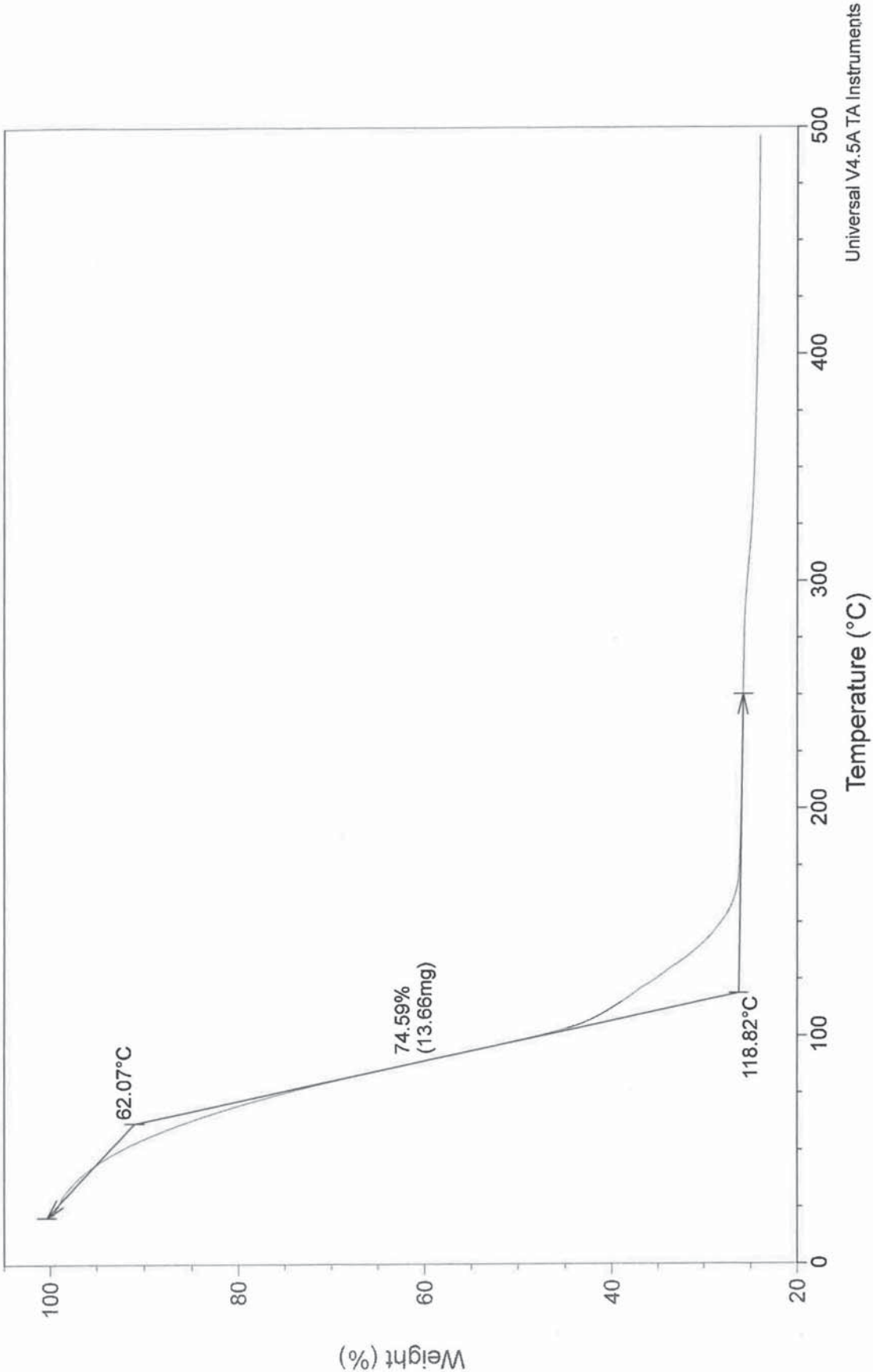
File: C:\TA\Data\TGA\2016\SAM160819.001
Operator: TLS
Run Date: 19-Aug-2016 12:07
Instrument: TGA Q50 V20.13 Build 39



Sample: S16R000254 DUP
Size: 18.3110 mg
Method: Sample
Comment: AN101 FLOATING SOLIDS & CORROSION (SOLID)

TGA

File: C:\TA\Data\TGA\2016\SAM160819.002
Operator: TLS
Run Date: 19-Aug-2016 14:54
Instrument: TGA Q50 V20.13 Build 39



Universal V4.5A TA Instruments

8/23/2016 11:26:16AM
CompleteBatch Version 3.0.10
batchreports 3.0.12

LABCORE Completed Batch Report for Batch# 00066110

Book#: 69N26A

Analyst: Sooter, Teresa
Instrument: DSC12/TGA11 Analyzer
Method: TGA-TA, LA-514-115 Rev/Mod 7-2
Specification: AN101 FLOATING SOLIDS & CORROSION
Prep Batch: N/A
Batch Comment:
None

Seq Type	Sample#	Assoc. Sample	RepR	A	* Test	Matrix	Actual	Found	Blank	CTR	Limit (DL/RL/UL)	Unit	Yield	Yield Unit	Flags
Sample Sequence 1															
1 LCS-INST	S1608220067		0 0		%WATER	LIQUID	56.01	55.77 *			0.01	%	99.572	%	Recovery
Sample Sequence 2															
2 SAMPLE	S16R000255		0 0		%WATER	LIQUID	N/A	86.48 *			0.01	%			
Sample Sequence 3															
3 DUP	S1608220068	S16R000255	0 0		%WATER	LIQUID	86.48	78.77			0.01	%	9.3313	%	RPD

Comments Section:

Data Flagger Status:

Final Page for Batch# 00066110

Reviewer Signature:  Date: 8/23/16
 8/25/16
PC review: Sam Sooter 11/22/2016
QA review: J. Galt 11-22-16

Units shown for QC (BLK/BKG) may not reflect the actual units.

* = Rejected Analyte
N, A = Non-reported Analyte

8/23/2016 11:26:16AM
CompleteBatch Version 3.0.10
batchreports 3.0.12

LABCORE Completed Batch Report for Batch# 00066110

Seq	Sample#	QC Type	Assoc. Sample	Sample Group	Method	Customer Id	Specification	Hold Time/Expiration Date
1	S1608220067	LCS-INST			TGA-TA			
2	S16R000255	SAMPLE		20161758	TGA-TA	Sample 4	AN101 FLOATING SOLIDS & CORROSION	
3	S1608220068	DUP	S16R000255		TGA-TA			

Units shown for QC (BLK/BKG) may not reflect the actual units.

* = Rejected Analyte
N, A = Non-reported Analyte

8/22/2016 3:17:24PM

IncompleteBatchShort Version 2.7.29

batchreports 3.0.12

Page: 1

LABCORE Data Entry Template for Batch# 00066110**Analyst:** Sooter, Teresa**Standard ID / Book#:** 69N26A**Instrument:** DSC12/TGA11 Analyzer**Method:** TGA-TA, LA-514-115 Rev/Mod 7-2**Prep Batch:** N/A**Batch Comment:**

None

CACN:200091

S	Type	Sample	R	A	Matrix	Group#	Project
1	LCS-INST	S1608220067	0		LIQUID		
Analytes Requested:		%WATER					
2	SAMPLE	S16R000255	0		LIQUID	20161758	AN101 FLOATING SOLIDS & CORROSION
Analytes Requested:		%WATER					
3	DUP	S1608220068	0		LIQUID		
Analytes Requested:		%WATER					

Final Page for Batch# 00066110

Analyst Signature

8/23/16

Date



Data Entry Signature

8-22-16

Date

Data Entry Comments:

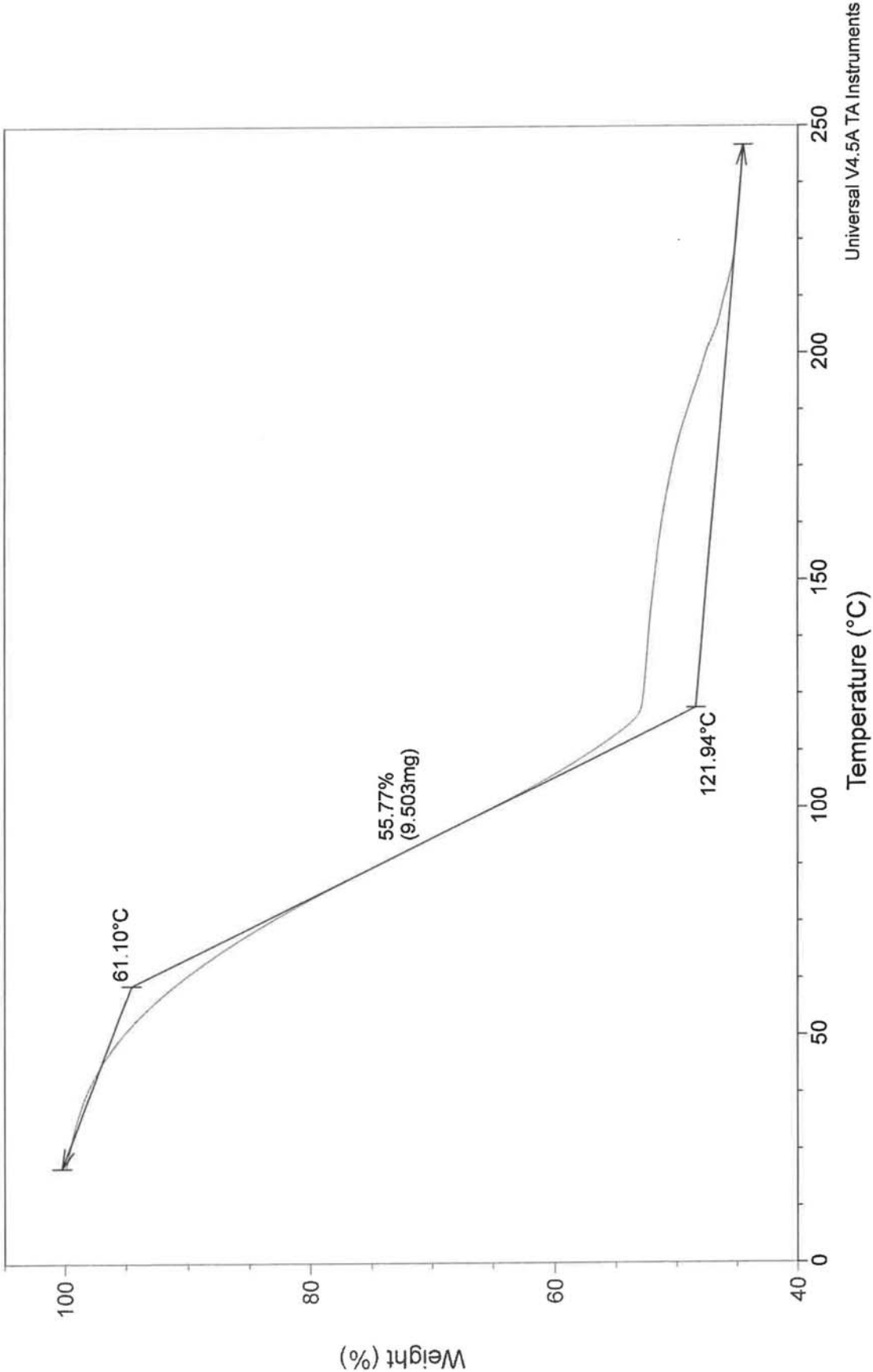
S = Batch Slot Number, R = Retest Number, A = Aliquot Code.

00066110

Sample: TERLIQ STD 69N26A
Size: 17.0400 mg
Method: Ramp
Comment: AN101 FLOATING SOLIDS & CORROSION (LIQUID)

TGA

File: C:\TA\Data\TGA\2016\TER160817.001
Operator: TLS
Run Date: 17-Aug-2016 10:04
Instrument: TGA Q50 V20.13 Build 39

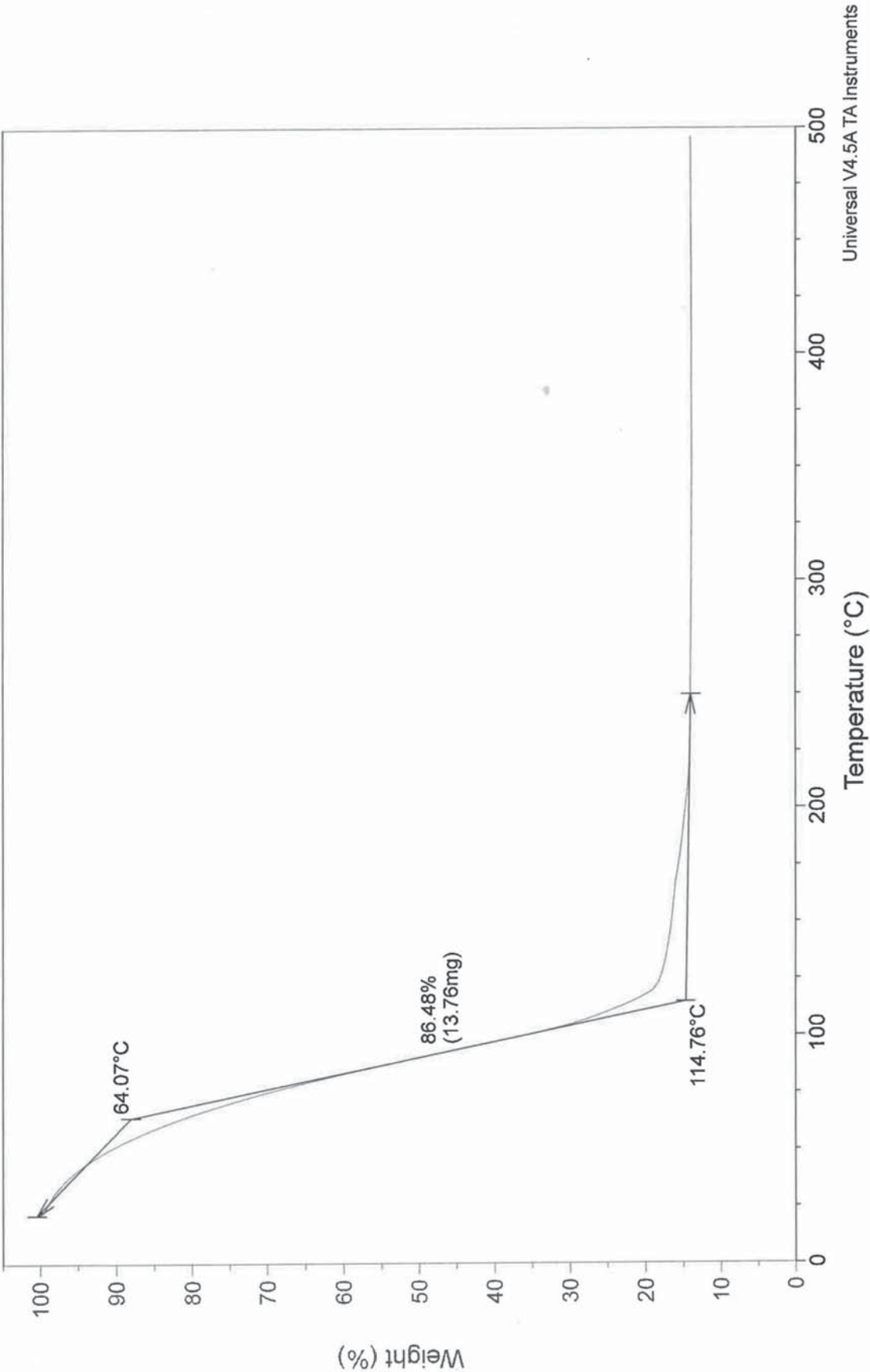


Universal V4.5A TA Instruments

Sample: S16R000255
Size: 15.9120 mg
Method: Sample
Comment: AN101 FLOATING SOLIDS & CORROSION (LIQUID)

TGA

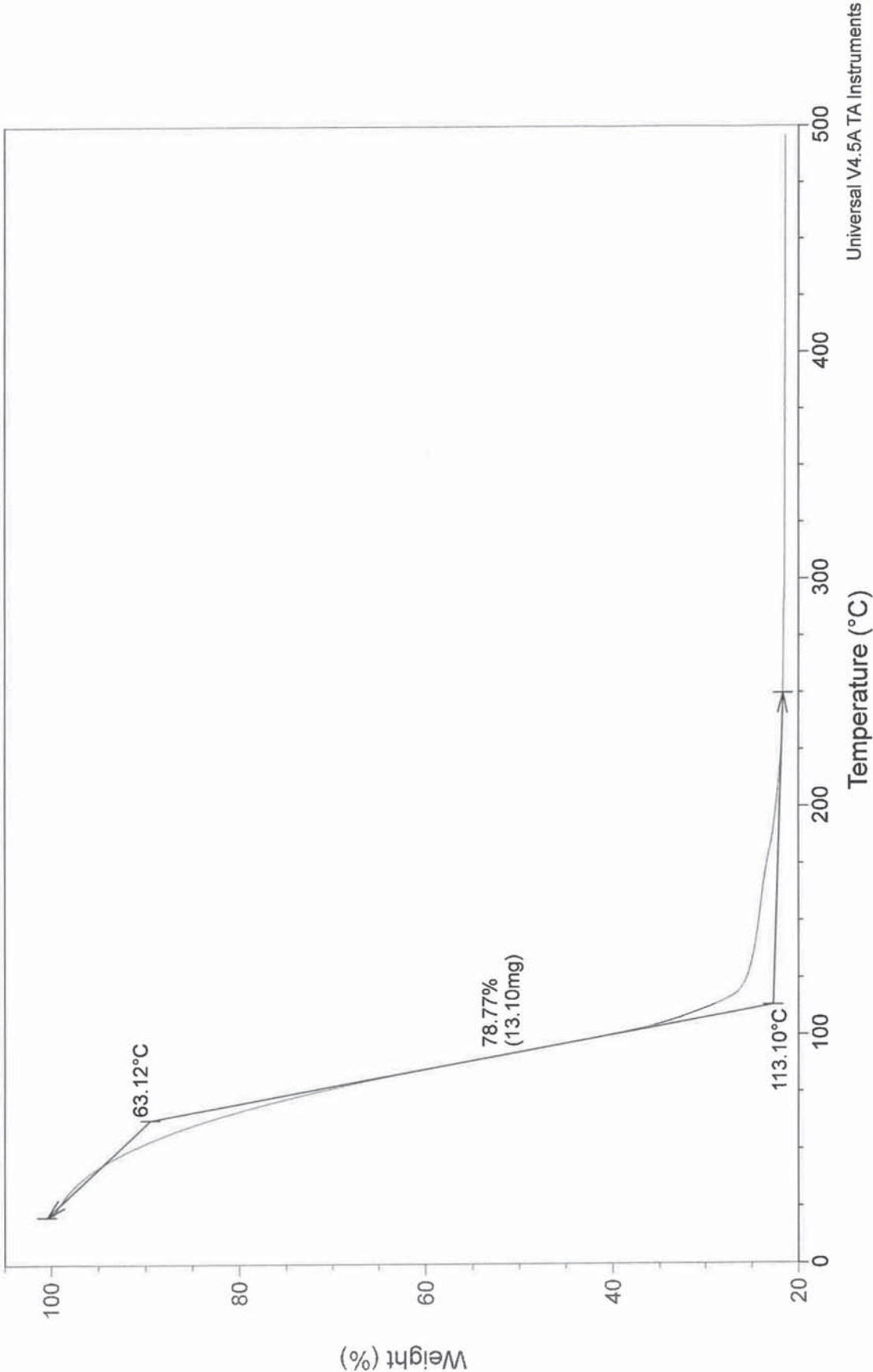
File: C:\TA\Data\TGA\2016\SAM160817.001
Operator: TLS
Run Date: 17-Aug-2016 10:56
Instrument: TGA Q50 V20.13 Build 39



Sample: S16R000255 DUP
Size: 16.6340 mg
Method: Sample
Comment: AN101 FLOATING SOLIDS & CORROSION (LIQUID)

TGA

File: C:\TA\Data\TGA\2016\SAM160817.002
Operator: TLS
Run Date: 17-Aug-2016 15:01
Instrument: TGA Q50 V20.13 Build 39



8/23/2016 11:27:59AM
CompleteBatch Version 3.0.10
batchreports 3.0.12

LABCORE Completed Batch Report for Batch# 00066111

Book#: 69N26A

Analyst: Sooter, Teresa
Instrument: DSC12/TGA11 Analyzer
Method: TGA-TA, LA-514-115 Rev/Mod 7-2
Specification: AN101 FLOATING SOLIDS & CORROSION
Prep Batch: N/A
Batch Comment:
None

Seq Type	Sample#	Assoc. Sample	RepR	A	* Test	Matrix	Actual	Found	Blank	CTR	Limit (DL/RL/UL)	Unit	Yield	Yield Unit	Flags
Sample Sequence 1															
1 LCS-INST	S1608220069		0 0		%WATER	SOLID	56.01	54.54				%	97.375		% Recovery
Sample Sequence 2															
2 SAMPLE	S16R0000241		0 0		%WATER	SOLID	N/A	81.37			0.01	%			
Sample Sequence 3															
3 DUP	S1608220070	S16R0000241	0 0		%WATER	SOLID	81.37	71.03			0.01	%	13.570		% RPD
Sample Sequence 4															
4 SAMPLE	S16R0000243		0 0		%WATER	SOLID	N/A	69.75			0.01	%			
Sample Sequence 5															
5 SAMPLE	S16R0000252		0 0		%WATER	SOLID	N/A	73.24			0.01	%			

Comments Section:

Data Flagger Status:

Final Page for Batch# 00066111

 8/23/16
Reviewer Signature Date

 8/25/16
Reviewer Signature Date

PC review: CEMmagines 10/09/2016
QA review: Jenitha Austin 11-22-16

Units shown for QC (BLK/BKG) may not reflect the actual units.

* = Rejected Analyte
N, A = Non-reported Analyte

8/23/2016 11:27:59AM
CompleteBatch Version 3.0.10
batchreports 3.0.12

LABCORE Completed Batch Report for Batch# 00066111

Seq	Sample#	QC Type	Assoc. Sample	Sample Group	Method	Customer Id	Specification	Hold Time/Expiration Date
1	S1608220069	LCS-INST			TGA-TA			
2	S16R000241	SAMPLE		20161758	TGA-TA	Sample 1	AN101 FLOATING SOLIDS & CORROSION	
3	S1608220070	DUP	S16R000241		TGA-TA			
4	S16R000243	SAMPLE		20161758	TGA-TA	Sample 3	AN101 FLOATING SOLIDS & CORROSION	
5	S16R000252	SAMPLE		20161758	TGA-TA	Sample 1	AN101 FLOATING SOLIDS & CORROSION	

Units shown for QC (BLK/BKG) may not reflect the actual units.

* = Rejected Analyte
N, A = Non-reported Analyte

8/22/2016 3:17:10 PM

IncompleteBatchShort Version 2.7.29

batchreports 3.0.12

Page: 1

LABCORE Data Entry Template for Batch# 00066111**Analyst:** Sooter, Teresa**Standard ID / Book#:** 69N26A**Instrument:** DSC12/TGA11 Analyzer**Method:** TGA-TA, LA-514-115 Rev/Mod 7-2**Prep Batch:** N/A**Batch Comment:**

None

CACN:200091

S	Type	Sample	R	A	Matrix	Group#	Project
1	LCS-INST	S1608220069	0		SOLID		
	Analytes Requested:	%WATER					
2	SAMPLE	S16R000241	0		SOLID	20161758	AN101 FLOATING SOLIDS & CORROSION
	Analytes Requested:	%WATER					
3	DUP	S1608220070	0		SOLID		
	Analytes Requested:	%WATER					
4	SAMPLE	S16R000243	0		SOLID	20161758	AN101 FLOATING SOLIDS & CORROSION
	Analytes Requested:	%WATER					
5	SAMPLE	S16R000252	0		SOLID	20161758	AN101 FLOATING SOLIDS & CORROSION
	Analytes Requested:	%WATER					

Final Page for Batch# 00066111

Analyst Signature

Date

Data Entry Signature

Date

Data Entry Comments:

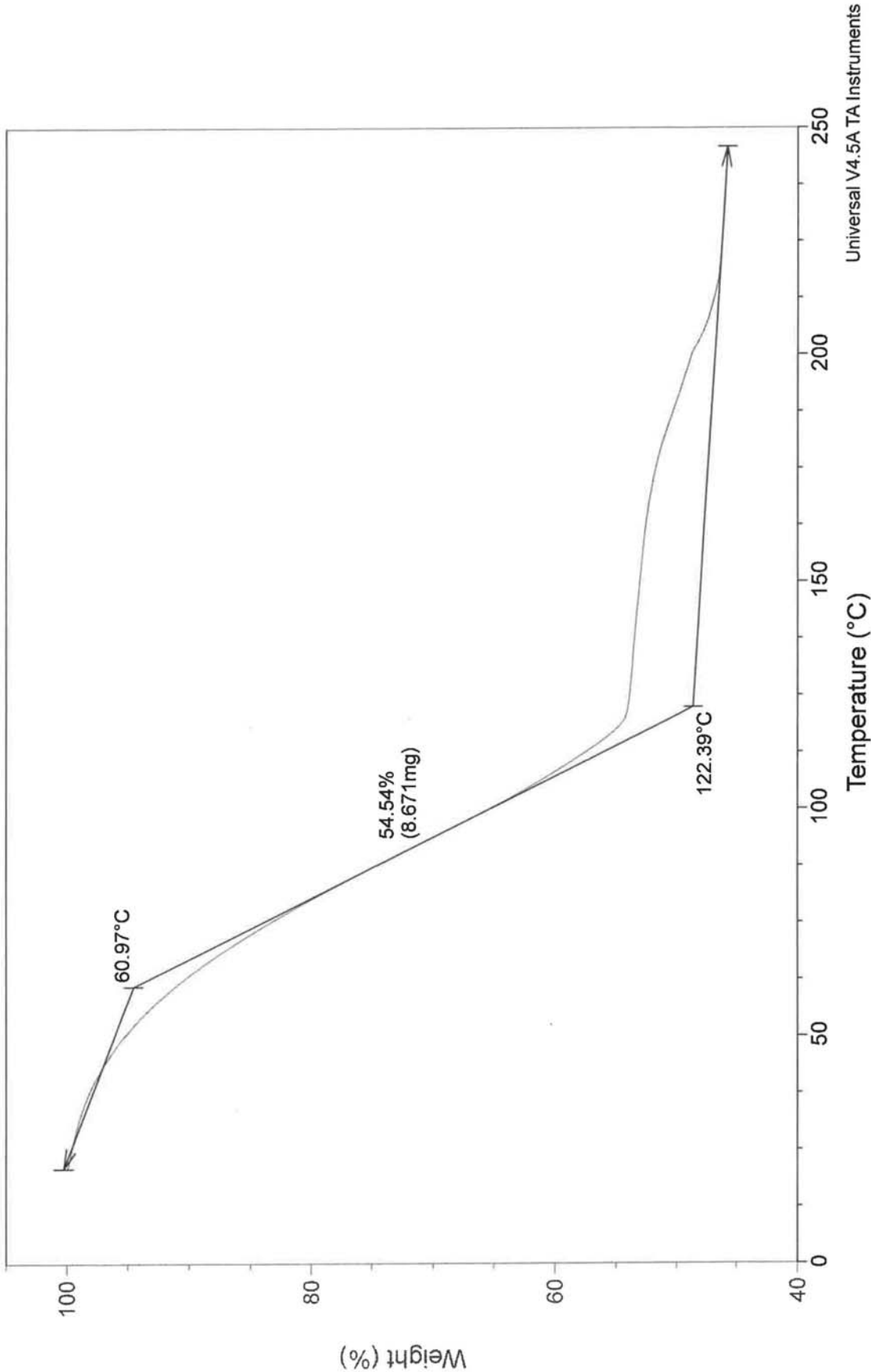
S = Batch Slot Number, R = Retest Number, A = Aliquot Code.

00066111

Sample: TERLIQ STD - 69N26A
Size: 15.8990 mg
Method: Ramp
Comment: AN101 FLOATING SOLIDS & CORROSION (SOLID)

TGA

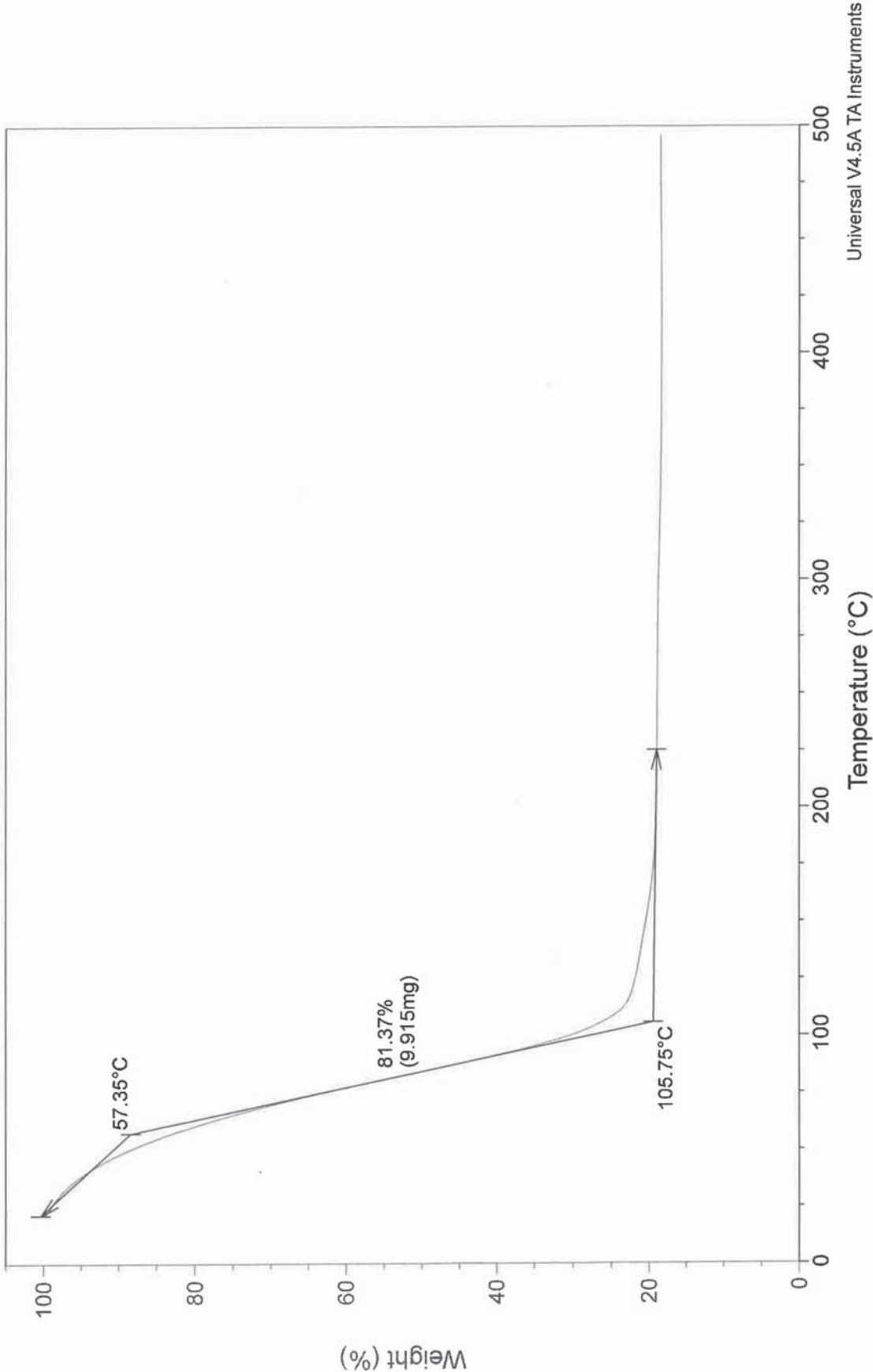
File: C:\TA\Data\TGA\2016\TER160818.001
Operator: TLS
Run Date: 18-Aug-2016 09:53
Instrument: TGA Q50 V20.13 Build 39



00066111
Sample: S16R000241
Size: 12.1850 mg
Method: Sample
Comment: AN101 FLOATING SOLIDS & CORROSION (SOLID)

TGA

File: C:\TA\Data\TGA\2016\SAM160818.001
Operator: TLS
Run Date: 18-Aug-2016 10:48
Instrument: TGA Q50 V20.13 Build 39



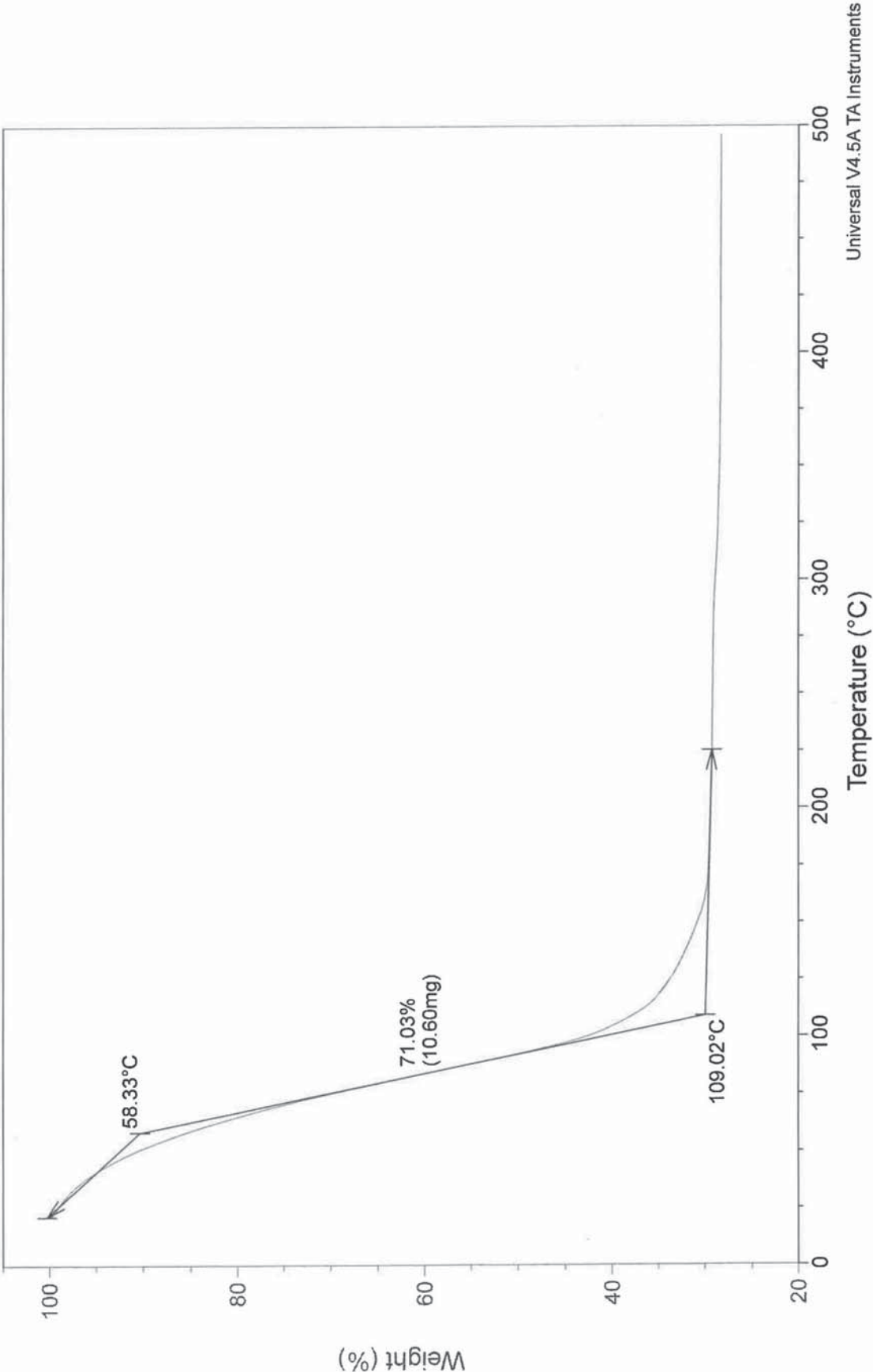
Universal V4.5A TA Instruments

00066111

Sample: S16R000241 DUP
Size: 14.9160 mg
Method: Sample
Comment: AN101 FLOATING SOLIDS & CORROSION (SOLID)

TGA

File: C:\TA\Data\TGA\2016\SAM160818.002
Operator: TLS
Run Date: 18-Aug-2016 12:10
Instrument: TGA Q50 V20.13 Build 39



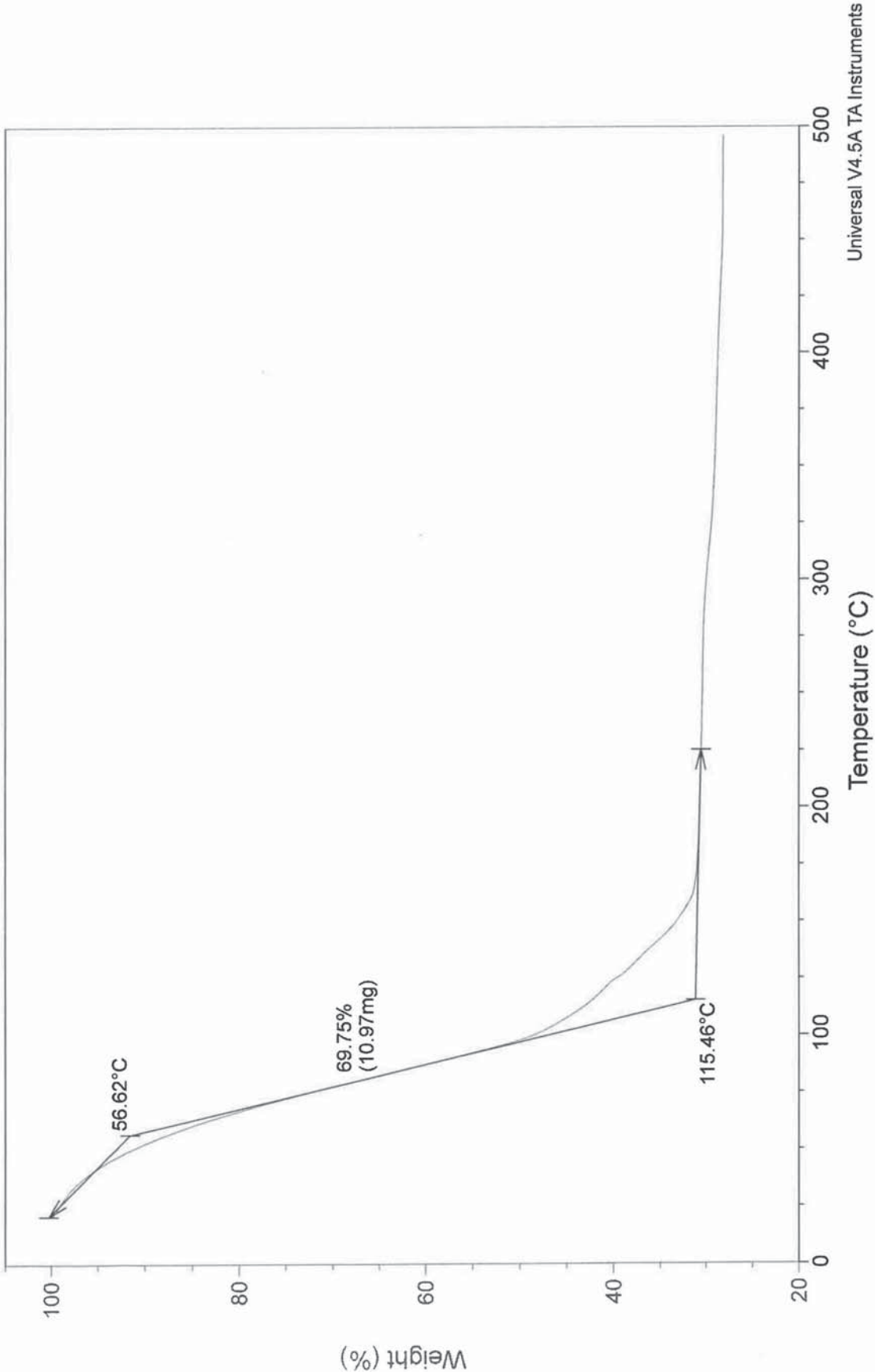
Universal V4.5A TA Instruments

00066111

Sample: S16R000243
Size: 15.7330 mg
Method: Sample
Comment: AN101 FLOATING SOLIDS & CORROSION (SOLID)

TGA

File: C:\TA\Data\TGA\2016\SAM160818.003
Operator: TLS
Run Date: 18-Aug-2016 14:53
Instrument: TGA Q50 V20.13 Build 39

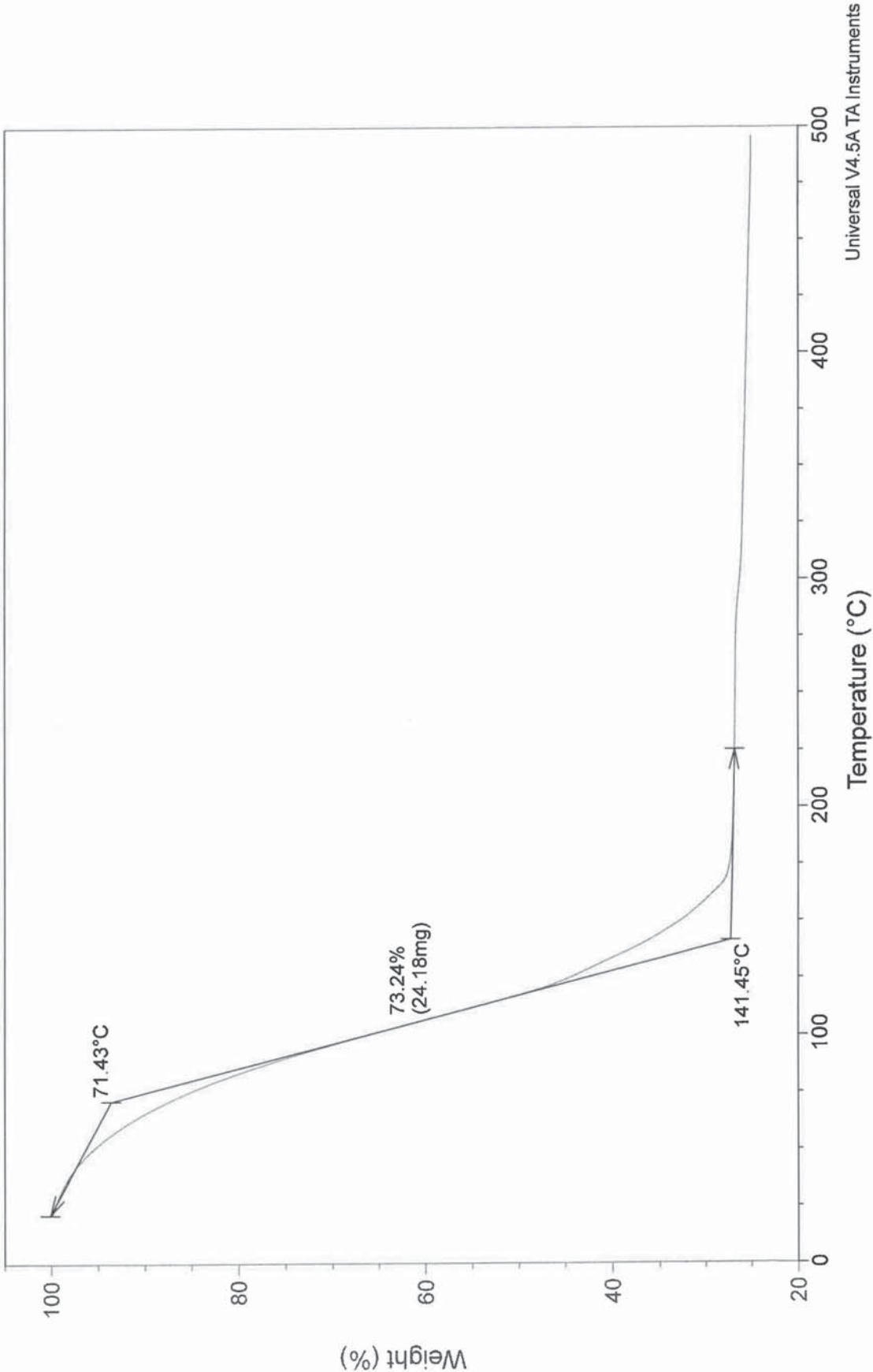


00066111

Sample: S16R000252
Size: 33.0140 mg
Method: Sample
Comment: AN101 FLOATING SOLIDS & CORROSION (SOLID)

TGA

File: C:\TA\Data\TGA\2016\SAM160818.004
Operator: TLS
Run Date: 18-Aug-2016 16:10
Instrument: TGA Q50 V20.13 Build 39



Universal V4.5A TA Instruments

RPP-RPT-59964

APPENDIX D.**DATA SUMMARY REPORT – TANK 241-AN-101 FLOATING SOLIDS -ANALYTICAL
PROJECT DEVELOPMENT (APD)**

(52 pages, including cover page)

AN101 FLOATING SOLIDS & CORROSION
Data Summary Report

Sample Group: 20161758

SDG Number:

Customer Sample ID: Acid Digest

Customer Sample ID: Acid Digest

Sample#	R	A#	CAS #	Analyte	Unit	STD %	Blank	Result	Duplicate	Average	RPD %	Spk Rec %	Det Limit	Cnt Err %	Qual Flags
ICP-AES															
S16R000246		A	7440-22-4	Silver	ug/g	94.0	<3.00E-03	8.49	n/a	n/a	n/a	n/a	5.96	n/a	J
S16R000246		A	7429-90-5	Aluminum	ug/g	93.3	<0.0140	8.43E+03	n/a	n/a	n/a	n/a	27.8	n/a	
S16R000246		A	7440-38-2	Arsenic	ug/g	92.9	<0.0150	<29.8	n/a	n/a	n/a	n/a	29.8	n/a	U
S16R000246		A	7440-42-8	Boron	ug/g	95.5	3.51E-03	18.0	n/a	n/a	n/a	n/a	3.97	n/a	BJ
S16R000246		A	7440-39-3	Barium	ug/g	95.4	<1.00E-03	3.24	n/a	n/a	n/a	n/a	1.99	n/a	J
S16R000246		A	7440-41-7	Beryllium	ug/g	93.8	<1.00E-03	<1.99	n/a	n/a	n/a	n/a	1.99	n/a	U
S16R000246		A	7440-69-9	Bismuth	ug/g	92.7	<0.0190	38.6	n/a	n/a	n/a	n/a	37.8	n/a	J
S16R000246		A	7440-70-2	Calcium	ug/g	100	0.124	646	n/a	n/a	n/a	n/a	238	n/a	BJ
S16R000246		A	7440-43-9	Cadmium	ug/g	94.9	<1.00E-03	<1.99	n/a	n/a	n/a	n/a	1.99	n/a	U
S16R000246		A	7440-45-1	Cerium	ug/g	99.1	0.0330	60.5	n/a	n/a	n/a	n/a	49.7	n/a	BJ
S16R000246		A	7440-48-4	Cobalt	ug/g	95.7	<1.00E-03	<1.99	n/a	n/a	n/a	n/a	1.99	n/a	U
S16R000246		A	7440-47-3	Chromium	ug/g	94.9	0.0138	72.0	n/a	n/a	n/a	n/a	3.97	n/a	B
S16R000246		A	7440-50-8	Copper	ug/g	94.3	<2.00E-03	<3.97	n/a	n/a	n/a	n/a	3.97	n/a	U
S16R000246		A	7440-53-1	Europium	ug/g	99.2	<1.00E-03	<1.99	n/a	n/a	n/a	n/a	1.99	n/a	U
S16R000246		A	7439-89-6	Iron	ug/g	95.5	<0.0200	771	n/a	n/a	n/a	n/a	39.7	n/a	
S16R000246		A	7440-09-7	Potassium	ug/g	93.6	0.0418	386	n/a	n/a	n/a	n/a	43.7	n/a	BJ
S16R000246		A	7439-91-0	Lanthanum	ug/g	96.0	<1.00E-03	2.22	n/a	n/a	n/a	n/a	1.99	n/a	J
S16R000246		A	7439-93-2	Lithium	ug/g	98.0	<1.00E-03	<1.99	n/a	n/a	n/a	n/a	1.99	n/a	U
S16R000246		A	7439-95-4	Magnesium	ug/g	95.2	<9.00E-03	<17.9	n/a	n/a	n/a	n/a	17.9	n/a	U
S16R000246		A	7439-96-5	Manganese	ug/g	95.8	<1.00E-03	3.08	n/a	n/a	n/a	n/a	1.99	n/a	J
S16R000246		A	7439-98-7	Molybdenum	ug/g	98.5	<2.00E-03	5.90	n/a	n/a	n/a	n/a	3.97	n/a	J
S16R000246		A	7440-23-5	Sodium	ug/g	95.9	<0.0920	9.08E+04	n/a	n/a	n/a	n/a	183	n/a	
S16R000246		A	7440-00-8	Neodymium	ug/g	102	<0.0150	<29.8	n/a	n/a	n/a	n/a	29.8	n/a	U
S16R000246		A	7440-02-0	Nickel	ug/g	94.2	<2.00E-03	691	n/a	n/a	n/a	n/a	3.97	n/a	
S16R000246		A	7440-03-1	Niobium	ug/g	101	<6.00E-03	<11.9	n/a	n/a	n/a	n/a	11.9	n/a	U
S16R000246		A	7723-14-0	Phosphorus	ug/g	95.5	<0.0130	3.67E+03	n/a	n/a	n/a	n/a	25.8	n/a	
S16R000246		A	7439-92-1	Lead	ug/g	97.1	<0.0130	185	n/a	n/a	n/a	n/a	25.8	n/a	J

N - Named TIC
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Y - Comment

T - Tentatively Identified Compound
b - MS/MSD Outside Range

NA = Not Analyzed, ND = Not Detected
I - Indirect Calibration
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AN101 FLOATING SOLIDS & CORROSION
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Customer Sample ID: Acid Digest

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Sample#	R	A#	CAS #	Analyte	Unit	STD %	Blank	Result	Duplicate	Average	RPD %	Spk Rec %	Det Limit	Cnt Err %	Qual Flags
ICP-AES															
S16R000246		A	7440-05-3	Palladium	ug/g	95.3	<0.0120	<23.8	n/a	n/a	n/a	n/a	23.8	n/a	U
S16R000246		A	7440-10-0	Praseodymium	ug/g	102	<0.0260	<51.7	n/a	n/a	n/a	n/a	51.7	n/a	U
S16R000246		A	7440-17-7	Rubidium	ug/g	97.0	<0.0570	<113	n/a	n/a	n/a	n/a	113	n/a	U
S16R000246		A	7440-16-6	Rhodium	ug/g	95.6	<0.0120	<23.8	n/a	n/a	n/a	n/a	23.8	n/a	U
S16R000246		A	7440-18-8	Ruthenium	ug/g	92.8	<5.00E-03	<9.94	n/a	n/a	n/a	n/a	9.94	n/a	U
S16R000246		A	7704-34-9	Sulfur	ug/g	95.7	0.0403	640	n/a	n/a	n/a	n/a	55.6	n/a	B
S16R000246		A	7440-36-0	Antimony	ug/g	94.4	<0.0180	<35.8	n/a	n/a	n/a	n/a	35.8	n/a	U
S16R000246		A	7782-49-2	Selenium	ug/g	94.5	<0.0300	<59.6	n/a	n/a	n/a	n/a	59.6	n/a	U
S16R000246		A	7440-21-3	Silicon	ug/g	100	0.0600	302	n/a	n/a	n/a	n/a	23.8	n/a	B
S16R000246		A	7440-19-9	Samarium	ug/g	101	<0.0170	<33.8	n/a	n/a	n/a	n/a	33.8	n/a	U
S16R000246		A	7440-31-5	Tin	ug/g	96.2	<8.00E-03	19.9	n/a	n/a	n/a	n/a	15.9	n/a	J
S16R000246		A	7440-24-6	Strontium	ug/g	95.3	<2.00E-03	7.32	n/a	n/a	n/a	n/a	3.97	n/a	J
S16R000246		A	7440-25-7	Tantalum	ug/g	104	<5.00E-03	<9.94	n/a	n/a	n/a	n/a	9.94	n/a	U
S16R000246		A	13494-80-9	Tellurium	ug/g	95.6	<9.00E-03	<17.9	n/a	n/a	n/a	n/a	17.9	n/a	U
S16R000246		A	7440-29-1	Thorium	ug/g	99.3	<0.0130	<25.8	n/a	n/a	n/a	n/a	25.8	n/a	U
S16R000246		A	7440-32-6	Titanium	ug/g	95.8	<2.00E-03	<3.97	n/a	n/a	n/a	n/a	3.97	n/a	U
S16R000246		A	7440-28-0	Thallium	ug/g	90.9	<0.0150	<29.8	n/a	n/a	n/a	n/a	29.8	n/a	U
S16R000246		A	7440-61-1	Uranium	ug/g	102	<0.0290	339	n/a	n/a	n/a	n/a	57.6	n/a	J
S16R000246		A	7440-62-2	Vanadium	ug/g	93.8	<1.00E-03	<1.99	n/a	n/a	n/a	n/a	1.99	n/a	U
S16R000246		A	7440-33-7	Tungsten	ug/g	101	<0.0160	<31.8	n/a	n/a	n/a	n/a	31.8	n/a	U
S16R000246		A	7440-65-5	Yttrium	ug/g	98.5	<2.00E-03	<3.97	n/a	n/a	n/a	n/a	3.97	n/a	U
S16R000246		A	7440-66-6	Zinc	ug/g	92.7	<0.0320	<63.6	n/a	n/a	n/a	n/a	63.6	n/a	U
S16R000246		A	7440-67-7	Zirconium	ug/g	95.2	<1.00E-03	2.80	n/a	n/a	n/a	n/a	1.99	n/a	J
S16R000248		A	7440-22-4	Silver	ug/g	94.0	<3.00E-03	7.75	n/a	n/a	n/a	n/a	5.97	n/a	J
S16R000248		A	7429-90-5	Aluminum	ug/g	93.3	<0.0140	8.32E+03	n/a	n/a	n/a	n/a	27.9	n/a	
S16R000248		A	7440-38-2	Arsenic	ug/g	92.9	<0.0150	<29.8	n/a	n/a	n/a	n/a	29.8	n/a	U
S16R000248		A	7440-42-8	Boron	ug/g	95.5	3.51E-03	11.7	n/a	n/a	n/a	n/a	3.98	n/a	BJ

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ICP-AES															
S16R000248		A	7440-39-3	Barium	ug/g	95.4	<1.00E-03	3.85	n/a	n/a	n/a	n/a	1.99	n/a	J
S16R000248		A	7440-41-7	Beryllium	ug/g	93.8	<1.00E-03	<1.99	n/a	n/a	n/a	n/a	1.99	n/a	U
S16R000248		A	7440-69-9	Bismuth	ug/g	92.7	<0.0190	53.1	n/a	n/a	n/a	n/a	37.8	n/a	J
S16R000248		A	7440-70-2	Calcium	ug/g	100	0.124	1.10E+03	n/a	n/a	n/a	n/a	239	n/a	BJ
S16R000248		A	7440-43-9	Cadmium	ug/g	94.9	<1.00E-03	<1.99	n/a	n/a	n/a	n/a	1.99	n/a	U
S16R000248		A	7440-45-1	Cerium	ug/g	99.1	0.0330	86.1	n/a	n/a	n/a	n/a	49.7	n/a	BJ
S16R000248		A	7440-48-4	Cobalt	ug/g	95.7	<1.00E-03	<1.99	n/a	n/a	n/a	n/a	1.99	n/a	U
S16R000248		A	7440-47-3	Chromium	ug/g	94.9	0.0138	64.8	n/a	n/a	n/a	n/a	3.98	n/a	B
S16R000248		A	7440-50-8	Copper	ug/g	94.3	<2.00E-03	4.42	n/a	n/a	n/a	n/a	3.98	n/a	J
S16R000248		A	7440-53-1	Europium	ug/g	99.2	<1.00E-03	<1.99	n/a	n/a	n/a	n/a	1.99	n/a	U
S16R000248		A	7439-89-6	Iron	ug/g	95.5	<0.0200	1.16E+03	n/a	n/a	n/a	n/a	39.8	n/a	
S16R000248		A	7440-09-7	Potassium	ug/g	93.6	0.0418	321	n/a	n/a	n/a	n/a	43.8	n/a	BJ
S16R000248		A	7439-91-0	Lanthanum	ug/g	96.0	<1.00E-03	3.10	n/a	n/a	n/a	n/a	1.99	n/a	J
S16R000248		A	7439-93-2	Lithium	ug/g	98.0	<1.00E-03	<1.99	n/a	n/a	n/a	n/a	1.99	n/a	U
S16R000248		A	7439-95-4	Magnesium	ug/g	95.2	<9.00E-03	28.2	n/a	n/a	n/a	n/a	17.9	n/a	J
S16R000248		A	7439-96-5	Manganese	ug/g	95.8	<1.00E-03	4.73	n/a	n/a	n/a	n/a	1.99	n/a	J
S16R000248		A	7439-98-7	Molybdenum	ug/g	98.5	<2.00E-03	<3.98	n/a	n/a	n/a	n/a	3.98	n/a	U
S16R000248		A	7440-23-5	Sodium	ug/g	95.9	<0.0920	1.04E+05	n/a	n/a	n/a	n/a	183	n/a	
S16R000248		A	7440-00-8	Neodymium	ug/g	102	<0.0150	<29.8	n/a	n/a	n/a	n/a	29.8	n/a	U
S16R000248		A	7440-02-0	Nickel	ug/g	94.2	<2.00E-03	1.13E+03	n/a	n/a	n/a	n/a	3.98	n/a	
S16R000248		A	7440-03-1	Niobium	ug/g	101	<6.00E-03	<11.9	n/a	n/a	n/a	n/a	11.9	n/a	U
S16R000248		A	7723-14-0	Phosphorus	ug/g	95.5	<0.0130	1.27E+04	n/a	n/a	n/a	n/a	25.9	n/a	
S16R000248		A	7439-92-1	Lead	ug/g	97.1	<0.0130	220	n/a	n/a	n/a	n/a	25.9	n/a	J
S16R000248		A	7440-05-3	Palladium	ug/g	95.3	<0.0120	<23.9	n/a	n/a	n/a	n/a	23.9	n/a	U
S16R000248		A	7440-10-0	Praseodymium	ug/g	102	<0.0260	<51.7	n/a	n/a	n/a	n/a	51.7	n/a	U
S16R000248		A	7440-17-7	Rubidium	ug/g	97.0	<0.0570	<113	n/a	n/a	n/a	n/a	113	n/a	U
S16R000248		A	7440-16-6	Rhodium	ug/g	95.6	<0.0120	<23.9	n/a	n/a	n/a	n/a	23.9	n/a	U

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ICP-AES															
S16R000248		A	7440-18-8	Ruthenium	ug/g	92.8	<5.00E-03	<9.95	n/a	n/a	n/a	n/a	9.95	n/a	n/a
S16R000248		A	7704-34-9	Sulfur	ug/g	95.7	0.0403	574	n/a	n/a	n/a	n/a	55.7	n/a	n/a
S16R000248		A	7440-36-0	Antimony	ug/g	94.4	<0.0180	<35.8	n/a	n/a	n/a	n/a	35.8	n/a	n/a
S16R000248		A	7782-49-2	Selenium	ug/g	94.5	<0.0300	<59.7	n/a	n/a	n/a	n/a	59.7	n/a	n/a
S16R000248		A	7440-21-3	Silicon	ug/g	100	0.0600	350	n/a	n/a	n/a	n/a	23.9	n/a	n/a
S16R000248		A	7440-19-9	Samarium	ug/g	101	<0.0170	<33.8	n/a	n/a	n/a	n/a	33.8	n/a	n/a
S16R000248		A	7440-31-5	Tin	ug/g	96.2	<8.00E-03	17.6	n/a	n/a	n/a	n/a	15.9	n/a	n/a
S16R000248		A	7440-24-6	Strontium	ug/g	95.3	<2.00E-03	12.4	n/a	n/a	n/a	n/a	3.98	n/a	n/a
S16R000248		A	7440-25-7	Tantalum	ug/g	104	<5.00E-03	<9.95	n/a	n/a	n/a	n/a	9.95	n/a	n/a
S16R000248		A	13494-80-9	Tellurium	ug/g	95.6	<9.00E-03	<17.9	n/a	n/a	n/a	n/a	17.9	n/a	n/a
S16R000248		A	7440-29-1	Thorium	ug/g	99.3	<0.0130	<25.9	n/a	n/a	n/a	n/a	25.9	n/a	n/a
S16R000248		A	7440-32-6	Titanium	ug/g	95.8	<2.00E-03	<3.98	n/a	n/a	n/a	n/a	3.98	n/a	n/a
S16R000248		A	7440-28-0	Thallium	ug/g	90.9	<0.0150	<29.8	n/a	n/a	n/a	n/a	29.8	n/a	n/a
S16R000248		A	7440-61-1	Uranium	ug/g	102	<0.0290	568	n/a	n/a	n/a	n/a	57.7	n/a	n/a
S16R000248		A	7440-62-2	Vanadium	ug/g	93.8	<1.00E-03	5.19	n/a	n/a	n/a	n/a	1.99	n/a	n/a
S16R000248		A	7440-33-7	Tungsten	ug/g	101	<0.0160	<31.8	n/a	n/a	n/a	n/a	31.8	n/a	n/a
S16R000248		A	7440-65-5	Yttrium	ug/g	98.5	<2.00E-03	<3.98	n/a	n/a	n/a	n/a	3.98	n/a	n/a
S16R000248		A	7440-66-6	Zinc	ug/g	92.7	<0.0320	<63.7	n/a	n/a	n/a	n/a	63.7	n/a	n/a
S16R000248		A	7440-67-7	Zirconium	ug/g	95.2	<1.00E-03	4.94	n/a	n/a	n/a	n/a	1.99	n/a	n/a
S16R000257		A	7440-22-4	Silver	ug/g	94.0	<3.00E-03	10.9	8.39	9.63	25.8	102	5.97	n/a	n/a
S16R000257		A	7429-90-5	Aluminum	ug/g	93.3	<0.0140	1.03E+04	1.10E+04	1.06E+04	6.57	155	27.9	n/a	n/a
S16R000257		A	7440-38-2	Arsenic	ug/g	92.9	<0.0150	<29.8	<29.8	n/a	n/a	102	29.8	n/a	n/a
S16R000257		A	7440-42-8	Boron	ug/g	95.5	3.51E-03	11.0	9.70	10.3	12.3	101	3.98	n/a	n/a
S16R000257		A	7440-39-3	Barium	ug/g	95.4	<1.00E-03	5.91	4.75	5.33	21.7	103	1.99	n/a	n/a
S16R000257		A	7440-41-7	Beryllium	ug/g	93.8	<1.00E-03	<1.99	<1.99	n/a	n/a	103	1.99	n/a	n/a
S16R000257		A	7440-69-9	Bismuth	ug/g	92.7	<0.0190	105	88.8	97.1	17.1	101	37.8	n/a	n/a
S16R000257		A	7440-70-2	Calcium	ug/g	100	0.124	1.85E+03	1.70E+03	1.77E+03	8.41	113	239	n/a	n/a

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ICP-AES															
S16R000257		A	7440-43-9	Cadmium	ug/g	94.9	<1.00E-03	<1.99	<1.99	n/a	n/a	104	1.99	n/a	U
S16R000257		A	7440-45-1	Cerium	ug/g	99.1	0.0330	<49.7	64.5	n/a	n/a	110	49.7	n/a	U
S16R000257		A	7440-48-4	Cobalt	ug/g	95.7	<1.00E-03	<1.99	<1.99	n/a	n/a	104	1.99	n/a	U
S16R000257		A	7440-47-3	Chromium	ug/g	94.9	0.0138	74.1	76.3	75.2	2.91	103	3.98	n/a	B
S16R000257		A	7440-50-8	Copper	ug/g	94.3	<2.00E-03	7.70	7.22	7.46	6.38	103	3.98	n/a	J
S16R000257		A	7440-53-1	Europium	ug/g	99.2	<1.00E-03	<1.99	<1.99	n/a	n/a	103	1.99	n/a	U
S16R000257		A	7439-89-6	Iron	ug/g	95.5	<0.0200	2.19E+03	1.94E+03	2.06E+03	12.1	102	39.8	n/a	
S16R000257		A	7440-09-7	Potassium	ug/g	93.6	0.0418	350	366	358	4.56	99.7	43.8	n/a	BJ
S16R000257		A	7439-91-0	Lanthanum	ug/g	96.0	<1.00E-03	7.70	6.48	7.09	17.2	103	1.99	n/a	J
S16R000257		A	7439-93-2	Lithium	ug/g	98.0	<1.00E-03	<1.99	<1.99	n/a	n/a	103	1.99	n/a	U
S16R000257		A	7439-95-4	Magnesium	ug/g	95.2	<9.00E-03	38.3	35.5	36.9	7.60	103	17.9	n/a	J
S16R000257		A	7439-96-5	Manganese	ug/g	95.8	<1.00E-03	8.04	7.12	7.58	12.2	102	1.99	n/a	J
S16R000257		A	7439-98-7	Molybdenum	ug/g	98.5	<2.00E-03	5.27	4.98	5.12	5.69	103	3.98	n/a	J
S16R000257		A	7440-23-5	Sodium	ug/g	95.9	<0.0920	9.63E+04	9.87E+04	9.75E+04	2.46	470	183	n/a	
S16R000257		A	7440-00-8	Neodymium	ug/g	102	<0.0150	<29.8	<29.8	n/a	n/a	108	29.8	n/a	U
S16R000257		A	7440-02-0	Nickel	ug/g	94.2	<2.00E-03	2.18E+03	1.94E+03	2.06E+03	12.0	106	3.98	n/a	
S16R000257		A	7440-03-1	Niobium	ug/g	101	<6.00E-03	<11.9	<11.9	n/a	n/a	109	11.9	n/a	U
S16R000257		A	7723-14-0	Phosphorus	ug/g	95.5	<0.0130	6.22E+03	6.36E+03	6.29E+03	2.23	223	25.9	n/a	
S16R000257		A	7439-92-1	Lead	ug/g	97.1	<0.0130	366	331	348	10.1	105	25.9	n/a	
S16R000257		A	7440-05-3	Palladium	ug/g	95.3	<0.0120	<23.9	<23.8	n/a	n/a	106	23.9	n/a	U
S16R000257		A	7440-10-0	Praseodymium	ug/g	102	<0.0260	<51.7	<51.6	n/a	n/a	108	51.7	n/a	U
S16R000257		A	7440-17-7	Rubidium	ug/g	97.0	<0.0570	<113	<113	n/a	n/a	99.9	113	n/a	U
S16R000257		A	7440-16-6	Rhodium	ug/g	95.6	<0.0120	<23.9	<23.8	n/a	n/a	106	23.9	n/a	U
S16R000257		A	7440-18-8	Ruthenium	ug/g	92.8	<5.00E-03	<9.95	<9.93	n/a	n/a	103	9.95	n/a	U
S16R000257		A	7704-34-9	Sulfur	ug/g	95.7	0.0403	614	639	627	3.98	103	55.7	n/a	B
S16R000257		A	7440-36-0	Antimony	ug/g	94.4	<0.0180	<35.8	<35.8	n/a	n/a	100	35.8	n/a	U
S16R000257		A	7782-49-2	Selenium	ug/g	94.5	<0.0300	<59.7	<59.6	n/a	n/a	101	59.7	n/a	U

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AN101 FLOATING SOLIDS & CORROSION
Data Summary Report

Sample Group: 20161758

SDG Number:

Customer Sample ID: Acid Digest

Customer Sample ID: Acid Digest

Sample#	R	A#	CAS #	Analyte	Unit	STD %	Blank	Result	Duplicate	Average	RPD %	Spk Rec %	Det Limit	Cnt Err %	Qual Flags
ICP-AES															
S16R000257		A	7440-21-3	Silicon	ug/g	100	0.0600	515	497	506	3.54	112	23.9	n/a	B
S16R000257		A	7440-19-9	Samarium	ug/g	101	<0.0170	39.3	<33.8	n/a	n/a	106	33.8	n/a	J
S16R000257		A	7440-31-5	Tin	ug/g	96.2	<8.00E-03	18.9	22.4	20.6	17.1	105	15.9	n/a	J
S16R000257		A	7440-24-6	Strontium	ug/g	95.3	<2.00E-03	21.8	20.9	21.4	3.91	102	3.98	n/a	J
S16R000257		A	7440-25-7	Tantalum	ug/g	104	<5.00E-03	<9.95	<9.93	n/a	n/a	111	9.95	n/a	U
S16R000257		A	13494-80-9	Tellurium	ug/g	95.6	<9.00E-03	<17.9	<17.9	n/a	n/a	106	17.9	n/a	U
S16R000257		A	7440-29-1	Thorium	ug/g	99.3	<0.0130	<25.9	<25.8	n/a	n/a	105	25.9	n/a	U
S16R000257		A	7440-32-6	Titanium	ug/g	95.8	<2.00E-03	4.62	4.06	4.34	12.8	98.7	3.98	n/a	J
S16R000257		A	7440-28-0	Thallium	ug/g	90.9	<0.0150	<29.8	<29.8	n/a	n/a	100	29.8	n/a	U
S16R000257		A	7440-61-1	Uranium	ug/g	102	<0.0290	1.02E+03	9.19E+02	9.71E+02	10.7	96.5	57.7	n/a	
S16R000257		A	7440-62-2	Vanadium	ug/g	93.8	<1.00E-03	<1.99	2.56	n/a	n/a	100	1.99	n/a	U
S16R000257		A	7440-33-7	Tungsten	ug/g	101	<0.0160	<31.8	<31.8	n/a	n/a	110	31.8	n/a	U
S16R000257		A	7440-65-5	Yttrium	ug/g	98.5	<2.00E-03	<3.98	<3.97	n/a	n/a	106	3.98	n/a	U
S16R000257		A	7440-66-6	Zinc	ug/g	92.7	<0.0320	<63.7	<63.6	n/a	n/a	106	63.7	n/a	U
S16R000257		A	7440-67-7	Zirconium	ug/g	95.2	<1.00E-03	10.1	9.00	9.57	11.8	98.0	1.99	n/a	J
S16R000259		A	7440-22-4	Silver	ug/g	94.0	<3.00E-03	8.24	n/a	n/a	n/a	n/a	5.97	n/a	J
S16R000259		A	7429-90-5	Aluminum	ug/g	93.3	<0.0140	9.08E+03	n/a	n/a	n/a	n/a	27.9	n/a	
S16R000259		A	7440-38-2	Arsenic	ug/g	92.9	<0.0150	<29.8	n/a	n/a	n/a	n/a	29.8	n/a	U
S16R000259		A	7440-42-8	Boron	ug/g	95.5	3.51E-03	11.5	n/a	n/a	n/a	n/a	3.98	n/a	BJ
S16R000259		A	7440-39-3	Barium	ug/g	95.4	<1.00E-03	5.33	n/a	n/a	n/a	n/a	1.99	n/a	J
S16R000259		A	7440-41-7	Beryllium	ug/g	93.8	<1.00E-03	<1.99	n/a	n/a	n/a	n/a	1.99	n/a	U
S16R000259		A	7440-69-9	Bismuth	ug/g	92.7	<0.0190	79.1	n/a	n/a	n/a	n/a	37.8	n/a	J
S16R000259		A	7440-70-2	Calcium	ug/g	100	0.124	1.44E+03	n/a	n/a	n/a	n/a	239	n/a	BJ
S16R000259		A	7440-43-9	Cadmium	ug/g	94.9	<1.00E-03	<1.99	n/a	n/a	n/a	n/a	1.99	n/a	U
S16R000259		A	7440-45-1	Cerium	ug/g	99.1	0.0330	98.4	n/a	n/a	n/a	n/a	49.7	n/a	BJ
S16R000259		A	7440-48-4	Cobalt	ug/g	95.7	<1.00E-03	<1.99	n/a	n/a	n/a	n/a	1.99	n/a	U
S16R000259		A	7440-47-3	Chromium	ug/g	94.9	0.0138	66.2	n/a	n/a	n/a	n/a	3.98	n/a	B

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AN101 FLOATING SOLIDS & CORROSION
Data Summary Report

Sample Group: 20161758

SDG Number:

Customer Sample ID: Acid Digest

Customer Sample ID: Acid Digest

Sample#	R	A#	CAS #	Analyte	Unit	STD %	Blank	Result	Duplicate	Average	RPD %	Spk Rec %	Det Limit	Cnt Err %	Qual Flags
ICP-AES															
S16R000259		A	7440-50-8	Copper	ug/g	94.3	<2.00E-03	5.46	n/a	n/a	n/a	n/a	3.98	n/a	J
S16R000259		A	7440-53-1	Europium	ug/g	99.2	<1.00E-03	<1.99	n/a	n/a	n/a	n/a	1.99	n/a	U
S16R000259		A	7439-89-6	Iron	ug/g	95.5	<0.0200	1.65E+03	n/a	n/a	n/a	n/a	39.8	n/a	
S16R000259		A	7440-09-7	Potassium	ug/g	93.6	0.0418	298	n/a	n/a	n/a	n/a	43.8	n/a	BJ
S16R000259		A	7439-91-0	Lanthanum	ug/g	96.0	<1.00E-03	5.27	n/a	n/a	n/a	n/a	1.99	n/a	J
S16R000259		A	7439-93-2	Lithium	ug/g	98.0	<1.00E-03	<1.99	n/a	n/a	n/a	n/a	1.99	n/a	U
S16R000259		A	7439-95-4	Magnesium	ug/g	95.2	<9.00E-03	34.7	n/a	n/a	n/a	n/a	17.9	n/a	J
S16R000259		A	7439-96-5	Manganese	ug/g	95.8	<1.00E-03	6.85	n/a	n/a	n/a	n/a	1.99	n/a	J
S16R000259		A	7439-98-7	Molybdenum	ug/g	98.5	<2.00E-03	4.20	n/a	n/a	n/a	n/a	3.98	n/a	J
S16R000259		A	7440-23-5	Sodium	ug/g	95.9	<0.0920	9.94E+04	n/a	n/a	n/a	n/a	183	n/a	
S16R000259		A	7440-00-8	Neodymium	ug/g	102	<0.0150	<29.8	n/a	n/a	n/a	n/a	29.8	n/a	U
S16R000259		A	7440-02-0	Nickel	ug/g	94.2	<2.00E-03	1.57E+03	n/a	n/a	n/a	n/a	3.98	n/a	
S16R000259		A	7440-03-1	Niobium	ug/g	101	<6.00E-03	<11.9	n/a	n/a	n/a	n/a	11.9	n/a	U
S16R000259		A	7723-14-0	Phosphorus	ug/g	95.5	<0.0130	1.12E+04	n/a	n/a	n/a	n/a	25.9	n/a	
S16R000259		A	7439-92-1	Lead	ug/g	97.1	<0.0130	275	n/a	n/a	n/a	n/a	25.9	n/a	
S16R000259		A	7440-05-3	Palladium	ug/g	95.3	<0.0120	<23.9	n/a	n/a	n/a	n/a	23.9	n/a	U
S16R000259		A	7440-10-0	Praseodymium	ug/g	102	<0.0260	<51.7	n/a	n/a	n/a	n/a	51.7	n/a	U
S16R000259		A	7440-17-7	Rubidium	ug/g	97.0	<0.0570	<113	n/a	n/a	n/a	n/a	113	n/a	U
S16R000259		A	7440-16-6	Rhodium	ug/g	95.6	<0.0120	<23.9	n/a	n/a	n/a	n/a	23.9	n/a	U
S16R000259		A	7440-18-8	Ruthenium	ug/g	92.8	<5.00E-03	<9.95	n/a	n/a	n/a	n/a	9.95	n/a	U
S16R000259		A	7704-34-9	Sulfur	ug/g	95.7	0.0403	572	n/a	n/a	n/a	n/a	55.7	n/a	B
S16R000259		A	7440-36-0	Antimony	ug/g	94.4	<0.0180	<35.8	n/a	n/a	n/a	n/a	35.8	n/a	U
S16R000259		A	7782-49-2	Selenium	ug/g	94.5	<0.0300	<59.7	n/a	n/a	n/a	n/a	59.7	n/a	U
S16R000259		A	7440-21-3	Silicon	ug/g	100	0.0600	421	n/a	n/a	n/a	n/a	23.9	n/a	B
S16R000259		A	7440-19-9	Samarium	ug/g	101	<0.0170	<33.8	n/a	n/a	n/a	n/a	33.8	n/a	U
S16R000259		A	7440-31-5	Tin	ug/g	96.2	<8.00E-03	17.2	n/a	n/a	n/a	n/a	15.9	n/a	J
S16R000259		A	7440-24-6	Strontium	ug/g	95.3	<2.00E-03	18.0	n/a	n/a	n/a	n/a	3.98	n/a	J

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AN101 FLOATING SOLIDS & CORROSION
Data Summary Report

Sample Group: 20161758

SDG Number:

Customer Sample ID: Acid Digest

Customer Sample ID: Acid Digest

Sample#	R	A#	CAS #	Analyte	Unit	STD %	Blank	Result	Duplicate	Average	RPD %	Spk Rec %	Det Limit	Cnt Err %	Qual Flags
ICP-AES															
S16R000259		A	7440-25-7	Tantalum	ug/g	104	<5.00E-03	<9.95	n/a	n/a	n/a	n/a	9.95	n/a	U
S16R000259		A	13494-80-9	Tellurium	ug/g	95.6	<9.00E-03	<17.9	n/a	n/a	n/a	n/a	17.9	n/a	U
S16R000259		A	7440-29-1	Thorium	ug/g	99.3	<0.0130	<25.9	n/a	n/a	n/a	n/a	25.9	n/a	U
S16R000259		A	7440-32-6	Titanium	ug/g	95.8	<2.00E-03	<3.98	n/a	n/a	n/a	n/a	3.98	n/a	U
S16R000259		A	7440-28-0	Thallium	ug/g	90.9	<0.0150	<29.8	n/a	n/a	n/a	n/a	29.8	n/a	U
S16R000259		A	7440-61-1	Uranium	ug/g	102	<0.0290	731	n/a	n/a	n/a	n/a	57.7	n/a	
S16R000259		A	7440-62-2	Vanadium	ug/g	93.8	<1.00E-03	3.95	n/a	n/a	n/a	n/a	1.99	n/a	J
S16R000259		A	7440-33-7	Tungsten	ug/g	101	<0.0160	<31.8	n/a	n/a	n/a	n/a	31.8	n/a	U
S16R000259		A	7440-65-5	Yttrium	ug/g	98.5	<2.00E-03	<3.98	n/a	n/a	n/a	n/a	3.98	n/a	U
S16R000259		A	7440-66-6	Zinc	ug/g	92.7	<0.0320	<63.7	n/a	n/a	n/a	n/a	63.7	n/a	U
S16R000259		A	7440-67-7	Zirconium	ug/g	95.2	<1.00E-03	9.96	n/a	n/a	n/a	n/a	1.99	n/a	J
ICP/MS															
S16R000246		A	14331-85-2	Protactinium-231	ug/g	n/a	<3.21E-03	<0.638	n/a	n/a	n/a	n/a	0.638	n/a	IU
S16R000246		A	TH-232	Thorium-232	ug/g	102	<3.21E-03	<0.638	n/a	n/a	n/a	n/a	0.638	n/a	U
S16R000246		A	13968-55-3	Uranium-233	ug/g	99.3	<5.00E-05	<9.94E-03	n/a	n/a	n/a	n/a	9.94E-03	n/a	Uab
S16R000246		A	13966-29-5	Uranium-234	ug/g	n/a	<5.40E-04	<0.107	n/a	n/a	n/a	n/a	0.107	n/a	IJ
S16R000246		A	15117-96-1	Uranium-235	ug/g	346	<5.40E-04	2.53	n/a	n/a	n/a	n/a	0.107	n/a	a
S16R000246		A	13982-70-2	Uranium-236	ug/g	n/a	<5.40E-04	<0.107	n/a	n/a	n/a	n/a	0.107	n/a	IJ
S16R000246		A	13994-20-2	Neptunium-237	ug/g	105	<1.12E-05	0.0102	n/a	n/a	n/a	n/a	2.23E-03	n/a	J
S16R000246		A	U-238	Uranium-238	ug/g	99.7	<4.18E-03	399	n/a	n/a	n/a	n/a	0.831	n/a	
S16R000246		A	13982-10-0	Plutonium-242	ug/g	107	<1.30E-04	<0.0258	n/a	n/a	n/a	n/a	0.0258	n/a	U
S16R000248		A	14331-85-2	Protactinium-231	ug/g	n/a	<3.21E-03	<0.639	n/a	n/a	n/a	n/a	0.639	n/a	IU
S16R000248		A	TH-232	Thorium-232	ug/g	102	<3.21E-03	<0.639	n/a	n/a	n/a	n/a	0.639	n/a	U
S16R000248		A	13968-55-3	Uranium-233	ug/g	99.3	<5.00E-05	<9.95E-03	n/a	n/a	n/a	n/a	9.95E-03	n/a	Uab
S16R000248		A	13966-29-5	Uranium-234	ug/g	n/a	<5.40E-04	<0.107	n/a	n/a	n/a	n/a	0.107	n/a	IJ
S16R000248		A	15117-96-1	Uranium-235	ug/g	346	<5.40E-04	4.25	n/a	n/a	n/a	n/a	0.107	n/a	a
S16R000248		A	13982-70-2	Uranium-236	ug/g	n/a	<5.40E-04	0.136	n/a	n/a	n/a	n/a	0.107	n/a	IJ

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AN101 FLOATING SOLIDS & CORROSION
Data Summary Report

Sample Group: 20161758

SDG Number:

Customer Sample ID: Acid Digest

Customer Sample ID: Acid Digest

Sample#	R	A#	CAS #	Analyte	Unit	STD %	Blank	Result	Duplicate	Average	RPD %	Spk Rec %	Det Limit	Cnt Err %	Qual Flags
ICP/MS															
S16R000248		A	13994-20-2	Neptunium-237	ug/g	105	<1.12E-05	0.0148	n/a	n/a	n/a	n/a	2.23E-03	n/a	J
S16R000248		A	U-238	Uranium-238	ug/g	99.7	<4.18E-03	667	n/a	n/a	n/a	n/a	0.832	n/a	
S16R000248		A	13982-10-0	Plutonium-242	ug/g	107	<1.30E-04	<0.0258	n/a	n/a	n/a	n/a	0.0258	n/a	U
S16R000257		A	14331-85-2	Protactinium-231	ug/g	n/a	<3.21E-03	<0.639	<0.638	n/a	n/a	n/a	0.639	n/a	IU
S16R000257		A	TH-232	Thorium-232	ug/g	102	<3.21E-03	1.58	1.23	1.41	24.6	96.4	0.639	n/a	BJ
S16R000257		A	13968-55-3	Uranium-233	ug/g	99.3	<5.00E-05	<9.95E-03	<9.93E-03	n/a	n/a	n/a	9.95E-03	n/a	Uab
S16R000257		A	13966-29-5	Uranium-234	ug/g	n/a	<5.40E-04	0.215	<0.107	n/a	n/a	n/a	0.107	n/a	IJ
S16R000257		A	15117-96-1	Uranium-235	ug/g	346	<5.40E-04	7.61	6.79	7.20	11.5	9970	0.107	n/a	a
S16R000257		A	13982-70-2	Uranium-236	ug/g	n/a	<5.40E-04	<0.107	0.163	n/a	n/a	n/a	0.107	n/a	IJ
S16R000257		A	13994-20-2	Neptunium-237	ug/g	105	<1.12E-05	0.0308	0.0268	0.0288	14.0	125	2.23E-03	n/a	J
S16R000257		A	U-238	Uranium-238	ug/g	99.7	<4.18E-03	1.09E+03	9.88E+02	1.04E+03	10.2	2750	0.832	n/a	
S16R000257		A	13982-10-0	Plutonium-242	ug/g	107	<1.30E-04	<0.0259	<0.0258	n/a	n/a	176	0.0259	n/a	Ub
S16R000259		A	14331-85-2	Protactinium-231	ug/g	n/a	<3.21E-03	<0.639	n/a	n/a	n/a	n/a	0.639	n/a	IU
S16R000259		A	TH-232	Thorium-232	ug/g	102	<3.21E-03	1.84	n/a	n/a	n/a	n/a	0.639	n/a	BJ
S16R000259		A	13968-55-3	Uranium-233	ug/g	99.3	<5.00E-05	<9.95E-03	n/a	n/a	n/a	n/a	9.95E-03	n/a	Uab
S16R000259		A	13966-29-5	Uranium-234	ug/g	n/a	<5.40E-04	0.147	n/a	n/a	n/a	n/a	0.107	n/a	IJ
S16R000259		A	15117-96-1	Uranium-235	ug/g	346	<5.40E-04	5.94	n/a	n/a	n/a	n/a	0.107	n/a	a
S16R000259		A	13982-70-2	Uranium-236	ug/g	n/a	<5.40E-04	<0.107	n/a	n/a	n/a	n/a	0.107	n/a	IJ
S16R000259		A	13994-20-2	Neptunium-237	ug/g	105	<1.12E-05	0.0264	n/a	n/a	n/a	n/a	2.23E-03	n/a	J
S16R000259		A	U-238	Uranium-238	ug/g	99.7	<4.18E-03	860	n/a	n/a	n/a	n/a	0.832	n/a	
S16R000259		A	13982-10-0	Plutonium-242	ug/g	107	<1.30E-04	<0.0259	n/a	n/a	n/a	n/a	0.0259	n/a	U

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AN101 FLOATING SOLIDS & CORROSION
Data Summary Report

Sample Group: 20161758
SDG Number:
Customer Sample ID: Acid Digest Sample 1
Customer Sample ID: Acid Digest Sample 1

Sample#	R	A#	CAS #	Analyte	Unit	STD %	Blank	Result	Duplicate	Average	RPD %	Spk Rec %	Det Limit	Cnt Err %	Qual Flags
ICP/MS															
S16R000301		A	14133-76-7	Technetium-99	ug/g	98.9	<6.00E-05	0.817	n/a	n/a	n/a	n/a	0.0113	n/a	
S16R000303		A	14133-76-7	Technetium-99	ug/g	98.9	<6.00E-05	0.799	0.873	0.836	8.85	98.2	0.0118	n/a	

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AN101 FLOATING SOLIDS & CORROSION
Data Summary Report

Sample Group: 20161758
SDG Number:
Customer Sample ID: Acid Digest Sample 3
Customer Sample ID: Acid Digest Sample 3

Sample#	R	A#	CAS #	Analyte	Unit	STD %	Blank	Result	Duplicate	Average	RPD %	Spk Rec %	Det Limit	Cnt Err %	Qual Flags
ICP/MS															
S16R000302		A	14133-76-7	Technetium-99	ug/g	98.9	<6.00E-05	0.770	n/a	n/a	n/a	n/a	0.0114	n/a	
S16R000304		A	14133-76-7	Technetium-99	ug/g	98.9	<6.00E-05	0.741	n/a	n/a	n/a	n/a	0.0113	n/a	

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AN101 FLOATING SOLIDS & CORROSION
Data Summary Report

Sample Group: 20161758
SDG Number:

Customer Sample ID: ENVIRONMENTAL DIGEST
Customer Sample ID: ENVIRONMENTAL DIGEST

Sample#	R	A#	CAS #	Analyte	Unit	STD %	Blank	Result	Duplicate	Average	RPD %	Spk Rec %	Det Limit	Cnt Err %	Qual Flags
Sr-89/90 by GPC															
S16R000344		E	SR-89/90	Strontium-89/90	uCi/g	107	0.0143	44.7	45.0	44.9	0.876	n/a	2.83E-03	0.418	
S16R000345		E	SR-89/90	Strontium-89/90	uCi/g	107	0.0143	50.2	n/a	n/a	n/a	n/a	3.08E-03	0.411	
S16R000346		E	SR-89/90	Strontium-89/90	uCi/g	107	0.0143	107	n/a	n/a	n/a	n/a	2.61E-03	0.259	
S16R000347		E	SR-89/90	Strontium-89/90	uCi/g	107	0.0143	67.7	n/a	n/a	n/a	n/a	2.61E-03	0.326	

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AN101 FLOATING SOLIDS & CORROSION
Data Summary Report

Sample Group: 20161758

SDG Number:

Customer Sample ID: Post - Test Sample 6

Customer Sample ID: Post - Test Sample 6

Sample#	R	A#	CAS #	Analyte	Unit	STD %	Blank	Result	Duplicate	Average	RPD %	Spk Rec %	Det Limit	Cnt Err %	Qual Flags
ICP-AES															
S16R000535			7440-22-4	Silver	ug/mL	99.3	<3.00E-03	<3.00	<3.00	n/a	n/a	91.7	3.00	n/a	U
S16R000535			7429-90-5	Aluminum	ug/mL	100	<0.0140	4.72E+03	4.76E+03	4.74E+03	0.839	97.0	14.0	n/a	
S16R000535			7440-38-2	Arsenic	ug/mL	100	<0.0150	<15.0	<15.0	n/a	n/a	94.1	15.0	n/a	U
S16R000535			7440-42-8	Boron	ug/mL	103	<2.00E-03	4.51	5.19	4.85	14.1	98.8	2.00	n/a	J
S16R000535			7440-39-3	Barium	ug/mL	99.9	<1.00E-03	<1.00	<1.00	n/a	n/a	92.5	1.00	n/a	U
S16R000535			7440-41-7	Beryllium	ug/mL	100	<1.00E-03	<1.00	<1.00	n/a	n/a	95.5	1.00	n/a	U
S16R000535			7440-69-9	Bismuth	ug/mL	99.9	<0.0190	<19.0	<19.0	n/a	n/a	93.8	19.0	n/a	U
S16R000535			7440-70-2	Calcium	ug/mL	104	<0.120	<120	<120	n/a	n/a	97.1	120	n/a	U
S16R000535			7440-43-9	Cadmium	ug/mL	102	<1.00E-03	<1.00	<1.00	n/a	n/a	94.8	1.00	n/a	U
S16R000535			7440-45-1	Cerium	ug/mL	105	0.0767	68.9	71.1	70.0	3.21	103	25.0	n/a	BJ
S16R000535			7440-48-4	Cobalt	ug/mL	101	<1.00E-03	1.76	1.62	1.69	7.88	93.6	1.00	n/a	J
S16R000535			7440-47-3	Chromium	ug/mL	100	<2.00E-03	82.6	83.1	82.9	0.613	94.5	2.00	n/a	
S16R000535			7440-50-8	Copper	ug/mL	101	<2.00E-03	2.78	2.50	2.64	10.7	99.7	2.00	n/a	J
S16R000535			7440-53-1	Europium	ug/mL	102	<1.00E-03	<1.00	<1.00	n/a	n/a	96.9	1.00	n/a	U
S16R000535			7439-89-6	Iron	ug/mL	97.7	<0.0200	61.8	62.4	62.1	0.980	91.7	20.0	n/a	J
S16R000535			7440-09-7	Potassium	ug/mL	99.5	<0.0220	832	833	833	0.146	97.6	22.0	n/a	
S16R000535			7439-91-0	Lanthanum	ug/mL	101	<1.00E-03	<1.00	<1.00	n/a	n/a	98.3	1.00	n/a	U
S16R000535			7439-93-2	Lithium	ug/mL	103	<1.00E-03	<1.00	<1.00	n/a	n/a	101	1.00	n/a	U
S16R000535			7439-95-4	Magnesium	ug/mL	101	<9.00E-03	<9.00	<9.00	n/a	n/a	98.3	9.00	n/a	U
S16R000535			7439-96-5	Manganese	ug/mL	101	<1.00E-03	<1.00	<1.00	n/a	n/a	95.9	1.00	n/a	U
S16R000535			7439-98-7	Molybdenum	ug/mL	98.7	<2.00E-03	6.53	6.51	6.52	0.265	96.6	2.00	n/a	J
S16R000535			7440-23-5	Sodium	ug/mL	102	<0.0920	1.03E+05	1.04E+05	1.03E+05	0.829	102	92.0	n/a	
S16R000535			7440-00-8	Neodymium	ug/mL	103	<0.0150	<15.0	<15.0	n/a	n/a	101	15.0	n/a	U
S16R000535			7440-02-0	Nickel	ug/mL	98.8	<2.00E-03	<2.00	<2.00	n/a	n/a	90.5	2.00	n/a	U
S16R000535			7440-03-1	Niobium	ug/mL	96.3	<6.00E-03	<6.00	<6.00	n/a	n/a	93.0	6.00	n/a	U
S16R000535			7723-14-0	Phosphorus	ug/mL	98.2	<0.0130	608	616	612	1.27	96.1	13.0	n/a	
S16R000535			7439-92-1	Lead	ug/mL	104	<0.0130	104	106	105	1.53	99.3	13.0	n/a	J

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AN101 FLOATING SOLIDS & CORROSION
Data Summary Report

Sample Group: 20161758
SDG Number:
Customer Sample ID: Post - Test Sample 6
Customer Sample ID: Post - Test Sample 6

Sample#	R	A#	CAS #	Analyte	Unit	STD %	Blank	Result	Duplicate	Average	RPD %	Spk Rec %	Det Limit	Cnt Err %	Qual Flags
ICP-AES															
S16R000535			7440-05-3	Palladium	ug/mL	102	<0.0120	<12.0		n/a	n/a	96.2	12.0	n/a	U
S16R000535			7440-10-0	Praseodymium	ug/mL	107	<0.0260	<26.0		n/a	n/a	105	26.0	n/a	U
S16R000535			7440-17-7	Rubidium	ug/mL	103	<0.0570	<57.0		n/a	n/a	97.4	57.0	n/a	U
S16R000535			7440-16-6	Rhodium	ug/mL	99.4	<0.0120	<12.0		n/a	n/a	96.0	12.0	n/a	U
S16R000535			7440-18-8	Ruthenium	ug/mL	106	<5.00E-03	<5.00	5.27	n/a	n/a	92.0	5.00	n/a	U
S16R000535			7704-34-9	Sulfur	ug/mL	98.8	<0.0280	797	804	800	0.776	95.1	28.0	n/a	
S16R000535			7440-36-0	Antimony	ug/mL	97.2	<0.0180	<18.0		n/a	n/a	110	18.0	n/a	U
S16R000535			7782-49-2	Selenium	ug/mL	99.6	<0.0300	<30.0		n/a	n/a	95.3	30.0	n/a	U
S16R000535			7440-21-3	Silicon	ug/mL	98.6	<0.0120	67.8	67.2	67.5	0.929	104	12.0	n/a	J
S16R000535			7440-19-9	Samarium	ug/mL	102	<0.0170	<17.0		n/a	n/a	94.9	17.0	n/a	U
S16R000535			7440-31-5	Tin	ug/mL	98.5	<8.00E-03	27.7	27.0	27.3	2.76	91.0	8.00	n/a	J
S16R000535			7440-24-6	Strontium	ug/mL	99.1	<2.00E-03	<2.00		n/a	n/a	90.5	2.00	n/a	U
S16R000535			7440-25-7	Tantalum	ug/mL	98.3	<5.00E-03	<5.00		n/a	n/a	94.3	5.00	n/a	U
S16R000535			13494-80-9	Tellurium	ug/mL	99.1	<9.00E-03	<9.00		n/a	n/a	92.0	9.00	n/a	U
S16R000535			7440-29-1	Thorium	ug/mL	101	<0.0130	<13.0		n/a	n/a	95.3	13.0	n/a	U
S16R000535			7440-32-6	Titanium	ug/mL	95.4	<2.00E-03	<2.00		n/a	n/a	94.3	2.00	n/a	U
S16R000535			7440-28-0	Thallium	ug/mL	103	<0.0150	<15.0		n/a	n/a	91.3	15.0	n/a	U
S16R000535			7440-61-1	Uranium	ug/mL	103	<0.0290	<29.0		n/a	n/a	100	29.0	n/a	U
S16R000535			7440-62-2	Vanadium	ug/mL	98.4	<1.00E-03	<1.00		n/a	n/a	94.4	1.00	n/a	U
S16R000535			7440-33-7	Tungsten	ug/mL	98.8	<0.0160	<16.0		n/a	n/a	96.4	16.0	n/a	U
S16R000535			7440-65-5	Yttrium	ug/mL	103	<2.00E-03	<2.00		n/a	n/a	97.8	2.00	n/a	U
S16R000535			7440-66-6	Zinc	ug/mL	100	<0.0320	<32.0		n/a	n/a	93.9	32.0	n/a	U
S16R000535			7440-67-7	Zirconium	ug/mL	96.9	<1.00E-03	<1.00		n/a	n/a	94.4	1.00	n/a	U
TIC/TOC by Acid Persulfate															
S16R000535				Total inorganic carbon	ug/mL	97.8	<7.00	2.18E+03	2.24E+03	2.21E+03	2.71	145	70.0	n/a	b
S16R000535				Total organic carbon	ug/mL	90.6	<20.0	3.23E+03	3.06E+03	3.14E+03	5.41	61.3	200	n/a	b
pH of Liquids															

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AN101 FLOATING SOLIDS & CORROSION
Data Summary Report

Sample Group: 20161758
SDG Number:

Customer Sample ID: Post - Test Sample 6
Customer Sample ID: Post - Test Sample 6

Sample#	R	A#	CAS #	Analyte	Unit	STD %	Blank	Result	Duplicate	Average	RPD %	Spk Rec %	Det Limit	Cnt Err %	Qual Flags
pH of Liquids															
S16R000535				pH			n/a	>13	>13	n/a	n/a	n/a	0.0100	n/a	E

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AN101 FLOATING SOLIDS & CORROSION
Data Summary Report

Sample Group: 20161758
SDG Number:
Customer Sample ID: Post-Liquid
Customer Sample ID: Post-Liquid

Sample#	R	A#	CAS #	Analyte	Unit	STD %	Blank	Result	Duplicate	Average	RPD %	Spk Rec %	Det Limit	Cnt Err %	Qual Flags
SVOA 222S LIQUID															
S17R000002		O	120-82-1	1,2,4-Trichlorobenzene	ug/L	34.4	<45.9	<551	n/a	n/a	n/a	32.5	551	n/a	U
S17R000002		O	95-50-1	1,2-Dichlorobenzene	ug/L	30.4	<45.0	<540	n/a	n/a	n/a	27.8	540	n/a	Uab
S17R000002		O	106-46-7	1,4-Dichlorobenzene	ug/L	27.1	<45.2	<543	n/a	n/a	n/a	25.7	543	n/a	U
S17R000002		O	71-36-3	1-Butanol	ug/L	52.6	<185	<2.22E+03	n/a	n/a	n/a	43.4	2.22E+03	n/a	Uab
S17R000002		O	108-60-1	2,2-oxybis(1-Chloropropane)	ug/L	75.2	<46.6	<560	n/a	n/a	n/a	74.6	560	n/a	U
S17R000002		O	95-95-4	2,4,5-Trichlorophenol	ug/L	83.0	<45.7	<549	n/a	n/a	n/a	0.0	549	n/a	Ub
S17R000002		O	88-06-2	2,4,6-Trichlorophenol	ug/L	81.8	<44.2	<531	n/a	n/a	n/a	17.1	531	n/a	Ub
S17R000002		O	120-83-2	2,4-Dichlorophenol	ug/L	84.0	<43.9	<526	n/a	n/a	n/a	0.0	526	n/a	Ub
S17R000002		O	105-67-9	2,4-Dimethylphenol	ug/L	75.7	<22.9	<275	n/a	n/a	n/a	0.0	275	n/a	Ub
S17R000002		O	51-28-5	2,4-Dinitrophenol	ug/L	85.7	<15.0	1.35E+03	n/a	n/a	n/a	100	180	n/a	J
S17R000002		O	121-14-2	2,4-Dinitrotoluene	ug/L	75.2	<24.3	<292	n/a	n/a	n/a	79.9	292	n/a	U
S17R000002		O	128-37-0	BHT	ug/L	41.0	<20.6	<247	n/a	n/a	n/a	0.0	247	n/a	Uab
S17R000002		O	606-20-2	2,6-Dinitrotoluene	ug/L	73.6	<30.8	<370	n/a	n/a	n/a	76.5	370	n/a	U
S17R000002		O	111-76-2	2-Butoxyethanol	ug/L	84.9	<93.6	<1.12E+03	n/a	n/a	n/a	80.3	1.12E+03	n/a	U
S17R000002		O	91-58-7	2-Chloronaphthalene	ug/L	54.8	<46.7	<560	n/a	n/a	n/a	54.2	560	n/a	Uab
S17R000002		O	95-57-8	2-Chlorophenol	ug/L	81.5	<39.3	<471	n/a	n/a	n/a	0.0	471	n/a	Ub
S17R000002		O	110-80-5	2-Ethoxyethanol	ug/L	71.7	<62.1	<746	n/a	n/a	n/a	67.8	746	n/a	Ub
S17R000002		O	91-57-6	2-Methylnaphthalene	ug/L	53.8	<47.1	<565	n/a	n/a	n/a	51.7	565	n/a	Uab
S17R000002		O	95-48-7	2-Methylphenol	ug/L	79.7	<42.1	<505	n/a	n/a	n/a	0.0	505	n/a	Ub
S17R000002		O	88-74-4	2-Nitroaniline	ug/L	79.4	<33.5	<402	n/a	n/a	n/a	0.0	402	n/a	Ub
S17R000002		O	88-75-5	2-Nitrophenol	ug/L	84.6	<42.0	<504	n/a	n/a	n/a	103	504	n/a	U
S17R000002		O	108-39-4M	Cresol (m & p)	ug/L	80.7	<37.5	<450	n/a	n/a	n/a	0.0	450	n/a	Ub
S17R000002		O	99-09-2	3-Nitroaniline	ug/L	83.8	<40.2	<483	n/a	n/a	n/a	0.0	483	n/a	Ub
S17R000002		O	534-52-1	4,6-Dinitro-o-cresol	ug/L	92.4	<9.97	<120	n/a	n/a	n/a	126	120	n/a	U
S17R000002		O	101-55-3	4-Bromophenylphenyl ether	ug/L	66.4	<27.8	<334	n/a	n/a	n/a	68.1	334	n/a	Uab
S17R000002		O	59-50-7	4-Chloro-3-methylphenol	ug/L	84.0	<42.4	<509	n/a	n/a	n/a	0.0	509	n/a	Ub
S17R000002		O	106-47-8	4-Chloroaniline	ug/L	79.2	<46.1	<553	n/a	n/a	n/a	14.1	553	n/a	Ub

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AN101 FLOATING SOLIDS & CORROSION
Data Summary Report

Sample Group: 20161758

SDG Number:

Customer Sample ID: Post-Liquid

Customer Sample ID: Post-Liquid

Sample#	R	A#	CAS #	Analyte	Unit	STD %	Blank	Result	Duplicate	Average	RPD %	Spk Rec %	Det Limit	Cnt Err %	Qual Flags
SVOA 222S LIQUID															
S17R000002		O	7005-72-3	4-Chlorophenylphenyl ether	ug/L	61.5	<38.4	<461	n/a	n/a	n/a	64.2	461	n/a	Uab
S17R000002		O	100-01-6	4-Nitroaniline	ug/L	91.7	<36.0	<432	n/a	n/a	n/a	0.0	432	n/a	Ub
S17R000002		O	100-02-7	4-Nitrophenol	ug/L	87.5	<24.4	566	n/a	n/a	n/a	143	293	n/a	Jb
S17R000002		O	83-32-9	Acenaphthene	ug/L	60.1	<43.3	<519	n/a	n/a	n/a	59.1	519	n/a	U
S17R000002		O	208-96-8	Acenaphthylene	ug/L	60.8	<50.0	<600	n/a	n/a	n/a	35.6	600	n/a	Uab
S17R000002		O	120-12-7	Anthracene	ug/L	73.0	<20.7	<248	n/a	n/a	n/a	58.2	248	n/a	Ub
S17R000002		O	56-55-3	Benzo(a)anthracene	ug/L	74.4	<18.8	<226	n/a	n/a	n/a	73.2	226	n/a	U
S17R000002		O	50-32-8	Benzo(a)pyrene	ug/L	67.2	<18.1	<217	n/a	n/a	n/a	65.0	217	n/a	Uab
S17R000002		O	205-99-2	Benzo(b)fluoranthene	ug/L	70.9	<20.7	<249	n/a	n/a	n/a	108	249	n/a	U
S17R000002		O	191-24-2	Benzo(ghi)perylene	ug/L	73.0	<17.7	<212	n/a	n/a	n/a	85.9	212	n/a	U
S17R000002		O	207-08-9	Benzo(k)fluoranthene	ug/L	66.1	<20.1	<241	n/a	n/a	n/a	101	241	n/a	Ua
S17R000002		O	85-68-7	Butylbenzylphthalate	ug/L	71.8	<15.5	<186	n/a	n/a	n/a	79.9	186	n/a	U
S17R000002		O	218-01-9	Chrysene	ug/L	69.4	<21.6	<260	n/a	n/a	n/a	112	260	n/a	Ua
S17R000002		O	108-94-1	Cyclohexanone	ug/L	79.6	<43.4	<521	n/a	n/a	n/a	69.7	521	n/a	Ub
S17R000002		O	84-74-2	Di-n-butylphthalate	ug/L	82.5	<12.5	<150	n/a	n/a	n/a	83.3	150	n/a	U
S17R000002		O	117-84-0	Di-n-octylphthalate	ug/L	81.3	<15.5	<186	n/a	n/a	n/a	118	186	n/a	U
S17R000002		O	53-70-3	Dibenz[a,h]anthracene	ug/L	65.5	<15.1	<181	n/a	n/a	n/a	87.4	181	n/a	Ua
S17R000002		O	132-64-9	Dibenzofuran	ug/L	63.3	<39.7	<476	n/a	n/a	n/a	65.4	476	n/a	Uab
S17R000002		O	84-66-2	Diethylphthalate	ug/L	41.6	<24.0	<288	n/a	n/a	n/a	25.6	288	n/a	Uab
S17R000002		O	131-11-3	Dimethyl phthalate	ug/L	16.9	<28.2	<338	n/a	n/a	n/a	21.0	338	n/a	Uab
S17R000002		O	122-39-4	Diphenylamine	ug/L	70.7	<25.8	<309	n/a	n/a	n/a	29.7	309	n/a	Ub
S17R000002		O	206-44-0	Fluoranthene	ug/L	77.9	<13.5	<162	n/a	n/a	n/a	79.2	162	n/a	U
S17R000002		O	86-73-7	Fluorene	ug/L	64.9	<42.4	<509	n/a	n/a	n/a	67.2	509	n/a	Uab
S17R000002		O	118-74-1	Hexachlorobenzene	ug/L	67.5	<36.1	<433	n/a	n/a	n/a	66.6	433	n/a	Uab
S17R000002		O	87-68-3	Hexachlorobutadiene	ug/L	21.5	<50.1	<601	n/a	n/a	n/a	24.2	601	n/a	Uab
S17R000002		O	77-47-4	Hexachlorocyclopentadiene	ug/L	2.42	<8.73	<105	n/a	n/a	n/a	2.12	105	n/a	Uab
S17R000002		O	67-72-1	Hexachloroethane	ug/L	16.2	<46.7	<560	n/a	n/a	n/a	21.7	560	n/a	Uab

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AN101 FLOATING SOLIDS & CORROSION
Data Summary Report

Sample Group: 20161758

SDG Number:

Customer Sample ID: Post-Liquid

Customer Sample ID: Post-Liquid

Sample#	R	A#	CAS #	Analyte	Unit	STD %	Blank	Result	Duplicate	Average	RPD %	Spk Rec %	Det Limit	Cnt Err %	Qual Flags
SVOA 222S LIQUID															
S17R000002		O	193-39-5	Indeno(1,2,3-cd)pyrene	ug/L	69.2	<8.73	<105	n/a	n/a	n/a	87.9	105	n/a	Ua
S17R000002		O	78-83-1	Isobutanol	ug/L	38.1	<71.9	<863	n/a	n/a	n/a	35.8	863	n/a	Uab
S17R000002		O	78-59-1	Isophorone	ug/L	81.5	<45.0	<540	n/a	n/a	n/a	82.1	540	n/a	U
S17R000002		O	62-75-9	N-Nitrosodimethylamine	ug/L	75.7	<41.3	<496	n/a	n/a	n/a	77.2	496	n/a	U
S17R000002		O	621-64-7	N-Nitroso-di-n-dipropylamine	ug/L	78.6	<45.2	<542	n/a	n/a	n/a	78.3	542	n/a	U
S17R000002		O	59-89-2	N-Nitrosomorpholine	ug/L	81.7	<36.2	<435	n/a	n/a	n/a	84.8	435	n/a	U
S17R000002		O	91-20-3	Naphthalene	ug/L	50.7	<41.1	<493	n/a	n/a	n/a	44.8	493	n/a	Uab
S17R000002		O	98-95-3	Nitrobenzene	ug/L	78.4	<40.6	<487	n/a	n/a	n/a	164	487	n/a	Ub
S17R000002		O	87-86-5	Pentachlorophenol	ug/L	89.5	<19.0	551	n/a	n/a	n/a	49.1	228	n/a	J
S17R000002		O	85-01-8	Phenanthrene	ug/L	72.3	<19.8	<237	n/a	n/a	n/a	73.1	237	n/a	U
S17R000002		O	108-95-2	Phenol	ug/L	80.0	<40.4	<485	n/a	n/a	n/a	0.0	485	n/a	Ub
S17R000002		O	129-00-0	Pyrene	ug/L	77.7	<12.7	<152	n/a	n/a	n/a	79.5	152	n/a	U
S17R000002		O	110-86-1	Pyridine	ug/L	66.5	<48.7	<585	n/a	n/a	n/a	0.0	585	n/a	Uab
S17R000002		O	126-73-8	Tributyl phosphate	ug/L	81.3	<17.1	322	n/a	n/a	n/a	83.9	205	n/a	J
S17R000002		O	111-91-1	Bis(2-Chloroethoxy)methane	ug/L	80.9	<44.6	<535	n/a	n/a	n/a	77.3	535	n/a	U
S17R000002		O	117-81-7	Bis(2-ethylhexyl) phthalate	ug/L	82.8	<14.7	<176	n/a	n/a	n/a	93.0	176	n/a	U
S17R000002		O	111-44-4	Bis(2-chloroethyl) ether	ug/L	79.2	<43.2	<519	n/a	n/a	n/a	73.4	519	n/a	U

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AN101 FLOATING SOLIDS & CORROSION
Data Summary Report

Sample Group: 20161758
SDG Number:
Customer Sample ID: Post-Solid
Customer Sample ID: Post-Solid

Sample#	R	A#	CAS #	Analyte	Unit	STD %	Blank	Result	Duplicate	Average	RPD %	Spk Rec %	Det Limit	Cnt Err %	Qual Flags
SVOA 222S SOLID															
S17R000001		O	120-82-1	1,2,4-Trichlorobenzene	ug/kg	41.9	<1.55E+03	<1.01E+03	<9.74E+02	n/a	n/a	35.8	1.01E+03	n/a	Uab
S17R000001		O	95-50-1	1,2-Dichlorobenzene	ug/kg	28.1	<2.01E+03	<1.31E+03	<1.27E+03	n/a	n/a	22.9	1.31E+03	n/a	Uab
S17R000001		O	106-46-7	1,4-Dichlorobenzene	ug/kg	24.7	<2.27E+03	<1.47E+03	<1.43E+03	n/a	n/a	20.2	1.47E+03	n/a	Uab
S17R000001		O	71-36-3	1-Butanol	ug/kg	12.4	<6.90E+03	<4.49E+03	<4.34E+03	n/a	n/a	10.0	4.49E+03	n/a	Uab
S17R000001		O	108-60-1	2,2-oxybis(1-Chloropropane)	ug/kg	37.6	<1.51E+03	<979	<947	n/a	n/a	32.3	979	n/a	Uab
S17R000001		O	95-95-4	2,4,5-Trichlorophenol	ug/kg	51.8	<880	<572	<553	n/a	n/a	39.3	572	n/a	Uab
S17R000001		O	88-06-2	2,4,6-Trichlorophenol	ug/kg	48.7	<990	<644	<623	n/a	n/a	33.9	644	n/a	Uab
S17R000001		O	120-83-2	2,4-Dichlorophenol	ug/kg	48.4	<1.08E+03	<701	<678	n/a	n/a	35.2	701	n/a	Uab
S17R000001		O	105-67-9	2,4-Dimethylphenol	ug/kg	40.8	<570	<371	<358	n/a	n/a	42.4	371	n/a	Uab
S17R000001		O	51-28-5	2,4-Dinitrophenol	ug/kg	65.7	<824	<536	<518	n/a	n/a	26.9	536	n/a	Uab
S17R000001		O	121-14-2	2,4-Dinitrotoluene	ug/kg	66.5	<762	<495	<479	n/a	n/a	63.5	495	n/a	Ub
S17R000001		O	128-37-0	BHT	ug/kg	29.4	<4.71E+03	<3.06E+03	<2.96E+03	n/a	n/a	40.0	3.06E+03	n/a	Uab
S17R000001		O	606-20-2	2,6-Dinitrotoluene	ug/kg	57.1	<774	<503	<487	n/a	n/a	54.2	503	n/a	Uab
S17R000001		O	111-76-2	2-Butoxyethanol	ug/kg	0.0	<3.01E+04	<1.95E+04	<1.89E+04	n/a	n/a	0.0	1.95E+04	n/a	Uab
S17R000001		O	91-58-7	2-Chloronaphthalene	ug/kg	45.7	<1.01E+03	<659	<638	n/a	n/a	42.3	659	n/a	Uab
S17R000001		O	95-57-8	2-Chlorophenol	ug/kg	40.2	<1.33E+03	<865	<836	n/a	n/a	29.6	865	n/a	Uab
S17R000001		O	110-80-5	2-Ethoxyethanol	ug/kg	29.6	<3.65E+03	<2.37E+03	<2.29E+03	n/a	n/a	25.7	2.37E+03	n/a	Uab
S17R000001		O	91-57-6	2-Methylnaphthalene	ug/kg	48.9	<1.11E+03	<720	<697	n/a	n/a	43.2	720	n/a	Uab
S17R000001		O	95-48-7	2-Methylphenol	ug/kg	43.5	<1.15E+03	<748	<723	n/a	n/a	39.1	748	n/a	Uab
S17R000001		O	88-74-4	2-Nitroaniline	ug/kg	52.0	<940	<611	<591	n/a	n/a	51.8	611	n/a	Uab
S17R000001		O	88-75-5	2-Nitrophenol	ug/kg	45.4	<1.07E+03	<698	<675	n/a	n/a	27.1	698	n/a	Uab
S17R000001		O	108-39-4M	Cresol (m & p)	ug/kg	45.1	<1.03E+03	<668	<647	n/a	n/a	41.1	668	n/a	Uab
S17R000001		O	99-09-2	3-Nitroaniline	ug/kg	56.7	<896	<583	<564	n/a	n/a	55.2	583	n/a	Uab
S17R000001		O	534-52-1	4,6-Dinitro-o-cresol	ug/kg	74.7	<630	<410	<396	n/a	n/a	38.2	410	n/a	Ub
S17R000001		O	101-55-3	4-Bromophenylphenyl ether	ug/kg	64.4	<662	<430	<416	n/a	n/a	65.2	430	n/a	Uab
S17R000001		O	59-50-7	4-Chloro-3-methylphenol	ug/kg	54.0	<864	<562	<543	n/a	n/a	55.0	562	n/a	U
S17R000001		O	106-47-8	4-Chloroaniline	ug/kg	43.7	<950	<618	<597	n/a	n/a	40.3	618	n/a	Uab

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AN101 FLOATING SOLIDS & CORROSION
Data Summary Report

Sample Group: 20161758
SDG Number:
Customer Sample ID: Post-Solid
Customer Sample ID: Post-Solid

Sample#	R	A#	CAS #	Analyte	Unit	STD %	Blank	Result	Duplicate	Average	RPD %	Spk Rec %	Det Limit	Cnt Err %	Qual Flags
SVOA 222S SOLID															
S17R000001		O	7005-72-3	4-Chlorophenylphenyl ether	ug/kg	53.9	<960	<624	<604	n/a	n/a	55.6	624	n/a	Uab
S17R000001		O	100-01-6	4-Nitroaniline	ug/kg	67.5	<1.03E+03	<671	<649	n/a	n/a	64.6	671	n/a	Uab
S17R000001		O	100-02-7	4-Nitrophenol	ug/kg	73.1	<1.05E+03	<684	<662	n/a	n/a	34.1	684	n/a	Ub
S17R000001		O	83-32-9	Acenaphthene	ug/kg	49.3	<352	<229	<221	n/a	n/a	48.1	229	n/a	U
S17R000001		O	208-96-8	Acenaphthylene	ug/kg	49.0	<916	<596	<576	n/a	n/a	46.8	596	n/a	Uab
S17R000001		O	120-12-7	Anthracene	ug/kg	73.6	<624	<406	<392	n/a	n/a	72.7	406	n/a	U
S17R000001		O	56-55-3	Benzo(a)anthracene	ug/kg	78.1	<756	<492	<475	n/a	n/a	75.2	492	n/a	U
S17R000001		O	50-32-8	Benzo(a)pyrene	ug/kg	73.2	<824	<536	<518	n/a	n/a	75.0	536	n/a	U
S17R000001		O	205-99-2	Benzo(b)fluoranthene	ug/kg	80.0	<978	<636	<615	n/a	n/a	79.5	636	n/a	U
S17R000001		O	191-24-2	Benzo(ghi)perylene	ug/kg	90.1	<822	<534	<517	n/a	n/a	93.6	534	n/a	U
S17R000001		O	207-08-9	Benzo(k)fluoranthene	ug/kg	73.2	<782	<508	<492	n/a	n/a	72.8	508	n/a	U
S17R000001		O	85-68-7	Butylbenzylphthalate	ug/kg	86.6	2.76E+03	1.74E+03	1.70E+03	1.72E+03	2.58	76.6	650	n/a	J
S17R000001		O	218-01-9	Chrysene	ug/kg	72.6	<1.63E+03	<1.06E+03	<1.02E+03	n/a	n/a	73.5	1.06E+03	n/a	U
S17R000001		O	108-94-1	Cyclohexanone	ug/kg	0.0	<1.12E+04	<7.27E+03	<7.03E+03	n/a	n/a	0.0	7.27E+03	n/a	Uab
S17R000001		O	84-74-2	Di-n-butylphthalate	ug/kg	98.6	<1.12E+04	<7.31E+03	<7.07E+03	n/a	n/a	94.8	7.31E+03	n/a	U
S17R000001		O	117-84-0	Di-n-octylphthalate	ug/kg	122	<954	<620	<600	n/a	n/a	146	620	n/a	Ub
S17R000001		O	53-70-3	Dibenz[a,h]anthracene	ug/kg	90.5	<1.02E+03	<664	<643	n/a	n/a	93.9	664	n/a	U
S17R000001		O	132-64-9	Dibenzofuran	ug/kg	53.0	<930	<605	<585	n/a	n/a	52.0	605	n/a	Uab
S17R000001		O	84-66-2	Diethylphthalate	ug/kg	70.9	<844	<549	<531	n/a	n/a	70.5	549	n/a	U
S17R000001		O	131-11-3	Dimethyl phthalate	ug/kg	62.6	<968	<629	<609	n/a	n/a	59.0	629	n/a	Uab
S17R000001		O	122-39-4	Diphenylamine	ug/kg	66.5	<772	<502	<486	n/a	n/a	66.4	502	n/a	Uab
S17R000001		O	206-44-0	Fluoranthene	ug/kg	82.0	<708	<460	<445	n/a	n/a	77.6	460	n/a	U
S17R000001		O	86-73-7	Fluorene	ug/kg	56.5	<792	<515	<498	n/a	n/a	56.9	515	n/a	Uab
S17R000001		O	118-74-1	Hexachlorobenzene	ug/kg	66.3	<950	<618	<597	n/a	n/a	64.9	618	n/a	Uab
S17R000001		O	87-68-3	Hexachlorobutadiene	ug/kg	39.4	<1.39E+03	<906	<877	n/a	n/a	33.6	906	n/a	Uab
S17R000001		O	77-47-4	Hexachlorocyclopentadiene	ug/kg	2.66	<284	<185	<179	n/a	n/a	14.8	185	n/a	Uab
S17R000001		O	67-72-1	Hexachloroethane	ug/kg	23.9	<2.24E+03	<1.45E+03	<1.41E+03	n/a	n/a	20.2	1.45E+03	n/a	Uab

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AN101 FLOATING SOLIDS & CORROSION
Data Summary Report

Sample Group: 20161758

SDG Number:

Customer Sample ID: Post-Solid

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Sample#	R	A#	CAS #	Analyte	Unit	STD %	Blank	Result	Duplicate	Average	RPD %	Spk Rec %	Det Limit	Cnt Err %	Qual Flags
SVOA 222S SOLID															
S17R000001		O	193-39-5	Indeno(1,2,3-cd)pyrene	ug/kg	88.9	<1.02E+03	<663	<642	n/a	n/a	92.4	663	n/a	U
S17R000001		O	78-83-1	Isobutanol	ug/kg	0.0	<9.21E+03	<5.99E+03	<5.79E+03	n/a	n/a	0.0	5.99E+03	n/a	Uab
S17R000001		O	78-59-1	Isophorone	ug/kg	62.0	1.37E+03	1.18E+04	2.83E+03	7.32E+03	123	19.9	692	n/a	Bab
S17R000001		O	62-75-9	N-Nitrosodimethylamine	ug/kg	31.4	<1.54E+03	<1.00E+03	<9.70E+02	n/a	n/a	27.6	1000	n/a	Uab
S17R000001		O	621-64-7	N-Nitroso-di-n-dipropylamine	ug/kg	43.9	<1.16E+03	<756	<731	n/a	n/a	39.1	756	n/a	Uab
S17R000001		O	59-89-2	N-Nitrosomorpholine	ug/kg	44.9	<3.83E+03	<2.49E+03	<2.41E+03	n/a	n/a	39.6	2.49E+03	n/a	Uab
S17R000001		O	91-20-3	Naphthalene	ug/kg	45.4	<1.25E+03	<814	<787	n/a	n/a	38.5	814	n/a	Uab
S17R000001		O	98-95-3	Nitrobenzene	ug/kg	43.4	<1.29E+03	<840	<813	n/a	n/a	36.7	840	n/a	Uab
S17R000001		O	87-86-5	Pentachlorophenol	ug/kg	76.1	2.43E+03	1.60E+03	1.51E+03	1.56E+03	6.04	38.2	488	n/a	Jb
S17R000001		O	85-01-8	Phenanthrene	ug/kg	72.7	<702	<456	<442	n/a	n/a	70.7	456	n/a	U
S17R000001		O	108-95-2	Phenol	ug/kg	42.9	<1.19E+03	<772	<747	n/a	n/a	36.2	772	n/a	Uab
S17R000001		O	129-00-0	Pyrene	ug/kg	80.4	<1.26E+03	<818	<791	n/a	n/a	78.4	818	n/a	U
S17R000001		O	110-86-1	Pyridine	ug/kg	26.9	<1.30E+03	<845	<818	n/a	n/a	23.1	845	n/a	Uab
S17R000001		O	126-73-8	Tributyl phosphate	ug/kg	85.7	<2.16E+03	<1.40E+03	<1.36E+03	n/a	n/a	87.0	1.40E+03	n/a	U
S17R000001		O	111-91-1	Bis(2-Chloroethoxy)methane	ug/kg	46.4	<1.38E+03	<897	<868	n/a	n/a	40.7	897	n/a	Uab
S17R000001		O	117-81-7	Bis(2-ethylhexyl) phthalate	ug/kg	113	<1.18E+04	7.80E+03	7.46E+03	7.63E+03	4.43	77.7	7.67E+03	n/a	J
S17R000001		O	111-44-4	Bis(2-chloroethyl) ether	ug/kg	37.5	<1.50E+03	<978	<946	n/a	n/a	31.6	978	n/a	Uab

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AN101 FLOATING SOLIDS & CORROSION
Data Summary Report

Sample Group: 20161758

SDG Number:

Customer Sample ID: SVOC EXTRACT

Customer Sample ID: SVOC EXTRACT

Sample#	R	A#	CAS #	Analyte	Unit	STD %	Blank	Result	Duplicate	Average	RPD %	Spk Rec %	Det Limit	Cnt Err %	Qual Flags
SVOA 22S LIQUID															
S16R000250		O	120-82-1	1,2,4-Trichlorobenzene	ug/L	27.2	<551	<551	n/a	n/a	n/a	35.7	551	n/a	U
S16R000250		O	95-50-1	1,2-Dichlorobenzene	ug/L	14.6	<540	<540	n/a	n/a	n/a	36.6	540	n/a	Uab
S16R000250		O	106-46-7	1,4-Dichlorobenzene	ug/L	12.4	<543	<543	n/a	n/a	n/a	35.2	543	n/a	Ua
S16R000250		O	71-36-3	1-Butanol	ug/L	55.6	<2.22E+03	<2.22E+03	n/a	n/a	n/a	30.1	2.22E+03	n/a	Uab
S16R000250		O	108-60-1	2,2-oxybis(1-Chloropropane)	ug/L	60.0	<560	<560	n/a	n/a	n/a	78.2	560	n/a	Ua
S16R000250		O	95-95-4	2,4,5-Trichlorophenol	ug/L	76.3	<549	<549	n/a	n/a	n/a	0.0	549	n/a	Ub
S16R000250		O	88-06-2	2,4,6-Trichlorophenol	ug/L	78.7	<531	<531	n/a	n/a	n/a	0.0	531	n/a	Ub
S16R000250		O	120-83-2	2,4-Dichlorophenol	ug/L	76.4	<526	<526	n/a	n/a	n/a	0.0	526	n/a	Ub
S16R000250		O	105-67-9	2,4-Dimethylphenol	ug/L	73.5	<275	<275	n/a	n/a	n/a	0.0	275	n/a	Ub
S16R000250		O	51-28-5	2,4-Dinitrophenol	ug/L	76.3	<180	<180	n/a	n/a	n/a	126	180	n/a	J
S16R000250		O	121-14-2	2,4-Dinitrotoluene	ug/L	76.7	<292	<292	n/a	n/a	n/a	86.1	292	n/a	U
S16R000250		O	128-37-0	BHT	ug/L	44.4	<247	<247	n/a	n/a	n/a	0.0	247	n/a	Uab
S16R000250		O	606-20-2	2,6-Dinitrotoluene	ug/L	73.8	<370	<370	n/a	n/a	n/a	80.4	370	n/a	U
S16R000250		O	111-76-2	2-Butoxyethanol	ug/L	78.2	<1.12E+03	<1.12E+03	n/a	n/a	n/a	62.7	1.12E+03	n/a	Ub
S16R000250		O	91-58-7	2-Chloronaphthalene	ug/L	54.4	<560	<560	n/a	n/a	n/a	53.5	560	n/a	Uab
S16R000250		O	95-57-8	2-Chlorophenol	ug/L	74.9	<471	<471	n/a	n/a	n/a	0.0	471	n/a	Ub
S16R000250		O	110-80-5	2-Ethoxyethanol	ug/L	79.9	<746	<746	n/a	n/a	n/a	54.9	746	n/a	Ub
S16R000250		O	91-57-6	2-Methylnaphthalene	ug/L	48.6	<565	<565	n/a	n/a	n/a	47.3	565	n/a	Uab
S16R000250		O	95-48-7	2-Methylphenol	ug/L	72.9	<505	<505	n/a	n/a	n/a	0.0	505	n/a	Ub
S16R000250		O	88-74-4	2-Nitroaniline	ug/L	76.5	<402	<402	n/a	n/a	n/a	0.0	402	n/a	Ub
S16R000250		O	88-75-5	2-Nitrophenol	ug/L	75.1	<504	<504	n/a	n/a	n/a	113	504	n/a	U
S16R000250		O	108-39-4M	Cresol (m & p)	ug/L	72.7	<450	<450	n/a	n/a	n/a	0.0	450	n/a	Ub
S16R000250		O	99-09-2	3-Nitroaniline	ug/L	79.9	<483	<483	n/a	n/a	n/a	0.0	483	n/a	Ub
S16R000250		O	534-52-1	4,6-Dinitro-o-cresol	ug/L	87.5	<120	<120	n/a	n/a	n/a	139	120	n/a	Jb
S16R000250		O	101-55-3	4-Bromophenylphenyl ether	ug/L	66.3	<334	<334	n/a	n/a	n/a	74.4	334	n/a	Ua
S16R000250		O	59-50-7	4-Chloro-3-methylphenol	ug/L	75.2	<509	<509	n/a	n/a	n/a	0.0	509	n/a	Ub
S16R000250		O	106-47-8	4-Chloroaniline	ug/L	72.7	<553	<553	n/a	n/a	n/a	14.8	553	n/a	Ub

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AN101 FLOATING SOLIDS & CORROSION
Data Summary Report

Sample Group: 20161758

SDG Number:

Customer Sample ID: SVOC EXTRACT

Customer Sample ID: SVOC EXTRACT

Sample#	R	A#	CAS #	Analyte	Unit	STD %	Blank	Result	Duplicate	Average	RPD %	Spk Rec %	Det Limit	Cnt Err %	Qual Flags
SVOA 222S LIQUID															
S16R000250		O	7005-72-3	4-Chlorophenylphenyl ether	ug/L	64.2	<461	<461	n/a	n/a	n/a	69.9	461	n/a	Uab
S16R000250		O	100-01-6	4-Nitroaniline	ug/L	85.1	<432	<432	n/a	n/a	n/a	0.0	432	n/a	Ub
S16R000250		O	100-02-7	4-Nitrophenol	ug/L	76.3	<293	<293	n/a	n/a	n/a	143	293	n/a	UYb
S16R000250		O	83-32-9	Acenaphthene	ug/L	60.5	<519	<519	n/a	n/a	n/a	59.0	519	n/a	U
S16R000250		O	208-96-8	Acenaphthylene	ug/L	60.6	<600	<600	n/a	n/a	n/a	0.0	600	n/a	Uab
S16R000250		O	120-12-7	Anthracene	ug/L	70.4	<248	<248	n/a	n/a	n/a	47.6	248	n/a	Ub
S16R000250		O	56-55-3	Benzo(a)anthracene	ug/L	75.9	<226	<226	n/a	n/a	n/a	81.3	226	n/a	U
S16R000250		O	50-32-8	Benzo(a)pyrene	ug/L	75.9	<217	<217	n/a	n/a	n/a	405	217	n/a	Ub
S16R000250		O	205-99-2	Benzo(b)fluoranthene	ug/L	79.0	<249	<249	n/a	n/a	n/a	2320	249	n/a	Ub
S16R000250		O	191-24-2	Benzo(g)h)perylene	ug/L	66.5	<212	<212	n/a	n/a	n/a	1800	212	n/a	UYab
S16R000250		O	207-08-9	Benzo(k)fluoranthene	ug/L	77.0	<241	<241	n/a	n/a	n/a	2280	241	n/a	Ub
S16R000250		O	85-68-7	Butylbenzylphthalate	ug/L	76.9	<186	<186	n/a	n/a	n/a	91.7	186	n/a	U
S16R000250		O	218-01-9	Chrysene	ug/L	80.8	<260	<260	n/a	n/a	n/a	2350	260	n/a	Ub
S16R000250		O	108-94-1	Cyclohexanone	ug/L	75.9	<521	<521	n/a	n/a	n/a	77.6	521	n/a	U
S16R000250		O	84-74-2	Di-n-butylphthalate	ug/L	77.9	<150	<150	n/a	n/a	n/a	86.6	150	n/a	U
S16R000250		O	117-84-0	Di-n-octylphthalate	ug/L	80.8	<186	<186	n/a	n/a	n/a	2330	186	n/a	Ub
S16R000250		O	53-70-3	Dibenz[a,h]anthracene	ug/L	65.6	<181	<181	n/a	n/a	n/a	1930	181	n/a	UYab
S16R000250		O	132-64-9	Dibenzofuran	ug/L	62.0	<476	<476	n/a	n/a	n/a	66.1	476	n/a	Uab
S16R000250		O	84-66-2	Diethylphthalate	ug/L	50.9	<288	<288	n/a	n/a	n/a	39.5	288	n/a	Uab
S16R000250		O	131-11-3	Dimethyl phthalate	ug/L	24.5	<338	<338	n/a	n/a	n/a	32.4	338	n/a	Uab
S16R000250		O	122-39-4	Diphenylamine	ug/L	69.6	<309	<309	n/a	n/a	n/a	17.4	309	n/a	Uab
S16R000250		O	206-44-0	Fluoranthene	ug/L	76.7	<162	<162	n/a	n/a	n/a	85.6	162	n/a	U
S16R000250		O	86-73-7	Fluorene	ug/L	64.8	<509	<509	n/a	n/a	n/a	69.6	509	n/a	Uab
S16R000250		O	118-74-1	Hexachlorobenzene	ug/L	68.4	<433	<433	n/a	n/a	n/a	76.6	433	n/a	Ua
S16R000250		O	87-68-3	Hexachlorobutadiene	ug/L	14.8	<601	<601	n/a	n/a	n/a	30.6	601	n/a	Uab
S16R000250		O	77-47-4	Hexachlorocyclopentadiene	ug/L	14.7	<105	<105	n/a	n/a	n/a	28.8	105	n/a	Uab
S16R000250		O	67-72-1	Hexachloroethane	ug/L	0.0	<560	<560	n/a	n/a	n/a	31.9	560	n/a	Uab

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AN101 FLOATING SOLIDS & CORROSION
Data Summary Report

Sample Group: 20161758

SDG Number:

Customer Sample ID: SVOC EXTRACT

Customer Sample ID: SVOC EXTRACT

Sample#	R	A#	CAS #	Analyte	Unit	STD %	Blank	Result	Duplicate	Average	RPD %	Spk Rec %	Det Limit	Cnt Err %	Qual Flags
SVOA 22S LIQUID															
S16R000250		O	193-39-5	Indeno(1,2,3-cd)pyrene	ug/L	66.8	<105	<105	n/a	n/a	n/a	1850	105	n/a	UYab
S16R000250		O	78-83-1	Isobutanol	ug/L	35.2	<863	<863	n/a	n/a	n/a	52.1	863	n/a	Uab
S16R000250		O	78-59-1	Isophorone	ug/L	75.0	<540	<540	n/a	n/a	n/a	77.7	540	n/a	U
S16R000250		O	62-75-9	N-Nitrosodimethylamine	ug/L	74.2	<496	<496	n/a	n/a	n/a	77.4	496	n/a	U
S16R000250		O	621-64-7	N-Nitroso-di-n-dipropylamine	ug/L	72.8	<542	<542	n/a	n/a	n/a	77.0	542	n/a	U
S16R000250		O	59-89-2	N-Nitrosomorpholine	ug/L	74.3	<435	<435	n/a	n/a	n/a	82.8	435	n/a	U
S16R000250		O	91-20-3	Naphthalene	ug/L	38.4	<493	<493	n/a	n/a	n/a	45.7	493	n/a	Uab
S16R000250		O	98-95-3	Nitrobenzene	ug/L	69.0	<487	<487	n/a	n/a	n/a	165	487	n/a	Uab
S16R000250		O	87-86-5	Pentachlorophenol	ug/L	81.8	<228	978	n/a	n/a	n/a	56.0	228	n/a	J
S16R000250		O	85-01-8	Phenanthrene	ug/L	69.7	<237	<237	n/a	n/a	n/a	80.0	237	n/a	Ua
S16R000250		O	108-95-2	Phenol	ug/L	73.5	<485	<485	n/a	n/a	n/a	0.0	485	n/a	Ub
S16R000250		O	129-00-0	Pyrene	ug/L	75.8	<152	<152	n/a	n/a	n/a	84.7	152	n/a	U
S16R000250		O	110-86-1	Pyridine	ug/L	65.1	<585	<585	n/a	n/a	n/a	16.0	585	n/a	Uab
S16R000250		O	126-73-8	Tributyl phosphate	ug/L	81.6	<205	472	n/a	n/a	n/a	89.7	205	n/a	J
S16R000250		O	111-91-1	Bis(2-Chloroethoxy)methane	ug/L	73.1	<535	<535	n/a	n/a	n/a	73.5	535	n/a	U
S16R000250		O	117-81-7	Bis(2-ethylhexyl) phthalate	ug/L	78.9	<176	437	n/a	n/a	n/a	84.7	176	n/a	J
S16R000250		O	111-44-4	Bis(2-chloroethyl) ether	ug/L	72.1	<519	<519	n/a	n/a	n/a	72.3	519	n/a	U
S16R000261		O	120-82-1	1,2,4-Trichlorobenzene	ug/L	27.2	<551	<551	n/a	n/a	n/a	n/a	551	n/a	U
S16R000261		O	95-50-1	1,2-Dichlorobenzene	ug/L	14.6	<540	<540	n/a	n/a	n/a	n/a	540	n/a	Ua
S16R000261		O	106-46-7	1,4-Dichlorobenzene	ug/L	12.4	<543	<543	n/a	n/a	n/a	n/a	543	n/a	Ua
S16R000261		O	71-36-3	1-Butanol	ug/L	55.6	<2.22E+03	<2.22E+03	n/a	n/a	n/a	n/a	2.22E+03	n/a	Ua
S16R000261		O	108-60-1	2,2-oxybis(1-Chloropropane)	ug/L	60.0	<560	<560	n/a	n/a	n/a	n/a	560	n/a	Ua
S16R000261		O	95-95-4	2,4,5-Trichlorophenol	ug/L	76.3	<549	<549	n/a	n/a	n/a	n/a	549	n/a	U
S16R000261		O	88-06-2	2,4,6-Trichlorophenol	ug/L	78.7	<531	<531	n/a	n/a	n/a	n/a	531	n/a	U
S16R000261		O	120-83-2	2,4-Dichlorophenol	ug/L	76.4	<526	<526	n/a	n/a	n/a	n/a	526	n/a	U
S16R000261		O	105-67-9	2,4-Dimethylphenol	ug/L	73.5	<275	<275	n/a	n/a	n/a	n/a	275	n/a	U
S16R000261		O	51-28-5	2,4-Dinitrophenol	ug/L	76.3	<180	<180	n/a	n/a	n/a	n/a	180	n/a	U

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AN101 FLOATING SOLIDS & CORROSION
Data Summary Report

Sample Group: 20161758

SDG Number:

Customer Sample ID: SVOC EXTRACT

Customer Sample ID: SVOC EXTRACT

Sample#	R	A#	CAS #	Analyte	Unit	STD %	Blank	Result	Duplicate	Average	RPD %	Spk Rec %	Det Limit	Cnt Err %	Qual Flags
SVOA 222S LIQUID															
S16R000261		O	121-14-2	2,4-Dinitrotoluene	ug/L	76.7	<292	<292	n/a	n/a	n/a	n/a	292	n/a	U
S16R000261		O	128-37-0	BHT	ug/L	44.4	<247	<247	n/a	n/a	n/a	n/a	247	n/a	Ua
S16R000261		O	606-20-2	2,6-Dinitrotoluene	ug/L	73.8	<370	<370	n/a	n/a	n/a	n/a	370	n/a	U
S16R000261		O	111-76-2	2-Butoxyethanol	ug/L	78.2	<1.12E+03	<1.12E+03	n/a	n/a	n/a	n/a	1.12E+03	n/a	U
S16R000261		O	91-58-7	2-Chloronaphthalene	ug/L	54.4	<560	<560	n/a	n/a	n/a	n/a	560	n/a	Ua
S16R000261		O	95-57-8	2-Chlorophenol	ug/L	74.9	<471	<471	n/a	n/a	n/a	n/a	471	n/a	U
S16R000261		O	110-80-5	2-Ethoxyethanol	ug/L	79.9	<746	<746	n/a	n/a	n/a	n/a	746	n/a	U
S16R000261		O	91-57-6	2-Methylnaphthalene	ug/L	48.6	<565	<565	n/a	n/a	n/a	n/a	565	n/a	Ua
S16R000261		O	95-48-7	2-Methylphenol	ug/L	72.9	<505	<505	n/a	n/a	n/a	n/a	505	n/a	U
S16R000261		O	88-74-4	2-Nitroaniline	ug/L	76.5	<402	<402	n/a	n/a	n/a	n/a	402	n/a	U
S16R000261		O	88-75-5	2-Nitrophenol	ug/L	75.1	<504	<504	n/a	n/a	n/a	n/a	504	n/a	U
S16R000261		O	108-39-4M	Cresol (m & p)	ug/L	72.7	<450	<450	n/a	n/a	n/a	n/a	450	n/a	U
S16R000261		O	99-09-2	3-Nitroaniline	ug/L	79.9	<483	<483	n/a	n/a	n/a	n/a	483	n/a	U
S16R000261		O	534-52-1	4,6-Dinitro-o-cresol	ug/L	87.5	<120	<120	n/a	n/a	n/a	n/a	120	n/a	U
S16R000261		O	101-55-3	4-Bromophenylphenyl ether	ug/L	66.3	<334	<334	n/a	n/a	n/a	n/a	334	n/a	Ua
S16R000261		O	59-50-7	4-Chloro-3-methylphenol	ug/L	75.2	<509	<509	n/a	n/a	n/a	n/a	509	n/a	U
S16R000261		O	106-47-8	4-Chloroaniline	ug/L	72.7	<553	<553	n/a	n/a	n/a	n/a	553	n/a	U
S16R000261		O	7005-72-3	4-Chlorophenylphenyl ether	ug/L	64.2	<461	<461	n/a	n/a	n/a	n/a	461	n/a	Ua
S16R000261		O	100-01-6	4-Nitroaniline	ug/L	85.1	<432	<432	n/a	n/a	n/a	n/a	432	n/a	U
S16R000261		O	100-02-7	4-Nitrophenol	ug/L	76.3	<293	<293	n/a	n/a	n/a	n/a	293	n/a	UY
S16R000261		O	83-32-9	Acenaphthene	ug/L	60.5	<519	<519	n/a	n/a	n/a	n/a	519	n/a	U
S16R000261		O	208-96-8	Acenaphthylene	ug/L	60.6	<600	<600	n/a	n/a	n/a	n/a	600	n/a	Ua
S16R000261		O	120-12-7	Anthracene	ug/L	70.4	<248	<248	n/a	n/a	n/a	n/a	248	n/a	U
S16R000261		O	56-55-3	Benzo(a)anthracene	ug/L	75.9	<226	<226	n/a	n/a	n/a	n/a	226	n/a	U
S16R000261		O	50-32-8	Benzo(a)pyrene	ug/L	75.9	<217	<217	n/a	n/a	n/a	n/a	217	n/a	U
S16R000261		O	205-99-2	Benzo(b)fluoranthene	ug/L	79.0	<249	<249	n/a	n/a	n/a	n/a	249	n/a	U
S16R000261		O	191-24-2	Benzo(ghi)perylene	ug/L	66.5	<212	<212	n/a	n/a	n/a	n/a	212	n/a	UYa

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AN101 FLOATING SOLIDS & CORROSION
Data Summary Report

Sample Group: 20161758

SDG Number:

Customer Sample ID: SVOC EXTRACT

Customer Sample ID: SVOC EXTRACT

Sample#	R	A#	CAS #	Analyte	Unit	STD %	Blank	Result	Duplicate	Average	RPD %	Spk Rec %	Det Limit	Cnt Err %	Qual Flags
SVOA 222S LIQUID															
S16R000261		O	207-08-9	Benzo(k)fluoranthene	ug/L	77.0	<241	<241	n/a	n/a	n/a	n/a	241	n/a	U
S16R000261		O	85-68-7	Butylbenzylphthalate	ug/L	76.9	<186	<186	n/a	n/a	n/a	n/a	186	n/a	U
S16R000261		O	218-01-9	Chrysene	ug/L	80.8	<260	<260	n/a	n/a	n/a	n/a	260	n/a	U
S16R000261		O	108-94-1	Cyclohexanone	ug/L	75.9	<521	<521	n/a	n/a	n/a	n/a	521	n/a	U
S16R000261		O	84-74-2	Di-n-butylphthalate	ug/L	77.9	<150	<150	n/a	n/a	n/a	n/a	150	n/a	U
S16R000261		O	117-84-0	Di-n-octylphthalate	ug/L	80.8	<186	<186	n/a	n/a	n/a	n/a	186	n/a	U
S16R000261		O	53-70-3	Dibenz[a,h]anthracene	ug/L	65.6	<181	<181	n/a	n/a	n/a	n/a	181	n/a	UYa
S16R000261		O	132-64-9	Dibenzofuran	ug/L	62.0	<476	<476	n/a	n/a	n/a	n/a	476	n/a	Ua
S16R000261		O	84-66-2	Diethylphthalate	ug/L	50.9	<288	<288	n/a	n/a	n/a	n/a	288	n/a	Ua
S16R000261		O	131-11-3	Dimethyl phthalate	ug/L	24.5	<338	<338	n/a	n/a	n/a	n/a	338	n/a	Ua
S16R000261		O	122-39-4	Dimethylamine	ug/L	69.6	<309	<309	n/a	n/a	n/a	n/a	309	n/a	Ua
S16R000261		O	206-44-0	Fluoranthene	ug/L	76.7	<162	<162	n/a	n/a	n/a	n/a	162	n/a	U
S16R000261		O	86-73-7	Fluorene	ug/L	64.8	<509	<509	n/a	n/a	n/a	n/a	509	n/a	Ua
S16R000261		O	118-74-1	Hexachlorobenzene	ug/L	68.4	<433	<433	n/a	n/a	n/a	n/a	433	n/a	Ua
S16R000261		O	87-68-3	Hexachlorobutadiene	ug/L	14.8	<601	<601	n/a	n/a	n/a	n/a	601	n/a	Ua
S16R000261		O	77-47-4	Hexachlorocyclopentadiene	ug/L	14.7	<105	<105	n/a	n/a	n/a	n/a	105	n/a	Ua
S16R000261		O	67-72-1	Hexachloroethane	ug/L	0.0	<560	<560	n/a	n/a	n/a	n/a	560	n/a	Ua
S16R000261		O	193-39-5	Indeno(1,2,3-cd)pyrene	ug/L	66.8	<105	<105	n/a	n/a	n/a	n/a	105	n/a	UYa
S16R000261		O	78-83-1	Isobutanol	ug/L	35.2	<863	<863	n/a	n/a	n/a	n/a	863	n/a	Ua
S16R000261		O	78-59-1	Isophorone	ug/L	75.0	<540	<540	n/a	n/a	n/a	n/a	540	n/a	U
S16R000261		O	62-75-9	N-Nitrosodimethylamine	ug/L	74.2	<496	<496	n/a	n/a	n/a	n/a	496	n/a	U
S16R000261		O	621-64-7	N-Nitroso-di-n-dipropylamine	ug/L	72.8	<542	<542	n/a	n/a	n/a	n/a	542	n/a	U
S16R000261		O	59-89-2	N-Nitrosomorpholine	ug/L	74.3	<435	<435	n/a	n/a	n/a	n/a	435	n/a	U
S16R000261		O	91-20-3	Naphthalene	ug/L	38.4	<493	<493	n/a	n/a	n/a	n/a	493	n/a	Ua
S16R000261		O	98-95-3	Nitrobenzene	ug/L	69.0	<487	<487	n/a	n/a	n/a	n/a	487	n/a	Ua
S16R000261		O	87-86-5	Pentachlorophenol	ug/L	81.8	<228	<228	n/a	n/a	n/a	n/a	228	n/a	U
S16R000261		O	85-01-8	Phenanthrene	ug/L	69.7	<237	<237	n/a	n/a	n/a	n/a	237	n/a	Ua

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AN101 FLOATING SOLIDS & CORROSION
Data Summary Report

Sample Group: 20161758

SDG Number:

Customer Sample ID: SVOC EXTRACT

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Sample#	R	A#	CAS #	Analyte	Unit	STD %	Blank	Result	Duplicate	Average	RPD %	Spk Rec %	Det Limit	Cnt Err %	Qual Flags
SVOA 222S LIQUID															
S16R000261		O	108-95-2	Phenol	ug/L	73.5	<485	<485	n/a	n/a	n/a	n/a	485	n/a	U
S16R000261		O	129-00-0	Pyrene	ug/L	75.8	<152	<152	n/a	n/a	n/a	n/a	152	n/a	U
S16R000261		O	110-86-1	Pyridine	ug/L	65.1	<585	<585	n/a	n/a	n/a	n/a	585	n/a	Ua
S16R000261		O	126-73-8	Tributyl phosphate	ug/L	81.6	<205	542	n/a	n/a	n/a	n/a	205	n/a	J
S16R000261		O	111-91-1	Bis(2-Chloroethoxy)methane	ug/L	73.1	<535	<535	n/a	n/a	n/a	n/a	535	n/a	U
S16R000261		O	117-81-7	Bis(2-ethylhexyl) phthalate	ug/L	78.9	<176	<176	n/a	n/a	n/a	n/a	176	n/a	J
S16R000261		O	111-44-4	Bis(2-chloroethyl) ether	ug/L	72.1	<519	<519	n/a	n/a	n/a	n/a	519	n/a	U
S17R000012		O	120-82-1	1,2,4-Trichlorobenzene	ug/L	33.1	<45.9	<290	n/a	n/a	n/a	n/a	290	n/a	U
S17R000012		O	95-50-1	1,2-Dichlorobenzene	ug/L	22.4	<45.0	<284	n/a	n/a	n/a	n/a	284	n/a	Ua
S17R000012		O	106-46-7	1,4-Dichlorobenzene	ug/L	19.3	<45.2	<286	n/a	n/a	n/a	n/a	286	n/a	U
S17R000012		O	71-36-3	1-Butanol	ug/L	51.4	<185	<1.17E+03	n/a	n/a	n/a	n/a	1.17E+03	n/a	Ua
S17R000012		O	108-60-1	2,2-oxybis(1-Chloropropane)	ug/L	73.4	<46.6	<295	n/a	n/a	n/a	n/a	295	n/a	U
S17R000012		O	95-95-4	2,4,5-Trichlorophenol	ug/L	84.6	<45.7	<289	n/a	n/a	n/a	n/a	289	n/a	U
S17R000012		O	88-06-2	2,4,6-Trichlorophenol	ug/L	84.6	<44.2	<279	n/a	n/a	n/a	n/a	279	n/a	U
S17R000012		O	120-83-2	2,4-Dichlorophenol	ug/L	89.0	<43.9	<277	n/a	n/a	n/a	n/a	277	n/a	U
S17R000012		O	105-67-9	2,4-Dimethylphenol	ug/L	79.9	<22.9	<145	n/a	n/a	n/a	n/a	145	n/a	U
S17R000012		O	51-28-5	2,4-Dinitrophenol	ug/L	81.4	<15.0	631	n/a	n/a	n/a	n/a	94.9	n/a	J
S17R000012		O	121-14-2	2,4-Dinitrotoluene	ug/L	73.1	<24.3	<153	n/a	n/a	n/a	n/a	153	n/a	U
S17R000012		O	128-37-0	BHT	ug/L	36.5	<20.6	<130	n/a	n/a	n/a	n/a	130	n/a	Ua
S17R000012		O	606-20-2	2,6-Dinitrotoluene	ug/L	74.6	<30.8	<195	n/a	n/a	n/a	n/a	195	n/a	U
S17R000012		O	111-76-2	2-Butoxyethanol	ug/L	86.6	<93.6	<591	n/a	n/a	n/a	n/a	591	n/a	U
S17R000012		O	91-58-7	2-Chloronaphthalene	ug/L	52.8	<46.7	<295	n/a	n/a	n/a	n/a	295	n/a	Ua
S17R000012		O	95-57-8	2-Chlorophenol	ug/L	82.3	<39.3	<248	n/a	n/a	n/a	n/a	248	n/a	U
S17R000012		O	110-80-5	2-Ethoxyethanol	ug/L	71.5	<62.1	<392	n/a	n/a	n/a	n/a	392	n/a	U
S17R000012		O	91-57-6	2-Methylnaphthalene	ug/L	52.8	<47.1	<297	n/a	n/a	n/a	n/a	297	n/a	Ua
S17R000012		O	95-48-7	2-Methylphenol	ug/L	81.8	<42.1	<266	n/a	n/a	n/a	n/a	266	n/a	U
S17R000012		O	88-74-4	2-Nitroaniline	ug/L	82.1	<33.5	<211	n/a	n/a	n/a	n/a	211	n/a	U

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AN101 FLOATING SOLIDS & CORROSION
Data Summary Report

Sample Group: 20161758

SDG Number:

Customer Sample ID: SVOC EXTRACT

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Sample#	R	A#	CAS #	Analyte	Unit	STD %	Blank	Result	Duplicate	Average	RPD %	Spk Rec %	Det Limit	Cnt Err %	Qual Flags
SVOA 222S LIQUID															
S17R000012		O	88-75-5	2-Nitrophenol	ug/L	87.0	<42.0	<265	n/a	n/a	n/a	n/a	265	n/a	U
S17R000012		O	108-39-4M	Cresol (m & p)	ug/L	84.5	<37.5	<237	n/a	n/a	n/a	n/a	237	n/a	U
S17R000012		O	99-09-2	3-Nitroaniline	ug/L	87.2	<40.2	<254	n/a	n/a	n/a	n/a	254	n/a	U
S17R000012		O	534-52-1	4,6-Dinitro-o-cresol	ug/L	92.9	<9.97	<62.9	n/a	n/a	n/a	n/a	62.9	n/a	U
S17R000012		O	101-55-3	4-Bromophenylphenyl ether	ug/L	62.4	<27.8	<176	n/a	n/a	n/a	n/a	176	n/a	Ua
S17R000012		O	59-50-7	4-Chloro-3-methylphenol	ug/L	88.3	<42.4	<268	n/a	n/a	n/a	n/a	268	n/a	U
S17R000012		O	106-47-8	4-Chloroaniline	ug/L	83.1	<46.1	<291	n/a	n/a	n/a	n/a	291	n/a	U
S17R000012		O	7005-72-3	4-Chlorophenylphenyl ether	ug/L	57.3	<38.4	<243	n/a	n/a	n/a	n/a	243	n/a	Ua
S17R000012		O	100-01-6	4-Nitroaniline	ug/L	93.1	<36.0	<227	n/a	n/a	n/a	n/a	227	n/a	U
S17R000012		O	100-02-7	4-Nitrophenol	ug/L	88.0	<24.4	<154	n/a	n/a	n/a	n/a	154	n/a	U
S17R000012		O	83-32-9	Acenaphthene	ug/L	56.9	<43.3	<273	n/a	n/a	n/a	n/a	273	n/a	U
S17R000012		O	208-96-8	Acenaphthylene	ug/L	57.9	<50.0	<316	n/a	n/a	n/a	n/a	316	n/a	Ua
S17R000012		O	120-12-7	Anthracene	ug/L	65.8	<20.7	<131	n/a	n/a	n/a	n/a	131	n/a	U
S17R000012		O	56-55-3	Benzo(a)anthracene	ug/L	66.5	<18.8	<119	n/a	n/a	n/a	n/a	119	n/a	U
S17R000012		O	50-32-8	Benzo(a)pyrene	ug/L	60.7	<18.1	<114	n/a	n/a	n/a	n/a	114	n/a	Ua
S17R000012		O	205-99-2	Benzo(b)fluoranthene	ug/L	64.6	<20.7	<131	n/a	n/a	n/a	n/a	131	n/a	U
S17R000012		O	191-24-2	Benzo(ghi)perylene	ug/L	65.1	<17.7	<112	n/a	n/a	n/a	n/a	112	n/a	U
S17R000012		O	207-08-9	Benzo(k)fluoranthene	ug/L	63.8	<20.1	<127	n/a	n/a	n/a	n/a	127	n/a	Ua
S17R000012		O	85-68-7	Butylbenzylphthalate	ug/L	66.5	<15.5	<97.7	n/a	n/a	n/a	n/a	97.7	n/a	U
S17R000012		O	218-01-9	Chrysene	ug/L	67.4	<21.6	<137	n/a	n/a	n/a	n/a	137	n/a	Ua
S17R000012		O	108-94-1	Cyclohexanone	ug/L	80.1	<43.4	<274	n/a	n/a	n/a	n/a	274	n/a	U
S17R000012		O	84-74-2	Di-n-butylphthalate	ug/L	76.0	<12.5	<79.2	n/a	n/a	n/a	n/a	79.2	n/a	U
S17R000012		O	117-84-0	Di-n-octylphthalate	ug/L	85.8	<15.5	<98.1	n/a	n/a	n/a	n/a	98.1	n/a	U
S17R000012		O	53-70-3	Dibenz[a,h]anthracene	ug/L	56.3	<15.1	<95.4	n/a	n/a	n/a	n/a	95.4	n/a	Ua
S17R000012		O	132-64-9	Dibenzofuran	ug/L	59.3	<39.7	<251	n/a	n/a	n/a	n/a	251	n/a	Ua
S17R000012		O	84-66-2	Diethylphthalate	ug/L	33.1	<24.0	<152	n/a	n/a	n/a	n/a	152	n/a	Ua
S17R000012		O	131-11-3	Dimethyl phthalate	ug/L	13.4	<28.2	<178	n/a	n/a	n/a	n/a	178	n/a	Ua

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AN101 FLOATING SOLIDS & CORROSION
Data Summary Report

Sample Group: 20161758

SDG Number:

Customer Sample ID: SVOC EXTRACT

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Sample#	R	A#	CAS #	Analyte	Unit	STD %	Blank	Result	Duplicate	Average	RPD %	Spk Rec %	Det Limit	Cnt Err %	Qual Flags
SVOA 222S LIQUID															
S17R000012		O	122-39-4	Diphenylamine	ug/L	68.0	<25.8	<163	n/a	n/a	n/a	n/a	163	n/a	U
S17R000012		O	206-44-0	Fluoranthene	ug/L	71.6	<13.5	<85.5	n/a	n/a	n/a	n/a	85.5	n/a	U
S17R000012		O	86-73-7	Fluorene	ug/L	59.1	<42.4	<268	n/a	n/a	n/a	n/a	268	n/a	Ua
S17R000012		O	118-74-1	Hexachlorobenzene	ug/L	62.1	<36.1	<228	n/a	n/a	n/a	n/a	228	n/a	Ua
S17R000012		O	87-88-3	Hexachlorobutadiene	ug/L	19.7	<50.1	<316	n/a	n/a	n/a	n/a	316	n/a	Ua
S17R000012		O	77-47-4	Hexachlorocyclopentadiene	ug/L	0.0	<8.73	<55.2	n/a	n/a	n/a	n/a	55.2	n/a	Ua
S17R000012		O	67-72-1	Hexachloroethane	ug/L	10.5	<46.7	<295	n/a	n/a	n/a	n/a	295	n/a	Ua
S17R000012		O	193-39-5	Indeno(1,2,3-cd)pyrene	ug/L	59.6	<8.73	<55.2	n/a	n/a	n/a	n/a	55.2	n/a	Ua
S17R000012		O	78-83-1	Isobutanol	ug/L	36.4	<71.9	<454	n/a	n/a	n/a	n/a	454	n/a	Ua
S17R000012		O	78-59-1	Isophorone	ug/L	86.4	<45.0	<284	n/a	n/a	n/a	n/a	284	n/a	U
S17R000012		O	62-75-9	N-Nitrosodimethylamine	ug/L	76.2	<41.3	<261	n/a	n/a	n/a	n/a	261	n/a	U
S17R000012		O	621-64-7	N-Nitroso-di-n-dipropylamine	ug/L	81.9	<45.2	<285	n/a	n/a	n/a	n/a	285	n/a	U
S17R000012		O	59-89-2	N-Nitrosomorpholine	ug/L	85.0	<36.2	<229	n/a	n/a	n/a	n/a	229	n/a	U
S17R000012		O	91-20-3	Naphthalene	ug/L	48.1	<41.1	<260	n/a	n/a	n/a	n/a	260	n/a	Ua
S17R000012		O	98-95-3	Nitrobenzene	ug/L	80.7	<40.6	<256	n/a	n/a	n/a	n/a	256	n/a	U
S17R000012		O	87-86-5	Pentachlorophenol	ug/L	91.0	<19.0	266	n/a	n/a	n/a	n/a	120	n/a	J
S17R000012		O	85-01-8	Phenanthrene	ug/L	67.1	<19.8	<125	n/a	n/a	n/a	n/a	125	n/a	U
S17R000012		O	108-95-2	Phenol	ug/L	81.2	<40.4	<255	n/a	n/a	n/a	n/a	255	n/a	U
S17R000012		O	129-00-0	Pyrene	ug/L	71.4	<12.7	<80.2	n/a	n/a	n/a	n/a	80.2	n/a	U
S17R000012		O	110-86-1	Pyridine	ug/L	68.3	<48.7	<308	n/a	n/a	n/a	n/a	308	n/a	Ua
S17R000012		O	126-73-8	Tributyl phosphate	ug/L	80.4	<17.1	197	n/a	n/a	n/a	n/a	108	n/a	J
S17R000012		O	111-91-1	Bis(2-Chloroethoxy)methane	ug/L	85.5	<44.6	<281	n/a	n/a	n/a	n/a	281	n/a	U
S17R000012		O	117-81-7	Bis(2-ethylhexyl) phthalate	ug/L	81.1	<14.7	<92.6	n/a	n/a	n/a	n/a	92.6	n/a	U
S17R000012		O	111-44-4	Bis(2-chloroethyl) ether	ug/L	80.1	<43.2	<273	n/a	n/a	n/a	n/a	273	n/a	U

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AN101 FLOATING SOLIDS & CORROSION
Data Summary Report

Sample Group: 20161758
SDG Number:
Customer Sample ID: Sample 1
Customer Sample ID: Sample 1

Sample#	R	A#	CAS #	Analyte	Unit	STD %	Blank	Result	Duplicate	Average	RPD %	Spk Rec %	Det Limit	Cnt Err %	Qual Flags
% Water by TGA															
S16R000241			%WATER	Percent water	%	97.4	n/a	81.4	71.0	76.2	13.6	n/a	0.0100	n/a	
S16R000252			%WATER	Percent water	%	97.4	n/a	73.2	n/a	n/a	n/a	n/a	0.0100	n/a	
TIC/TOC by Acid Persulfate															
S16R000241			TIC	Total inorganic carbon	ug/g	95.4	<7.00	3.54E+03	3.50E+03	3.52E+03	1.14	95.4	194	n/a	
S16R000241			TOC	Total organic carbon	ug/g	91.4	<20.0	8.24E+03	1.83E+04	1.33E+04	75.8	153	554	n/a	Bb
S16R000252			TIC	Total inorganic carbon	ug/g	95.4	<7.00	3.66E+03	n/a	n/a	n/a	n/a	191	n/a	
S16R000252			TOC	Total organic carbon	ug/g	91.4	<20.0	8.51E+03	n/a	n/a	n/a	n/a	547	n/a	B

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AN101 FLOATING SOLIDS & CORROSION
Data Summary Report

Sample Group: 20161758
SDG Number:
Customer Sample ID: Sample 2
Customer Sample ID: Sample 2

Sample#	R	A#	CAS #	Analyte	Unit	STD %	Blank	Result	Duplicate	Average	RPD %	Spk Rec %	Det Limit	Cnt Err %	Qual Flags
% Water by TGA															
S16R000242			%WATER	Percent water	%	103	n/a	80.1	75.7	77.9	5.65	n/a	0.0100	n/a	
S16R000253			%WATER	Percent water	%	103	n/a	81.6	n/a	n/a	n/a	n/a	0.0100	n/a	
Anions and Small Organic Acids															
S16R000242			16984-48-8	Fluoride	ug/mL	100	<1.00E-03	2.12E+03	2.12E+03	2.12E+03	0.158	99.5	1.50	n/a	
S16R000242			666-14-8	Glycolate	ug/mL	100	<5.00E-03	<7.50	<7.50	n/a	n/a	100	7.50	n/a	U
S16R000242			71-50-1	Acetate	ug/mL	98.8	<0.0100	505	503	504	0.247	102	15.0	n/a	
S16R000242			12311-97-6	Formate	ug/mL	99.9	<7.00E-03	300	300	300	0.116	99.1	10.5	n/a	J
S16R000242			16887-00-6	Chloride	ug/mL	98.0	<4.00E-03	533	534	533	0.0202	99.2	6.00	n/a	
S16R000242			14797-65-0	Nitrite	ug/mL	99.8	<9.00E-03	1.64E+04	1.64E+04	1.64E+04	0.142	100	13.5	n/a	
S16R000242			14808-79-8	Sulfate	ug/mL	99.5	<9.00E-03	2.05E+03	2.05E+03	2.05E+03	0.0300	98.4	13.5	n/a	
S16R000242			338-70-5	Oxalate	ug/mL	99.2	<9.00E-03	669	672	670	0.542	97.9	13.5	n/a	
S16R000242			24959-67-9	Bromide	ug/mL	100	<6.00E-03	<9.00	<9.00	n/a	n/a	95.4	9.00	n/a	U
S16R000242			14797-55-8	Nitrate	ug/mL	100	<0.0210	2.93E+04	2.92E+04	2.92E+04	0.166	93.9	31.5	n/a	
S16R000242			14265-44-2	Phosphate	ug/mL	100	<0.0140	1.79E+03	1.76E+03	1.78E+03	1.63	96.6	21.0	n/a	
S16R000242			7772-98-7	Thiosulfate	ug/mL	99.7	<6.00E-03	<9.00	<9.00	n/a	n/a	97.3	9.00	n/a	U
S16R000253			16984-48-8	Fluoride	ug/mL	100	<1.00E-03	2.15E+03	n/a	n/a	n/a	n/a	1.50	n/a	
S16R000253			666-14-8	Glycolate	ug/mL	100	<5.00E-03	<7.50	n/a	n/a	n/a	n/a	7.50	n/a	U
S16R000253			71-50-1	Acetate	ug/mL	98.8	<0.0100	508	n/a	n/a	n/a	n/a	15.0	n/a	
S16R000253			12311-97-6	Formate	ug/mL	99.9	<7.00E-03	303	n/a	n/a	n/a	n/a	10.5	n/a	J
S16R000253			16887-00-6	Chloride	ug/mL	98.0	<4.00E-03	536	n/a	n/a	n/a	n/a	6.00	n/a	
S16R000253			14797-65-0	Nitrite	ug/mL	99.8	<9.00E-03	1.65E+04	n/a	n/a	n/a	n/a	13.5	n/a	
S16R000253			14808-79-8	Sulfate	ug/mL	99.5	<9.00E-03	2.07E+03	n/a	n/a	n/a	n/a	13.5	n/a	
S16R000253			338-70-5	Oxalate	ug/mL	99.2	<9.00E-03	675	n/a	n/a	n/a	n/a	13.5	n/a	
S16R000253			24959-67-9	Bromide	ug/mL	100	<6.00E-03	<9.00	n/a	n/a	n/a	n/a	9.00	n/a	U
S16R000253			14797-55-8	Nitrate	ug/mL	100	<0.0210	2.94E+04	n/a	n/a	n/a	n/a	31.5	n/a	
S16R000253			14265-44-2	Phosphate	ug/mL	100	<0.0140	1.94E+03	n/a	n/a	n/a	n/a	21.0	n/a	
S16R000253			7772-98-7	Thiosulfate	ug/mL	99.7	<6.00E-03	<9.00	n/a	n/a	n/a	n/a	9.00	n/a	U
DENSITY															

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AN101 FLOATING SOLIDS & CORROSION
Data Summary Report

Sample Group: 20161758
SDG Number:
Customer Sample ID: Sample 2
Customer Sample ID: Sample 2

Sample#	R	A#	CAS #	Analyte	Unit	STD %	Blank	Result	Duplicate	Average	RPD %	Spk Rec %	Det Limit	Cnt Err %	Qual Flags
S16R000242			Density	Density	g/mL	100.8	n/a	1.197	n/a	n/a	n/a	n/a	1.000E-03	n/a	
S16R000253			Density	Density	g/mL	100.8	n/a	1.194	1.194	1.194	0.0	n/a	1.000E-03	n/a	
ICP-AES															
S16R000242		7440-22-4		Silver	ug/mL	96.5	<3.00E-03	6.83	6.70	6.77	1.92	86.5	3.00	n/a	J
S16R000242		7429-90-5		Aluminum	ug/mL	95.8	<0.0140	8.70E+03	8.77E+03	8.74E+03	0.789	91.7	14.0	n/a	
S16R000242		7440-38-2		Arsenic	ug/mL	98.2	<0.0150	<15.0	<15.0	n/a	n/a	94.7	15.0	n/a	U
S16R000242		7440-42-8		Boron	ug/mL	97.4	<2.00E-03	7.14	6.81	6.98	4.74	92.9	2.00	n/a	J
S16R000242		7440-39-3		Barium	ug/mL	97.5	<1.00E-03	1.93	2.18	2.06	12.4	92.4	1.00	n/a	J
S16R000242		7440-41-7		Beryllium	ug/mL	96.2	<1.00E-03	<1.00	<1.00	n/a	n/a	93.0	1.00	n/a	U
S16R000242		7440-69-9		Bismuth	ug/mL	96.4	<0.0190	<19.0	<19.0	n/a	n/a	91.1	19.0	n/a	U
S16R000242		7440-70-2		Calcium	ug/mL	102	<0.120	<120	<120	n/a	n/a	95.3	120	n/a	U
S16R000242		7440-43-9		Cadmium	ug/mL	100	<1.00E-03	<1.00	<1.00	n/a	n/a	93.7	1.00	n/a	U
S16R000242		7440-48-4		Cobalt	ug/mL	98.5	<1.00E-03	1.60	1.08	1.34	38.8	93.3	1.00	n/a	J
S16R000242		7440-47-3		Chromium	ug/mL	96.7	<2.00E-03	83.2	83.8	83.5	0.793	93.3	2.00	n/a	
S16R000242		7440-50-8		Copper	ug/mL	95.8	<2.00E-03	<2.00	<2.00	n/a	n/a	94.0	2.00	n/a	U
S16R000242		7440-53-1		Europium	ug/mL	102	<1.00E-03	<1.00	<1.00	n/a	n/a	91.8	1.00	n/a	U
S16R000242		7439-89-6		Iron	ug/mL	96.9	<0.0200	68.2	69.1	68.7	1.31	94.1	20.0	n/a	J
S16R000242		7440-09-7		Potassium	ug/mL	95.9	<0.0220	432	445	439	2.94	93.4	22.0	n/a	
S16R000242		7439-91-0		Lanthanum	ug/mL	95.3	<1.00E-03	<1.00	<1.00	n/a	n/a	92.9	1.00	n/a	U
S16R000242		7439-93-2		Lithium	ug/mL	96.5	<1.00E-03	<1.00	<1.00	n/a	n/a	93.4	1.00	n/a	U
S16R000242		7439-95-4		Magnesium	ug/mL	96.5	<9.00E-03	<9.00	<9.00	n/a	n/a	94.0	9.00	n/a	U
S16R000242		7439-96-5		Manganese	ug/mL	98.2	<1.00E-03	<1.00	<1.00	n/a	n/a	93.4	1.00	n/a	U
S16R000242		7439-98-7		Molybdenum	ug/mL	94.8	<2.00E-03	5.99	6.17	6.08	3.06	93.5	2.00	n/a	J
S16R000242		7440-23-5		Sodium	ug/mL	96.0	<0.0920	9.96E+04	1.01E+05	1.00E+05	1.27	91.2	92.0	n/a	
S16R000242		7440-00-8		Neodymium	ug/mL	103	<0.0150	<15.0	<15.0	n/a	n/a	94.6	15.0	n/a	U
S16R000242		7440-02-0		Nickel	ug/mL	97.5	<2.00E-03	6.06	6.34	6.20	4.42	92.1	2.00	n/a	J
S16R000242		7440-03-1		Niobium	ug/mL	104	<6.00E-03	<6.00	<6.00	n/a	n/a	97.1	6.00	n/a	U
S16R000242		7723-14-0		Phosphorus	ug/mL	95.1	<0.0130	536	543	540	1.16	94.5	13.0	n/a	

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AN101 FLOATING SOLIDS & CORROSION
Data Summary Report

Sample Group: 20161758
SDG Number:
Customer Sample ID: Sample 2
Customer Sample ID: Sample 2

Sample#	R	A#	CAS #	Analyte	Unit	STD %	Blank	Result	Duplicate	Average	RPD %	Spk Rec %	Det Limit	Cnt Err %	Qual Flags
ICP-AES															
S16R000242			7439-92-1	Lead	ug/mL	102	<0.0130	104	107	105	3.02	96.6	13.0	n/a	J
S16R000242			7440-05-3	Palladium	ug/mL	105	<0.0120	<12.0	<12.0	n/a	n/a	92.7	12.0	n/a	U
S16R000242			7440-10-0	Praseodymium	ug/mL	107	<0.0260	<26.0	<26.0	n/a	n/a	93.0	26.0	n/a	U
S16R000242			7440-17-7	Rubidium	ug/mL	103	<0.0570	<57.0	<57.0	n/a	n/a	93.2	57.0	n/a	U
S16R000242			7440-16-6	Rhodium	ug/mL	103	<0.0120	<12.0	<12.0	n/a	n/a	93.2	12.0	n/a	U
S16R000242			7440-18-8	Ruthenium	ug/mL	108	<5.00E-03	<5.00	<5.00	n/a	n/a	91.3	5.00	n/a	U
S16R000242			7704-34-9	Sulfur	ug/mL	96.3	<0.0280	766	776	771	1.36	95.0	28.0	n/a	
S16R000242			7440-36-0	Antimony	ug/mL	93.1	<0.0180	<18.0	<18.0	n/a	n/a	107	18.0	n/a	U
S16R000242			7782-49-2	Selenium	ug/mL	97.1	<0.0300	<30.0	<30.0	n/a	n/a	94.0	30.0	n/a	U
S16R000242			7440-21-3	Silicon	ug/mL	96.1	<0.0120	86.1	73.4	79.7	15.9	100	12.0	n/a	BJ
S16R000242			7440-19-9	Samarium	ug/mL	105	<0.0170	<17.0	<17.0	n/a	n/a	92.5	17.0	n/a	U
S16R000242			7440-31-5	Tin	ug/mL	103	<8.00E-03	25.7	23.9	24.8	7.26	94.3	8.00	n/a	J
S16R000242			7440-24-6	Strontium	ug/mL	97.9	<2.00E-03	<2.00	<2.00	n/a	n/a	92.4	2.00	n/a	U
S16R000242			7440-25-7	Tantalum	ug/mL	107	<5.00E-03	<5.00	<5.00	n/a	n/a	99.2	5.00	n/a	U
S16R000242			13494-80-9	Tellurium	ug/mL	106	<9.00E-03	<9.00	<9.00	n/a	n/a	96.2	9.00	n/a	U
S16R000242			7440-29-1	Thorium	ug/mL	102	<0.0130	<13.0	<13.0	n/a	n/a	92.4	13.0	n/a	U
S16R000242			7440-32-6	Titanium	ug/mL	90.7	<2.00E-03	<2.00	<2.00	n/a	n/a	91.2	2.00	n/a	U
S16R000242			7440-28-0	Thallium	ug/mL	106	<0.0150	<15.0	<15.0	n/a	n/a	89.6	15.0	n/a	U
S16R000242			7440-61-1	Uranium	ug/mL	103	<0.0290	<29.0	<29.0	n/a	n/a	93.4	29.0	n/a	U
S16R000242			7440-62-2	Vanadium	ug/mL	94.7	<1.00E-03	<1.00	<1.00	n/a	n/a	92.0	1.00	n/a	U
S16R000242			7440-33-7	Tungsten	ug/mL	105	<0.0160	<16.0	<16.0	n/a	n/a	97.8	16.0	n/a	U
S16R000242			7440-65-5	Yttrium	ug/mL	103	<2.00E-03	<2.00	<2.00	n/a	n/a	92.9	2.00	n/a	U
S16R000242			7440-66-6	Zinc	ug/mL	98.4	<0.0320	<32.0	<32.0	n/a	n/a	94.1	32.0	n/a	U
S16R000242			7440-67-7	Zirconium	ug/mL	92.0	<1.00E-03	<1.00	<1.00	n/a	n/a	90.4	1.00	n/a	U
S16R000253			7440-22-4	Silver	ug/mL	96.5	<3.00E-03	7.44	n/a	n/a	n/a	n/a	3.00	n/a	J
S16R000253			7429-90-5	Aluminum	ug/mL	95.8	<0.0140	8.47E+03	n/a	n/a	n/a	n/a	14.0	n/a	
S16R000253			7440-38-2	Arsenic	ug/mL	98.2	<0.0150	<15.0	n/a	n/a	n/a	n/a	15.0	n/a	U

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AN101 FLOATING SOLIDS & CORROSION
Data Summary Report

Sample Group: 20161758
SDG Number:
Customer Sample ID: Sample 2
Customer Sample ID: Sample 2

Sample#	R	A#	CAS #	Analyte	Unit	STD %	Blank	Result	Duplicate	Average	RPD %	Spk Rec %	Det Limit	Cnt Err %	Qual Flags
ICP-AES															
S16R000253			7440-42-8	Boron	ug/mL	97.4	<2.00E-03	10.2	n/a	n/a	n/a	n/a	2.00	n/a	J
S16R000253			7440-39-3	Barium	ug/mL	97.5	<1.00E-03	2.12	n/a	n/a	n/a	n/a	1.00	n/a	J
S16R000253			7440-41-7	Beryllium	ug/mL	96.2	<1.00E-03	<1.00	n/a	n/a	n/a	n/a	1.00	n/a	U
S16R000253			7440-69-9	Bismuth	ug/mL	96.4	<0.0190	<19.0	n/a	n/a	n/a	n/a	19.0	n/a	U
S16R000253			7440-70-2	Calcium	ug/mL	102	<0.120	<120	n/a	n/a	n/a	n/a	120	n/a	U
S16R000253			7440-43-9	Cadmium	ug/mL	100	<1.00E-03	<1.00	n/a	n/a	n/a	n/a	1.00	n/a	U
S16R000253			7440-48-4	Cobalt	ug/mL	98.5	<1.00E-03	1.54	n/a	n/a	n/a	n/a	1.00	n/a	J
S16R000253			7440-47-3	Chromium	ug/mL	96.7	<2.00E-03	81.8	n/a	n/a	n/a	n/a	2.00	n/a	
S16R000253			7440-50-8	Copper	ug/mL	95.8	<2.00E-03	<2.00	n/a	n/a	n/a	n/a	2.00	n/a	U
S16R000253			7440-53-1	Europium	ug/mL	102	<1.00E-03	<1.00	n/a	n/a	n/a	n/a	1.00	n/a	U
S16R000253			7439-89-6	Iron	ug/mL	96.9	<0.0200	67.7	n/a	n/a	n/a	n/a	20.0	n/a	J
S16R000253			7440-09-7	Potassium	ug/mL	95.9	<0.0220	428	n/a	n/a	n/a	n/a	22.0	n/a	
S16R000253			7439-91-0	Lanthanum	ug/mL	95.3	<1.00E-03	<1.00	n/a	n/a	n/a	n/a	1.00	n/a	U
S16R000253			7439-93-2	Lithium	ug/mL	96.5	<1.00E-03	<1.00	n/a	n/a	n/a	n/a	1.00	n/a	U
S16R000253			7439-95-4	Magnesium	ug/mL	96.5	<9.00E-03	<9.00	n/a	n/a	n/a	n/a	9.00	n/a	U
S16R000253			7439-96-5	Manganese	ug/mL	98.2	<1.00E-03	<1.00	n/a	n/a	n/a	n/a	1.00	n/a	U
S16R000253			7439-98-7	Molybdenum	ug/mL	94.8	<2.00E-03	5.81	n/a	n/a	n/a	n/a	2.00	n/a	J
S16R000253			7440-23-5	Sodium	ug/mL	96.0	<0.0920	9.67E+04	n/a	n/a	n/a	n/a	92.0	n/a	
S16R000253			7440-00-8	Neodymium	ug/mL	103	<0.0150	<15.0	n/a	n/a	n/a	n/a	15.0	n/a	U
S16R000253			7440-02-0	Nickel	ug/mL	97.5	<2.00E-03	5.25	n/a	n/a	n/a	n/a	2.00	n/a	J
S16R000253			7440-03-1	Niobium	ug/mL	104	<6.00E-03	<6.00	n/a	n/a	n/a	n/a	6.00	n/a	U
S16R000253			7723-14-0	Phosphorus	ug/mL	95.1	<0.0130	529	n/a	n/a	n/a	n/a	13.0	n/a	
S16R000253			7439-92-1	Lead	ug/mL	102	<0.0130	107	n/a	n/a	n/a	n/a	13.0	n/a	J
S16R000253			7440-05-3	Palladium	ug/mL	105	<0.0120	<12.0	n/a	n/a	n/a	n/a	12.0	n/a	U
S16R000253			7440-10-0	Praseodymium	ug/mL	107	<0.0260	<26.0	n/a	n/a	n/a	n/a	26.0	n/a	U
S16R000253			7440-17-7	Rubidium	ug/mL	103	<0.0570	<57.0	n/a	n/a	n/a	n/a	57.0	n/a	U
S16R000253			7440-16-6	Rhodium	ug/mL	103	<0.0120	<12.0	n/a	n/a	n/a	n/a	12.0	n/a	U

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U - Less Than Detection Limit

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AN101 FLOATING SOLIDS & CORROSION
Data Summary Report

Sample Group: 20161758
SDG Number:
Customer Sample ID: Sample 2
Customer Sample ID: Sample 2

Sample#	R	A#	CAS #	Analyte	Unit	STD %	Blank	Result	Duplicate	Average	RPD %	Spk Rec %	Det Limit	Cnt Err %	Qual Flags
ICP-AES															
S16R000253			7440-18-8	Ruthenium	ug/mL	108	<5.00E-03	<5.00	n/a	n/a	n/a	n/a	5.00	n/a	U
S16R000253			7704-34-9	Sulfur	ug/mL	96.3	<0.0280	761	n/a	n/a	n/a	n/a	28.0	n/a	
S16R000253			7440-36-0	Antimony	ug/mL	93.1	<0.0180	<18.0	n/a	n/a	n/a	n/a	18.0	n/a	U
S16R000253			7782-49-2	Selenium	ug/mL	97.1	<0.0300	<30.0	n/a	n/a	n/a	n/a	30.0	n/a	U
S16R000253			7440-21-3	Silicon	ug/mL	96.1	<0.0120	81.0	n/a	n/a	n/a	n/a	12.0	n/a	J
S16R000253			7440-19-9	Samarium	ug/mL	105	<0.0170	<17.0	n/a	n/a	n/a	n/a	17.0	n/a	U
S16R000253			7440-31-5	Tin	ug/mL	103	<8.00E-03	25.1	n/a	n/a	n/a	n/a	8.00	n/a	J
S16R000253			7440-24-6	Strontium	ug/mL	97.9	<2.00E-03	<2.00	n/a	n/a	n/a	n/a	2.00	n/a	U
S16R000253			7440-25-7	Tantalum	ug/mL	107	<5.00E-03	<5.00	n/a	n/a	n/a	n/a	5.00	n/a	U
S16R000253			13494-80-9	Tellurium	ug/mL	106	<9.00E-03	<9.00	n/a	n/a	n/a	n/a	9.00	n/a	U
S16R000253			7440-29-1	Thorium	ug/mL	102	<0.0130	<13.0	n/a	n/a	n/a	n/a	13.0	n/a	U
S16R000253			7440-32-6	Titanium	ug/mL	90.7	<2.00E-03	<2.00	n/a	n/a	n/a	n/a	2.00	n/a	U
S16R000253			7440-28-0	Thallium	ug/mL	106	<0.0150	<15.0	n/a	n/a	n/a	n/a	15.0	n/a	U
S16R000253			7440-61-1	Uranium	ug/mL	103	<0.0290	<29.0	n/a	n/a	n/a	n/a	29.0	n/a	U
S16R000253			7440-62-2	Vanadium	ug/mL	94.7	<1.00E-03	<1.00	n/a	n/a	n/a	n/a	1.00	n/a	U
S16R000253			7440-33-7	Tungsten	ug/mL	105	<0.0160	<16.0	n/a	n/a	n/a	n/a	16.0	n/a	U
S16R000253			7440-65-5	Yttrium	ug/mL	103	<2.00E-03	<2.00	n/a	n/a	n/a	n/a	2.00	n/a	U
S16R000253			7440-66-6	Zinc	ug/mL	98.4	<0.0320	<32.0	n/a	n/a	n/a	n/a	32.0	n/a	U
S16R000253			7440-67-7	Zirconium	ug/mL	92.0	<1.00E-03	<1.00	n/a	n/a	n/a	n/a	1.00	n/a	U
ICP/MS															
S16R000242			14331-85-2	Protactinium-231	ug/mL	n/a	<3.21E-07	<1.60E-03	<1.60E-03	n/a	n/a	n/a	1.60E-03	n/a	IU
S16R000242			TH-232	Thorium-232	ug/mL	102	<3.21E-07	<1.60E-03	<1.60E-03	n/a	n/a	102	1.60E-03	n/a	U
S16R000242			13968-55-3	Uranium-233	ug/mL	99.9	<5.00E-07	<2.50E-04	<2.50E-04	n/a	n/a	99.1	2.50E-04	n/a	U
S16R000242			13966-29-5	Uranium-234	ug/mL	n/a	<5.40E-08	<1.08E-03	<1.08E-03	n/a	n/a	n/a	1.08E-03	n/a	BIJ
S16R000242			15117-96-1	Uranium-235	ug/mL	105	<5.40E-08	0.0279	0.0291	0.0285	4.21	96.9	1.08E-03	n/a	
S16R000242			13982-70-2	Uranium-236	ug/mL	n/a	<5.40E-08	<1.08E-03	<1.08E-03	n/a	n/a	n/a	1.08E-03	n/a	IJ
S16R000242			13994-20-2	Neptunium-237	ug/mL	99.5	<1.12E-07	1.38E-04	1.20E-04	1.29E-04	14.1	98.7	5.60E-05	n/a	J

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AN101 FLOATING SOLIDS & CORROSION
Data Summary Report

Sample Group: 20161758
SDG Number:
Customer Sample ID: Sample 2
Customer Sample ID: Sample 2

Sample#	R	A#	CAS #	Analyte	Unit	STD %	Blank	Result	Duplicate	Average	RPD %	Spk Rec %	Det Limit	Cnt Err %	Qual Flags
ICP/MS															
S16R000242			U-238	Uranium-238	ug/mL	98.1	<4.18E-07	4.38	4.45	4.42	1.63	100	2.09E-03	n/a	
S16R000242			13982-10-0	Plutonium-242	ug/mL	95.8	<1.30E-06	<1.30E-03	<1.30E-03	n/a	n/a	98.9	1.30E-03	n/a	U
S16R000242			14133-76-7	Technetium-99	ug/mL	104	<6.00E-07	0.987	0.989	0.988	0.132	95.0	6.00E-04	n/a	
S16R000253			14331-85-2	Protactinium-231	ug/mL	n/a	<3.21E-07	<1.60E-03	n/a	n/a	n/a	n/a	1.60E-03	n/a	IU
S16R000253			TH-232	Thorium-232	ug/mL	102	<3.21E-07	<1.60E-03	n/a	n/a	n/a	n/a	1.60E-03	n/a	U
S16R000253			13968-55-3	Uranium-233	ug/mL	99.9	<5.00E-07	<2.50E-04	n/a	n/a	n/a	n/a	2.50E-04	n/a	U
S16R000253			13966-29-5	Uranium-234	ug/mL	n/a	<5.40E-08	<1.08E-03	n/a	n/a	n/a	n/a	1.08E-03	n/a	IU
S16R000253			15117-96-1	Uranium-235	ug/mL	105	<5.40E-08	0.0280	n/a	n/a	n/a	n/a	1.08E-03	n/a	
S16R000253			13982-70-2	Uranium-236	ug/mL	n/a	<5.40E-08	<1.08E-03	n/a	n/a	n/a	n/a	1.08E-03	n/a	IU
S16R000253			13994-20-2	Neptunium-237	ug/mL	99.5	<1.12E-07	1.81E-04	n/a	n/a	n/a	n/a	5.60E-05	n/a	J
S16R000253			U-238	Uranium-238	ug/mL	98.1	<4.18E-07	4.21	n/a	n/a	n/a	n/a	2.09E-03	n/a	
S16R000253			13982-10-0	Plutonium-242	ug/mL	95.8	<1.30E-06	<1.30E-03	n/a	n/a	n/a	n/a	1.30E-03	n/a	U
S16R000253			14133-76-7	Technetium-99	ug/mL	104	<6.00E-07	1.04	n/a	n/a	n/a	n/a	6.00E-04	n/a	
OH- by Pot. Titration															
S16R000242			HYDROXIDE	Hydroxide	ug/mL	109	<9.22	3.76E+04	n/a	n/a	n/a	n/a	553	n/a	
S16R000253			HYDROXIDE	Hydroxide	ug/mL	109	<9.22	3.87E+04	3.78E+04	3.82E+04	2.34	84.0	553	n/a	
Sr-89/90 by GPC															
S16R000242			SR-89/90	Strontium-89/90	uCi/mL	102	<4.36E-04	0.0716	0.0733	0.0724	2.39	n/a	4.42E-04	4.537	
S16R000253			SR-89/90	Strontium-89/90	uCi/mL	102	<4.36E-04	0.0812	n/a	n/a	n/a	n/a	4.42E-04	4.216	
TIC/TOC by Acid Persulfate															
S16R000242			TIC	Total inorganic carbon	ug/mL	95.0	<7.00	4.33E+03	4.29E+03	4.31E+03	0.928	92.7	35.0	n/a	
S16R000242			TOC	Total organic carbon	ug/mL	91.1	<20.0	1.09E+03	1.13E+03	1.11E+03	3.60	91.6	100	n/a	
S16R000253			TIC	Total inorganic carbon	ug/mL	95.0	<7.00	4.26E+03	n/a	n/a	n/a	n/a	35.0	n/a	
S16R000253			TOC	Total organic carbon	ug/mL	91.1	<20.0	1.10E+03	n/a	n/a	n/a	n/a	100	n/a	
pH of Liquids															
S16R000242			PH	pH	unitless	n/a	n/a	>13	n/a	n/a	n/a	n/a	0.0100	n/a	E
S16R000253			PH	pH	unitless	n/a	n/a	>13	>13	n/a	n/a	n/a	0.0100	n/a	E

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AN101 FLOATING SOLIDS & CORROSION
Data Summary Report

Sample Group: 20161758
SDG Number:
Customer Sample ID: Sample 3
Customer Sample ID: Sample 3

Sample#	R	A#	CAS #	Analyte	Unit	STD %	Blank	Result	Duplicate	Average	RPD %	Spk Rec %	Det Limit	Cnt Err %	Qual Flags
% Water by TGA															
S16R000243			%WATER	Percent water	%	97.4	n/a	69.8	n/a	n/a	n/a	n/a	0.0100	n/a	
S16R000254			%WATER	Percent water	%	99.1	n/a	70.6	74.6	72.6	5.44	n/a	0.0100	n/a	
TIC/TOC by Acid Persulfate															
S16R000243			TIC	Total inorganic carbon	ug/g	95.4	<7.00	3.37E+03	n/a	n/a	n/a	n/a	138	n/a	
S16R000243			TOC	Total organic carbon	ug/g	91.4	<20.0	1.03E+04	n/a	n/a	n/a	n/a	393	n/a	
S16R000254			TIC	Total inorganic carbon	ug/g	95.4	<7.00	3.38E+03	n/a	n/a	n/a	n/a	97.0	n/a	
S16R000254			TOC	Total organic carbon	ug/g	91.4	<20.0	6.25E+03	n/a	n/a	n/a	n/a	277	n/a	

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AN101 FLOATING SOLIDS & CORROSION
Data Summary Report

Sample Group: 20161758
SDG Number:
Customer Sample ID: Sample 4
Customer Sample ID: Sample 4

Sample#	R	A#	CAS #	Analyte	Unit	STD %	Blank	Result	Duplicate	Average	RPD %	Spk Rec %	Det Limit	Cnt Err %	Qual Flags
% Water by TGA															
S16R000244			%WATER	Percent water	%	103	n/a	76.1	n/a	n/a	n/a	n/a	0.0100	n/a	
S16R000255			%WATER	Percent water	%	99.6	n/a	86.5	78.8	82.6	9.33	n/a	0.0100	n/a	
Anions and Small Organic Acids															
S16R000244			16984-48-8	Fluoride	ug/mL	96.3	<1.00E-03	2.15E+03	2.15E+03	2.15E+03	0.114	96.3	1.50	n/a	
S16R000244			666-14-8	Glycolate	ug/mL	96.2	<5.00E-03	<7.50	<7.50	n/a	n/a	99.0	7.50	n/a	U
S16R000244			71-50-1	Acetate	ug/mL	95.2	<0.0100	516	515	515	0.276	99.5	15.0	n/a	
S16R000244			12311-97-6	Formate	ug/mL	96.2	0.0530	305	305	305	0.278	98.0	10.5	n/a	BJ
S16R000244			16887-00-6	Chloride	ug/mL	95.2	9.00E-03	550	546	548	0.630	98.1	6.00	n/a	
S16R000244			14797-65-0	Nitrite	ug/mL	96.4	<9.00E-03	1.67E+04	1.67E+04	1.67E+04	0.0628	97.0	13.5	n/a	
S16R000244			14808-79-8	Sulfate	ug/mL	96.0	0.0350	2.08E+03	2.09E+03	2.09E+03	0.260	97.5	13.5	n/a	
S16R000244			338-70-5	Oxalate	ug/mL	95.6	<9.00E-03	681	684	683	0.377	96.7	13.5	n/a	
S16R000244			24959-67-9	Bromide	ug/mL	96.1	<6.00E-03	<9.00	<9.00	n/a	n/a	94.8	9.00	n/a	U
S16R000244			14797-55-8	Nitrate	ug/mL	96.1	<0.0210	2.98E+04	2.99E+04	2.99E+04	0.126	90.6	31.5	n/a	
S16R000244			14265-44-2	Phosphate	ug/mL	95.6	<0.0140	1.67E+03	1.64E+03	1.66E+03	1.79	96.2	21.0	n/a	
S16R000244			7772-98-7	Thiosulfate	ug/mL	96.6	<6.00E-03	<9.00	<9.00	n/a	n/a	97.5	9.00	n/a	U
S16R000255			16984-48-8	Fluoride	ug/mL	96.3	<1.00E-03	2.15E+03	n/a	n/a	n/a	n/a	1.50	n/a	
S16R000255			666-14-8	Glycolate	ug/mL	96.2	<5.00E-03	<7.50	n/a	n/a	n/a	n/a	7.50	n/a	U
S16R000255			71-50-1	Acetate	ug/mL	95.2	<0.0100	510	n/a	n/a	n/a	n/a	15.0	n/a	
S16R000255			12311-97-6	Formate	ug/mL	96.2	0.0530	304	n/a	n/a	n/a	n/a	10.5	n/a	BJ
S16R000255			16887-00-6	Chloride	ug/mL	95.2	9.00E-03	542	n/a	n/a	n/a	n/a	6.00	n/a	
S16R000255			14797-65-0	Nitrite	ug/mL	96.4	<9.00E-03	1.66E+04	n/a	n/a	n/a	n/a	13.5	n/a	
S16R000255			14808-79-8	Sulfate	ug/mL	96.0	0.0350	2.07E+03	n/a	n/a	n/a	n/a	13.5	n/a	
S16R000255			338-70-5	Oxalate	ug/mL	95.6	<9.00E-03	681	n/a	n/a	n/a	n/a	13.5	n/a	
S16R000255			24959-67-9	Bromide	ug/mL	96.1	<6.00E-03	<9.00	n/a	n/a	n/a	n/a	9.00	n/a	U
S16R000255			14797-55-8	Nitrate	ug/mL	96.1	<0.0210	2.96E+04	n/a	n/a	n/a	n/a	31.5	n/a	
S16R000255			14265-44-2	Phosphate	ug/mL	95.6	<0.0140	1.77E+03	n/a	n/a	n/a	n/a	21.0	n/a	
S16R000255			7772-98-7	Thiosulfate	ug/mL	96.6	<6.00E-03	<9.00	n/a	n/a	n/a	n/a	9.00	n/a	U
TIC/TOC by Acid Persulfate															

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AN101 FLOATING SOLIDS & CORROSION
Data Summary Report

Sample Group: 20161758
SDG Number:
Customer Sample ID: Sample 4
Customer Sample ID: Sample 4

Sample#	R	A#	CAS #	Analyte	Unit	STD %	Blank	Result	Duplicate	Average	RPD %	Spk Rec %	Det Limit	Cnt Err %	Qual Flags
S16R000244			TIC	Total inorganic carbon	ug/g	95.0	<7.00	4.36E+03	n/a	n/a	n/a	n/a	35.0	n/a	
S16R000244			TOC	Total organic carbon	ug/g	91.1	<20.0	1.12E+03	n/a	n/a	n/a	n/a	100	n/a	
S16R000255			TIC	Total inorganic carbon	ug/g	95.0	<7.00	4.30E+03	n/a	n/a	n/a	n/a	35.0	n/a	
S16R000255			TOC	Total organic carbon	ug/g	91.1	<20.0	1.09E+03	n/a	n/a	n/a	n/a	100	n/a	

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AN101 FLOATING SOLIDS & CORROSION
Data Summary Report

Sample Group: 20161758

SDG Number:

Customer Sample ID: Top Layer-Liquid
Customer Sample ID: Top Layer-Liquid

Sample#	R	A#	CAS #	Analyte	Unit	STD %	Blank	Result	Duplicate	Average	RPD %	Spk Rec %	Det Limit	Cnt Err %	Qual Flags
SVOA 222S LIQUID															
S17R000003		O	120-82-1	1,2,4-Trichlorobenzene	ug/L	34.4	<45.9	<551	n/a	n/a	n/a	n/a	551	n/a	n/a U
S17R000003		O	95-50-1	1,2-Dichlorobenzene	ug/L	30.4	<45.0	<540	n/a	n/a	n/a	n/a	540	n/a	n/a Ua
S17R000003		O	106-46-7	1,4-Dichlorobenzene	ug/L	27.1	<45.2	<543	n/a	n/a	n/a	n/a	543	n/a	n/a U
S17R000003		O	71-36-3	1-Butanol	ug/L	52.6	<185	<222E+03	n/a	n/a	n/a	n/a	2.22E+03	n/a	n/a Ua
S17R000003		O	108-60-1	2,2-oxybis(1-Chloropropane)	ug/L	75.2	<46.6	<560	n/a	n/a	n/a	n/a	560	n/a	n/a U
S17R000003		O	95-95-4	2,4,5-Trichlorophenol	ug/L	83.0	<45.7	<549	n/a	n/a	n/a	n/a	549	n/a	n/a U
S17R000003		O	88-06-2	2,4,6-Trichlorophenol	ug/L	81.8	<44.2	<531	n/a	n/a	n/a	n/a	531	n/a	n/a U
S17R000003		O	120-83-2	2,4-Dichlorophenol	ug/L	84.0	<43.9	<526	n/a	n/a	n/a	n/a	526	n/a	n/a U
S17R000003		O	105-67-9	2,4-Dimethylphenol	ug/L	75.7	<22.9	<275	n/a	n/a	n/a	n/a	275	n/a	n/a U
S17R000003		O	51-28-5	2,4-Dinitrophenol	ug/L	85.7	<15.0	1.10E+03	n/a	n/a	n/a	n/a	180	n/a	n/a J
S17R000003		O	121-14-2	2,4-Dinitrotoluene	ug/L	75.2	<24.3	<292	n/a	n/a	n/a	n/a	292	n/a	n/a U
S17R000003		O	128-37-0	BHT	ug/L	41.0	<20.6	<247	n/a	n/a	n/a	n/a	247	n/a	n/a Ua
S17R000003		O	606-20-2	2,6-Dinitrotoluene	ug/L	73.6	<30.8	<370	n/a	n/a	n/a	n/a	370	n/a	n/a U
S17R000003		O	111-76-2	2-Butoxyethanol	ug/L	84.9	<93.6	<1.12E+03	n/a	n/a	n/a	n/a	1.12E+03	n/a	n/a U
S17R000003		O	91-58-7	2-Chloronaphthalene	ug/L	54.8	<46.7	<560	n/a	n/a	n/a	n/a	560	n/a	n/a Ua
S17R000003		O	95-57-8	2-Chlorophenol	ug/L	81.5	<39.3	<471	n/a	n/a	n/a	n/a	471	n/a	n/a U
S17R000003		O	110-80-5	2-Ethoxyethanol	ug/L	71.7	<62.1	<746	n/a	n/a	n/a	n/a	746	n/a	n/a U
S17R000003		O	91-57-6	2-Methylnaphthalene	ug/L	53.8	<47.1	<565	n/a	n/a	n/a	n/a	565	n/a	n/a Ua
S17R000003		O	95-48-7	2-Methylphenol	ug/L	79.7	<42.1	<505	n/a	n/a	n/a	n/a	505	n/a	n/a U
S17R000003		O	88-74-4	2-Nitroaniline	ug/L	79.4	<33.5	<402	n/a	n/a	n/a	n/a	402	n/a	n/a U
S17R000003		O	88-75-5	2-Nitrophenol	ug/L	84.6	<42.0	<504	n/a	n/a	n/a	n/a	504	n/a	n/a U
S17R000003		O	108-39-4M	Cresol (m & p)	ug/L	80.7	<37.5	<450	n/a	n/a	n/a	n/a	450	n/a	n/a U
S17R000003		O	99-09-2	3-Nitroaniline	ug/L	83.8	<40.2	<483	n/a	n/a	n/a	n/a	483	n/a	n/a U
S17R000003		O	534-52-1	4,6-Dinitro-o-cresol	ug/L	92.4	<9.97	<120	n/a	n/a	n/a	n/a	120	n/a	n/a U
S17R000003		O	101-55-3	4-Bromophenylphenyl ether	ug/L	66.4	<27.8	<334	n/a	n/a	n/a	n/a	334	n/a	n/a Ua
S17R000003		O	59-50-7	4-Chloro-3-methylphenol	ug/L	84.0	<42.4	<509	n/a	n/a	n/a	n/a	509	n/a	n/a U
S17R000003		O	106-47-8	4-Chloroaniline	ug/L	79.2	<46.1	<553	n/a	n/a	n/a	n/a	553	n/a	n/a U

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AN101 FLOATING SOLIDS & CORROSION
Data Summary Report

Sample Group: 20161758
SDG Number:
Customer Sample ID: Top Layer-Liquid
Customer Sample ID: Top Layer-Liquid

Sample#	R	A#	CAS #	Analyte	Unit	STD %	Blank	Result	Duplicate	Average	RPD %	Spk Rec %	Det Limit	Cnt Err %	Qual Flags
SVOA 222S LIQUID															
S17R000003		O	7005-72-3	4-Chlorophenylphenyl ether	ug/L	61.5	<38.4	<461	n/a	n/a	n/a	n/a	461	n/a	Ua
S17R000003		O	100-01-6	4-Nitroaniline	ug/L	91.7	<36.0	<432	n/a	n/a	n/a	n/a	432	n/a	U
S17R000003		O	100-02-7	4-Nitrophenol	ug/L	87.5	<24.4	606	n/a	n/a	n/a	n/a	293	n/a	J
S17R000003		O	83-32-9	Acenaphthene	ug/L	60.1	<43.3	<519	n/a	n/a	n/a	n/a	519	n/a	U
S17R000003		O	208-96-8	Acenaphthylene	ug/L	60.8	<50.0	<600	n/a	n/a	n/a	n/a	600	n/a	Ua
S17R000003		O	120-12-7	Anthracene	ug/L	73.0	<20.7	<248	n/a	n/a	n/a	n/a	248	n/a	U
S17R000003		O	56-55-3	Benzo(a)anthracene	ug/L	74.4	<18.8	<226	n/a	n/a	n/a	n/a	226	n/a	U
S17R000003		O	50-32-8	Benzo(a)pyrene	ug/L	67.2	<18.1	<217	n/a	n/a	n/a	n/a	217	n/a	Ua
S17R000003		O	205-99-2	Benzo(b)fluoranthene	ug/L	70.9	<20.7	<249	n/a	n/a	n/a	n/a	249	n/a	U
S17R000003		O	191-24-2	Benzo(g,h,i)perylene	ug/L	73.0	<17.7	<212	n/a	n/a	n/a	n/a	212	n/a	U
S17R000003		O	207-08-9	Benzo(k)fluoranthene	ug/L	66.1	<20.1	<241	n/a	n/a	n/a	n/a	241	n/a	Ua
S17R000003		O	85-68-7	Butylbenzylphthalate	ug/L	71.8	<15.5	<186	n/a	n/a	n/a	n/a	186	n/a	U
S17R000003		O	218-01-9	Chrysene	ug/L	69.4	<21.6	<260	n/a	n/a	n/a	n/a	260	n/a	Ua
S17R000003		O	108-94-1	Cyclohexanone	ug/L	79.6	<43.4	<521	n/a	n/a	n/a	n/a	521	n/a	U
S17R000003		O	84-74-2	Di-n-butylphthalate	ug/L	82.5	<12.5	<150	n/a	n/a	n/a	n/a	150	n/a	U
S17R000003		O	117-84-0	Di-n-octylphthalate	ug/L	81.3	<15.5	<186	n/a	n/a	n/a	n/a	186	n/a	U
S17R000003		O	53-70-3	Dibenz[a,h]anthracene	ug/L	65.5	<15.1	<181	n/a	n/a	n/a	n/a	181	n/a	Ua
S17R000003		O	132-64-9	Dibenzofuran	ug/L	63.3	<39.7	<476	n/a	n/a	n/a	n/a	476	n/a	Ua
S17R000003		O	84-66-2	Diethylphthalate	ug/L	41.6	<24.0	<288	n/a	n/a	n/a	n/a	288	n/a	Ua
S17R000003		O	131-11-3	Dimethyl phthalate	ug/L	16.9	<28.2	<338	n/a	n/a	n/a	n/a	338	n/a	Ua
S17R000003		O	122-39-4	Diphenylamine	ug/L	70.7	<25.8	<309	n/a	n/a	n/a	n/a	309	n/a	U
S17R000003		O	206-44-0	Fluoranthene	ug/L	77.9	<13.5	<162	n/a	n/a	n/a	n/a	162	n/a	U
S17R000003		O	86-73-7	Fluorene	ug/L	64.9	<42.4	<509	n/a	n/a	n/a	n/a	509	n/a	Ua
S17R000003		O	118-74-1	Hexachlorobenzene	ug/L	67.5	<36.1	<433	n/a	n/a	n/a	n/a	433	n/a	Ua
S17R000003		O	87-68-3	Hexachlorobutadiene	ug/L	21.5	<50.1	<601	n/a	n/a	n/a	n/a	601	n/a	Ua
S17R000003		O	77-47-4	Hexachlorocyclopentadiene	ug/L	2.42	<8.73	<105	n/a	n/a	n/a	n/a	105	n/a	Ua
S17R000003		O	67-72-1	Hexachloroethane	ug/L	16.2	<46.7	<560	n/a	n/a	n/a	n/a	560	n/a	Ua

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AN101 FLOATING SOLIDS & CORROSION
Data Summary Report

Sample Group: 20161758

SDG Number:

Customer Sample ID: Top Layer-Liquid

Customer Sample ID: Top Layer-Liquid

Sample#	R	A#	CAS #	Analyte	Unit	STD %	Blank	Result	Duplicate	Average	RPD %	Spk Rec %	Det Limit	Cnt Err %	Qual Flags
SVOA 222S LIQUID															
S17R000003		O	193-39-5	Indeno(1,2,3-cd)pyrene	ug/L	69.2	<8.73	<105	n/a	n/a	n/a	n/a	105	n/a	Ua
S17R000003		O	78-83-1	Isobutanol	ug/L	38.1	<71.9	<863	n/a	n/a	n/a	n/a	863	n/a	Ua
S17R000003		O	78-59-1	Isophorone	ug/L	81.5	<45.0	<540	n/a	n/a	n/a	n/a	540	n/a	U
S17R000003		O	62-75-9	N-Nitrosodimethylamine	ug/L	75.7	<41.3	<496	n/a	n/a	n/a	n/a	496	n/a	U
S17R000003		O	621-64-7	N-Nitroso-di-n-dipropylamine	ug/L	78.6	<45.2	<542	n/a	n/a	n/a	n/a	542	n/a	U
S17R000003		O	59-89-2	N-Nitrosomorpholine	ug/L	81.7	<36.2	<435	n/a	n/a	n/a	n/a	435	n/a	U
S17R000003		O	91-20-3	Naphthalene	ug/L	50.7	<41.1	<493	n/a	n/a	n/a	n/a	493	n/a	Ua
S17R000003		O	98-95-3	Nitrobenzene	ug/L	78.4	<40.6	<487	n/a	n/a	n/a	n/a	487	n/a	U
S17R000003		O	87-86-5	Pentachlorophenol	ug/L	89.5	<19.0	488	n/a	n/a	n/a	n/a	228	n/a	J
S17R000003		O	85-01-8	Phenanthrene	ug/L	72.3	<19.8	<237	n/a	n/a	n/a	n/a	237	n/a	U
S17R000003		O	108-95-2	Phenol	ug/L	80.0	<40.4	<485	n/a	n/a	n/a	n/a	485	n/a	U
S17R000003		O	129-00-0	Pyrene	ug/L	77.7	<12.7	<152	n/a	n/a	n/a	n/a	152	n/a	U
S17R000003		O	110-86-1	Pyridine	ug/L	66.5	<48.7	<585	n/a	n/a	n/a	n/a	585	n/a	Ua
S17R000003		O	126-73-8	Tributyl phosphate	ug/L	81.3	<17.1	320	n/a	n/a	n/a	n/a	205	n/a	J
S17R000003		O	111-91-1	Bis(2-Chloroethoxy)methane	ug/L	80.9	<44.6	<535	n/a	n/a	n/a	n/a	535	n/a	U
S17R000003		O	117-81-7	Bis(2-ethylhexyl) phthalate	ug/L	82.8	<14.7	2.06E+03	n/a	n/a	n/a	n/a	176	n/a	
S17R000003		O	111-44-4	Bis(2-chloroethyl) ether	ug/L	79.2	<43.2	<519	n/a	n/a	n/a	n/a	519	n/a	U

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AN101 FLOATING SOLIDS & CORROSION
Data Summary Report

Sample Group: 20161758

SDG Number:

Customer Sample ID: Water Digest

Customer Sample ID: Water Digest

Sample#	R	A#	CAS #	Analyte	Unit	STD %	Blank	Result	Duplicate	Average	RPD %	Spk Rec %	Det Limit	Cnt Err %	Qual Flags
Anions and Small Organic Acids															
S16R000247		W	16984-48-8	Fluoride	ug/g	97.3	9.00E-03	3.29E+03	n/a	n/a	n/a	n/a	20.1	n/a	
S16R000247		W	666-14-8	Glycolate	ug/g	97.5	<0.0160	<64.3	n/a	n/a	n/a	n/a	64.3	n/a	U
S16R000247		W	71-50-1	Acetate	ug/g	99.6	0.0310	412	n/a	n/a	n/a	n/a	113	n/a	BJ
S16R000247		W	12311-97-6	Formate	ug/g	98.2	0.0550	357	n/a	n/a	n/a	n/a	169	n/a	BJ
S16R000247		W	16887-00-6	Chloride	ug/g	96.0	<0.0160	401	n/a	n/a	n/a	n/a	64.3	n/a	B
S16R000247		W	14797-65-0	Nitrite	ug/g	99.1	<0.0700	1.26E+04	n/a	n/a	n/a	n/a	281	n/a	
S16R000247		W	14808-79-8	Sulfate	ug/g	98.9	0.0730	1.57E+03	n/a	n/a	n/a	n/a	185	n/a	B
S16R000247		W	338-70-5	Oxalate	ug/g	98.6	<0.0260	473	n/a	n/a	n/a	n/a	104	n/a	BJ
S16R000247		W	24959-67-9	Bromide	ug/g	96.9	<0.0150	<60.3	n/a	n/a	n/a	n/a	60.3	n/a	U
S16R000247		W	14797-55-8	Nitrate	ug/g	99.0	0.141	2.26E+04	n/a	n/a	n/a	n/a	253	n/a	
S16R000247		W	14265-44-2	Phosphate	ug/g	96.8	<0.0200	1.73E+04	n/a	n/a	n/a	n/a	80.4	n/a	
S16R000247		W	7772-98-7	Thiosulfate	ug/g	96.1	<6.00E-03	268	n/a	n/a	n/a	n/a	24.1	n/a	J
S16R000249		W	16984-48-8	Fluoride	ug/g	97.3	9.00E-03	6.90E+03	n/a	n/a	n/a	n/a	20.0	n/a	
S16R000249		W	666-14-8	Glycolate	ug/g	97.5	<0.0160	<64.0	n/a	n/a	n/a	n/a	64.0	n/a	U
S16R000249		W	71-50-1	Acetate	ug/g	99.6	0.0310	334	n/a	n/a	n/a	n/a	112	n/a	BJ
S16R000249		W	12311-97-6	Formate	ug/g	98.2	0.0550	321	n/a	n/a	n/a	n/a	168	n/a	BJ
S16R000249		W	16887-00-6	Chloride	ug/g	96.0	<0.0160	335	n/a	n/a	n/a	n/a	64.0	n/a	B
S16R000249		W	14797-65-0	Nitrite	ug/g	99.1	<0.0700	1.02E+04	n/a	n/a	n/a	n/a	280	n/a	
S16R000249		W	14808-79-8	Sulfate	ug/g	98.9	0.0730	1.30E+03	n/a	n/a	n/a	n/a	184	n/a	BJ
S16R000249		W	338-70-5	Oxalate	ug/g	98.6	<0.0260	387	n/a	n/a	n/a	n/a	104	n/a	BJ
S16R000249		W	24959-67-9	Bromide	ug/g	96.9	<0.0150	<60.0	n/a	n/a	n/a	n/a	60.0	n/a	U
S16R000249		W	14797-55-8	Nitrate	ug/g	99.0	0.141	1.82E+04	n/a	n/a	n/a	n/a	252	n/a	
S16R000249		W	14265-44-2	Phosphate	ug/g	96.8	<0.0200	5.53E+04	n/a	n/a	n/a	n/a	80.0	n/a	
S16R000249		W	7772-98-7	Thiosulfate	ug/g	96.1	<6.00E-03	<24.0	n/a	n/a	n/a	n/a	24.0	n/a	U
S16R000258		W	16984-48-8	Fluoride	ug/g	97.3	9.00E-03	2.96E+03	2.97E+03	2.97E+03	0.762	136	20.0	n/a	b
S16R000258		W	666-14-8	Glycolate	ug/g	97.5	<0.0160	<64.1	<63.8	n/a	n/a	n/a	64.1	n/a	U
S16R000258		W	71-50-1	Acetate	ug/g	99.6	0.0310	455	510	482	11.4	98.1	112	n/a	BJ

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AN101 FLOATING SOLIDS & CORROSION
Data Summary Report

Sample Group: 20161758

SDG Number:

Customer Sample ID: Water Digest

Customer Sample ID: Water Digest

Sample#	R	A#	CAS #	Analyte	Unit	STD %	Blank	Result	Duplicate	Average	RPD %	Spk Rec %	Det Limit	Cnt Err %	Qual Flags
Anions and Small Organic Acids															
S16R000258		W	12311-97-6	Formate	ug/g	98.2	0.0550	376	402	389	6.76	92.2	168	n/a	BJ
S16R000258		W	16887-00-6	Chloride	ug/g	96.0	<0.0160	456	513	484	11.7	88.7	64.1	n/a	B
S16R000258		W	14797-65-0	Nitrite	ug/g	99.1	<0.0700	1.43E+04	1.63E+04	1.53E+04	13.1	82.7	280	n/a	
S16R000258		W	14808-79-8	Sulfate	ug/g	98.9	0.0730	1.76E+03	2.00E+03	1.88E+03	12.6	93.1	184	n/a	B
S16R000258		W	338-70-5	Oxalate	ug/g	98.6	<0.0260	531	605	568	13.1	95.5	104	n/a	BJ
S16R000258		W	24959-67-9	Bromide	ug/g	96.9	<0.0150	<60.1	<59.8	n/a	n/a	90.8	60.1	n/a	U
S16R000258		W	14797-55-8	Nitrate	ug/g	99.0	0.141	2.56E+04	2.93E+04	2.74E+04	13.4	68.0	252	n/a	b
S16R000258		W	14265-44-2	Phosphate	ug/g	96.8	<0.0200	1.23E+04	1.01E+04	1.12E+04	18.8	153	80.1	n/a	b
S16R000258		W	7772-98-7	Thiosulfate	ug/g	96.1	<6.00E-03	<24.0	<23.9	n/a	n/a	89.8	24.0	n/a	U
S16R000260		W	16984-48-8	Fluoride	ug/g	97.3	9.00E-03	4.30E+03	n/a	n/a	n/a	n/a	19.9	n/a	
S16R000260		W	666-14-8	Glycolate	ug/g	97.5	<0.0160	<63.6	n/a	n/a	n/a	n/a	63.6	n/a	U
S16R000260		W	71-50-1	Acetate	ug/g	99.6	0.0310	413	n/a	n/a	n/a	n/a	111	n/a	BJ
S16R000260		W	12311-97-6	Formate	ug/g	98.2	0.0550	344	n/a	n/a	n/a	n/a	167	n/a	BJ
S16R000260		W	16887-00-6	Chloride	ug/g	96.0	<0.0160	394	n/a	n/a	n/a	n/a	63.6	n/a	B
S16R000260		W	14797-65-0	Nitrite	ug/g	99.1	<0.0700	1.18E+04	n/a	n/a	n/a	n/a	278	n/a	
S16R000260		W	14808-79-8	Sulfate	ug/g	98.9	0.0730	1.48E+03	n/a	n/a	n/a	n/a	183	n/a	B
S16R000260		W	338-70-5	Oxalate	ug/g	98.6	<0.0260	440	n/a	n/a	n/a	n/a	103	n/a	BJ
S16R000260		W	24959-67-9	Bromide	ug/g	96.9	<0.0150	<59.7	n/a	n/a	n/a	n/a	59.7	n/a	U
S16R000260		W	14797-55-8	Nitrate	ug/g	99.0	0.141	2.12E+04	n/a	n/a	n/a	n/a	251	n/a	
S16R000260		W	14265-44-2	Phosphate	ug/g	96.8	<0.0200	2.84E+04	n/a	n/a	n/a	n/a	79.6	n/a	
S16R000260		W	7772-98-7	Thiosulfate	ug/g	96.1	<6.00E-03	255	n/a	n/a	n/a	n/a	23.9	n/a	J

N - Named TIC
E - Outside Calibration Range
J - Estimated

a - LCS Outside Range
B - Found in Blank
Y - Comment

T - Tentatively Identified Compound
b - MS/MSD Outside Range

NA = Not Analyzed, ND = Not Detected
I - Indirect Calibration
U - Less Than Detection Limit

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AN101 FLOATING SOLIDS & CORROSION
Data Summary Report

Sample Group: 20161758

SDG Number:

Customer Sample ID: Post-Liquid
Customer Sample ID: Post-Liquid

Sample#	R	A#	QC Type	Analyte	CAS No.	Retention Time (Minutes)	Unit	Result	Qual Flags
SVOA 222S LIQUID									
S17R000002		O		Unknown Organic Acid	None	3.55	ug/L	4.9E+03	JNT
S17R000002		O		Unknown 1	None	3.93	ug/L	1.6E+03	JNT
S17R000002		O		Butanoic acid	107-92-6	4.60	ug/L	9.7E+03	JNT
S17R000002		O		Phosgene oxime	1794-86-1	5.57	ug/L	2.6E+03	JNT
S17R000002		O		Pentanoic acid	109-52-4	5.66	ug/L	3.1E+03	JNT
S17R000002		O		Unknown 2	None	5.86	ug/L	1.7E+03	JNT
S17R000002		O		Unknown 3	None	6.34	ug/L	2.7E+03	JNT
S17R000002		O		Unknown 4	None	6.76	ug/L	6.1E+03	JNT
S17R000002		O		Heptanoic acid	111-14-8	7.82	ug/L	3.4E+03	JNT
S17R000002		O		Unknown 5	None	8.51	ug/L	2.1E+03	JNT
S17R000002		O		Unknown 6	None	8.67	ug/L	2.2E+03	JNT
S17R000002		O		Unknown 7	None	8.83	ug/L	3.1E+03	JNT
S17R000002		O		Unknown 8	None	9.38	ug/L	2.0E+03	JNT
S17R000002		O		Nonanoic acid	112-05-0	9.85	ug/L	1.5E+03	JNT
S17R000002		O		1,3-Propanediol, 2-ethyl-2-(hy	77-99-6	10.08	ug/L	9.6E+03	JNT
S17R000002		O		Unknown 9	None	10.52	ug/L	1.2E+03	JNT
S17R000002		O		Unknown 10	None	11.83	ug/L	1.4E+03	JNT
S17R000002		O		Unknown 11	None	12.22	ug/L	1.6E+03	JNT
S17R000002		O		Unknown 12	None	12.30	ug/L	1.4E+03	JNT
S17R000002		O		Unknown 13	None	12.99	ug/L	1.3E+03	JNT
S17R000002		O	BLNK	Amylene Hydrate	75-85-4	3.06	ug/L	140	JNT

N - Named TIC

E - Outside Calibration Range

a - LCS Outside Range

B - Found in Blank

T - Tentatively Identified Compound

b - MS/MSD Outside Range

NA = Not Analyzed, ND = Not Detectec

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U - Less Than Detection Limit

26-Apr-2017 14:1326
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DSR.Jar v. 3.0.12

AN101 FLOATING SOLIDS & CORROSION
Data Summary Report

Sample Group: 20161758

SDG Number:

Customer Sample ID: Post-Solid
Customer Sample ID: Post-Solid

Sample#	R	A#	QC Type	Analyte	CAS No.	Retention Time (Minutes)	Unit	Result	Qual Flags
SVOA 222S SOLID									
S17R000001		O		Amylene Hydrate	75-85-4	3.06	ug/kg	4.8E+03	JNT
S17R000001		O		Unknown1	--	3.21	ug/kg	4.4E+03	JNT
S17R000001		O		Unknown2	--	3.54	ug/kg	3.0E+03	JNT
S17R000001		O		Butane, 2,3-dichloro-2-methyl-	507-45-9	5.05	ug/kg	1.9E+03	JNT
S17R000001		O		Unknown3	--	5.71	ug/kg	3.1E+03	JNT
S17R000001		O		Pentanedioic acid, dimethyl es	1119-40-0	8.51	ug/kg	9.4E+03	JNT
S17R000001		O		Unknown4	--	8.54	ug/kg	7.4E+03	JNT
S17R000001		O		Hexanedioic acid, dimethyl est	627-93-0	9.60	ug/kg	5.2E+03	JNT
S17R000001		O		Unknown5	--	9.80	ug/kg	3.1E+03	JNT
S17R000001		O		1,3-Propanediol, 2-ethyl-2-(hy	77-99-6	10.01	ug/kg	1.8E+04	JNT
S17R000001		O		Unknown6	--	14.89	ug/kg	4.1E+03	JNT
S17R000001		O		Unknown7	--	15.55	ug/kg	4.1E+03	JNT
S17R000001		O		Unknown8	--	16.21	ug/kg	4.8E+03	JNT
S17R000001		O		Unknown9	--	16.69	ug/kg	4.3E+04	JNT
S17R000001		O		Unknown10	--	18.74	ug/kg	6.2E+03	JNT
S17R000001		O		2,5-Cyclohexadien-1-one, 4-[3,	2455-14-3	19.77	ug/kg	1.2E+04	JNT
S17R000001		O	BLNK	Amylene Hydrate	75-85-4	3.06	ug/kg	6.2E+03	JNT
S17R000001		O	BLNK	Unknown1	--	3.21	ug/kg	5.7E+03	JNT
S17R000001		O	BLNK	Unknown2	--	3.54	ug/kg	4.2E+03	JNT
S17R000001		O	BLNK	Unknown3	--	5.51	ug/kg	3.6E+03	JNT
S17R000001		O	BLNK	Unknown4	--	18.75	ug/kg	4.9E+03	JNT

N - Named TIC

E - Outside Calibration Range

a - LCS Outside Range

B - Found in Blank

T - Tentatively Identified Compound

b - MS/MSD Outside Range

NA = Not Analyzed, ND = Not Detectec

I - Indirect Calibration

U - Less Than Detection Limit

26-Apr-2017 14:1326
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AN101 FLOATING SOLIDS & CORROSION
Data Summary Report

Sample Group: 20161758

SDG Number:

Customer Sample ID: SVOC EXTRACT
Customer Sample ID: SVOC EXTRACT

Sample#	R	A#	QC Type	Analyte	CAS No.	Retention Time (Minutes)	Unit	Result	Qual Flags
SVOA 222S LIQUID									
S16R000250		O		Acetic acid	64-19-7	2.75	ug/L	2.9E+03	JNT
S16R000250		O		Oxirane, trimethyl-	5076-19-7	2.93	ug/L	2.4E+03	JNT
S16R000250		O		2-Butanone, 3-methyl-	563-80-4	3.23	ug/L	860	JNT
S16R000250		O		Butane, 2-chloro-2-methyl-	594-36-5	3.30	ug/L	1.5E+03	JNT
S16R000250		O		Unkown1	--	3.46	ug/L	2.0E+03	JT
S16R000250		O		Unkown2	--	3.56	ug/L	4.4E+03	JT
S16R000250		O		Methane, dichloronitro-	7119-89-3	4.22	ug/L	780	JNT
S16R000250		O		Butanoic acid	107-92-6	4.62	ug/L	5.9E+03	JNT
S16R000250		O		Unkown3	--	5.36	ug/L	2.6E+03	JT
S16R000250		O		Unkown4	--	5.51	ug/L	4.4E+03	JT
S16R000250		O		Unkown5	--	5.58	ug/L	750	JT
S16R000250		O		Unkown6	--	5.68	ug/L	3.4E+03	JT
S16R000250		O		Unkown7	--	5.90	ug/L	2.4E+03	JT
S16R000250		O		Unkown8	--	6.08	ug/L	1.1E+03	JT
S16R000250		O		Unkown9	--	6.36	ug/L	900	JT
S16R000250		O		Unkown10	--	6.40	ug/L	3.9E+03	JT
S16R000250		O		Unkown11	--	6.57	ug/L	1.3E+03	JT
S16R000250		O		Hexanoic acid	142-62-1	6.80	ug/L	3.2E+03	JNT
S16R000250		O		Unkown12	--	6.82	ug/L	1.1E+03	JT
S16R000250		O		Heptanoic acid	111-14-8	7.87	ug/L	2.6E+03	JNT
S16R000250		O		Unkown13	--	8.58	ug/L	3.1E+03	JT
S16R000250		O		Unkown14	--	8.73	ug/L	2.1E+03	JT
S16R000250		O		Unkown15	--	8.90	ug/L	4.0E+03	JT
S16R000250		O		Nonanoic acid	112-05-0	9.89	ug/L	1.3E+03	JNT
S16R000250		O		Unkown16	--	10.02	ug/L	1.9E+03	JT
S16R000250		O		Unkown17	--	10.67	ug/L	1.4E+03	JT
S16R000250		O		Unkown18	--	12.30	ug/L	640	JT

N - Named TIC
E - Outside Calibration Range

a - LCS Outside Range
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b - MS/MSD Outside Range

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I - Indirect Calibration
U - Less Than Detection Limit

26-Apr-2017 14:1326
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AN101 FLOATING SOLIDS & CORROSION
Data Summary Report

Sample Group: 20161758

SDG Number:

Customer Sample ID: SVOC EXTRACT
Customer Sample ID: SVOC EXTRACT

Sample#	R	A#	QC Type	Analyte	CAS No.	Retention Time (Minutes)	Unit	Result	Qual Flags
SVOA 222S LIQUID									
S16R000250		O		Unknown19	--	12.45	ug/L	1.7E+03	JT
S16R000250		O		2,6-Dibromo-4-nitrophenol	99-28-5	14.67	ug/L	830	JNT
S16R000250		O		Unknown20	--	16.76	ug/L	780	JT
S16R000250		O		Unknown21	--	16.78	ug/L	1.4E+03	JT
S16R000250		O	BLNK	Butane, 2-chloro-2-methyl-	594-36-5	3.30	ug/L	2.1E+03	
S16R000250		O	BLNK	Unknown1	--	3.46	ug/L	2.8E+03	
S16R000261		O		Acetic acid	64-19-7	2.74	ug/L	1.5E+03	JNT
S16R000261		O		Unknown1	--	3.23	ug/L	1.8E+03	JT
S16R000261		O		Butane, 2-chloro-2-methyl-	594-36-5	3.30	ug/L	1.6E+03	JNT
S16R000261		O		Unknown2	--	3.45	ug/L	2.3E+03	JT
S16R000261		O		Unknown3	--	3.60	ug/L	2.4E+03	JT
S16R000261		O		Unknown4	--	3.97	ug/L	1.2E+03	JT
S16R000261		O		Butanoic acid	107-92-6	4.59	ug/L	5.7E+03	JNT
S16R000261		O		Unknown5	--	4.74	ug/L	850	JT
S16R000261		O		Unknown6	--	5.36	ug/L	1.2E+03	JT
S16R000261		O		Unknown7	--	5.50	ug/L	2.6E+03	JT
S16R000261		O		Unknown8	--	5.58	ug/L	660	JT
S16R000261		O		Unknown9	--	5.68	ug/L	3.4E+03	JT
S16R000261		O		Unknown10	--	5.90	ug/L	1.6E+03	JT
S16R000261		O		Unknown11	--	6.08	ug/L	1.3E+03	JT
S16R000261		O		Unknown12	--	6.36	ug/L	740	JT
S16R000261		O		Unknown13	--	6.40	ug/L	2.4E+03	JT
S16R000261		O		Unknown14	--	6.57	ug/L	1.2E+03	JT
S16R000261		O		Hexanoic acid	142-62-1	6.79	ug/L	3.4E+03	JNT
S16R000261		O		Unknown15	--	6.82	ug/L	860	JT
S16R000261		O		Heptanoic acid	111-14-8	7.86	ug/L	2.5E+03	JNT
S16R000261		O		Unknown16	--	8.58	ug/L	2.1E+03	JT

N - Named TIC
E - Outside Calibration Range

a - LCS Outside Range
B - Found in Blank

T - Tentatively Identified Compound
b - MS/MSD Outside Range

NA = Not Analyzed, ND = Not Detectec
I - Indirect Calibration
U - Less Than Detection Limit

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AN101 FLOATING SOLIDS & CORROSION
Data Summary Report

Sample Group: 20161758

SDG Number:

Customer Sample ID: SVOC EXTRACT
Customer Sample ID: SVOC EXTRACT

Sample#	R	A#	QC Type	Analyte	CAS No.	Retention Time (Minutes)	Unit	Result	Qual Flags
SVOA 222S LIQUID									
S16R0000261		O		Unknown17	--	8.73	ug/L	2.1E+03	JT
S16R0000261		O		Unknown18	--	8.90	ug/L	3.0E+03	JT
S16R0000261		O		Unknown19	--	9.89	ug/L	3.8E+03	JT
S16R0000261		O		Unknown20	--	10.67	ug/L	1.5E+03	JT
S16R0000261		O		Unknown21	--	12.45	ug/L	1.8E+03	JT
S16R0000261		O		2,6-Dibromo-4-nitrophenol	99-28-5	14.67	ug/L	1.2E+03	JNT
S16R0000261		O		Unknown22	--	16.75	ug/L	410	JT
S16R0000261		O		Unknown23	--	16.77	ug/L	550	JT
S16R0000261		O	BLNK	Butane, 2-chloro-2-methyl-	594-36-5	3.30	ug/L	2.1E+03	
S16R0000261		O	BLNK	Unknown1	--	3.46	ug/L	2.8E+03	
S17R0000012		O		Amylene Hydrate	75-85-4	3.07	ug/L	470	JNT
S17R0000012		O		Propanoic acid	79-09-4	3.70	ug/L	3.9E+03	JNT
S17R0000012		O		Butanoic acid	107-92-6	4.69	ug/L	7.0E+03	JNT
S17R0000012		O		Unknown1	--	5.33	ug/L	3.7E+03	JNT
S17R0000012		O		Unknown2	--	5.47	ug/L	4.6E+03	JNT
S17R0000012		O		Unknown3	--	5.72	ug/L	3.4E+03	JNT
S17R0000012		O		Unknown4	--	5.87	ug/L	4.3E+03	JNT
S17R0000012		O		Unknown5	--	6.35	ug/L	2.6E+03	JNT
S17R0000012		O		Unknown6	--	6.52	ug/L	2.5E+03	JNT
S17R0000012		O		Unknown7	--	6.78	ug/L	5.3E+03	JNT
S17R0000012		O		Unknown8	--	7.25	ug/L	2.4E+03	JNT
S17R0000012		O		Unknown9	--	7.83	ug/L	2.0E+03	JNT
S17R0000012		O		Unknown10	--	8.51	ug/L	1.8E+03	JNT
S17R0000012		O		Unknown11	--	8.52	ug/L	1.6E+03	JNT
S17R0000012		O		Octanoic Acid	124-07-2	8.91	ug/L	1.9E+03	JNT
S17R0000012		O		Unknown12	--	8.97	ug/L	1.6E+03	JNT
S17R0000012		O		Unknown13	--	9.40	ug/L	2.6E+03	JNT

N - Named TIC

E - Outside Calibration Range

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26-Apr-2017 14:1326
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AN101 FLOATING SOLIDS & CORROSION
Data Summary Report

Sample Group: 20161758

SDG Number:

Customer Sample ID: SVOC EXTRACT
Customer Sample ID: SVOC EXTRACT

Sample#	R	A#	QC Type	Analyte	CAS No.	Retention Time (Minutes)	Unit	Result	Qual Flags
SVOA 222S LIQUID									
S17R000012		O		1,3-Propanediol, 2-ethyl-2-(hy	77-99-6	10.16	ug/L	8.5E+03	JNT
S17R000012		O		Unknown14	--	11.83	ug/L	1.1E+03	JNT
S17R000012		O		Unknown15	--	13.01	ug/L	870	JNT
S17R000012		O	BLNK	Amylene Hydrate	75-85-4	3.06	ug/L	150	JNT
S17R000012		O	BLNK	Butane, 2-ethoxy-2-methyl-	919-94-8	3.83	ug/L	68	JNT

N - Named TIC
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a - LCS Outside Range
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b - MS/MSD Outside Range

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DSR.Jar v. 3.0.12

AN101 FLOATING SOLIDS & CORROSION
Data Summary Report

Sample Group: 20161758

SDG Number:

Customer Sample ID: Top Layer-Liquid

Customer Sample ID: Top Layer-Liquid

Sample#	R	A#	QC Type	Analyte	CAS No.	Retention Time (Minutes)	Unit	Result	Qual Flags
SVOA 222S LIQUID									
S17R000003		O		Unknown Organic Acid	None	3.55	ug/L	4.2E+03	JNT
S17R000003		O		Butanoic acid	107-92-6	4.59	ug/L	8.0E+03	JNT
S17R000003		O		Unknown1	--	5.31	ug/L	1.8E+03	JNT
S17R000003		O		Unknown2	--	5.46	ug/L	3.0E+03	JNT
S17R000003		O		Phosgene oxime	1794-86-1	5.57	ug/L	2.0E+03	JNT
S17R000003		O		Pentanoic acid	109-52-4	5.66	ug/L	2.4E+03	JNT
S17R000003		O		Unknown3	--	5.86	ug/L	2.4E+03	JNT
S17R000003		O		Unknown4	--	6.34	ug/L	2.9E+03	JNT
S17R000003		O		Unknown5	--	6.52	ug/L	1.7E+03	JNT
S17R000003		O		Unknown6	--	6.76	ug/L	5.4E+03	JNT
S17R000003		O		Unknown7	--	7.25	ug/L	2.4E+03	JNT
S17R000003		O		Heptanoic acid	111-14-8	7.82	ug/L	3.0E+03	JNT
S17R000003		O		Unknown8	--	8.51	ug/L	3.1E+03	JNT
S17R000003		O		Unknown9	--	8.67	ug/L	2.2E+03	JNT
S17R000003		O		Unknown10	--	8.83	ug/L	3.0E+03	JNT
S17R000003		O		Unknown11	--	9.37	ug/L	1.2E+03	JNT
S17R000003		O		Unknown12	--	9.85	ug/L	1.9E+03	JNT
S17R000003		O		1,3-Propanediol, 2-ethyl-2-(hy	77-99-6	10.05	ug/L	6.0E+03	JNT
S17R000003		O		Unknown13	--	10.52	ug/L	1.9E+03	JNT
S17R000003		O		Unknown14	--	12.30	ug/L	1.9E+03	JNT
S17R000003		O	BLNK	Amylene Hydrate	75-85-4	3.06	ug/L	140	JNT

N - Named TIC

E - Outside Calibration Range

a - LCS Outside Range

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b - MS/MSD Outside Range

NA = Not Analyzed, ND = Not Detectec

I - Indirect Calibration

U - Less Than Detection Limit

RPP-RPT-59964

APPENDIX E.

POLARIZED LIGHT MICROSCOPY REPORT

(11 pages, including cover page)

RPP-RPT-59964
Appendix E**Polarized Light Microscopy Report****Summary:**

Polarized light microscopy (PLM) analysis of Tank 241-AN-101 floating and settled solids was performed on June 22, 2016, by scientists Dr. D. Herting, S. Bolling, and Dr. H. Meznarich with assistance from L. Dinh as the technician. All analyses were performed at the 222-S Laboratory using procedure ATS-LT-519-107, "222-S Laboratory Polarized Light Microscopy." This data can be found in laboratory notebook HNF-N-395 2 "PLM Sample Log," on pages 30-32.

Grab samples taken from AN-101 contained a floating solids layer. Three phases were found in samples 1AN-16-01 (S16T005858) and 1AN-16-01B (S16T0005862). Each sample contained a floating layer of brown solids, a yellow liquid layer, and brown solids settled on the bottom of the samples. S16T005858 was subsampled to create samples S16R000241 through S16R000244. S16T005862 was subsampled to create samples S16R000252 through S16R000255. All of these subsamples were logged into OmniLims group 20161758. Samples S16R000241 and S16R000252 contained floating solids. Samples S16R000243 and S16R000254 contained settled solids. The customer requested chemical analyses and solid phase characterization (SPC) to identify the components in these floating and settled solids. In addition to SPC, PLM was also used to determine whether or not the floating solids were due to excessive air bubbles surrounding crystals as opposed to an organic layer. As the solids are present in both the floating and settled layers, it was thought perhaps a transition between the layers might be taking place.

RPP-RPT-59964

Appendix E

Description:

Sample S16R000241 [S16T005858 floating solids] was described as a yellow liquid with brown and white solids. The white solids resembled round sesame seeds or small pebbles. There were predominantly more brown solids than white solids, but both types of solids did float in the liquid portion of the sample. The first slide mounted contained brown solids in mother liquor. Very few air bubbles were seen on the slide. This slide contained unknown material, which was too small to identify by PLM (**Figure 1**), isotropic crystals, and unknown anisotropic crystals (**Figure 2**). The second slide mounted contained white solids in mother liquor. No air bubbles were seen on this slide. This slide also contained unknown crystals. The unknown anisotropic crystals are suspected to be gibbsite based on scanning electron microscopy (SEM) and X-ray diffraction (XRD) data. As very few air bubbles were found, it is probable that the unknown crystals are organic in nature based on the fact that they float. The material too small to identify from the first slide is probably organic as well. **Figure 3** is an example of the “fuzziness” of the suspected organic material. The isotropic crystals are suspected to be natrophosphate (**Figure 4**). A third slide was not prepared.

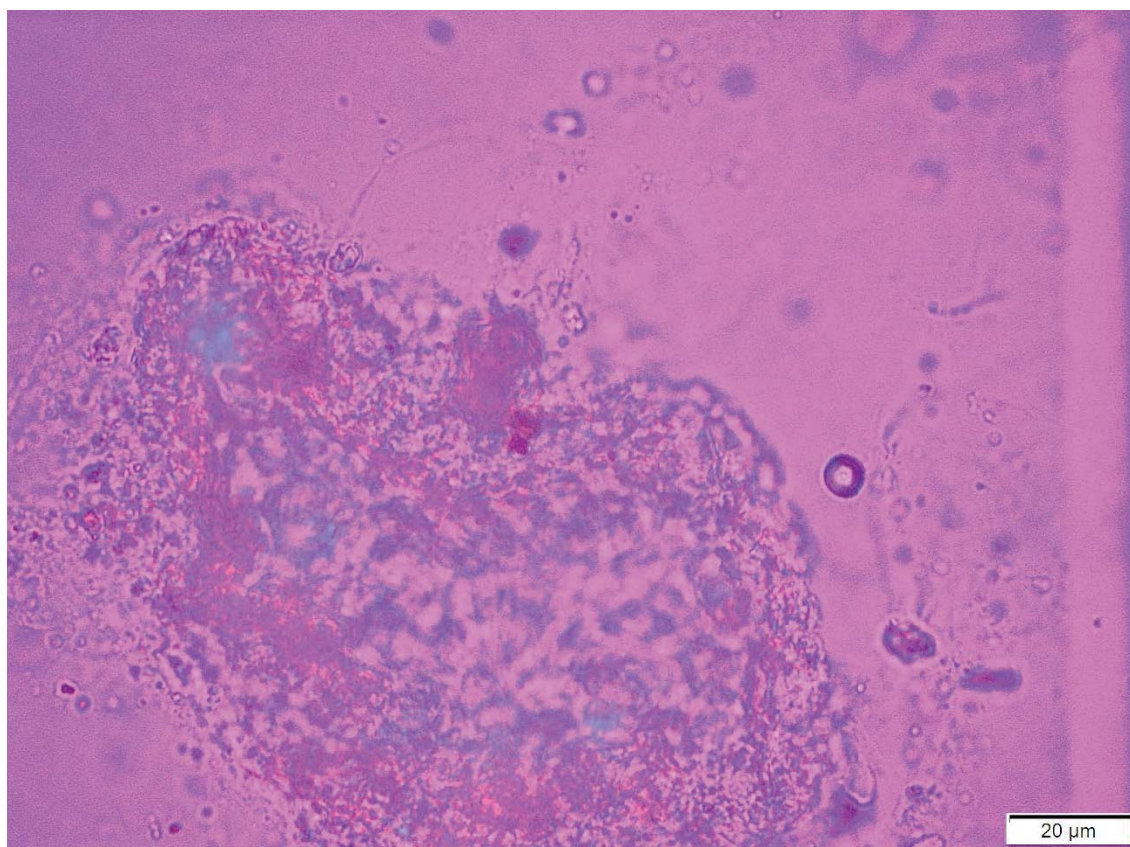


Figure 1. Photo S16R000241a, crossed polars with red 1 compensator, showing suspect organic material. Dark circle is an air bubble.

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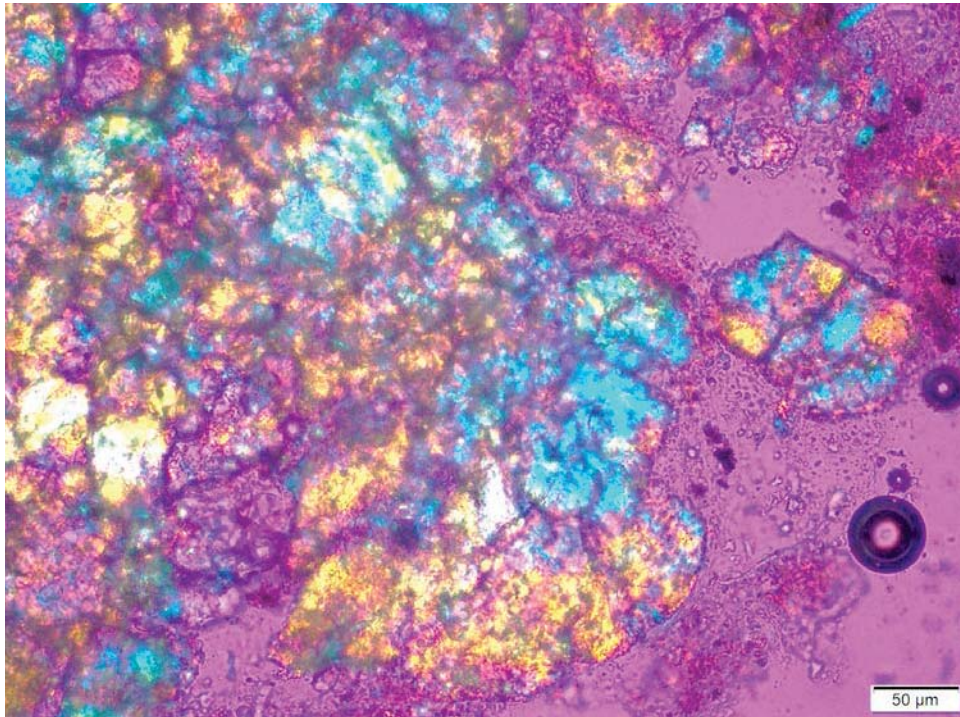


Figure 2. Photo S16R000241e, crossed polars with red 1 compensator, showing brightly colored (blue and orange) unknown isotropic crystals. Black circles are air bubbles.

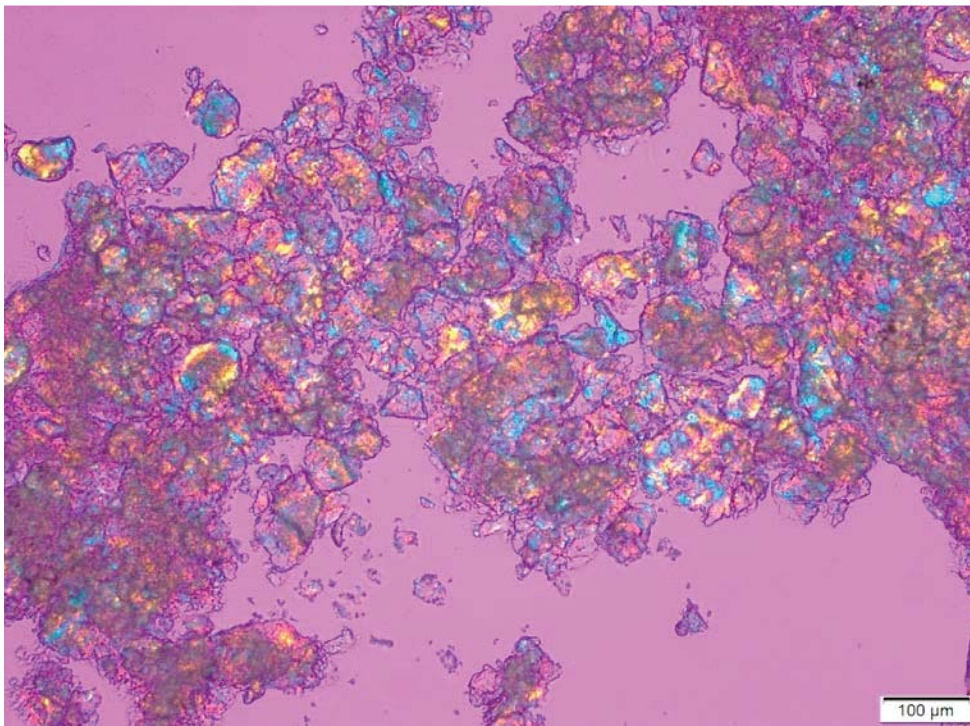


Figure 3. Photo S16R000241i, crossed polars with red 1 compensator, overview showing the “fuzziness” of the organic material.

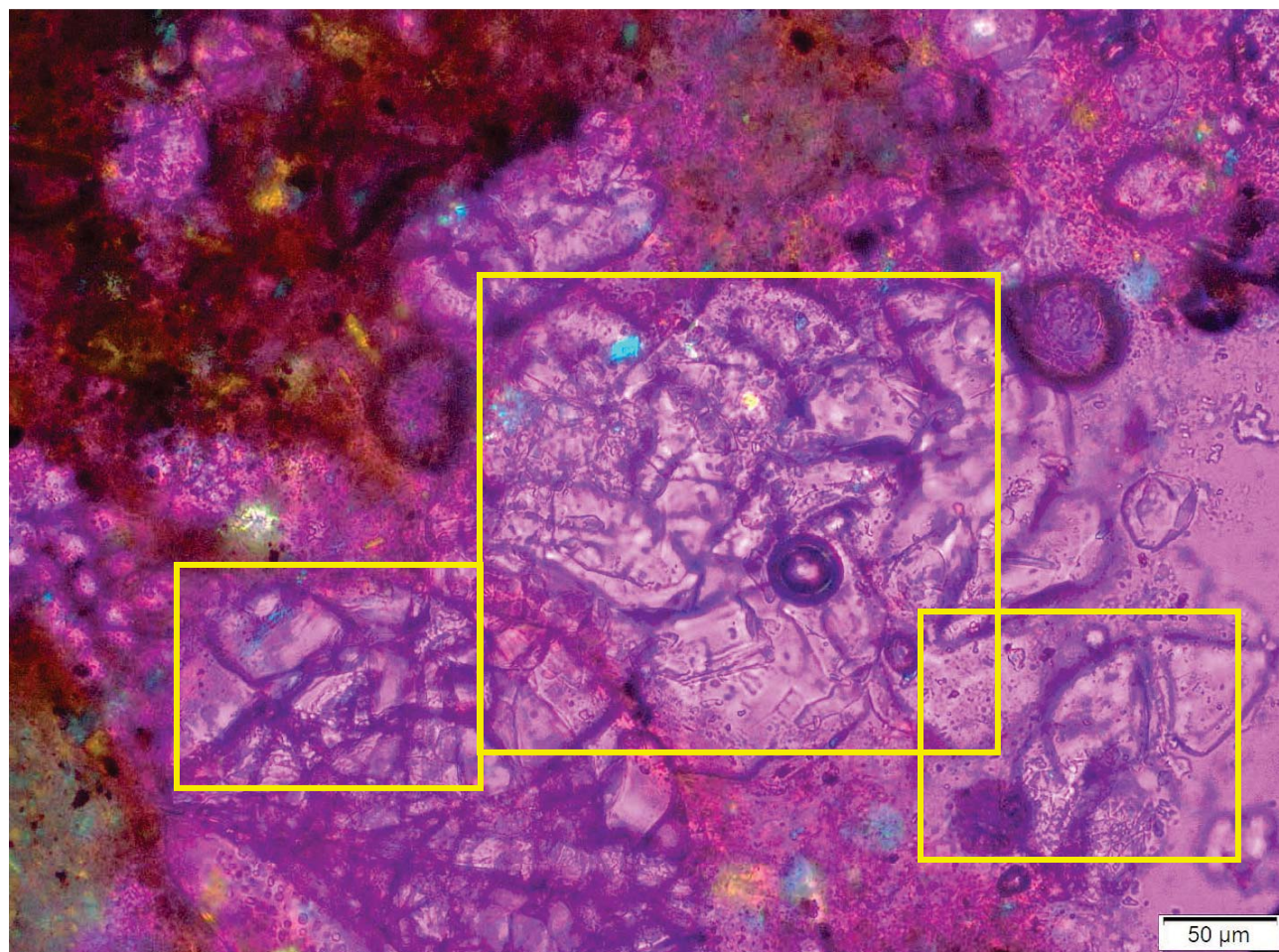
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Figure 4. Photo S16R000241d, crossed polars with red 1 compensator, showing suspect natrophosphate isotropic crystals (yellow squares). Black circle is an air bubble.

Sample S16R000252 [S16T005862 floating solids] was a field sample duplicate of sample S16R000241. This sample was also described as a yellow liquid with brown and white solids. The white solids resembled round sesame seeds or small pebbles. There were predominantly more brown solids than white solids, but both types of solids did float in the liquid portion of the sample. This sample was similar to S16R000241, therefore only one slide was prepared. This mount contained solids in the mother liquor. This slide contained suspect natrophosphate, unknown anisotropic crystals, and an organic material (**Figure 5**). The unknown anisotropic crystals are suspected to be gibbsite based on SEM and XRD data. A few more air bubbles were noted than were seen in S16R000241.

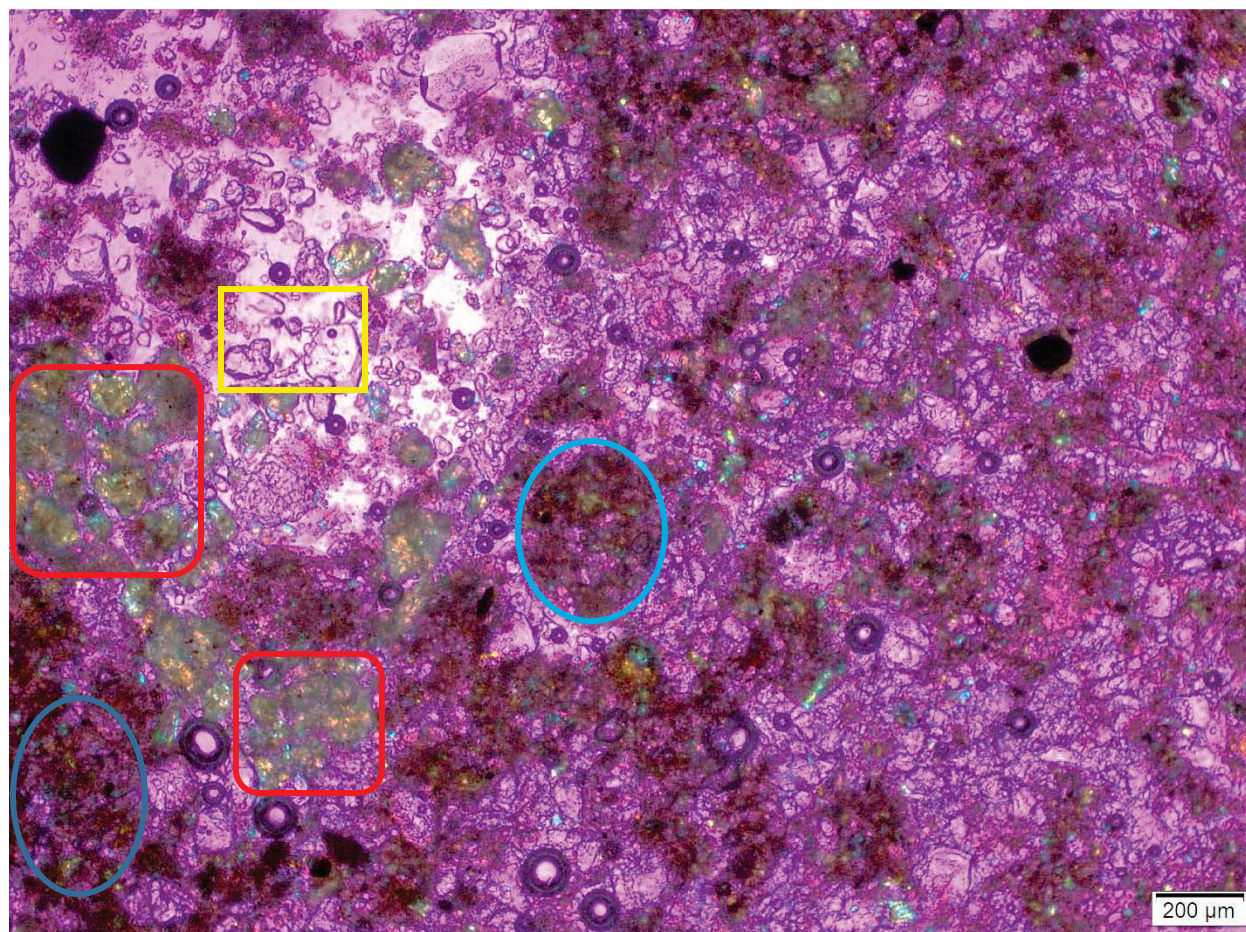
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Figure 5. Photo S16R000252a, crossed polars with red 1 compensator, showing natrophosphate isotropic crystals (yellow rectangle), “fuzzy” particulate with it is suspect organic material (blue circles), and unknown isotropic crystals (red rectangles). Black circles are air bubbles.

S16R000243 [S16T005858 settled solids] was described as brown solids clumped together with a small amount of supernate. The sample was thoroughly mixed prior to preparing the mounts. All of the slides were mounted in mother liquor. The first slide (**Figure 6**) contained less organic material, very few air bubbles, and more natrophosphate than the samples with floating solids. The second slide contained particulate, which was thought to comprise either metals (possibly iron, nickel, and/or chromium) or organic material (**Figure 7**). **Figure 8** is an isolated cluster of “fuzzy” organic material and natrophosphate crystals. This figure was included as it shows good contrast of the particles of interest. This slide also contained unknown anisotropic crystals, which are suspected to be gibbsite based on SEM and XRD data. The third slide was similar to the first slide, so no additional photos were taken.

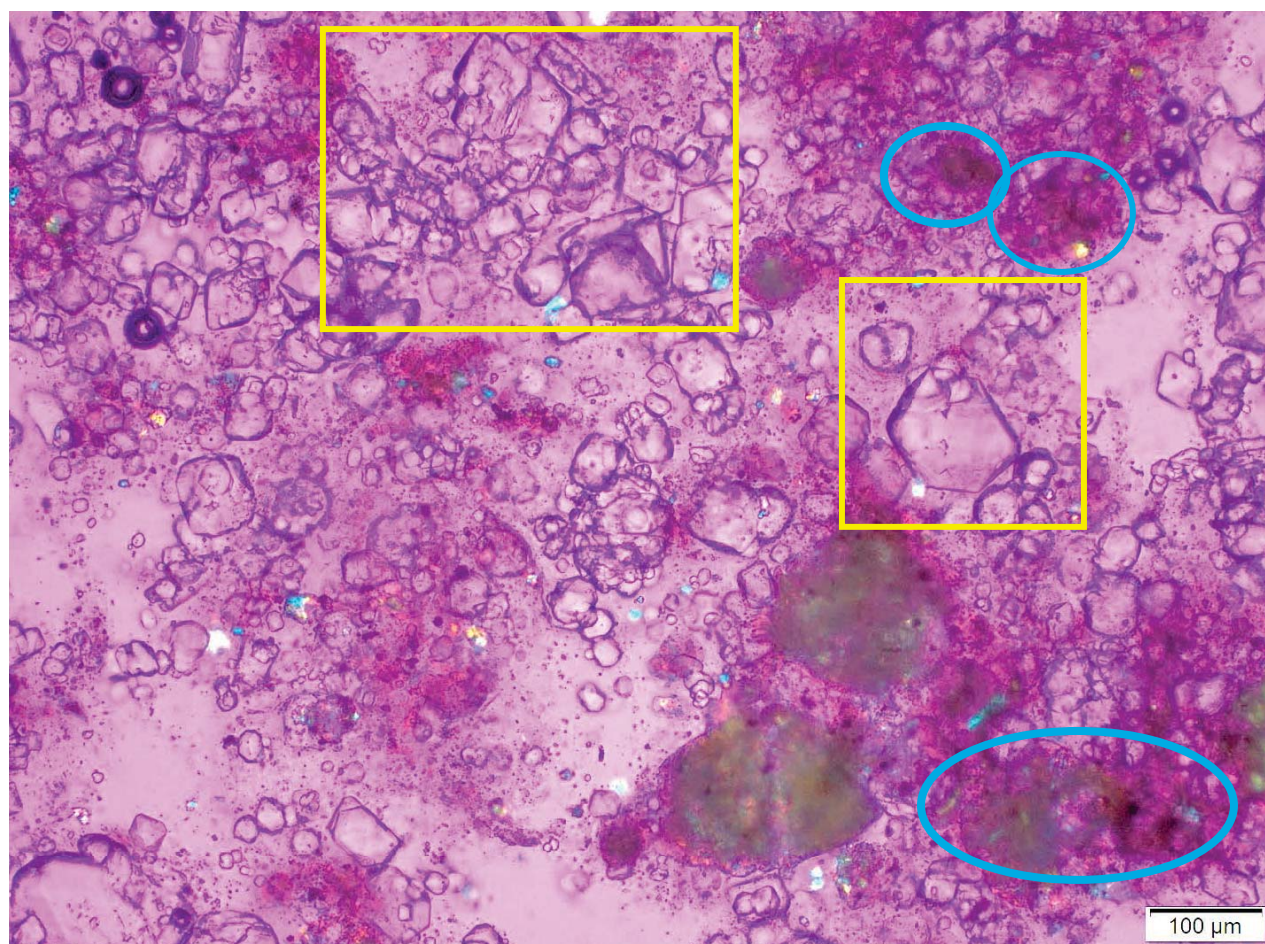
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Figure 6. Photo S16R000243a, crossed polars with red 1 compensator, showing natrophosphate isotropic crystals (yellow rectangles) and “fuzzy” particulate which is suspect organic material (blue circles). Black circles are air bubbles.

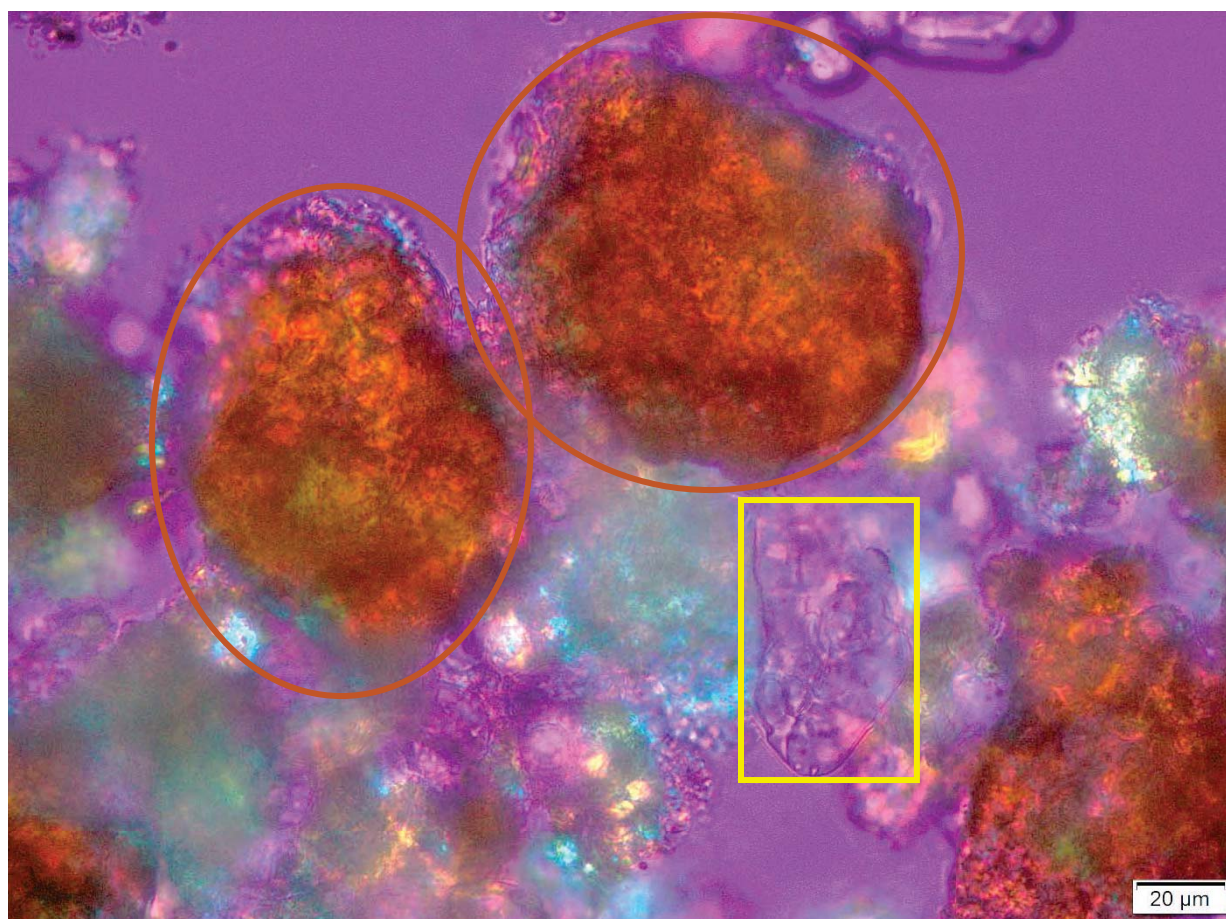
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Figure 7. Photo S16R000243e, crossed polars with red 1 compensator, showing natrophosphate isotropic crystals (yellow rectangle) and unknown particulate (orange circles).

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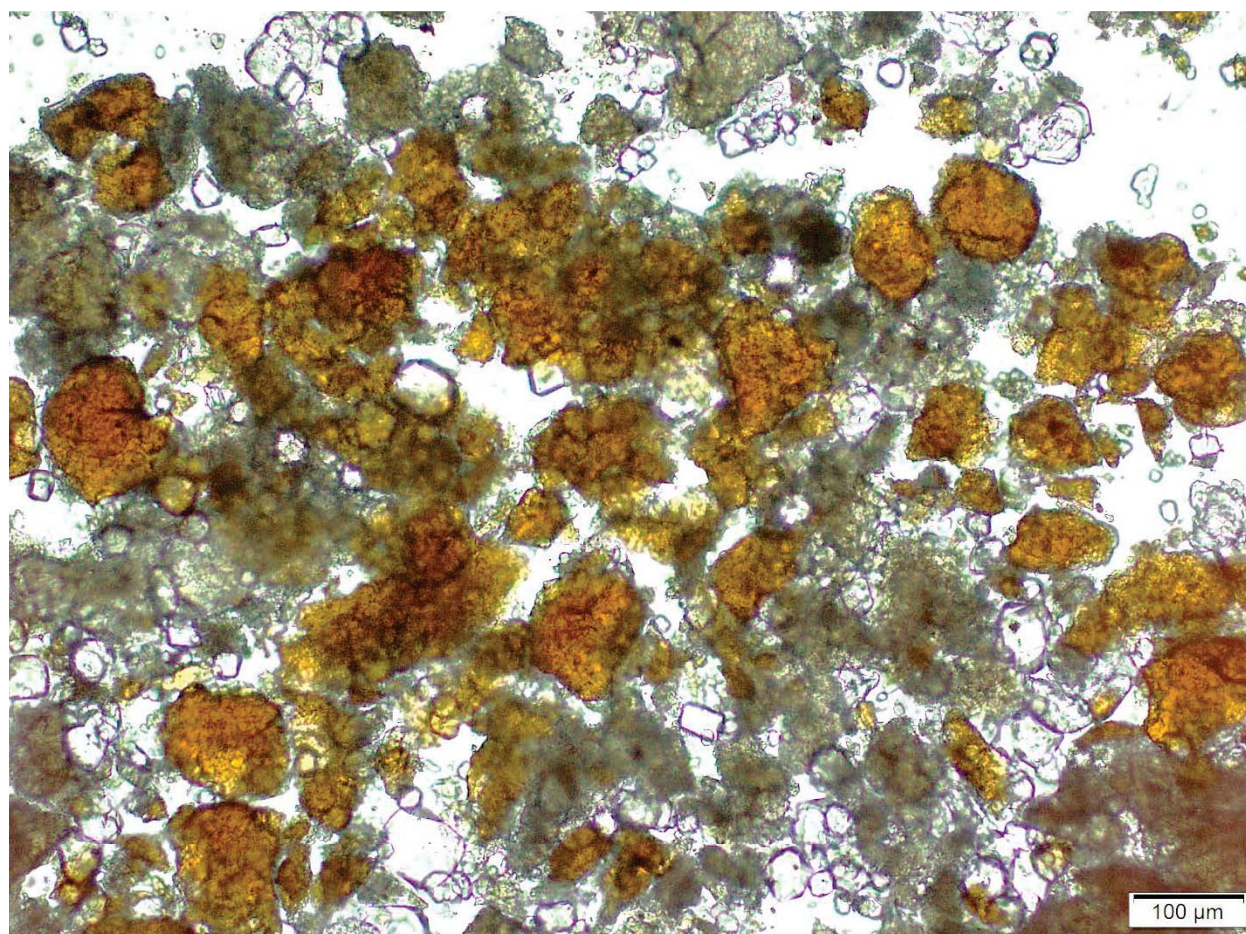


Figure 8. Photo S16R000243g, uncrossed polars, showing good contrast and outlines of particles of interest.

S16R000254 [S16T005862 settled solids] was a field sample duplicate of S16R000243. This sample was also described as brown solids clumped together with a small amount of supernate. However, this sample contained several pieces of white solids. These white solids appeared to be clusters of natrophosphate. This sample was thoroughly mixed prior to preparing the mount. The slide was mounted in mother liquor. It looked very much like sample S16R000243, so only one slide was prepared. This slide contained natrophosphate, organic “fuzz” and/or metal particulate (too small to differentiate), and a few unknown anisotropic crystals, which are suspected to be gibbsite based on SEM and XRD data (**Figure 9**).

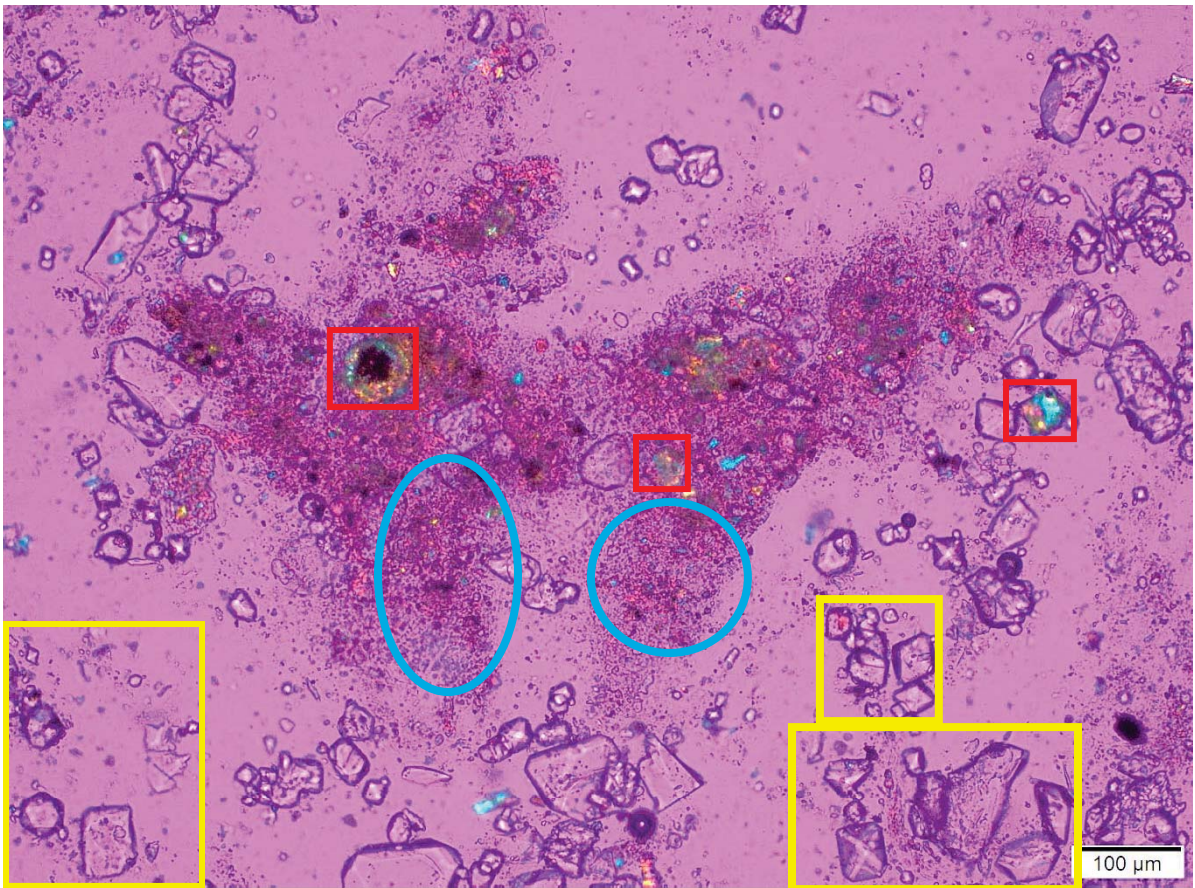


Figure 9. Photo S16R000254a, crossed polars with red 1 compensator, showing natrophosphate isotropic crystals (yellow rectangles), unknown anisotropic crystals (red squares), and unknown particulate (blue ovals).

Summary of Phases

	Chemical Formula	S16R000241	S16R000252	S16R000243	S16R000254
Natrophosphate	Na ₇ F(PO ₄) ₂ •19H ₂ O	Major	Major	Major	Major
Unknown sub-micron particulate	N/A	Major	Major	Major	Major
Unknown Anisotropic Crystals (suspect Gibbsite)	N/A	Major	Major	Minor	Minor

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Appendix E**References:**

ATS-LT-519-107, as revised, "222-S Laboratory Polarized Light Microscopy," Washington River Protection Solutions LLC 222-S Laboratory, Richland, Washington.

HNF-N-395 2, "PLM Sample Log," Laboratory Notebook, Washington River Protection Solutions LLC 222-S Laboratory, Richland, Washington.

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APPENDIX F.**SCANNING ELECTRON MICROSCOPY AND ENERGY DISPERSIVE
SPECTROMETRY REPORT**

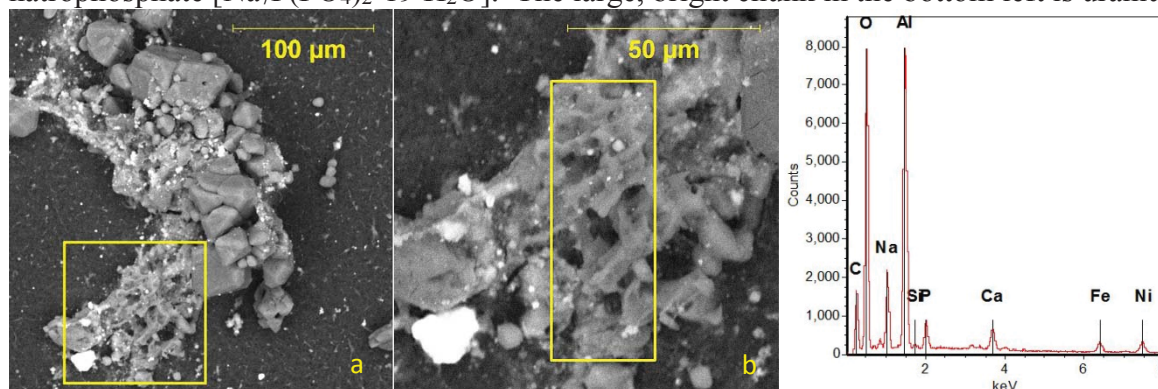
(9 pages, including cover page)

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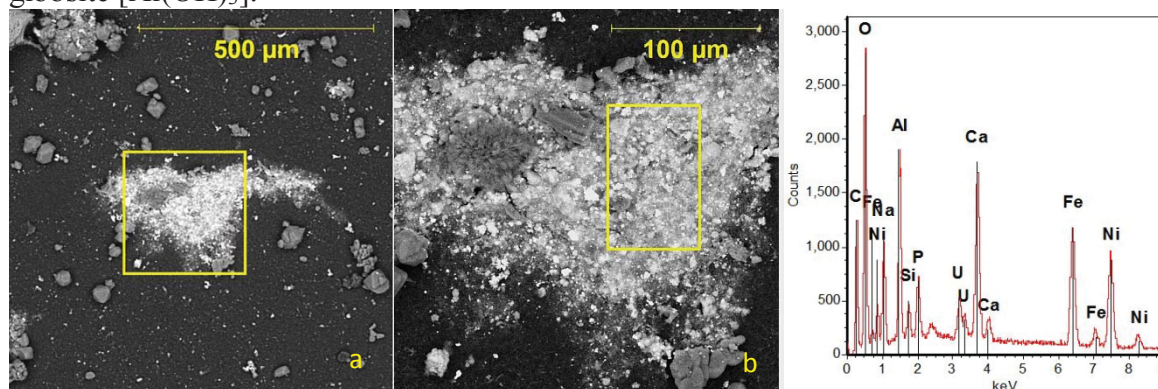
Appendix F

Tank 241-AN-101 Scanning Electron Microscopy / Energy Dispersive Spectrometry (SEM/EDS) Report

S16R000241-1a,b: Upper right corner of photo 1a is sodium fluoride phosphate hydrate or natrophosphate [$\text{Na}_7\text{F}(\text{PO}_4)_2 \cdot 19 \text{H}_2\text{O}$]. The large, bright chunk in the bottom left is uranium.



S16R000241-2a,b: The dark, fuzzy ball in the upper left of photo 2b is sodium carbonate monohydrate or thermonatrite [$\text{Na}_2\text{CO}_3 \cdot \text{H}_2\text{O}$]. The dark layered piece to the upper right of it is gibbsite [$\text{Al}(\text{OH})_3$].



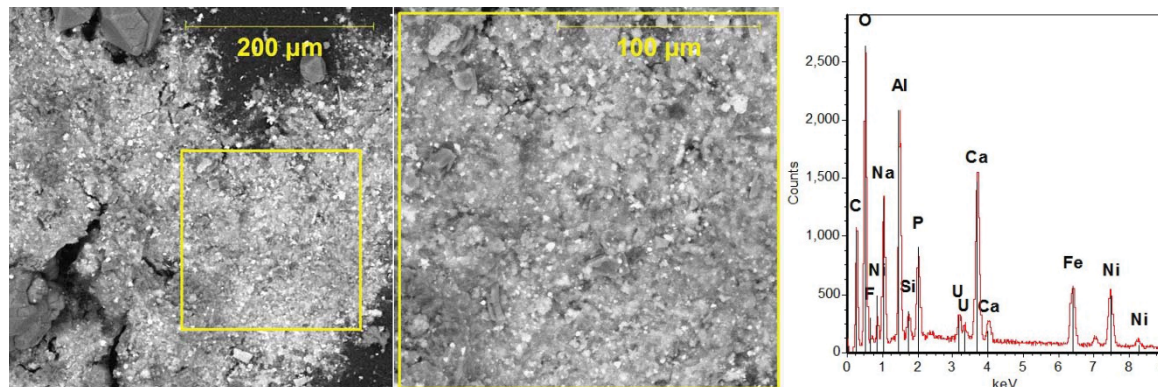
S16R000241-3: Gibbsite. The bright particulate is iron oxide [Fe_2O_3] or hematite and a combination of iron and nickel. Natrophosphate is also present.



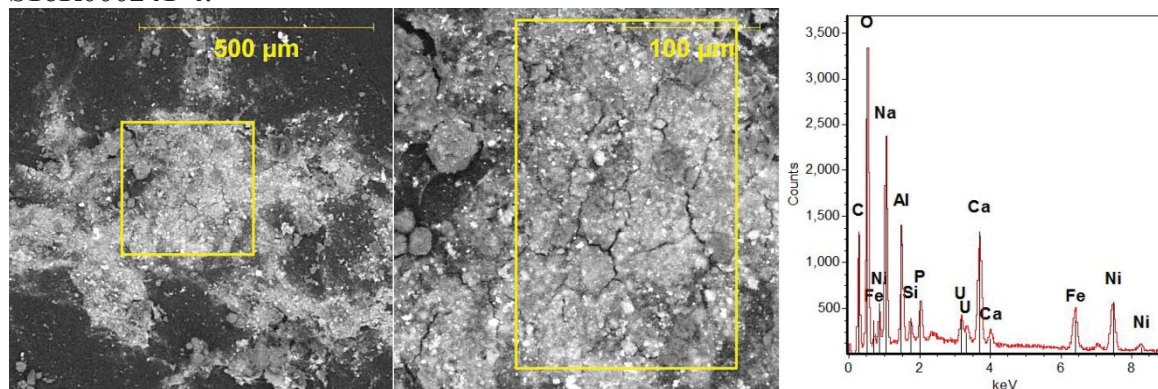
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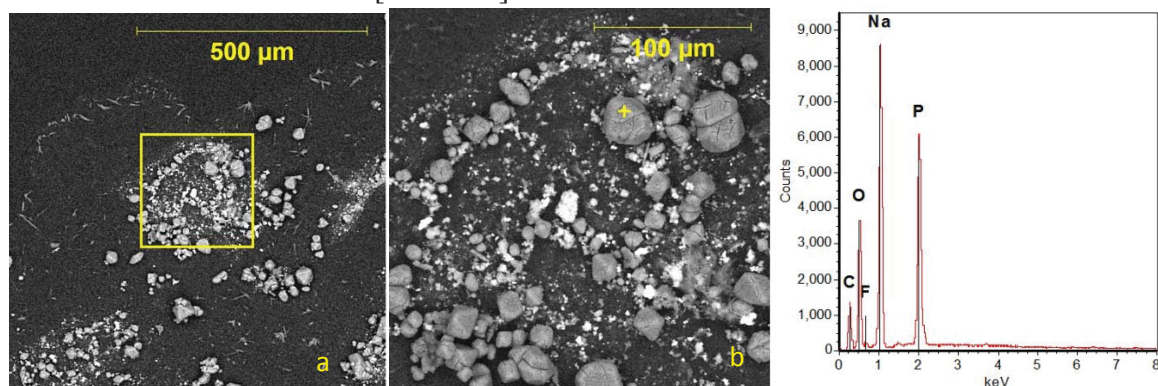
S16R000241-4: Natrophosphate under the bright layer. The bright layer consists of very small particles of aluminum, calcium, sodium iron, silicon, and nickel with uranium present in low levels.



S16R000241-5: “Bright layer” throughout the sample with the same components listed in S16R000241-4.



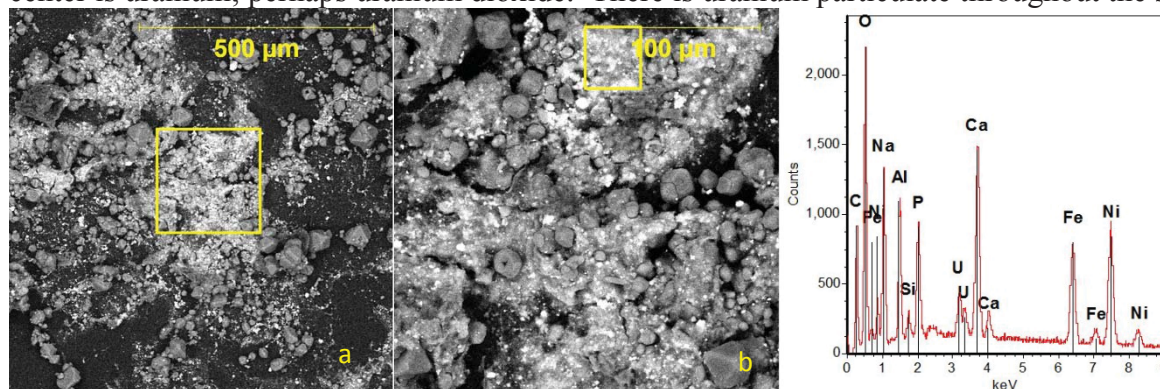
S16R000243-1a,b: Natrophosphate present; thermonatrite present in lower right (fuzzball) (photo of 1b). The bright center particle contains carbon, oxygen, iron, sodium, aluminum, silicon, phosphorus, calcium, nickel, and lead. The wisps in the upper left of photo 1a are thermonatrite or natroxalate $[\text{Na}_2\text{C}_2\text{O}_4]$.



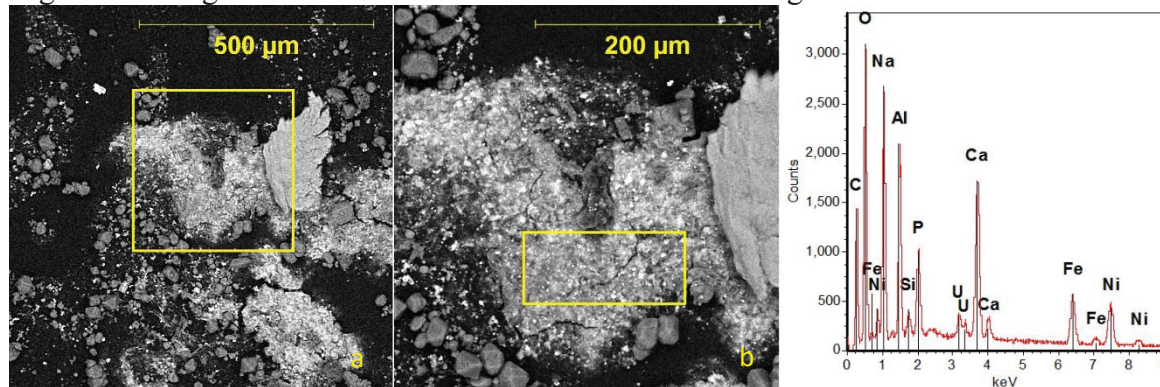
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S16R000243-2a,b: Partial scan of “coating”; natrophosphate present. Bright spot in upper center is uranium; perhaps uranium dioxide. There is uranium particulate throughout the sample.



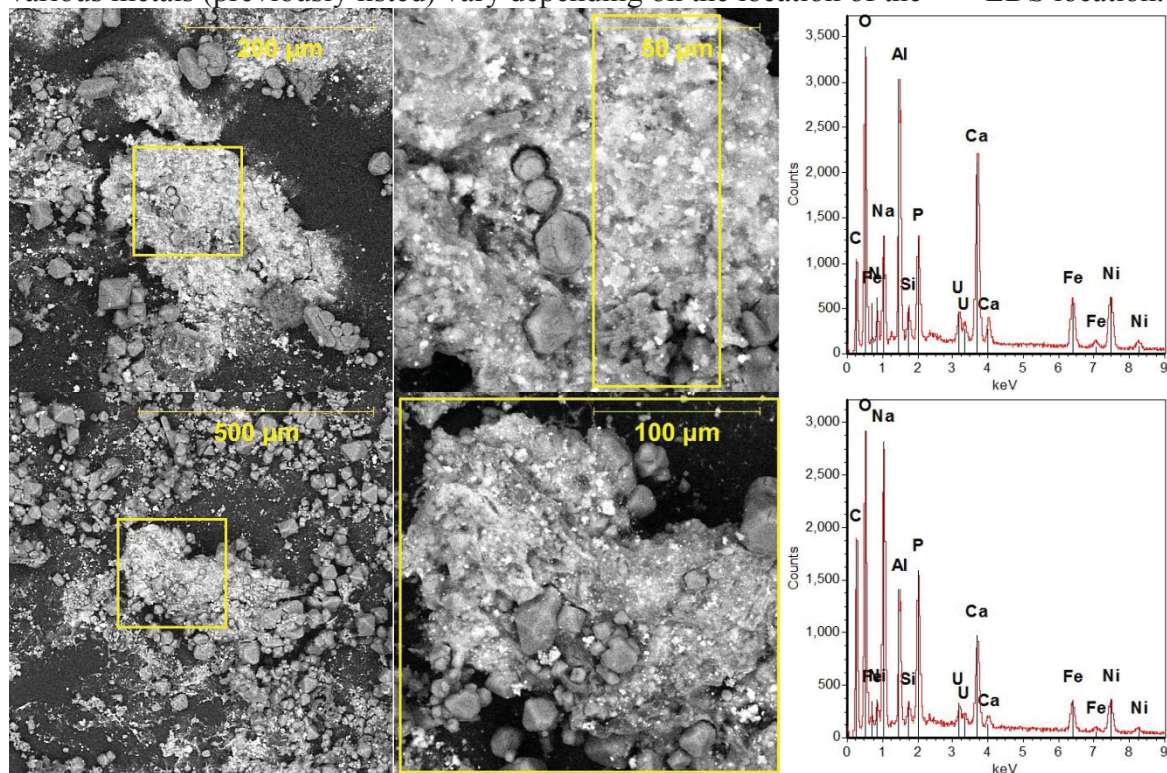
S16R000243-3a: Bright coating is the same as in S16R000243-1a, with the addition of uranium. Big chunk to right side of box is aluminum with a hint of magnesium.



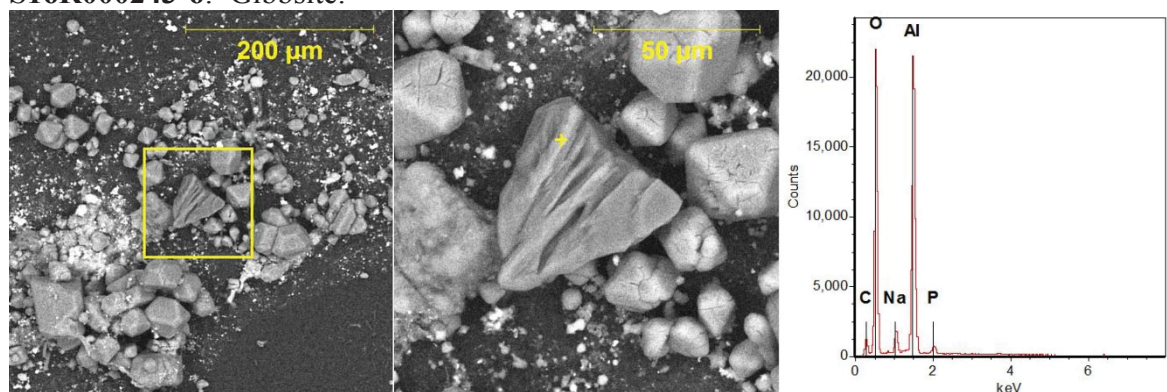
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S16R000243-4;5: Samples have natrophosphate present and bright top layer. Concentration of various metals (previously listed) vary depending on the location of the “+” EDS location.



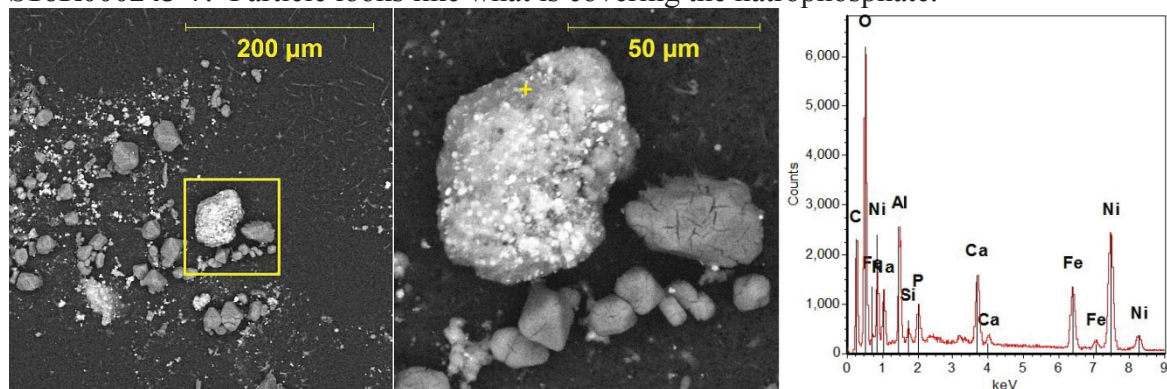
S16R000243-6: Gibbsite.



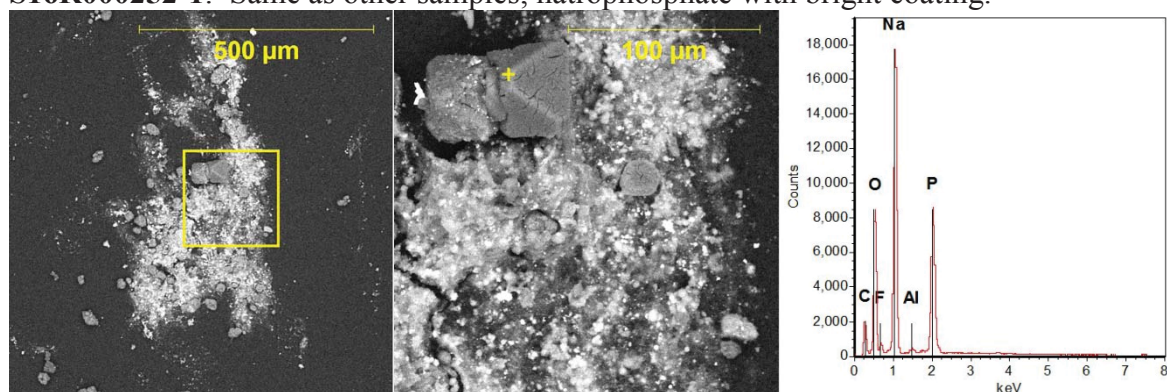
RPP-RPT-59964

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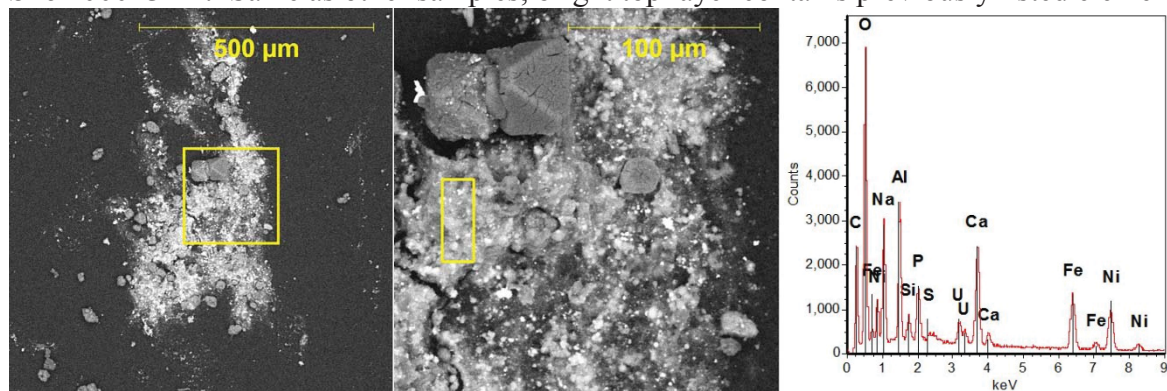
S16R000243-7: Particle looks like what is covering the natrophosphate.



S16R000252-1: Same as other samples; natrophosphate with bright coating.



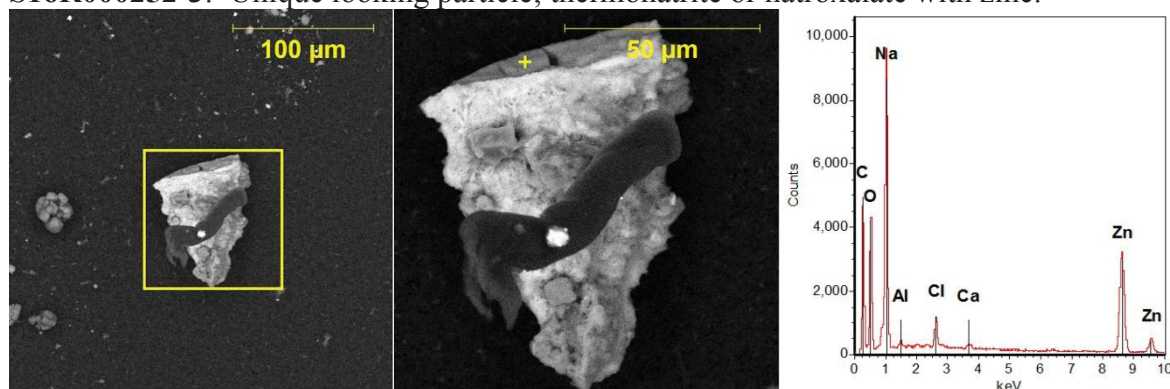
S16R000252-2: Same as other samples; bright top layer contains previously listed elements.



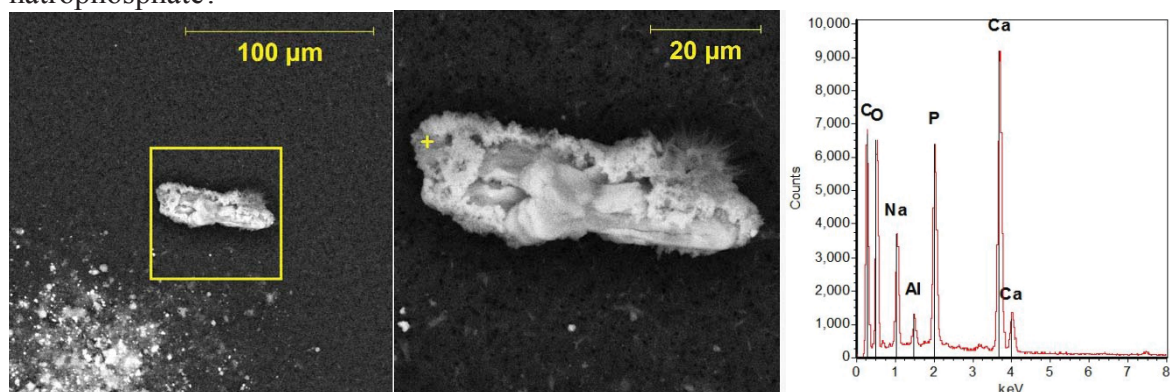
RPP-RPT-59964

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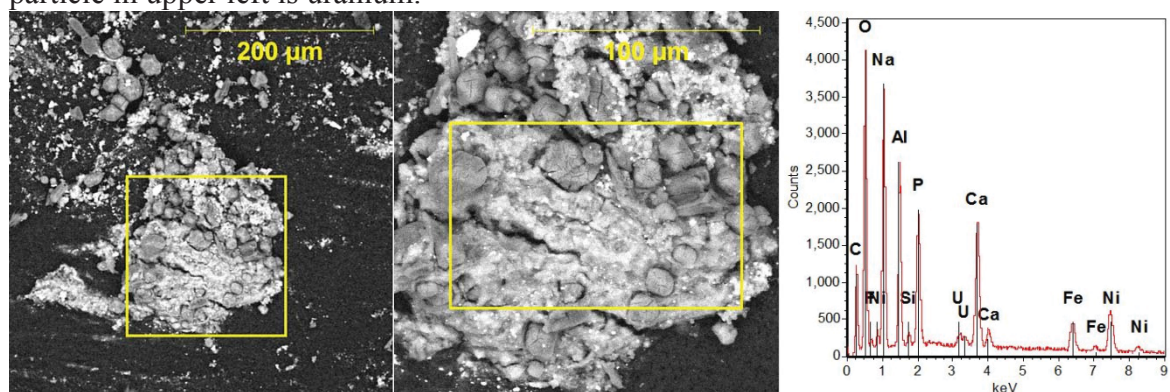
S16R000252-3: Unique looking particle; thermonatrite or natroxalate with zinc.



S16R000252-4: Unique looking particle; thermonatrite or natroxalate with some natrophosphate?



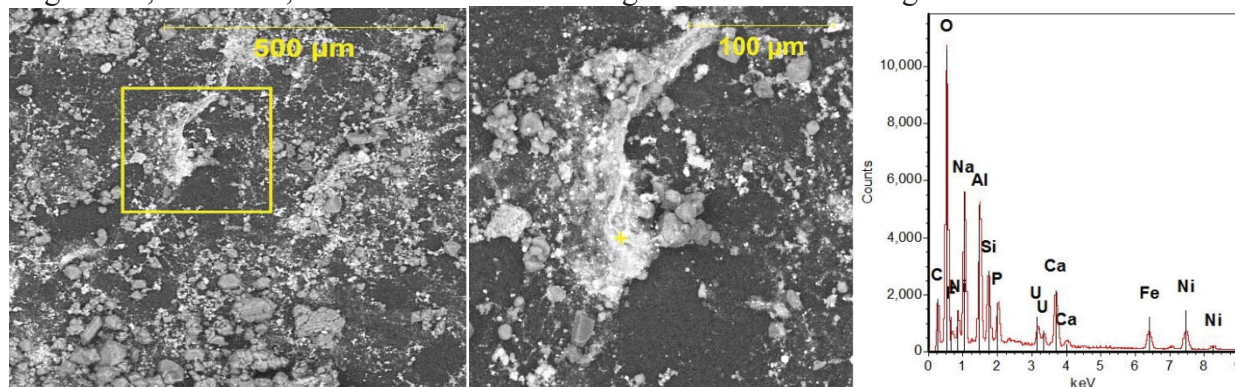
S16R000254-1: Natrophosphate present with bright layer of various metals present. Bright particle in upper left is uranium.



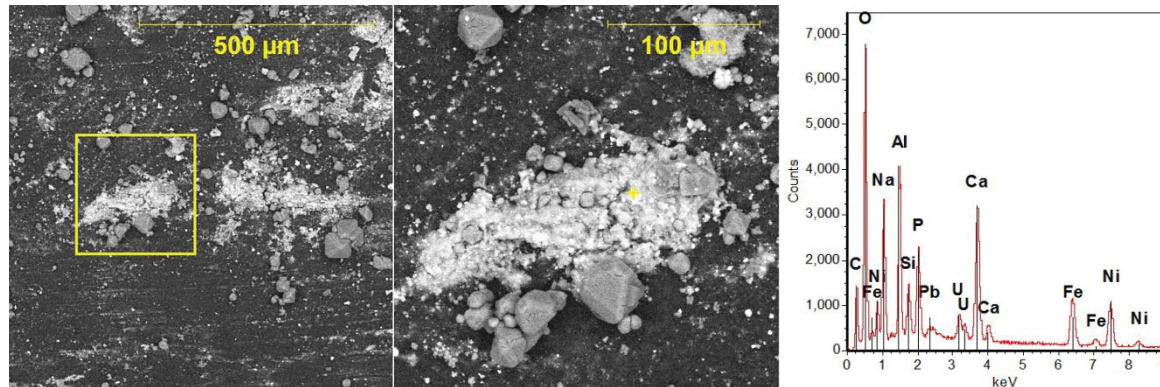
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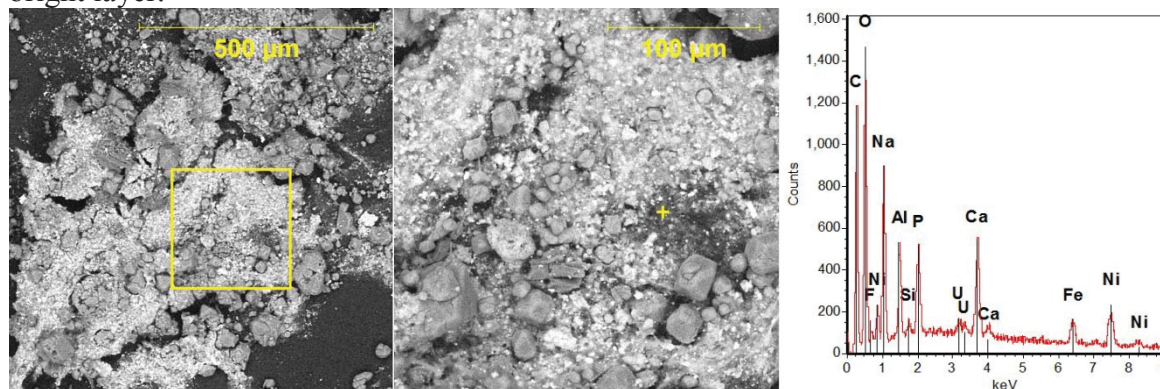
S16R000254-2: Particle in middle left-center is calcium phosphate, and at the bottom of the bright area, to the left, the short block with a ridge down the center is gibbsite.



S16R000254-3: More of the same; bright coating contains same various metals as previously listed.



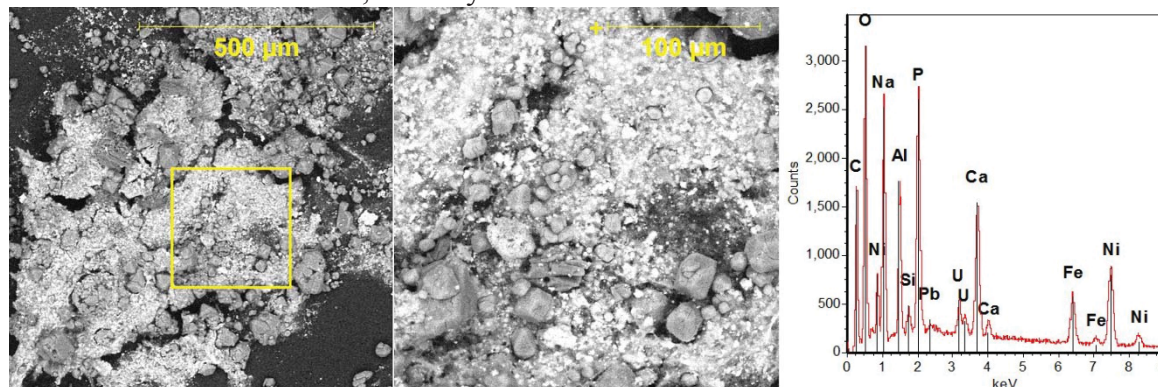
S16R000254-4: Natrophosphate with bright coating material. EDS taken in darker spot of bright layer.



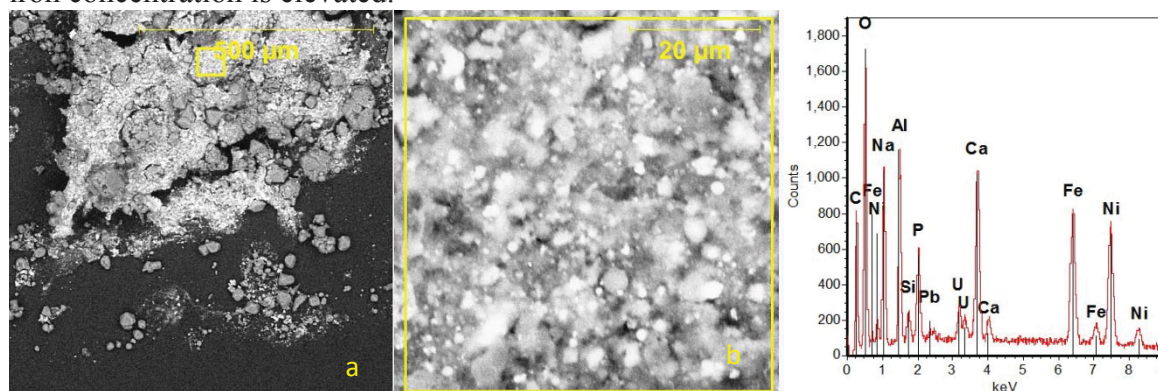
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S16R000254-5: Same picture as **S16R000254-4**. Natrophosphate with bright coating material. EDS taken in lighter spot of bright layer. The same elements are present in both dark and light areas of the coated material; the only difference is in concentration.



S16R000254-6: Natrophosphate with bright coating material. Area scan of magnified coated material (**S16R000254-6a**). Bright coating contains same various metals as previously listed; iron concentration is elevated.



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APPENDIX G.**X-RAY DIFFRACTION REPORT**

(12 pages, including cover page)

X-ray Diffraction Report

Phase Analysis Summary: Four samples were evaluated for solid crystalline phase content using X-ray diffraction methods. The results of the phase analysis are summarized in Table 1. In all cases, the samples were principally composed of natrophosphate with a clay-like compound (hydrogen-aluminum-silicon oxide) along with a few other minor or trace phases. Sample-by-sample analysis details are presented in subsequent sections.

Table 1. Phase Results Summary Table for AN 101 Samples.

	S16R000241	S16R000243	S16R000252	S16R000254
Natrophosphate	M	M	M	M
C17H36	m			
Gibbsite	m	m		m
Hydrogen	t	t	t	t
Fe2(CO3)(OH)				m
Unidentified Peaks	1	1	0	0

Sample Preparation: Sample solids were removed from the original container and were vacuum filtered in accord with the steps described in ATS-LT-161-104, “SEM Sample Preparation Procedure.” Subsequently, the solids were scraped off the filter into a mortar where they were wet ground in ethyl alcohol to a fine consistency. The solids were allowed to dry overnight in the mortar. The dried solids were dry ground to a flourlike consistency principally to release the sample solids from the surface of the mortar. The powder-like specimen material was deposited on a masked and coated (thin layer of petroleum jelly) zero background substrate. The petroleum jelly layer was used as a compliant adhesive that helps to minimize crystallographic orientation of the sample materials. Specimen material was evenly distributed across the petroleum jelly adherent, and excess sample was removed by tilting the sample on its side and tapping on the substrate. Once a uniform deposit was achieved, the masking material was removed, revealing a centered circular, thin deposit of finely ground sample material.

Data Acquisition: Diffraction patterns were acquired using measurement conditions as described in Table 2 using the Rigaku MiniFlex II configured with an auto sample changer and graphite monochromator. All measurements were performed in accordance with the steps described in ATL-LT-507-103, “222-S Laboratory X-Ray Diffractometry (XRD) Using the Rigaku™¹ MiniFlexII.”

¹ Rigaku is a trademark of Rigaku Americas Corporation, The Woodlands, Texas.

Table 2. Measurement Conditions used to Acquire Diffraction Data.

Scan Range	5-85 deg.
Step Size	0.02 deg.
Scan Speed	0.1 deg./min.

Data Processing: The raw diffraction data with a background model were compared to the International Centre for Diffraction Data (ICDD) powder diffraction file database using the whole pattern fitting algorithm in MDI Jade analysis software. Typically, the entire database was searched first and primary phase(s) were identified. Subsequent searches involved searching specific sub files (e.g., minerals) with other filters applied to the data (e.g., specifying allowed elemental chemistry). The chemistry filter was specified for each sample using a composite of all energy dispersive spectroscopy (EDS) spectra acquired from the sample. Hydrogen was also added to the filter as an allowable element. Individual data processing and interpretation details are presented in the following sections.

Phase Analysis - S16R000241 (Floating Solids)

Natrophosphate was identified as the only major phase in the data from this specimen (see Figure 1 and Table 3). One unidentified peak remained. The hydrocarbon phase identified is most likely associated with the petroleum jelly adherent layer rather than being a constituent of the floating layer solids. Gibbsite and the aluminum/silicon oxide phase were identified as minor phases. One weak diffraction peak remained unidentified.

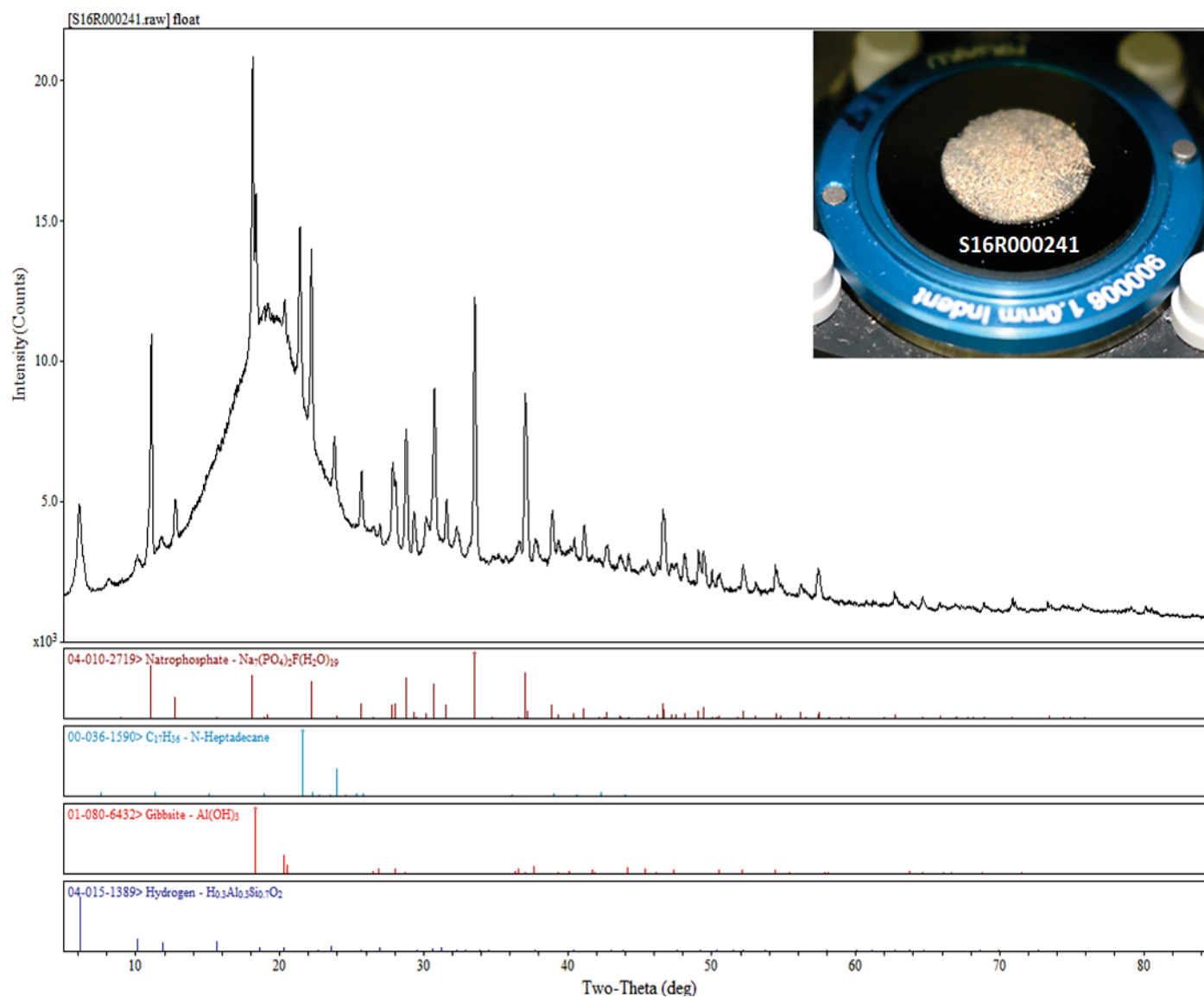
RPP-RPT-59964
Appendix G**Figure 1. Phase Identification Results for S16R000241.**

Table 3. Phase Identification Results for S16R000241.

2-Theta	d(Å)	Height	Height%	Phase ID	d(Å)	h	k	l	2-Theta	Delta
6.140	14.384	3182	31.3	Hydrogen	14.2929	100	(1 1 1)		6.179	0.039
8.158	10.8292	321	3.2	Unidentified						
10.179	8.6832	643	6.3	Hydrogen	8.7526	17.1	(2 2 0)		10.098	-0.081
11.121	7.9499	8189	80.6	Natrophosphate	8.0122	87.8	(2 2 2)		11.034	-0.087
11.820	7.4811	658	6.5	Hydrogen	7.4642	12.3	(3 1 1)		11.847	0.027
12.783	6.9197	1488	14.7	Natrophosphate	6.9388	32.7	(4 0 0)		12.747	-0.035
18.161	4.8809	10155	100	Natrophosphate	4.9064	64.7	(4 4 0)		18.065	-0.095
18.398	4.8184	5013	49.4	Gibbsite	4.8487	100	(0 0 2)		18.282	-0.116
18.921	4.6863	433	4.3	C17H36	4.683	3	(0,0,10)		18.935	0.013
19.276	4.6008	552	5.4	Natrophosphate	4.6258	6.4	(4 4 2)		19.171	-0.105
19.878	4.463	370	3.6	Gibbsite	4.4959	0.3	(0 1 1)		19.731	-0.147
20.380	4.3541	1521	15	Gibbsite	4.3754	26.8	(1 1 0)		20.28	-0.101
20.708	4.2859	494	4.9	Gibbsite	4.3202	12.1	(2 0 0)		20.542	-0.166
21.460	4.1374	5984	58.9	Hydrogen	4.126	0.1	(4 4 2)		21.52	0.06
22.241	3.9937	6601	65	C17H36	3.99	5	(1 1 3)		22.262	0.021
23.841	3.7293	2120	20.9	Natrophosphate	3.7089	4.1	(6 4 2)		23.974	0.133
25.739	3.4584	2273	22.4	C17H36	3.453	3	(2 0 5)		25.78	0.041
26.560	3.3533	588	5.8	C17H36	3.348	1	(2 0 6)		26.603	0.043
27.019	3.2974	779	7.7	Gibbsite	3.2894	0.4	(2 1 0)		27.086	0.067
27.900	3.1952	3136	30.9	Natrophosphate	3.2049	20.4	(7 5 1)		27.815	-0.086
28.821	3.0952	4430	43.6	Hydrogen	3.0945	0.1	(8 0 0)		28.828	0.007
29.363	3.0393	1525	15	Natrophosphate	3.0465	9.6	(7 5 3)		29.292	-0.071
30.220	2.9551	1395	13.7	Gibbsite	2.9519	0.1	(1 0 3)		30.253	0.034
30.780	2.9025	6018	59.3	Natrophosphate	2.9095	52.2	(9 3 1)		30.704	-0.076
31.621	2.8272	2114	20.8	Gibbsite	2.8226	0.1	(-3 0 1)		31.674	0.053
32.321	2.7675	1195	11.8	Hydrogen	2.7678	1.1	(8 4 0)		32.318	-0.003
33.599	2.6652	9412	92.7	Natrophosphate	2.6707	100	(10,2,2)		33.527	-0.072
34.936	2.5661	238	2.3	Natrophosphate	2.577	2	(8 6 4)		34.785	-0.152
35.220	2.5462	311	3.1	Gibbsite	2.5371	0.1	(0 2 0)		35.35	0.131
35.776	2.5078	243	2.4	Gibbsite	2.5048	0.1	(3 1 0)		35.821	0.045
36.681	2.448	754	7.4	Natrophosphate	2.4532	1.5	(8 8 0)		36.6	-0.081
37.100	2.4213	6005	59.1	Gibbsite	2.4244	0.8	(0 0 4)		37.051	-0.049
37.800	2.3781	783	7.7	Natrophosphate	2.38	1.1	(10,6,0)		37.769	-0.031
38.961	2.3098	1805	17.8	Hydrogen	2.3085	0.1	(9 5 3)		38.984	0.023
39.400	2.2851	752	7.4	Natrophosphate	2.2892	5.2	(11,5,1)		39.327	-0.073
40.499	2.2256	872	8.6	Natrophosphate	2.2293	7.7	(9 7 5)		40.428	-0.071
41.180	2.1903	1355	13.3	Gibbsite	2.1895	0.6	(0 1 4)		41.197	0.017
41.742	2.1622	352	3.5	Hydrogen	2.1629	0.2	(9 7 1)		41.726	-0.016
42.236	2.138	272	2.7	Natrophosphate	2.1413	2.4	(10,8,2)		42.167	-0.069
42.818	2.1103	821	8.1	Gibbsite	2.116	0.1	(2 2 1)		42.697	-0.121
43.701	2.0697	571	5.6	Gibbsite	2.0705	0.1	(3 0 3)		43.681	-0.019
44.239	2.0457	695	6.8	Natrophosphate	2.0461	2.4	(12,6,2)		44.23	-0.01
45.147	2.0067	277	2.7	Hydrogen	2.008	0.1	(10,6,4)		45.116	-0.031

2-Theta	d(Å)	Height	Height%	Phase ID	d(Å)	h	k	l	2-Theta	Delta
45.600	1.9878	612	6	Natrophosphate	1.9876	3.8	(13,5,1)		45.605	0.005
46.281	1.9601	584	5.7	Natrophosphate	1.9626	6.9	(10,10,0)		46.219	-0.062
46.661	1.945	2517	24.8	Natrophosphate	1.9432	12.6	(14,2,2)		46.706	0.046
47.259	1.9218	646	6.4	Gibbsite	1.9241	0.4	(-1 0 5)		47.2	-0.058
47.542	1.911	658	6.5	Natrophosphate	1.9107	6.7	(11,9,3)		47.549	0.007
48.179	1.8872	1033	10.2	Gibbsite	1.8869	0.1	(-3 2 1)		48.189	0.009
49.125	1.8531	1243	12.2	Natrophosphate	1.8545	11.1	(12,8,4)		49.086	-0.039
49.460	1.8413	1237	12.2	Natrophosphate	1.8422	17.7	(13,7,3)		49.435	-0.025
50.057	1.8207	621	6.1	Natrophosphate	1.8222	1.9	(14,6,0)		50.014	-0.043
50.600	1.8025	524	5.2	Gibbsite	1.8052	5.6	(-3 1 4)		50.517	-0.083
52.221	1.7503	941	9.3	Hydrogen	1.7505	0.6	(14,2,0)		52.213	-0.008
53.103	1.7232	370	3.6	Natrophosphate	1.7246	3.8	(13,9,3)		53.058	-0.046
54.117	1.6933	202	2	Natrophosphate	1.6954	0.6	(14,6,6)		54.045	-0.072
54.462	1.6834	1094	10.8	Natrophosphate	1.6829	8.6	(16,4,0)		54.48	0.019
54.919	1.6705	377	3.7	Gibbsite	1.6712	0.1	(-3 0 5)		54.894	-0.025
55.454	1.6556	139	1.4	Hydrogen	1.6541	0.3	(12,8,4)		55.51	0.056
56.277	1.6334	509	5	Natrophosphate	1.6355	10.3	(12,12,0)		56.197	-0.08
56.555	1.626	246	2.4	Natrophosphate	1.627	2.1	(13,11,1)		56.515	-0.04
57.461	1.6025	1122	11	Natrophosphate	1.6024	8.9	(14,10,2)		57.462	0.001
58.197	1.584	176	1.7	Natrophosphate	1.5841	1.8	(15,9,1)		58.193	-0.004
60.760	1.5231	156	1.5	Natrophosphate	1.5233	1.1	(18,2,2)		60.755	-0.006
61.400	1.5088	154	1.5	Natrophosphate	1.5074	0.9	(17,7,1)		61.46	0.06
61.921	1.4973	160	1.6	Gibbsite	1.4967	0.1	(0 3 3)		61.948	0.027
62.738	1.4798	500	4.9	Hydrogen	1.4795	0.4	(12,10,6)		62.753	0.016
63.881	1.456	272	2.7	Natrophosphate	1.4548	0.4	(18,6,2)		63.943	0.063
64.681	1.4399	465	4.6	Gibbsite	1.4401	1.8	(6 0 0)		64.674	-0.007
65.862	1.417	286	2.8	Gibbsite	1.4174	0.1	(2 1 6)		65.838	-0.024
66.139	1.4117	154	1.5	Gibbsite	1.4124	2.1	(-6 0 2)		66.103	-0.036
66.941	1.3967	243	2.4	Natrophosphate	1.3965	2.1	(15,13,1)		66.952	0.011
67.378	1.3887	165	1.6	Natrophosphate	1.3878	0.4	(20,0,0)		67.431	0.053
67.878	1.3797	187	1.8	Natrophosphate	1.3809	1.7	(16,12,2)		67.813	-0.066
68.123	1.3753	189	1.9	Hydrogen	1.3753	0.1	(16,8,2)		68.123	-0.001
68.923	1.3613	300	3	Natrophosphate	1.3608	2.5	(20,4,0)		68.952	0.028
69.197	1.3566	177	1.7	Gibbsite	1.357	0.1	(6 1 1)		69.17	-0.027
70.906	1.328	393	3.9	Hydrogen	1.329	0.1	(17,7,3)		70.847	-0.058
73.379	1.2892	319	3.1	Gibbsite	1.2889	0.1	(-3 0 7)		73.4	0.021
74.382	1.2743	229	2.3	Natrophosphate	1.2735	1.6	(21,5,3)		74.439	0.057
74.821	1.2679	220	2.2	Gibbsite	1.2674	0.1	(-5 2 4)		74.86	0.038
75.820	1.2537	260	2.6	Natrophosphate	1.2526	1.8	(17,11,9)		75.9	0.079
79.183	1.2087	212	2.1	Gibbsite	1.2088	0.2	(5 3 0)		79.176	-0.006
80.164	1.1963	263	2.6	Hydrogen	1.1966	0.2	(14,14,6)		80.14	-0.024
80.580	1.1912	213	2.1	Hydrogen	1.1911	0.1	(20,4,4)		80.59	0.011

Phase Analysis - S16R000243 (Settled Solids)

Natrophosphate was identified as the only major phase in the data (see Figure 2 and Table 4). Gibbsite was identified as a minor phase, and the aluminum/silicon oxide phase was identified as a barely detectable trace phase. No peaks remained unidentified in the pattern.

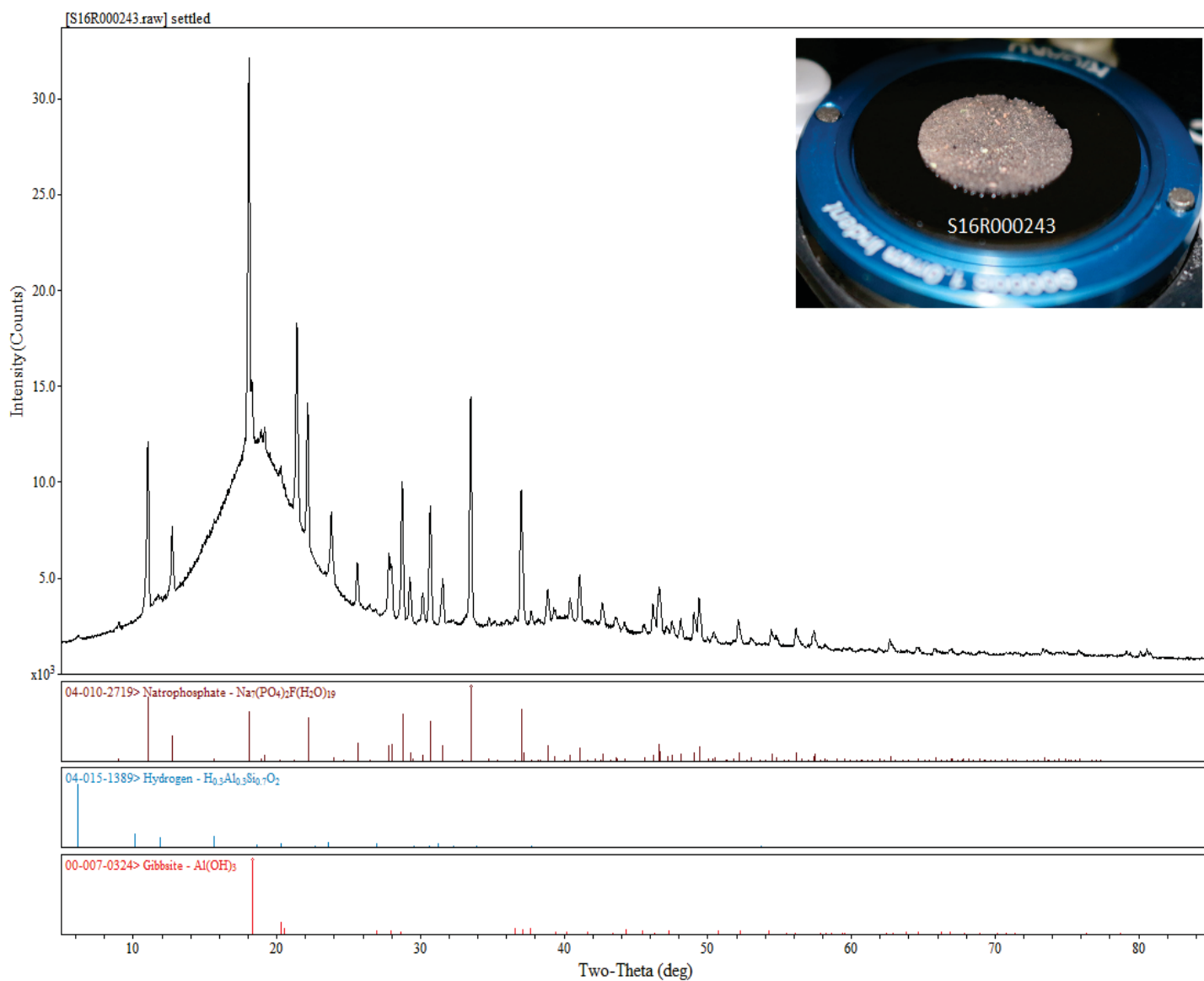


Figure 2. Phase Analysis Results for S16R000243.

Table 4. Phase Analysis Results for S16R000243.

2-Theta	d(Å)	Height	Height%	Phase ID	d(Å)	%	(h k l)	2-Theta	Delta
6.181	14.2875	225	1.1	Hydrogen	14.2929	100	(1 1 1)	6.179	-0.002
9.038	9.7761	332	1.6	Natrophosphate	9.8129	2	(2 2 0)	9.005	-0.034
11.060	7.9931	8958	44.1	Natrophosphate	8.0122	87.8	(2 2 2)	11.094	-0.026
11.760	7.5188	612	3	Hydrogen	7.4642	12.3	(3 1 1)	11.847	0.086
12.247	7.2212	237	1.2	Hydrogen	7.1464	0.1	(2 2 2)	12.376	0.129
12.759	6.9325	3517	17.3	Natrophosphate	6.9388	32.7	(4 0 0)	12.747	-0.012
18.098	4.8975	20299	100	Natrophosphate	4.9064	64.7	(4 4 0)	18.065	-0.033
18.925	4.6855	839	4.1	Natrophosphate	4.6915	1.8	(5 3 1)	18.901	-0.024
19.184	4.6228	1215	6	Natrophosphate	4.6258	6.4	(4 4 2)	19.171	-0.013
20.303	4.3704	761	3.7	Gibbsite	4.37	16	(1 1 0)	20.305	0.002
21.440	4.1412	10218	50.3	Hydrogen	4.1126	0.1	(4 4 2)	21.52	0.08
22.181	4.0045	7290	35.9	Natrophosphate	4.0061	56.4	(4 4 4)	22.172	-0.009
23.822	3.7323	3841	18.9	Natrophosphate	3.7089	4.1	(6 4 2)	23.974	0.152
25.640	3.4715	2324	11.5	Natrophosphate	3.4694	22.4	(8 0 0)	25.656	0.016
26.501	3.3606	399	2	Natrophosphate	3.3658	1.5	(6 4 4)	26.46	-0.041
26.959	3.3046	233	1.1	Gibbsite	3.306	5	(-1 1 2)	26.947	-0.012
27.859	3.1999	3316	16.3	Natrophosphate	3.2049	20.4	(7 5 1)	27.815	-0.044
28.778	3.0997	7193	35.4	Natrophosphate	3.1031	62	(8 4 0)	28.746	-0.032
29.301	3.0456	2247	11.1	Natrophosphate	3.0465	9.6	(7 5 3)	29.292	-0.009
30.199	2.957	1552	7.6	Natrophosphate	2.9587	7.3	(6 6 4)	30.182	-0.018
30.719	2.9081	6110	30.1	Natrophosphate	2.9095	52.2	(9 3 1)	30.704	-0.015
31.579	2.8309	2400	11.8	Natrophosphate	2.8327	19.9	(8 4 4)	31.558	-0.021
32.322	2.7675	299	1.5	Hydrogen	2.7678	1.1	(8 4 0)	32.318	-0.004
33.539	2.6698	11955	58.9	Natrophosphate	2.6707	100	(10,2,2)	33.527	-0.012
34.783	2.5771	425	2.1	Natrophosphate	2.577	2	(8 6 4)	34.785	0.002
35.220	2.5461	248	1.2	Natrophosphate	2.5337	0.2	(10,4,2)	35.399	0.179
35.729	2.511	165	0.8	Hydrogen	2.5267	0.2	(8 4 4)	35.5	-0.229
36.059	2.4888	310	1.5	Hydrogen	2.4881	0.2	(9 3 3)	36.07	0.011
36.622	2.4518	478	2.4	Natrophosphate	2.4532	1.5	(8 8 0)	36.6	-0.022
37.060	2.4239	6971	34.3	Natrophosphate	2.425	67.8	(11,3,1)	37.042	-0.018
37.739	2.3818	665	3.3	Hydrogen	2.3822	1.2	(10,2,2)	37.733	-0.006
38.900	2.3133	1692	8.3	Natrophosphate	2.3129	19.9	(12,0,0)	38.907	0.007
39.340	2.2885	702	3.5	Natrophosphate	2.2892	5.2	(11,5,1)	39.327	-0.013
40.076	2.2481	281	1.4	Natrophosphate	2.2512	0.3	(10,6,4)	40.018	-0.059
40.441	2.2287	1162	5.7	Natrophosphate	2.2293	7.7	(9 7 5)	40.428	-0.013
41.102	2.1943	2388	11.8	Natrophosphate	2.1942	16.1	(12,4,0)	41.104	0.002
42.203	2.1396	172	0.8	Natrophosphate	2.1413	2.4	(10,8,2)	42.167	-0.036
42.682	2.1167	1087	5.4	Natrophosphate	2.1163	8.9	(10,6,6)	42.69	0.007
43.680	2.0706	558	2.7	Natrophosphate	2.0687	2.8	(10,8,4)	43.721	0.041
44.220	2.0466	417	2.1	Natrophosphate	2.0461	2.4	(12,6,2)	44.23	0.01
45.616	1.9871	509	2.5	Natrophosphate	1.9876	3.8	(13,5,1)	45.605	-0.011
46.222	1.9625	1677	8.3	Natrophosphate	1.9626	6.9	(10,10,0)	46.219	-0.002
46.680	1.9443	2593	12.8	Natrophosphate	1.9432	12.6	(14,2,2)	46.706	0.027
47.160	1.9256	627	3.1	Natrophosphate	1.9245	5.2	(12,8,0)	47.19	0.029
47.542	1.911	951	4.7	Natrophosphate	1.9107	6.7	(11,9,3)	47.549	0.007

2-Theta	d(Å)	Height	Height%	Phase ID	d(Å)	%	(h k l)	2-Theta	Delta
48.140	1.8886	1124	5.5	Natrophosphate	1.8885	8.1	(12,6,6)	48.145	0.004
49.080	1.8547	1503	7.4	Natrophosphate	1.8545	11.1	(12,8,4)	49.086	0.006
49.421	1.8426	2268	11.2	Natrophosphate	1.8422	17.7	(13,7,3)	49.435	0.014
50.022	1.8219	304	1.5	Natrophosphate	1.8222	1.9	(14,6,0)	50.014	-0.008
50.443	1.8077	601	3	Natrophosphate	1.8067	4.1	(14,6,2)	50.473	0.03
51.784	1.764	220	1.1	Natrophosphate	1.7624	2.1	(12,10,2)	51.833	0.049
52.161	1.7521	1334	6.6	Natrophosphate	1.7519	10.7	(11,9,7)	52.169	0.008
53.039	1.7252	427	2.1	Natrophosphate	1.7246	3.8	(13,9,3)	53.058	0.019
53.618	1.7079	150	0.7	Natrophosphate	1.7082	0.8	(16,2,2)	53.608	-0.01
54.080	1.6944	190	0.9	Natrophosphate	1.6954	0.6	(14,6,6)	54.045	-0.035
54.460	1.6835	882	4.3	Natrophosphate	1.6829	8.6	(16,4,0)	54.48	0.02
54.798	1.6739	604	3	Natrophosphate	1.6737	4.6	(15,7,1)	54.805	0.007
56.180	1.6359	1011	5	Natrophosphate	1.6355	10.3	(12,12,0)	56.197	0.017
57.023	1.6137	228	1.1	Natrophosphate	1.6132	1.2	(16,6,2)	57.043	0.02
57.421	1.6035	942	4.6	Natrophosphate	1.6024	8.9	(14,10,2)	57.462	0.042
58.198	1.5839	131	1.2	Gibbsite	1.584	1	(-4 2 2)	58.195	-0.003
59.521	1.5519	137	0.7	Natrophosphate	1.5516	1.7	(16,8,0)	59.533	0.013
59.918	1.5425	174	0.9	Natrophosphate	1.5419	1.1	(12,12,6)	59.942	0.024
60.756	1.5232	118	0.6	Natrophosphate	1.5233	1.1	(18,2,2)	60.755	-0.001
61.341	1.5101	110	0.5	Natrophosphate	1.5074	0.9	(17,7,1)	61.46	0.12
61.925	1.4972	207	1	Natrophosphate	1.4965	1.9	(14,12,2)	61.961	0.036
62.703	1.4805	704	3.5	Hydrogen	1.4795	0.4	(12,10,6)	62.753	0.051
63.499	1.4639	131	0.6	Natrophosphate	1.4628	1	(18,6,0)	63.55	0.05
63.901	1.4556	133	0.7	Natrophosphate	1.4548	0.4	(18,6,2)	63.943	0.042
64.620	1.4412	319	1.6	Gibbsite	1.441	2	(6 0 0)	64.628	0.008
65.858	1.417	287	1.4	Natrophosphate	1.4164	3.5	(16,8,8)	65.892	0.034
66.118	1.4121	156	0.8	Hydrogen	1.4129	0.1	(15,9,1)	66.075	-0.043
66.940	1.3967	238	1.2	Natrophosphate	1.3965	2.1	(15,13,1)	66.952	0.011
67.776	1.3815	177	0.9	Natrophosphate	1.3809	1.7	(16,12,2)	67.813	0.037
68.917	1.3614	184	0.9	Gibbsite	1.361	1	(0 2 6)	68.94	0.023
69.297	1.3549	158	0.8	Natrophosphate	1.3543	1.2	(16,10,8)	69.329	0.032
70.783	1.33	107	0.5	Gibbsite	1.33	1	(4 3 0)	70.784	0.002
71.403	1.32	156	0.8	Gibbsite	1.32	1	(3 1 6)	71.402	-0.001
71.623	1.3165	112	0.6	Natrophosphate	1.3187	1.3	(15,13,7)	71.485	-0.138
72.219	1.3071	118	0.6	Natrophosphate	1.3069	0.9	(21,3,1)	72.228	0.009
73.364	1.2895	351	1.7	Natrophosphate	1.2885	4.7	(20,8,0)	73.429	0.065
73.600	1.2859	280	1.4	Hydrogen	1.2853	0.1	(19,3,1)	73.643	0.043
74.362	1.2746	182	0.9	Natrophosphate	1.2735	1.6	(21,5,3)	74.439	0.077
74.799	1.2682	218	1.1	Natrophosphate	1.2668	1.7	(20,8,4)	74.896	0.097
75.877	1.2529	283	1.4	Natrophosphate	1.2526	1.8	(14,14,10)	75.9	0.023
76.637	1.2424	100	0.5	Natrophosphate	1.2412	0.3	(16,12,10)	76.718	0.081
77.901	1.2245	101	0.5	Hydrogen	1.2256	0.1	(20,2,2)	77.88	-0.082
79.261	1.2084	295	1.5	Hydrogen	1.2094	0.2	(15,13,5)	79.125	-0.076
80.160	1.1964	305	1.5	Hydrogen	1.1966	0.2	(14,14,6)	80.14	-0.02
80.603	1.1909	445	2.2	Hydrogen	1.1911	0.1	(20,4,4)	80.59	-0.013

Phase Analysis - S16R000252 (Floating Solids)

Natrophosphate was identified as the only major phase in the diffraction data (see Figure 3 and Table 5). The aluminum/silicon oxide phase was identified as a minor phase. One weak peak remained unidentified in the pattern.

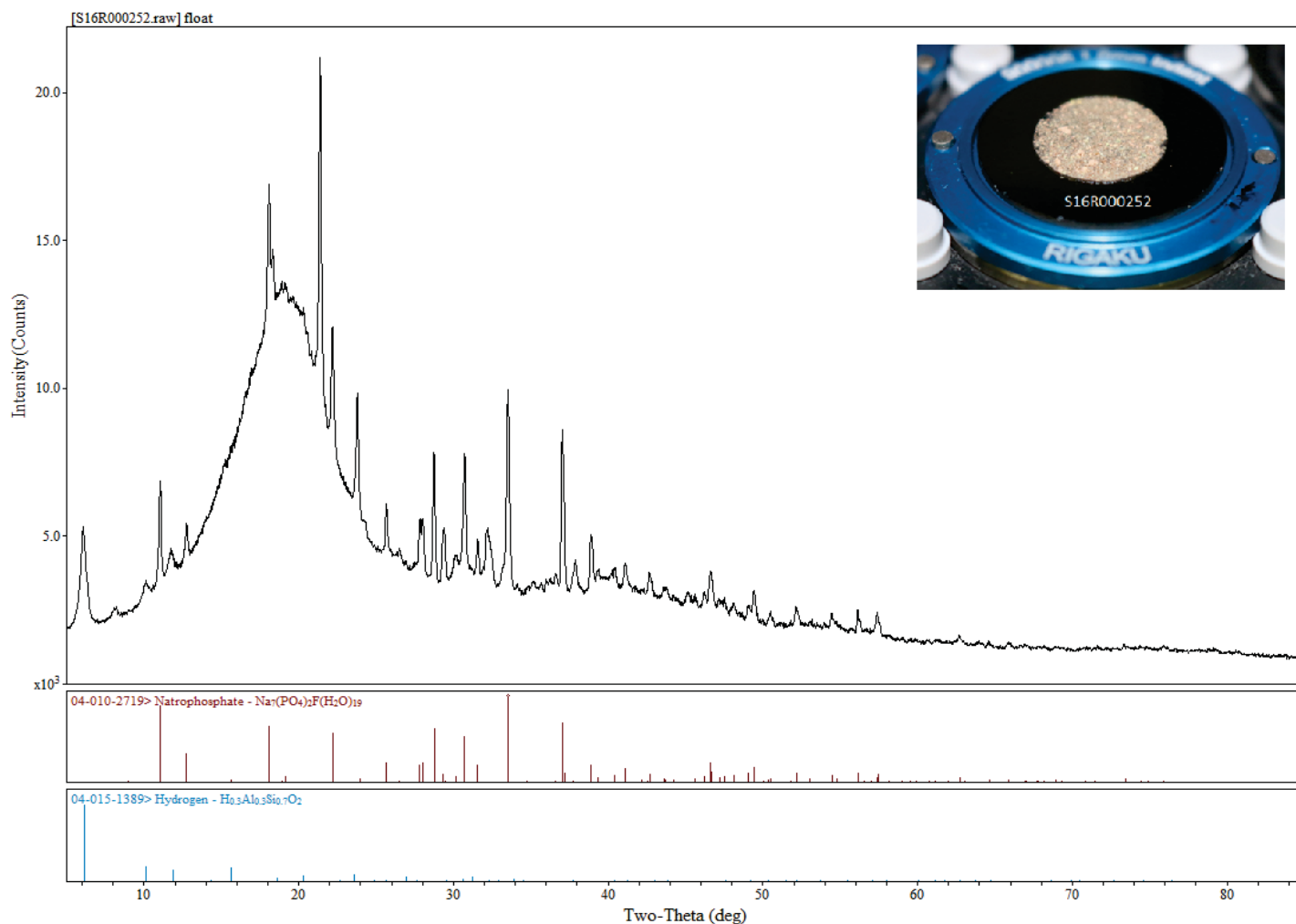


Figure 3. Phase Analysis Results for S16R000252.

Table 5. Phase Analysis Results for S16R000252.

2-Theta	d(Å)	Height	Height%	Phase ID	d(Å)	I%	(h k l)	2-Theta	Delta
6.100	14.4775	3313	30.3	Hydrogen	14.2929	100	(1 1 1)	6.179	0.079
8.118	10.882	311	2.8	Unidentified					
10.178	8.6843	495	4.5	Hydrogen	8.7526	17.1	(2 2 0)	10.098	-0.080
11.081	7.9784	3319	30.3	Natrophosphate	8.0122	87.8	(2 2 2)	11.034	-0.047
11.799	7.4942	781	7.1	Hydrogen	7.4642	12.3	(3 1 1)	11.847	0.048
12.798	6.9117	1094	10	Natrophosphate	6.9388	32.7	(4 0 0)	12.747	-0.050
18.119	4.8921	4621	42.2	Natrophosphate	4.9064	64.7	(4 4 0)	18.065	-0.053
18.359	4.8286	2552	23.3	Hydrogen	4.7643	4.1	(5 1 1)	18.609	0.250
18.901	4.6912	1421	13	Natrophosphate	4.6915	1.8	(5 3 1)	18.901	-0.001
19.160	4.6285	1471	13.4	Natrophosphate	4.6258	6.4	(4 4 2)	19.171	0.011
21.422	4.1447	10946	100	Hydrogen	4.126	0.1	(4 4 2)	21.52	0.098
22.219	3.9977	3845	35.1	Natrophosphate	4.0061	56.4	(4 4 4)	22.172	-0.047
23.820	3.7325	3934	35.9	Natrophosphate	3.7089	4.1	(6 4 2)	23.974	0.154
25.701	3.4635	1641	15	Hydrogen	3.4665	0.9	(5 5 1)	25.678	-0.023
26.556	3.3539	412	3.8	Natrophosphate	3.3658	1.5	(6 4 4)	26.46	-0.096
27.481	3.243	224	2	Hydrogen	3.223	0.3	(7 3 1)	27.655	0.174
28.023	3.1815	1792	16.4	Natrophosphate	3.1837	22.1	(6 6 2)	28.003	-0.020
28.781	3.0994	4252	38.8	Natrophosphate	3.1031	62	(8 4 0)	28.746	-0.035
29.401	3.0355	1771	16.2	Natrophosphate	3.0283	1.7	(8 4 2)	29.472	0.071
30.142	2.9625	640	5.8	Natrophosphate	2.9587	7.3	(6 6 4)	30.182	0.040
30.759	2.9044	4113	37.6	Natrophosphate	2.9095	52.2	(9 3 1)	30.704	-0.055
31.601	2.829	1081	9.9	Natrophosphate	2.8327	19.9	(8 4 4)	31.558	-0.043
32.259	2.7727	1673	15.3	Hydrogen	2.7678	1.1	(8 4 0)	32.318	0.059
33.560	2.6681	6703	61.2	Natrophosphate	2.6707	100	(10,2,2)	33.527	-0.033
34.146	2.6237	194	1.8	Hydrogen	2.639	2.2	(6 6 4)	33.942	-0.204
34.861	2.5715	214	2	Natrophosphate	2.577	2	(8 6 4)	34.785	-0.077
35.220	2.5461	344	3.1	Natrophosphate	2.5337	0.2	(10,4,2)	35.399	0.179
35.719	2.5117	262	2.4	Hydrogen	2.5267	0.2	(8 4 4)	35.5	-0.218
36.037	2.4903	314	2.9	Hydrogen	2.4881	0.2	(9 3 3)	36.07	0.033
36.660	2.4493	550	5	Natrophosphate	2.4532	1.5	(8 8 0)	36.6	-0.060
37.080	2.4226	5260	48.1	Natrophosphate	2.425	67.8	(11,3,1)	37.042	-0.038
37.920	2.3708	1009	9.2	Natrophosphate	2.38	1.1	(10,6,0)	37.769	-0.151
38.939	2.3111	1634	14.9	Natrophosphate	2.3129	19.9	(12,0,0)	38.907	-0.032
39.416	2.2842	493	4.5	Natrophosphate	2.2892	5.2	(11,5,1)	39.327	-0.089

2-Theta	d(Å)	Height	Height%	Phase ID	d(Å)	I%	(h k l)	2-Theta	Delta
39.801	2.263	259	2.4	Hydrogen	2.2599	0.1	(10,4,2)	39.858	0.057
40.495	2.2258	546	5	Natrophosphate	2.2293	7.7	(9 7 5)	40.428	-0.068
41.102	2.1943	845	7.7	Natrophosphate	2.1942	16.1	(12,4,0)	41.104	0.002
42.701	2.1158	739	6.8	Natrophosphate	2.1163	8.9	(10,6,6)	42.69	-0.011
43.759	2.067	393	3.6	Natrophosphate	2.0687	2.8	(10,8,4)	43.721	-0.038
45.201	2.0044	403	3.7	Hydrogen	2.008	0.1	(10,6,4)	45.116	-0.085
45.622	1.9869	350	3.2	Natrophosphate	1.9876	3.8	(13,5,1)	45.605	-0.017
46.241	1.9617	476	4.3	Natrophosphate	1.9626	6.9	(10,10,0)	46.219	-0.021
46.679	1.9443	1172	10.7	Natrophosphate	1.9432	12.6	(14,2,2)	46.706	0.027
47.236	1.9227	267	2.4	Natrophosphate	1.9245	5.2	(12,8,0)	47.19	-0.046
47.546	1.9109	378	3.5	Natrophosphate	1.9107	6.7	(11,9,3)	47.549	0.003
48.143	1.8886	382	3.5	Natrophosphate	1.8885	8.1	(12,6,6)	48.145	0.002
49.099	1.854	454	4.2	Natrophosphate	1.8545	11.1	(12,8,4)	49.086	-0.013
49.460	1.8413	1016	9.3	Natrophosphate	1.8422	17.7	(13,7,3)	49.435	-0.025
50.521	1.8051	457	4.2	Natrophosphate	1.8067	4.1	(14,6,2)	50.473	-0.048
52.180	1.7515	628	5.7	Natrophosphate	1.7519	10.7	(11,9,7)	52.169	-0.011
53.048	1.7249	163	1.5	Natrophosphate	1.7246	3.8	(13,9,3)	53.058	0.010
54.020	1.6962	160	1.5	Natrophosphate	1.6954	0.6	(14,6,6)	54.045	0.025
54.498	1.6824	533	4.9	Natrophosphate	1.6829	8.6	(16,4,0)	54.48	-0.017
56.165	1.6363	723	6.6	Natrophosphate	1.6355	10.3	(12,12,0)	56.197	0.032
57.439	1.603	747	6.8	Natrophosphate	1.6024	8.9	(14,10,2)	57.462	0.023
59.625	1.5494	135	1.2	Hydrogen	1.5473	0.1	(16,0,0)	59.715	0.091
59.901	1.5429	145	1.3	Natrophosphate	1.5419	1.1	(12,12,6)	59.942	0.041
61.301	1.511	120	1.1	Natrophosphate	1.5142	1.3	(16,8,4)	61.158	-0.143
62.740	1.4797	290	2.7	Hydrogen	1.4795	0.4	(12,10,6)	62.753	0.014
64.639	1.4408	202	1.8	Natrophosphate	1.441	3	(13,11,9)	64.629	-0.010
65.879	1.4166	199	1.8	Natrophosphate	1.4164	3.5	(16,8,8)	65.892	0.014
66.976	1.3961	112	1	Natrophosphate	1.3965	2.1	(15,13,1)	66.952	-0.024
68.197	1.374	135	1.2	Natrophosphate	1.3741	1.9	(20,2,2)	68.193	-0.003
68.882	1.362	118	1.1	Natrophosphate	1.3608	2.5	(20,4,0)	68.952	0.070
73.383	1.2892	181	1.7	Natrophosphate	1.2885	4.7	(20,8,0)	73.429	0.046
75.902	1.2525	165	1.5	Natrophosphate	1.2526	1.8	(14,14,10)	75.9	-0.002
80.619	1.1907	104	1	Hydrogen	1.1911	0.1	(20,4,4)	80.59	-0.029

Phase Analysis - S16R000254 (Settled Solids)

Natrophosphate was identified as the only major phase in the diffraction data (see Figure 4 and Table 6). Gibbsite and iron carbonate hydroxide were identified as minor phases contributing to the pattern while the aluminum/silicon oxide phase was identified as a barely detectable phase. No peaks remained unidentified in the pattern.

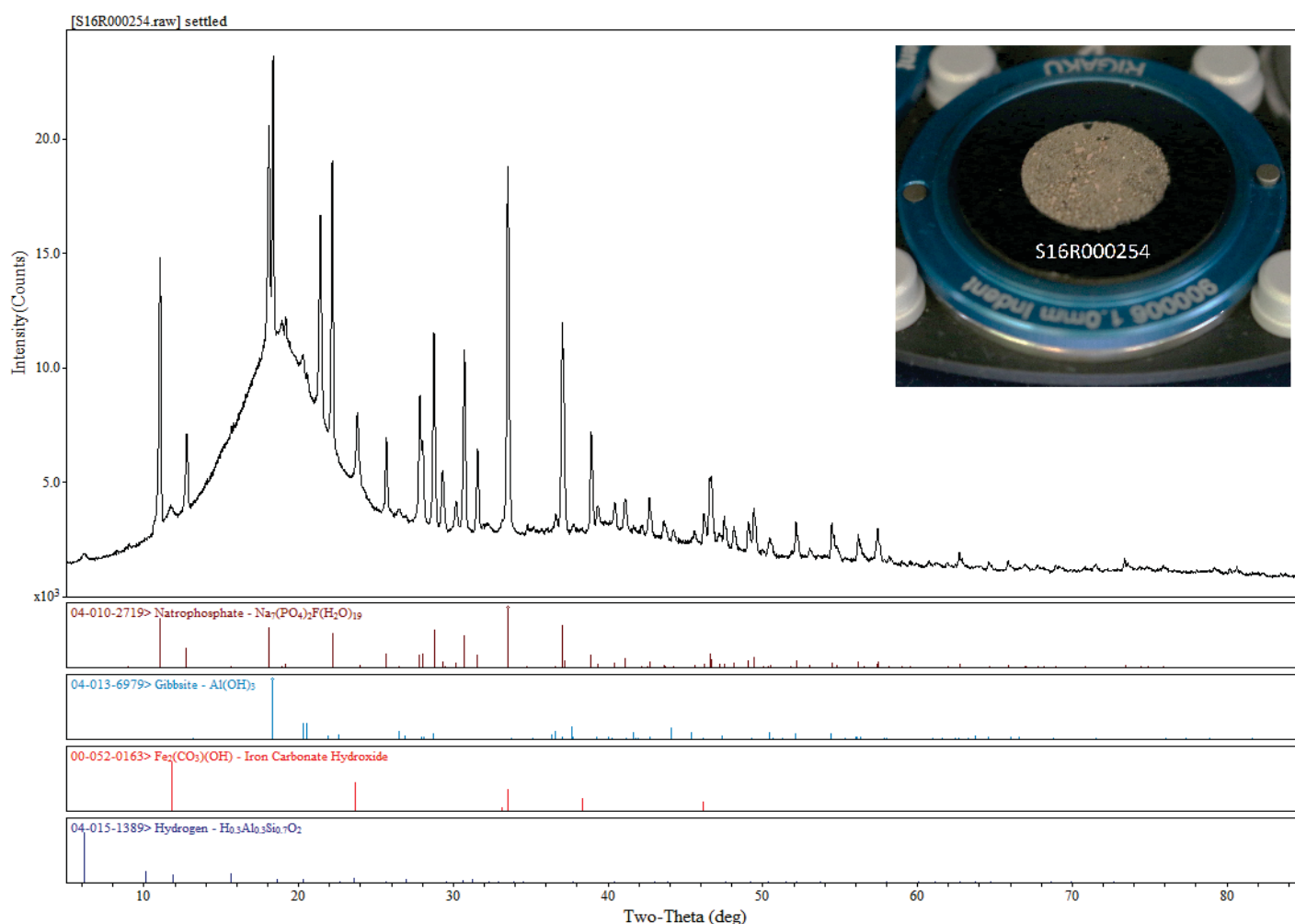


Figure 4. Phase Analysis Results for S16R000254.

Table 6. Phase Analysis Results for S16R000254.

2-Theta	d(Å)	Height	Height%	Phase ID	d(Å)	I%	(h k l)	2-Theta	Delta
6.161	14.3349	375	2.3	Hydrogen	14.2929	100	(1 1 1)	6.179	0.018
11.080	7.9788	11966	74.5	Natrophosphate	8.0122	87.8	(2 2 2)	11.034	-0.046
11.781	7.506	838	5.2	Fe2(CO3)(OH)	7.497	100	(0 0 3)	11.795	0.014
12.802	6.9094	3368	21	Natrophosphate	6.9388	32.7	(4 0 0)	12.747	-0.054
15.682	5.6462	413	2.6	Natrophosphate	5.6655	2.4	(4 2 2)	15.629	-0.054
18.118	4.8923	9414	58.6	Natrophosphate	4.9064	64.7	(4 4 0)	18.065	-0.053
18.397	4.8187	12217	76.1	Gibbsite	4.8477	100	(0 0 2)	18.286	-0.111
18.979	4.6721	670	4.2	Natrophosphate	4.6915	1.8	(5 3 1)	18.901	-0.079
19.218	4.6146	984	6.1	Natrophosphate	4.6258	6.4	(4 4 2)	19.171	-0.047
20.340	4.3626	994	6.2	Gibbsite	4.3731	37.8	(1 1 0)	20.291	-0.05
20.600	4.3081	694	4.3	Gibbsite	4.3238	18.3	(2 0 0)	20.524	-0.076
21.458	4.1377	9041	56.3	Hydrogen	4.126	0.1	(4 4 2)	21.52	0.061
22.219	3.9978	12562	78.2	Natrophosphate	4.0061	56.4	(4 4 4)	22.172	-0.047
23.840	3.7294	3369	21	Natrophosphate	3.7089	4.1	(6 4 2)	23.974	0.134
25.719	3.461	3457	21.5	Hydrogen	3.4665	0.9	(5 5 1)	25.678	-0.042
26.578	3.3511	617	3.8	Gibbsite	3.362	6	(-2 0 2)	26.49	-0.088
27.000	3.2996	440	2.7	Gibbsite	3.2924	0.4	(2 1 0)	27.061	0.06
27.879	3.1976	5791	36.1	Natrophosphate	3.2049	20.4	(7 5 1)	27.815	-0.065
28.782	3.0993	8585	53.5	Natrophosphate	3.1031	62	(8 4 0)	28.746	-0.036
29.341	3.0415	2573	16	Natrophosphate	3.0465	9.6	(7 5 3)	29.292	-0.049
30.202	2.9567	1263	7.9	Natrophosphate	2.9587	7.3	(6 6 4)	30.182	-0.02
30.741	2.9061	7881	49.1	Natrophosphate	2.9095	52.2	(9 3 1)	30.704	-0.037
31.601	2.829	3615	22.5	Gibbsite	2.8268	0.1	(-3 0 1)	31.626	0.025
32.179	2.7794	413	2.6	Hydrogen	2.7678	1.1	(8 4 0)	32.318	0.139
33.561	2.6681	16055	100	Natrophosphate	2.6707	100	(10,2,2)	33.527	-0.034
34.839	2.5731	444	2.8	Natrophosphate	2.577	2	(8 6 4)	34.785	-0.054
35.220	2.5461	329	2.1	Gibbsite	2.5506	0.1	(1 1 3)	35.156	-0.064
35.756	2.5092	217	1.4	Gibbsite	2.5075	0.1	(3 1 0)	35.781	0.025
36.137	2.4836	262	1.6	Hydrogen	2.4881	0.2	(9 3 3)	36.07	-0.067
36.660	2.4493	870	5.4	Gibbsite	2.4521	13.1	(0 2 1)	36.617	-0.043
37.099	2.4213	9206	57.3	Gibbsite	2.4238	3.1	(0 0 4)	37.06	-0.04
37.819	2.3769	366	2.3	Natrophosphate	2.38	1.1	(10,6,0)	37.769	-0.051
38.356	2.3448	228	1.4	Natrophosphate	2.3457	0.8	(10,6,2)	38.341	-0.015
38.943	2.3109	4390	27.3	Natrophosphate	2.3129	19.9	(12,0,0)	38.907	-0.036
39.380	2.2862	1156	7.2	Natrophosphate	2.2892	5.2	(11,5,1)	39.327	-0.053
39.859	2.2598	543	3.4	Hydrogen	2.2599	0.1	(10,4,2)	39.858	-0.001
40.443	2.2285	1377	8.6	Natrophosphate	2.2293	7.7	(9 7 5)	40.428	-0.015
41.121	2.1933	1564	9.7	Natrophosphate	2.1942	16.1	(12,4,0)	41.104	-0.017
41.680	2.1652	423	2.6	Gibbsite	2.1659	9.3	(3 1 2)	41.667	-0.013
42.256	2.137	478	3	Natrophosphate	2.1413	2.4	(10,8,2)	42.167	-0.09
42.719	2.1149	1732	10.8	Gibbsite	2.1148	0.1	(2 2 1)	42.721	0.002
43.640	2.0724	782	4.9	Gibbsite	2.0718	0.4	(3 0 3)	43.653	0.013
44.278	2.044	483	3	Natrophosphate	2.0461	2.4	(12,6,2)	44.23	-0.048
45.619	1.987	567	3.5	Natrophosphate	1.9876	3.8	(13,5,1)	45.605	-0.015
46.206	1.9631	1384	8.6	Natrophosphate	1.9626	6.9	(10,10,0)	46.219	0.013

2-Theta	d(Å)	Height	Height%	Phase ID	d(Å)	I%	(h k l)	2-Theta	Delta
46.718	1.9428	3055	19	Natrophosphate	1.9432	12.6	(14,2,2)	46.706	-0.011
47.239	1.9225	630	3.9	Natrophosphate	1.9245	5.2	(12,8,0)	47.19	-0.05
47.559	1.9104	1437	8.9	Natrophosphate	1.9107	6.7	(11,9,3)	47.549	-0.01
48.161	1.8879	1051	6.5	Gibbsite	1.8884	0.5	(-3 2 1)	48.147	-0.014
49.118	1.8533	1347	8.4	Natrophosphate	1.8545	11.1	(12,8,4)	49.086	-0.032
49.460	1.8413	1969	12.3	Natrophosphate	1.8422	17.7	(13,7,3)	49.435	-0.025
50.016	1.8221	191	1.2	Natrophosphate	1.8222	1.9	(14,6,0)	50.014	-0.002
50.482	1.8064	753	4.7	Natrophosphate	1.8067	4.1	(14,6,2)	50.473	-0.009
51.898	1.7604	277	1.7	Natrophosphate	1.7624	2.1	(12,10,2)	51.833	-0.065
52.183	1.7514	1548	9.6	Gibbsite	1.7517	11.9	(0 2 4)	52.174	-0.009
53.080	1.7239	478	3	Natrophosphate	1.7246	3.8	(13,9,3)	53.058	-0.022
53.622	1.7078	203	1.3	Natrophosphate	1.7082	0.8	(16,2,2)	53.608	-0.014
54.079	1.6944	212	1.3	Natrophosphate	1.6954	0.6	(14,6,6)	54.045	-0.034
54.502	1.6823	1638	10.2	Natrophosphate	1.6829	8.6	(16,4,0)	54.48	-0.021
54.858	1.6722	547	3.4	Hydrogen	1.6729	0.1	(11,7,7)	54.834	-0.023
55.344	1.6587	160	1	Natrophosphate	1.6587	0.6	(12,10,6)	55.343	-0.001
56.203	1.6353	1204	7.5	Natrophosphate	1.6355	10.3	(12,12,0)	56.197	-0.006
57.461	1.6025	1502	9.4	Natrophosphate	1.6024	8.9	(14,10,2)	57.462	0.001
58.237	1.583	280	1.7	Natrophosphate	1.5841	1.8	(15,9,1)	58.193	-0.044
59.030	1.5636	184	1.1	Gibbsite	1.5636	0.2	(-2 3 1)	59.028	-0.002
59.554	1.5511	186	1.2	Natrophosphate	1.5516	1.7	(16,8,0)	59.533	-0.021
60.779	1.5227	243	1.5	Natrophosphate	1.5233	1.1	(18,2,2)	60.755	-0.024
61.279	1.5115	179	1.1	Gibbsite	1.5116	0.3	(-2 3 2)	61.275	-0.004
61.941	1.4969	189	1.2	Gibbsite	1.4973	0.5	(1 1 6)	61.923	-0.018
62.760	1.4793	694	4.3	Natrophosphate	1.4794	5.4	(12,12,8)	62.758	-0.001
64.042	1.4528	139	0.9	Gibbsite	1.4517	0.2	(-3 3 1)	64.094	0.052
64.639	1.4408	326	2	Natrophosphate	1.441	3	(13,11,9)	64.629	-0.01
65.882	1.4166	402	2.5	Natrophosphate	1.4164	3.5	(16,8,8)	65.892	0.011
66.981	1.396	289	1.8	Natrophosphate	1.3965	2.1	(15,13,1)	66.952	-0.029
67.784	1.3814	250	1.6	Natrophosphate	1.3809	1.7	(16,12,2)	67.813	0.029
68.944	1.3609	262	1.6	Natrophosphate	1.3608	2.5	(20,4,0)	68.952	0.008
69.199	1.3565	193	1.2	Natrophosphate	1.3559	1	(15,13,5)	69.235	0.036
70.858	1.3288	208	1.3	Hydrogen	1.329	0.1	(17,7,3)	70.847	-0.011
71.201	1.3232	137	0.9	Natrophosphate	1.3232	1	(20,6,2)	71.205	0.004
71.579	1.3172	338	2.1	Gibbsite	1.3173	2.6	(3 1 6)	71.574	-0.005
73.438	1.2884	567	3.5	Natrophosphate	1.2885	4.7	(20,8,0)	73.429	-0.009
74.384	1.2743	247	1.5	Natrophosphate	1.2735	1.6	(21,5,3)	74.439	0.055
74.861	1.2673	234	1.5	Natrophosphate	1.2668	1.7	(20,8,4)	74.896	0.035
75.902	1.2525	292	1.8	Natrophosphate	1.2526	1.8	(14,14,10)	75.9	-0.002
76.639	1.2423	105	0.7	Gibbsite	1.2417	0.2	(1 4 1)	76.685	0.046
79.202	1.2084	230	1.4	Gibbsite	1.2086	0.5	(5 3 0)	79.187	-0.016
80.220	1.1956	206	1.3	Gibbsite	1.1963	1	(-5 1 6)	80.167	-0.053
80.680	1.19	306	1.9	Gibbsite	1.1895	0.4	(-5 3 2)	80.721	0.041
80.940	1.1868	121	0.8	Hydrogen	1.187	0.2	(17,11,5)	80.927	-0.013

References

ATS-LT-161-104, as revised, "SEM Sample Preparation Procedure," Washington River Protection Solutions LLC 222-S Laboratory, Richland, Washington.

ATS-LT-507-103, as revised, "222-S Laboratory X-Ray Diffractometry (XRD) Using the Rigaku MiniFlexII," Washington River Protection Solutions LLC 222-S Laboratory, Richland, Washington.

RPP-RPT-59964, Rev 0

Calculation Checklist

Calculation Title/Subject: Workbooks associated with RPP-RPT-59964, Investigation of Tank 241-AN-101 Floating Solids

Scope of Review: Entire set of workbooks attached to report in SPF.

Engineer/Analyst: Huel Mezmarich *Huel Mezmarich* Date: 7/10/17

Organization Manager: Gary Cooke *Gary A. Cooke* Date: 7/10/17

Yes No* NA*

- | | | | | |
|-------------------------------------|--------------------------|-------------------------------------|----|---|
| ☒ | ☐ | ☐ | a. | The objective/purpose of the calculation is clearly stated and the problem is completely defined by the purpose statement. |
| ☒ | ☐ | ☐ | b. | Analytical and technical approaches and results are reasonable and appropriate. |
| ☒ | ☐ | ☐ | c. | Input data are adequately described, referenced to their source, and checked for consistency with original source information. |
| ☒ | ☐ | ☐ | d. | Necessary assumptions are reasonable, explicitly stated, and supported. Assumptions requiring verification prior to use are clearly stated and identified/tracked using TBD/HOLD numbers. |
| ☒ | ☐ | ☐ | e. | For both qualitative and quantitative data, uncertainties are recognized and discussed and the data is presented in a manner to minimize design interpretations. |
| ☒ | ☐ | ☐ | f. | Mathematical derivations were checked, including dimensional consistency of results. |
| ☒ | ☐ | ☐ | g. | Calculations are sufficiently detailed such that a technically qualified person can understand the analysis without requiring outside information. |
| ☐ | ☐ | ☒ | h. | Hand and MathCAD® calculations were verified, including review that correct input data are used, formulae correctly interpret intended expressions, correct units are used, and results are reasonable and appropriate. |

No Hand or MathCAD calculations were used.

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|--------------------------|--------------------------|-------------------------------------|----|---|
| ☐ | ☐ | ☒ | i. | Software applications used are identified by the program name and version/release number as required by Attachment A (Section 7, Use of Computer Software). |
|--------------------------|--------------------------|-------------------------------------|----|---|

The only software used was the Hanford site standard of Microsoft Excel.

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|-------------------------------------|--------------------------|-------------------------------------|----|--|
| ☒ | ☐ | ☐ | j. | Software input data is identified and/or attached/included, the input data is correct, and consistent with the calculation document. |
| ☐ | ☐ | ☒ | k. | Software output is consistent with the input and with the results reported in the calculation document. |

These workbooks are not software.

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|--------------------------|--------------------------|-------------------------------------|----|--|
| ☐ | ☐ | ☒ | l. | Software verification and validation are addressed adequately in accordance with TFC-BSM-IRM_HS-C-01. Software verification documentation, (typically the Software Management Plan or Test Report), is included in the calculation document, or a reference is provided as required by Attachment A (Section 7, Use of Computer Software). |
|--------------------------|--------------------------|-------------------------------------|----|--|

These workbooks are not software.

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|-------------------------------------|--------------------------|-------------------------------------|----|---|
| ☒ | ☐ | ☐ | m. | Software verification show that software produces correct solution for the encoded mathematical model within defined limits for each parameter employed and the software is used within its limits. |
| ☒ | ☐ | ☐ | n. | The encoded mathematical model (method), produces a valid solution to the physical problem associated with the particular application (i.e., the methodology used is applicable to the problem being solved). |
| ☐ | ☐ | ☒ | o. | Multiple-Use spreadsheets used in the calculation are identified, verified, and documented in accordance with TFC-ENG-DESIGN-C-32. Reference to the corresponding Software Management Plan or Spreadsheet Verification Form (for legacy spreadsheets) is included in calculation as required by Attachment A (Section 7, Use of Computer Software). |

These workbooks are single use spreadsheets.

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|-------------------------------------|--------------------------|--------------------------|----|---|
| ☒ | ☐ | ☐ | p. | Single-Use spreadsheets used in the calculation are identified, verified, and documented as part of the calculation or other technical document as prescribed in TFC-ENG-DESIGN-C-10. |
| ☒ | ☐ | ☐ | q. | Data or results presented in tables and graphs have been checked against original source. |
| ☒ | ☐ | ☐ | r. | The number of significant digits is appropriate and consistent. |
| ☒ | ☐ | ☐ | s. | Limits/criteria/guidelines applied to the analysis results are appropriate and referenced. Limits/criteria/guidelines were checked against references. |
| ☒ | ☐ | ☐ | t. | Conclusions are consistent with analytical results and applicable limits. |

* If less than the entire calculation was checked, the scope of the check should be discussed. If any blocks are checked "No" or "NA", an explanation must be provided here or attached.

- ☒ ☐ ☐ u. Results and conclusions address all points in the purpose.
- ☒ ☐ ☐ v. Referenced documents are retrievable or otherwise available and the version or revision of each reference is cited.
- ☒ ☐ ☐ w. The calculation was prepared in accordance with Attachment A, "Calculation Format and Preparation Instructions," of TFC-ENG-DESIGN-C-10.
- ☒ ☐ ☐ x. Impacts on requirements have been assessed and change documentation initiated to incorporate revisions to affected documents, as appropriate.
- ☒ ☐ ☐ y. All checker comments have been dispositioned.
- ☒ ☐ ☐ z. The design media matches the calculations.

Doug Kraft



7/10/17

Checker (printed name and signature)

Date

INFORMATION CLEARANCE REVIEW AND RELEASE APPROVAL

Part I: Background Information

Title: Investigation of Tank 241-AN-101 Floating Solids	Information Category: ☐ Abstract ☐ Journal Article ☐ Summary ☐ Internet ☐ Visual Aid ☐ Software ☐ Full Paper ☒ Report ☐ Other _____
Publish to OSTI? ☒ Yes ☐ No	
Trademark/Copyright "Right to Use" Information or Permission Documentation	
Yes NA ☐ ☒	
Document Number: RPP-RPT-59964 Revision 0	Date: August 2017 ^{JRR} 10/30/2017
Author: Meznarich, Huei K	

Part II: External/Public Presentation Information

Conference Name: NA	
Sponsoring Organization(s): WRPS	
Date of Conference:	Conference Location:
Will Material be Handed Out? ☐ Yes ☒ No	Will Information be Published? ☐ Yes ☒ No <i>(If Yes, attach copy of Conference format instructions/guidance.)</i>

Part III: WRPS Document Originator Checklist

Description	Yes	N/A	Print/Sign/Date
Information Product meets requirements in TFC-BSM-AD-C-01?	☐	☒	
Document Release Criteria in TFC-ENG-DESIGN-C-25 completed? (Attach checklist)	☐	☒	
If product contains pictures, safety review completed?	☐	☒	

Part IV: WRPS Internal Review

Function	Organization	Date	Print Name/Signature/Date
Subject Matter Expert	WRPS		Meznarich, Huei K Approved via att. IDMS data file.
Responsible Manager	WRPS		Cooke, Gary A Approved via att. IDMS data file.
Other:			

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WRPS Office of Chief Counsel	☒	☐	Approved via att. IDMS data file.
DOE – ORP Public Affairs/Communications	☒	☐	Approved via att. IDMS data file.
Other: ORP SME	☒	☐	Approved via att. IDMS data file.
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Comments Required for WRPS-Indicate Purpose of Document:

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APPROVED
By Julia Raymer at 8:30 am, Oct 30, 2017**Approved for Public Release;
Further Dissemination Unlimited****Information Release Station**Was/Is Information Product Approved for Release? ☒ Yes ☐ NoIf Yes, what is the Level of Releaser? ☒ Public/Unrestricted ☐ Other (Specify) _____

Date Information Product Stamped/Marked for Release: 10/30/2017

Was/Is Information Product Transferred to OSTI? ☒ Yes ☐ No**Forward Copies of Completed Form to WRPS Originator**

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- <workflow name="(JRR) RPP-RPT-59964-00" id="215252678">
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  <comments>Please approve RPP-RPT-59964, Rev. 0, for public release. POC:
    Huei Meznarich (509) 373-7492 Thank you, Julia Raymer (509) 373-
    0230</comments>
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