Petition to Amend
40 C.F.R. § 261.4(b)(6)(ii) to Specifically Exclude Trivalent Chromium-Bearing Waste Streams From Regulation as Hazardous Waste
March 8, 2017

Pursuant to section 7004(a) of the Resource Conservation and Recovery Act ("RCRA"), 42 U.S.C. § 6974(a), and 40 C.F.R. § 260.20(a), NSK-AKS Precision Ball Company (NSK/AKS) submits this Petition to amend 40 C.F.R. § 261.4(b)(6)(ii) to add certain chrome-bearing waste streams generated by NSK/AKS at its Clarinda, Iowa facility to the list of specific wastes which meet the standard in 40 C.F.R. § 261.4(b)(6)(i)(A), (B) and (C) and which are therefore excluded from regulation as hazardous waste. NSK/AKS submits this Petition at the invitation of the United States Environmental Protection Agency ("EPA") as stated in its October 30, 1980 Federal Register notice adding 40 C.F.R. § 261.4(b)(6).

ITEM 1: PETITIONER'S NAME AND ADDRESS

Name of Petitioner:

NSK/AKS Precision Ball Company
1100A North First Street
Clarinda, Iowa 51632
Telephone: (712) 542-6515
RCRA ID No.: IAR000518720

People to contact for additional information pertaining to this Petition:

Mr. Rhett Nason
Environmental Health and Safety Coordinator
Address: Same as above
Telephone: (712) 542-6515 ext. 6473
e-mail: nasonr@aksball-us.com

Facility Responsible for generating petitioned waste:

Same as above

Location of Petitioned waste:

Same as above

ITEM 2: PETITIONER'S INTEREST IN PROPOSED ACTION

NSK/AKS seeks an amendment to 40 C.F.R. § 261.4(b)(6)(ii) to specifically exclude from hazardous waste regulation two grinding swarf chrome-bearing waste streams generated by NSK/AKS at its Clarinda, Iowa facility. NSK/AKS manufactures steel balls of various sizes at this facility for use in ball bearing assemblies. These steel balls are manufactured from high carbon chromium bearing steel. NSK/AKS's manufacturing processes generate two distinct grinding swarf waste streams referred to in this Petition individually as "Grind Swarf" and "L-1 Swarf," and collectively as the "Petitioned Waste." These waste streams and their generating processes are described in greater detail in Item 4 Section B of this Petition.

NSK/AKS has contracted testing laboratories to analyze the Grind Swarf and the L-1 Swarf to characterize them for disposal. These waste streams contain steel fines and hydrocarbon coolant, rendering the streams an "oily waste" under current waste regulations. Historic analytical results have, on occasion, exceeded the 5.0 mg/L TCLP limit for chromium (but exhibits no other hazardous characteristic) and, accordingly, NSK/AKS has managed these streams as a characteristic hazardous waste. During a 14 month period from December 2014 through January 2016, the cost for disposal of this material as a characteristic hazardous waste due solely to TCLP-Cr exceedances was $208,000.

The chromium contained in the raw materials, however, does not exist as hexavalent chromium, and until now, NSK/AKS had not previously attempted to speciate the chromium in the Petitioned Waste to determine whether chromium exists as trivalent (Cr III) or hexavalent (Cr VI). Recent advancements in chromium speciation analytical techniques have allowed NSK/AKS to determine the Grind Swarf and the L-1 Swarf contain exclusively, or nearly exclusively, trivalent chromium (Cr III). Based on the data generated for this Petition, the two grinding swarfs discussed herein qualify for exclusion under 40 C.F.R. § 261.4(b)(6) Trivalent Chromium Wastes.

ITEM 3: DESCRIPTION OF PROPOSED ACTION

Subparagraph (i) of 40 C.F.R. § 261.4(b)(6) provides that the following chrome-bearing solid wastes are excluded from regulation as hazardous waste:

> Wastes which fail the test for the Toxicity Characteristic because chromium is present or are listed in subpart D due to the presence of chromium, which do not fail the test for the Toxicity Characteristic for any other constituent or are not listed due to the presence of any other constituent, and which do not fail the test for any other characteristic, if it is shown by a waste generator or by waste generators that:
>
> (A) The chromium in the waste is exclusively (or nearly exclusively) trivalent chromium; and

(B) The waste is generated from an industrial process which uses trivalent chromium exclusively (or nearly exclusively) and the process does not generate hexavalent chromium; and

(C) The waste is typically and frequently managed in non-oxidizing environments.

Subparagraph (ii) of 40 C.F.R. § 261.4(b)(6) lists eight specific waste streams which the United States Environmental Protection Agency ("EPA") has determined meet the above-listed standard. EPA, however, expressly stated in the Federal Register preamble that the exclusion afforded in § 261.4(b)(6) was not limited to these eight listed waste streams, and invited other persons to petition EPA for a rulemaking to add other wastes:

> Other wastes also may meet the temporary exclusion factors and will be excluded if a proper showing is made to the Agency. ***Eligibility for a temporary exclusion may be requested by filing a petition for rulemaking under § 260.20(a). Petitions may be filed by individual generators, or on an industry-wide basis.*** Each petition must demonstrate why the wastes in question meet the temporary exclusion standards. Petitions will then be processed by the Agency in accordance with the procedures set forth in § 260.20(c)-(e). 45 Fed. Reg. 72035, 72036 (Oct. 30, 1980) (emphasis added).

As documented in this Petition, the Petitioned Waste meets the standard set forth in 40 C.F.R. § 261.4(b)(6). Accordingly, NSK/AKS requests that EPA amend that regulation to add a new subparagraph (ii)(I) that expressly lists the Petitioned Wastes as excluded under that regulation.

ITEM 4: STATEMENT OF NEED & JUSTIFICATION FOR ACTION

A. Statement of Need for Amendment to 40 C.F.R. § 261.4(b)(6)

NSK/AKS's primary need for the requested amendment to 40 C.F.R. § 261.4(b)(6)(ii) is to ensure that the Petitioned Wastes are properly managed as non-hazardous waste in accordance with applicable regulations, and to prevent the mismanagement of these waste streams as hazardous waste. Such mismanagement can result in the waste streams being subjected to unnecessary and costly treatment, storage and disposal requirements, which reduces capacity for the management of actual hazardous wastes. Further, an amendment is 40 C.F.R. § 261.4(b)(6)(ii) to specifically list the Petitioned Wastes as excluded is necessary to document to waste service providers that the Petitioned Wastes do in fact meet the standard for exclusion under 40 C.F.R. § 261.4(b)(6). Waste service providers do not have the expertise necessary to review the complex chromium speciation demonstration contained in this Petition, and are therefore are unwilling to manage the Petitioned Wastes as excluded waste in the absence of the requested EPA action. During a 14 month period from December 2014 through January

2016, NSK/ASK needlessly incurred $208,000 in excess disposal costs to manage this material as TCLP-Cr, hazardous even though it contains exclusively trivalent chromium.

B. Statement of Justification for Amendment to 40 C.F.R. § 261.4(b)(6)

The discussion in this section of the Petition presents NSK/AKS's justification for the requested amendment to 40 C.F.R. § 261.4(b)(6)(ii). First, NSK/AKS's manufacturing process is described in detail, including the waste generation process for the Grind Swarf and the L-1 Swarf. Second, NSK/AKS's procedures for sampling and analyzing the Petitioned Waste for purposes of this Petition is discussed. Finally, the analytical results demonstrating that the Petitioned waste meets the standard of 40 C.F.R. § 261.4(b)(6)(i) are summarized.

1. NSK/AKS Steel Ball Manufacturing Process and Waste Generation Description

a. Manufacturing Processes

NSK/AKS produces high quality steel balls that are utilized in fabricating ball bearing assemblies. NSK/AKS forms steel balls from coil high carbon steel stock using a cold heading process and then through a series of grinding and lapping steps, the final size and surface finish is produced. This process consists of seven steps, described as follows (A detailed flow diagram describing the steel ball process can be found in Appendix 4):

Step 1 - Heading Machine: cuts steel coil into a billet of desired length and presses the billet into a round shape;
Step 2 - Flashing: removes the small amount of metal that remains from heading process;
Step 3 - Retort Heat Treat: increases steel ball hardness using heat and air;
Step 4 - Grind Process ("Grind"): hardened steel ball is introduced into the Grind process where the hardened steel balls are ground to the desired round shape and size between a cast iron plate and a silicon carbide plate. Circulating hydrocarbon based coolant is used to lubricate and cool the steel balls during the grinding process, as well as to carry the grinding swarf away from the plates and back to the Grind Central System, where swarf is separated from the coolant. ***This step generates the Grind Swarf.***
Step 5 - Off-line Wash: grinding residue from the Grind process is washed off the steel ball;
Step 6 - Peening: steel balls are further abraded by tumbling balls into one another. No additives are used in this step.

Step 7 - Lapping Process ("L-1"): final grinding step polishes the steel balls between a cast iron plate and a polishing plate. Circulating hydrocarbon based coolant is used to lubricate and cool the steel balls during the lapping process, as well as to carry the grinding swarf away from the plates and back to the L-1 Central System, where swarf is separated from the coolant. ***This step generates the L-1 Swarf.***

b. Raw Materials

The materials and processes used by NSK/AKS are maintained to close tolerances in order to predictably and consistently produce a high quality product. The precision required to attain these goals dictate that the raw materials and equipment used during the manufacturing process must be closely controlled, with minimal differences between raw materials used and the process variables involved in manufacturing the steel balls. The primary raw materials used in ball manufacturing include:

- High carbon steel coil stock
- Hydrocarbon based coolant and additives
- Abrasive grinding wheel materials
- Equipment Hydraulic Oil

NSK/AKS uses three primary suppliers for its steel raw material, each meeting the same specification. The composition specifications for the high carbon chromium bearing steel are as follows (Steel Safety Data Sheets and raw material certifications are provided in Appendix 3):

Iron:	84 – 100 (wt. %)
Carbon:	0.95 –1.1 (wt. %)
Chromium:	0 – 5 (wt. %)
Nickel:	0 – 5 (wt. %)
Manganese:	0 – 3 (wt. %)
Molybdenum:	0 – 3 (wt. %)

Similarly, the "Grind" and "L-1" processes use identical coolant formulations to minimize process variability, including (SDSs can be found in Appendix 5):

- [redacted]

In addition to these coolants, the process equipment used to grind and lap the steel balls during production operates under hydraulic pressure and therefore hydraulic oil is present in these machines. Hydraulic oil is not intentionally used in the ball manufacturing process, however NSK/AKS anticipates coolant and hydraulic fluid has the potential to commingle, and therefore be present in the grinding swarf wastes.

The coolant, steel grinding swarf, and grinding wheel residues all combine to generate the Grind Swarf and L-1 Swarf. The Off-line Wash process utilizes a silicate based detergent. Wash residues that

remain on the steel balls, if any, are also incorporated into the swarf wastes. Wash solution wastes are collected separately and later combined with the grinding swarf wastes. No other waste is produced from the steel ball production process. The safety data sheets (SDSs) for the products used in the steel ball process can be found in Appendix 3.

c. Waste Description

The Grind Swarf and L-1 Swarf generated by these processes consist of gray, fine grain particles (steel and grinding wheel residues) in a matrix of medium brown oily liquid (coolant). The pictures below show the "Grind Swarf" and "L-1 Swarf" at their points of generation as they exit their respective collection/separation devices.

"Grind" Swarf Waste

"L-1" Swarf Waste

Both the Grind Swarf and the L-1 Swarf are collected in 55 gallon drums, which are shipped off-site for disposal. NSK/AKS monitors the combined quantities of Grind Swarf and L-1 Swarf generated monthly. Table 1 below describes the monthly and annual combined quantities of waste swarf generated by NSK/AKS at its Clarinda, Iowa facility.

Table 1: 2016 Annual Waste Swarf Generation

Process	Monthly Average Tons	Maximum Monthly Tons	Annual Average Tons	Estimated Maximum Annual Tons
Grind & L-1	24	50.7	288	355

2. Characterization of Petitioned Waste for Purposes of Exclusion

a. Waste Exclusion Petition Team

NSK/AKS has established a Waste Exclusion Petition Team consisting of NSK/AKS employees and contracted professional consulting and analytical services. Petitioned Waste samples were collected by Terry Kinman, a facilities engineering technician employed by NSK/AKS. Mr. Kinman collected samples as described in the SAP/QAPP. Oversight was provided by Rhett Nason, Technical Assistant Manager for the facility.

NSK/AKS has contracted with the following organization for environmental chemistry consulting and analytical testing services:

Ann Arbor Technical Services, Inc. (ATS)
290 South Wagner Road
Ann Arbor, Michigan 48103
Phone: 734-995-0995

All analytical data presented in this petition have been generated by ATS. The qualifications and responsibilities for NSK/AKS and ATS team members are provided in Appendix 2.

b. Sampling and Analysis Time Line

Weekly swarf samples were collected over a six week period in 2014, and 12 weekly samples over a 15 week period in 2016. Samples were collected at one week intervals from the same sample locations described in the Sampling and Analysis Plan/Quality Assurance Project Plan (SAP/QAPP) developed for this petition, found in Appendix 1. A total of 18 samples were collected from the Grind process and another 18 samples were collected from the L-1 process. The tables in Appendix 6 detail the sample identification and collection dates/times.

c. Petitioned Waste Sampling Methodology and Handling Procedures

The information gathering effort for this petition was conducted according to a formal SAP/QAPP. Development of the sampling plan for this waste incorporated a review of the process raw materials used (high grade carbon steel), grinding equipment consumed by the process (grinding wheels), and any other raw materials that have a potential to exist in the final waste material being sampled (coolant and hydraulic oil).

The Sampling and Analysis Plan (SAP/QAPP) for this petition was designed to evaluate a statistically significant number of samples from both the “Grind” and “L-1” waste streams so that the variability associated with production of each waste could be determined. Between October 14, 2014 and November 18, 2014, weekly grab samples were taken from the “Grind” and “L-1” sampling locations, described in the Process Flow Diagram in Appendix 4. Six samples from the “Grind” process

and six samples from the "L-1" process were collected and analyzed, providing an initial dataset to evaluate whether the hypothesis underlying this petition was correct. The initial testing confirmed that the chromium in TCLP extracts of the swarfs was exclusively, or nearly exclusively, Cr III, and not Cr VI. Follow-up testing was conducted in 2016.

Between May 3, 2016 and August 9, 2016, weekly grab samples were taken from the "Grind" and "L-1" sampling locations, described in the Process Flow Diagram in Appendix 4. In all, twelve samples were collected during this period from each location. The first five weekly "Grind" samples were composited for analysis, as were the first five weekly "L-1" samples (taken between May 3 and May 31, 2016). Thereafter, the weekly grab samples of "Grind" and "L-1" swarf were analyzed discretely, to provide information on waste composition variability.

Grab samples were taken at the "Grind" and "L-1" sample collection points by the NSK/AKS Sample Custodian using a dedicated steel knife. Using the steel knife, waste grinding swarf was scooped off the integrated steel tray used to guide the waste swarf into collection drums. See Figures 1 and 2 below for an illustration of this procedure.

Figure 1: "Grind" Swarf

Figure 2: Steel Sample Knife

Waste swarf was transferred from the sample knife to a clean, 250 mL poly sample container until the container was filled. Each sample container was labeled immediately after collection, indicating the location, time and date of collection, and type of sample. Each sample collected was a grab taken over a time span of 2 – 3 minutes in duration.

Samples were collected 1 week apart. Every two weeks the sample containers were packaged appropriately and shipped from the NSK/ASK facility to ATS. Samples were maintained at 4° C during storage at ATS. A Chain of Custody form was prepared and included with the samples during shipment. Upon receipt at ATS, the COC was used to check in the samples. A Sample Receipt Form (SRF) was prepared to describe the condition of the samples upon receipt. Inconsistencies between the sample

labels and the COC, if any, were documented on the SRF. If there were inconsistencies, a Corrective Action Form (CAF) was filled out to reconcile them. The SAP/QAPP prepared for this effort, found in Appendix 1, includes the requirements for sample handling and preparation.

d. Analytical Testing and Reporting

Swarf samples received at ATS were stored at 4° C, except during analysis. Sample preservation, containerization, and storage specifications are given in the SAP/QAPP Table 4. Prior to analysis, each swarf sample was homogenized by transferring the entire sample of the 250 mL poly bottle to a large aperture container, and then manually mixing the dense solids and viscous liquid oil phase thoroughly to visual homogeneity. This is an important preparation step, because of the density and viscosity of the phases, and rapid phase separation that occurs during sample storage.

Once homogenized, sub-samples were taken for the following analyses using the methods referenced:

- Oil Content (USEPA 9071B)
- TCLP Metals (USEPA 1311/3010A/6010C/7470A)
- TCLP Chromium Speciation (ATS Custom IC/ICP-MS)

Standard Operating Procedures (SOPs) for these analytical methods are given in the SAP/QAPP (Appendix 1).

e. Laboratory Data Reports

The analytical data generated to support this petition are presented in data reports found in Appendix 6. A summary of the total chromium, chromium VI, and chromium II & III results can be found in Table 2 below.

ATS prepared EPA Level 2 data reports for this project. These reports include key quality control information useful to the users of the data. An Electronic Data Deliverable and EPA Level 4 Data Validation Package (DVP) can also be provided upon request.

Table 2: Chromium Data Summary of TCLP Analyses: "Grind" & "L-1" Swarfs

Sample Name	Sample Date & Time	TCLP Leachability Results		
		Total Chromium	Chromium VI	Chromium II & III
		mg/L	mg/L	mg/L
Grind Sludge #G-01	10/14/2014; 12:30 PM	0.57	-	-
Grind Sludge #G-02	10/21/2014; 12:30 PM	0.77	-	-
Grind Sludge #G-3	10/28/2014; 12:20 PM	0.48	-	-
Grind Sludge #G-4	11/4/2014; 12:25 PM	0.51	-	-
Grind Sludge #G-5	11/11/2014; 12:35 PM	0.61	-	-
Grind Sludge #G-6	11/18/2014; 12:30 PM	0.85	-	-
Grind Sludge #G-01	5/3/2016; 12:30 PM	0.95 (Composite)	<0.02 (Composite)	0.83 (Composite)
Grind Sludge #G-02	5/10/2016; 1:00 PM			
Grind Sludge #G-03	5/17/2016; 12:30 PM			
Grind Sludge #G-04	5/24/2016; 1:00 PM			
Grind Sample	5/31/2016; 12:30 PM			
Grind Sample	6/7/2016; 12:15 PM	1.1	<0.02	0.83
Grind Sludge	6/14/2016; 12:00 PM	0.92	<0.02	0.70
Grind Sludge	6/21/2016; 12:00 PM	0.63	<0.02	0.48
Grind Sample	7/19/2016; 12:00 PM	0.60	<0.02	0.48
Grind Sample	7/26/2016; 12:00 PM	0.52	<0.02	0.46
Grind Sample	8/2/2016; 12:00 PM	0.88	<0.02	0.90
Grind Sample	8/9/2016; 12:00 PM	0.99	<0.02	1.0
L1 Sludge #L1-01	10/14/2014; 12:30 PM	1.0	-	-
L1 Sludge #L1-02	10/21/2014; 12:30 PM	0.1	-	-
L1 Sludge #L1-3	10/28/2014; 12:20 PM	0.70	-	-
L1 Sludge #L1-4	11/4/2014; 12:25 PM	0.92	-	-
L1 Sludge #L1-5	11/11/2014; 12:35 PM	0.48	-	-
L1 Sludge #L1-6	11/18/2014; 12:30 PM	3.6	-	-
L1 Sludge #L1-01	5/3/2016; 12:30 PM	4.4 (Composite)	<0.02 (Composite)	4.6 (Composite)
L1 Sludge #L1-02	5/10/2016; 1:00 PM			
L1 Sludge #L1-03	5/17/2016; 12:30 PM			
L1 Sludge #L1-04	5/24/2016; 1:00 PM			
L1 Sample	5/31/2016; 12:30 PM			
L1 Sample	6/7/2016; 12:15 PM	0.46	<0.02	0.40
L1 Sludge	6/14/2016; 12:00 PM	0.32	<0.02	0.33
L1 Sludge	6/21/2016; 12:00 PM	0.67	<0.02	0.63
L1 Sample	7/19/2016; 12:00 PM	0.21	<0.02	0.21
L1 Sample	7/26/2016; 12:00 PM	1.2	<0.02	0.99
L1 Sample	8/2/2016; 12:00 PM	0.65	<0.02	0.74
L1 Sample	8/9/2016; 12:00 PM	0.35	<0.02	0.42

3. Demonstration That the Petitioned Waste Meets the Standard for Exclusion Under 40 C.F.R. § 261.4(b)(6)

40 C.F.R. § 261.4(b)(6)(i): "Wastes which fail the test for the Toxicity Characteristic because chromium is present or are listed in subpart D due to the presence of chromium …"

- Both the Grind Swarf and the L-1 Swarf periodically exhibit the toxicity characteristic for chromium.
- In this Petition NSK/AKS presented TCLP data that shows chromium is consistently found in TCLP waste extracts of the Petitioned Wastes (see Table 2, and the summary table and laboratory data reports in Appendix 6).
- Although TCLP data generated specifically for this Petition indicate that the Petitioned Waste did not exhibit the hazardous characteristic for Chromium during the specific study period, other historical data demonstrate that the Petitioned Waste does exhibit this characteristic from time to time. The TCLP-Cr exceedances in these historic samples range from 5 to 8 mg/L (see summary table in Appendix 7).
- During a 14 month period from December 2014 through January 2016, NSK/ASK needlessly incurred $208,000 in excess disposal costs to manage this material as TCLP-Cr, even though it contains exclusively trivalent chromium.

40 C.F.R. § 261.4(b)(6)(i): "Wastes … which do not fail the test for the Toxicity Characteristic for any other constituent or are not listed due to the presence of any other constituent, and which do not fail the test for any other characteristic …"

- In this Petition NSK/AKS presented analytical test results for multiple samples showing the only constituent causing the waste to fail TCLP is chromium (see summary table and laboratory data reports in Appendix 6).
- Documentation (product bulletins and Safety Data Sheets) of all materials used in the process further supports the waste does not contain any other constituent that could cause the waste to fail for constituents other than chromium, since no other TCLP target analytes are contained in their formulations (see Appendices 3 and 5).
- In this Petition NSK/AKS presented information on the manufacturing process, including all raw materials, processing materials, and process controls that support the declaration that the resulting the Petitioned Wastes are not listed hazardous wastes.

40 C.F.R. § 261.4(b)(6)(i)(A): "The chromium in the waste is exclusively (or nearly exclusively) trivalent chromium …"

- In this Petition NSK/AKS presented chromium speciation analytical data that confirm the chromium in TCLP extracts is present exclusively as Cr II and Cr III, with no Cr VI detected in any of the sample TCLP extracts (see Table 2, and summary table and laboratory data reports in Appendix 6).

40 C.F.R. § 261.4(b)(6)(i)(B): "The waste is generated from an industrial process which uses trivalent chromium exclusively (or nearly exclusively) and the process does not generate hexavalent chromium …"

- In this Petition NSK/AKS presented information on the raw materials, processing materials, and process controls that demonstrate that they do not contain hexavalent chromium, and do not generate hexavalent chromium (see Appendices 3 - 6);
- The carbon steel raw material used is the product of a reductive steel-making process that yields alloy metals such as iron and chromium in the zero valent state;
- Steel ball production is done at in ambient air and at ambient temperatures. Raw steel balls are heat treated in ambient air, exposing the surface of the steel to oxygen at elevated temperatures which could produce surface oxides of the alloy metals.

40 C.F.R. § 261.4(b)(6)(i)(C): "The waste is typically and frequently managed in non-oxidizing environments."

- The presence of high concentrations of zero valent iron in the grinding swarf wastes serves as a reducing agent in the TCLP extraction, as acetic acid dissolves the Fe (0) to produce Fe II and free electrons at a pH of approximately 4.0. Chromium (0) is similarly dissolved by acetic acid to produce Cr II and Cr III, plus free electrons. Under these conditions any minor residues of Cr VI, if present, would be quickly reduced to Cr III;
- The Petitioned Waste will be disposed of in a municipal waste landfill where non-oxidizing conditions are typically found (See 45 Fed. Reg. 72036, citing Ham. R.A., et al, Background Study on the Development of a Standard Leaching Test).

ITEM 5: Certification Statement

For the foregoing reasons, NSK/AKS requests that EPA grant this Petition and amend 40 C.F.R. § 261.4(b)(6)(ii) to specifically exclude from hazardous waste regulation the Petitioned Waste generated by NSK/AKS at its Clarinda, Iowa facility.

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this demonstration and all attached documents, and that, based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the submitted information is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment.

For NSK-AKS Precision Ball Company:

By: _____

Its: _____

Date: _____

Appendix 1

___

SAP/QAPP

(Title Page & Table of Contents only)

SAMPLING AND ANALYSIS PLAN (SAP) & QUALITY ASSURANCE PROJECT PLAN (QAPP)

PETITION TO EXCLUDE TRIVALENT CHROMIUM BEARING WASTE STREAMS NSK/AKS PRECISION BEARINGS CLARINDA, IOWA

Prepared for:

The NSK/AKS Precision Ball Company
1100A North First Street
Clarinda, Iowa 51632

Prepared by:

Ann Arbor Technical Services, Inc.
290 South Wagner Road
Ann Arbor, Michigan 48103

January 31,2017

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APPENDIX C ATS SOPS: MERCURY BY COLD VAPOR ATOMIC ABSORPTION SPECTROSCOPY (WATER AND SOLID WASTE) (CVAAS)
APPENDIX D ATS SOP: TOTAL GREASE AND OIL
APPENDIX E ATS SOP: TOXICITY CHARACTERISTIC LEACHING PROCEDURE (TCLP)
APPENDIX F ATS SOP: CHROMIUM SPECIATION BY ION CHROMATOGRAPHY INDUCTIVELY COUPLED PLASMA MASS SPECTROMETRY (IC-ICP-MS)
APPENDIX G ATS SOPS: ACID DIGESTION OF OIL, AQUEOUS, OR SOLID SAMPLES AND EXTRACTS FOR ANALYSIS BY FAAS OR ICP-AES

ACRONYMS AND ABBREVIATIONS

ºC	degrees centigrade/celsius
%RSD	percent relative standard deviation
ASTM	American Society for Testing and Materials
ATS	Ann Arbor Technical Services, Inc.
APHA	American Public Health Association
ASAP	as soon as possible
CAS RN	Chemical Abstract Service Reporting Number
CFR	Code of Federal Regulations
CHMM	Certified Hazardous Materials Manager
CLs	control limits
COC	chain of custody
COI	constituent of interest
CR III	trivalent chromium
CR VI	hexavalent chromium
CSV	Continuing Standard Verification
CV	coefficient of variation
DQE	data quality evaluation
DQOs	data quality objectives
DVP	data validation package
EDD	electronic data deliverable
EPA	U. S. Environmental Protection Agency
EPQ	
EP Tox	Extraction Procedure Toxicity
Facility	NSK/AKS Precision Ball Company
g	gram
g/mL	grams per milliliter
GC	gas chromatograph, gas chromatography
GC/MS	gas chromatography and mass spectrometry
Grind	grinding process
H_2SO_4	sulfuric acid
HASP	Health and Safety Plan
HCl	hydrochloric acid
HNO_3	nitric acid
IC	ion chromatography
IC-ICP-MS	Ion chromatography inductively coupled plasma mass spectrometry
ICP	inductively coupled plasma
ICP-MS	inductively coupled plasma mass spectrometry
ICP-AES	inductively coupled plasma atomic emission spectroscopy
ICS	interference check sample
IDNR	Iowa Department of Natural Resources

IDL	instrument detection limit
IS	internal standards
L-1	lapping process
L	liter
LCS	laboratory control sample
LCSD	laboratory control sample duplicate
LD	laboratory duplicate
License	Hazardous Waste Management Facility Operating License
MDLs	method detection limits
µm	micrometer
mg/L	milligrams per liter
mL	milliliter
mm	millimeter
MS/MSD	matrix spike/matrix spike duplicate
NA	not applicable
NaOH	sodium hydroxide
NIST	National Institute of Standards and Technology
nm	nanometers
NSK/AKS	NSK/AKS Precision Ball Company
OSHA	Occupational Safety and Health Administration
oz	ounce
OWEP	Oily Waste Extraction Procedure
PARCC	precision, accuracy, representativeness, comparability, and completeness
PDF	portable document format
ppb	part per billion
ppm	part per million
ppq	part-per-quadrillion
ppt	part-per-trillion
PQL	practical quantitation limit
QA	quality assurance
QA/QC	quality assurance/quality control
QAPP	Quality Assurance Project Plan
QC	quality control
QL	quantitation limit
RCRA	Resource Conservation and Recovery Act
RF	response factor
RL	reporting limit
RPD	relative percent difference
SA	spike concentration added to the spiked sample
SAP	Sampling and Analysis Plan
SOPs	standard operating procedures
SQL	sample quantitation limit

SR	sample result (native)
SRF	sample receipt form
SSR	spiked sample result
SU	standard units
SVOC	semivolatile organic compound
TA	target analyte
TAL	target analyte list
TCLP	toxicity characteristic leaching procedure
TOC	total organic carbon
USEPA	United States Environmental Protection Agency
VOC	volatile organic compound

Appendix 2

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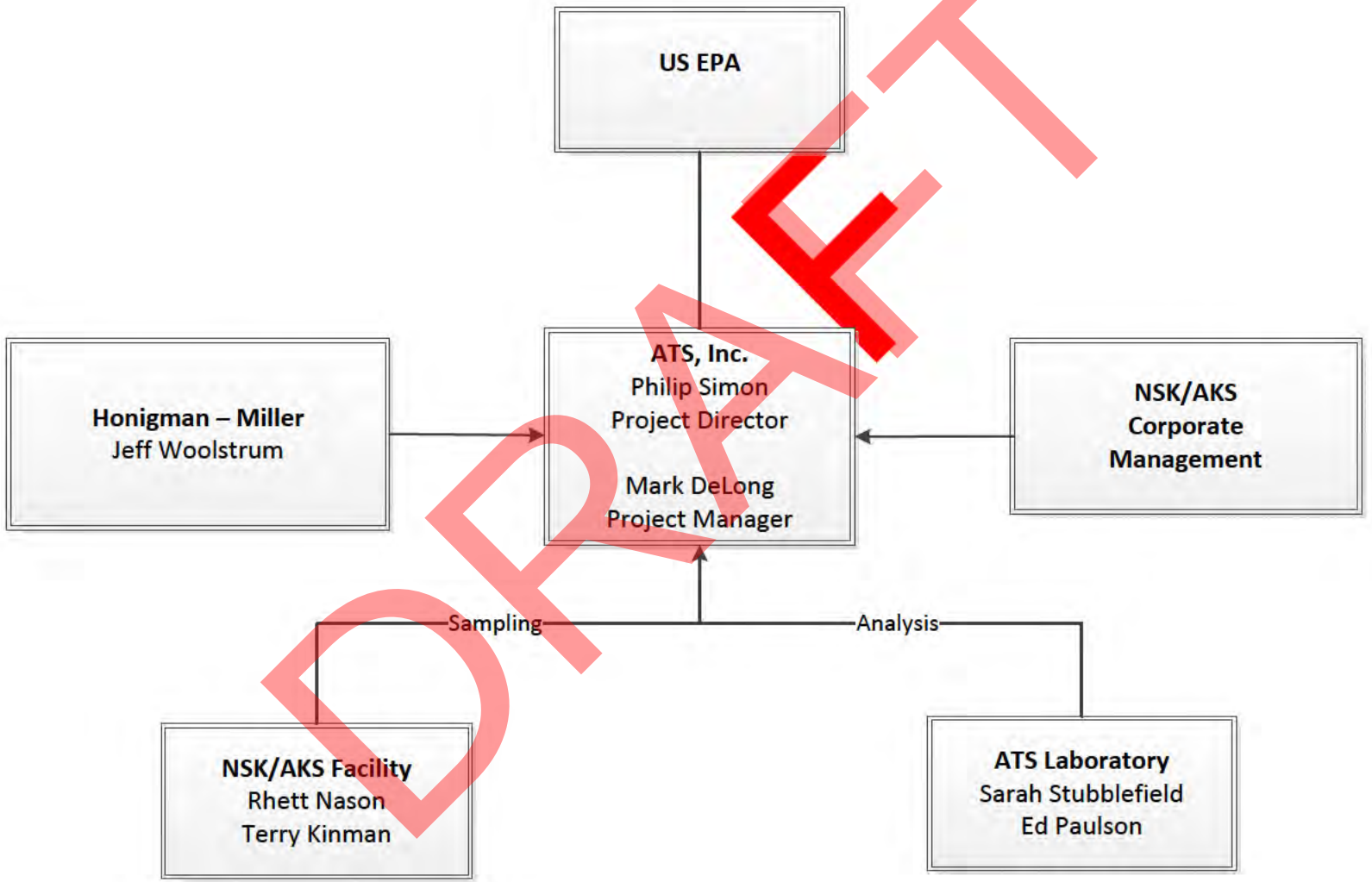
NSK/AKS & ATS Grinding Swarf Team

Responsibilities & Organization Chart

Figure 1
Grinding Swarf Team



Appendix 3

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High Carbon Steel Raw Materials

Composition Certifications & Safety Data Sheets

Revision

RECEIVED 3.21.11

[redacted]

Internal Ref. No. : 11－004

Material Safety Data Sheet

NSK-AKS Ltd.

Manufacture's name [redacted]

Date prepared ; Feb.18th.2011

1. Product Identification: High carbon chromium bearing steel

High carbon chromium bearing steel specified in the [redacted] material standard and equivalent grades.

2. Composition/information on Ingredients:

Pure / mixed material: Alloy steel

Chemical element and composition: As shown in Table 1

Table 1 (wt%)

	Fe (*2)	Cr (*1,*2)	Ni (*1,*2)	Mn (*1,*2)	Mo (*1,*2)
Contents	Bal.	0~5	0~5	0~3	0~3
CAS No.	7439-89-6	7440-47-3	7440-02-0	7439-96-5	7439-98-7

(*1) Designated as first-class chemical element in the [redacted]

[redacted] chemical element required to be reported of its use in the [redacted] Although, the product specified in this document is solid and stable at normal conditions, descriptions in the clause 3 should be referred.

Notes: (1) Contents of chemical element are within the range shown above, but will be different according to each grade.

(2) Chemical element other than listed in Table.1 might be contained in accordance with the application of each grade.

(3) Details are specified in the mill sheet.

3. Hazards identification:

Steel products in their solid state and under normal conditions do not present any harmful effect. However, appropriate measures to prevent injuries should be taken in following cases/conditions.

(1) In case of dust and fume are produced by processing (e.g. heating, melting, grinding etc.), measures for protecting faces and ventilation should be taken to avoid the chemical hazard. (e.g. fume of manganese compound causes acute and chronic health hazard if it is inhaled.) Guidelines provided by [redacted] and ACGIH should be referred.

(2) Collected dust and/or fume should be treated in accordance with its form and toxicity. (e.g. steel powder might be combustible/explosive.)

(3) When the metal is dissolved in solutions of pickling or de-scaling, measures should be taken to avoid contacting with the solutions or inhaling of the solutions.

(4) Pb, Te, Se contained in steels might be vaporized slightly during machining. Mechanical parts should be covered by hood while machining.

[redacted]

4. First-aid measures:

Basically, the material has no danger or hazardousness to cause situations that require first-aid measures, however in case of overexposure to dusts or fumes as described above, immediately remove them to fresh-air, wash off them with waters and get immediate medical attention if required.

5. Fire-fighting measures:

Incombustible. Any kind of extinguishers can be used in case of fire around products.

6. Accidental release measures:

Not applicable. High carbon chromium bearing steel is non-hazardous solid material.

7. Handling and storage:
(1) Pay special attention not to collapse, rolling and falling of bar products.
(2) There is no danger and toxicity stored under normal condition.

8. Exposure controls/personal protection: Not required.

9. Physical and chemical properties:

Appearance: Bar/Wire rod steel product (Solid)

Combustibility: Not flammable. Steel powder produced by grinding/machining might be combustible/explosive.

Melting point: over 1400 ℃

Density: 7 ~ 8g/cm^3

Chemical properties: Water-insoluble. Corrosion resistant to weak acid and alkaline. Low solubility to strong acid (Hydrochloric acid, Sulfuric-acid and alkaline at high temperature. Passive state film is formed by oxidizing acid

10. Stability and reactivity:

Stable under normal condition. Metallic compound might be formed by processing (e.g. heating, melting, grinding).

11. Toxicological information:

No specific information available on these products.

12. Ecological information:

No specific information available on these products.

13. Disposal consideration:

Recyclable as steel scrap.

14. Transport information:

No specific information available on these products.

15. Regulatory information:

[redacted] and [redacted] applied.

[redacted]

16. Other information

References;

(1) Database of hazardous materials ([redacted]Fire Department)

(2) Special research report of major 1000 data ([redacted])

(3) Metallic Alloys and Harmonization of Classification Criteria(OECD)

(4) Safety data sheet for chemical products (ISO11014-1)

(5) Recommended values provided by [redacted] and ACGIH

(6) Handbook of dangerous and hazardous material edited by the [redacted]Safety and Health Association.

Anyone using this information is solely responsible for the accuracy and applicability of this information to a particular use or situation.

[redacted]does not in any way suggest or guarantee the applicability, viability or use of this information to any person or for use in any situation.
The information in this document is complied from information maintained by [redacted] and the original documents are written [redacted] We are not responsible for inappropriate descriptions induced through [redacted]translation since the English translation is provided only for reference.

[redacted]

Issued June 17, 2002

MATERIAL SAFETY DATA SHEET

Section□□Product and Company Identification

Product Name: Rolled Steel

Company Identification : [redacted]

Inquiry Department : [redacted]

Phone: [redacted]

Emergency Telephone Number : the same as the above

Section□□Composition and Information on Ingredients

Distinction (single-component substance, or compound) : Compound (alloy)

Composition and content : refer to MILL SHEET

CAS № and ICSC №

Element	Content (mass%)	CAS №	ICSC №	Note
Iron (Fe)	99 or lower	7439-89-6	---	---
Manganese (Mn)	25 or lower	7439-96-5	0174	□
Chromium (Cr)	10 or lower	7440-47-3	0029	□
Nickel (Ni)	4 or lower	7440-02-0	0062	□

□ Note: □ mark indicates those that are regulated by [redacted]

Section 3□Summary of Hazards

□ This product is solid at room temperature and is chemically stable. However, its fume or coarse particulate that occur during machining, such as welding, thermal cutting, □□grinding and, machining , may irritate mucous membrane of respiratory organs, eye, etc. And, arc or chips that are generated from machining may cause burns or cut wounds to human body.

Section□□First-Aid Measures

Appropriate protections should be provided against fume, dust, arc, chips that occur during the machining of welding, thermal cutting, cutting, grinding, etc.

- Inhalation : Remove to fresh air. Use breathing assistance.
- Skin contact : Wash thoroughly with soap and water.
- Eye contact : Flush with clean water sufficiently.
- Ingestion : Vomit immediately. Take gargling.
- Burns : Cool the affected part sufficiently. Apply medicine.
- Cut wounds : Flush with clean water. Apply medicine.

For all the cases above, see a physician if necessary.

Section□□Fire-Fighting Measures

Not applicable. The product is solid and chemically stable.

Section□□Accidental-Release Measures

Not applicable. The product is solid under normal conditions.

Section□□Handling and Storage

□□Handling : Wear protective gloves to prevent possible cut wounds due to sharp edges of product.

Storage : If necessary, provide preventive measures against leakage of rainwater, seawater, etc. Also, ensure to keep the products from falling.

Section□□Exposure Controls and Personal Protection

The product is solid and chemically stable.

However, during welding, thermal cutting, cutting, grinding, etc., use respiratory protection mask, safety goggles, protective gloves, and protective clothing, to guard face, hand, and foot against the fume, dust, chips, etc. occurring from machining.

Section□□Physical and Chemical Properties

□□Physical state: Solid showing silver-white under normal conditions

□□Physical properties:□Melting point : 1440 – 1535□

□□□□ Specific gravity : approx. 7.85

Section10□Stability and Reactivity

The product is chemically stable substance having Fe as its base and some alloy elements as additives. So reactivity is low.

Section11□Hazards Information

As a steel product, no significant data on toxicity for humans has been reported to date.

For some alloy elements, however, potential hazards are pointed out, when each element as a single-component substance exceeds allowable concentration rate and the machining mentioned in Section 8 are applied. Information on such hazards can be obtained from publications. For example, "[redacted]

Section12□Environmental Impact

As a steel product, no significant data on environmental impact has been reported up to the present.

Section13□Disposal Considerations

Dispose of by using officially licensed waste disposal agent.

If any deposit is involved, take due consideration for such deposit as well.

Section14□Transport Information

Since it is a heavy load, fasten tightly to avoid tumbling of load.

It is advisable to provide measure against leak-in of rainwater. For example, use sheet over the load.

Section15□Applicable laws and regulations

[redacted]

Section16□Other Information

Contact for inquiries about the contents of this data sheet:

[redacted]

This Material Safety Data Sheet has been prepared in conformance to [redacted]

This Material Safety Data Sheet is made available to the product users as "reference data" to help them assure the workers' safety and prevent personal injuries. It is not intended to guarantee the safety of product. The products may cause such potential hazards that are not of our knowledge to date.

It is the user's responsibility to implement the proper measures for their own particular situations, making reference to the information provided in this Material Safety Data Sheet.

[redacted]

Issued・Revised : September 12,2013

Safety Data Sheet (SDS)

1. Chemical product and company identification

◇Product name : Bearing steel

◇Company name [redacted]

◇Address

◇Prepared by

◇Contact

◇Emergency contact : Same as above

2. Hazards identification

◇Health hazards :

Hazard item	Hazard category	Hazard information
Serious eye damage/ eye irritation	Category 2B	Cause eye irritation
Respiratory sensitization	Category 1	May cause allergy or asthma symptoms or breathing difficulties if inhaled
Skin sensitization	Category 1	May cause an allergic skin reaction
Germ cell mutagenicity	Category 2	Suspected of causing genetic defects
Carcinogenicity	Category 2	Suspected of causing cancer
Reproductive toxicity	Category 1B	May damage fertility or the unborn child
	Category 2	May damage fertility or the unborn child
Specific target organ toxicity (single exposure)	Category 1	Causes damage to organs
	Category 2 (Systemic toxicity)	May cause damage to organs
	Category 3 (Respiratory tract irritation)	May cause respiratory irritation
Specific target organ toxicity (repeated exposure)	Category 1	Causes damage to organs through prolonged or repeated exposure

◇Environmental hazards :

Hazard item	Hazard category	Hazard information
Aquatic environment (long-term hazard)	Category 4	May cause long lasting harmful effects to aquatic life

◇Pictogram or symbol :

◇Signal word : Danger Warning

◇**Precautionary statements :**

＜Safety measures＞

- Obtain special instructions before use.
- Do not handle until all safety precautions have been read and understood.
- Do not breathe dust/fume.
- Avoid breathing dust/fume.
- Wash hands thoroughly after handling.
- Do not eat, drink or smoke when using this product.
- Use only outdoors or in a well-ventilated area.
- Contaminated work clothing should not be allowed out of the workplace.
- Avoid release to the environment.
- Wear protective gloves/protective clothing/eye protection/face protection.
- [In case of inadequate ventilation] wear respiratory protection.

＜First-aid＞

- Call a doctor if you feel unwell.
- Get medical advice/attention if you feel unwell.
- IF ON SKIN: Wash with plenty of water/soap.
- IF INHALED: Remove person to fresh air and keep comfortable for breathing.
- IF IN EYES: Rinse cautiously with water for several minutes.
  Remove contact lenses, if present and easy to do. Continue rinsing.
- IF exposed or concerned: Call doctor.
- IF exposed or concerned: Get medical advice/attention.
- If skin irritation or rash occurs: Get medical advice/attention.
- If eye irritation persists: Get medical advice/attention.
- If experiencing respiratory symptoms: Call doctor.
- Take off contaminated clothing and wash it before reuse.

＜Storage＞

- Store locked up.

＜Disposal＞

- Dispose of contents/container in accordance with local/regional/national/international regulation.

3. Composition/information on ingredients

◇**Substance/mixture** : Mixture(iron based alloy steel)

◇**Ingredient and content :**

Element	Symbol	Content[%]	CAS No.	[redacted]
Carbon	C	max. 1.50%	7440-44-0	
Silicon	Si	max. 1.50%	7440-21-3	
Manganese	Mn	below 1.50%	7439-96-5	
Phosphorous	P	max. 0.050%	7723-14-0	
Sulfur	S	max. 0.050%	7704-34-9	
Nickel	Ni	max. 0.50%	7440-02-0	
Chromium	Cr	max. 2.50%	7440-47-3	
Molybdenum	Mo	below 1.00%	7439-98-7	
Copper	Cu	max. 0.50%	7440-50-8	
Aluminum	Al	max. 0.10%	7429-90-5	
Cobalt	Co	below 0.10%	7440-48-4	
Niobium	Nb	max. 0.20%	7440-03-1	
Titanium	Ti	max. 0.02%	7440-32-6	
Vanadium	V	max. 0.15%	7440-62-2	
Tungsten	W	max. 0.15%	7440-33-7	
Iron	Fe	balance	7439-89-6	

Notes: Although the ingredient content of a product is in the above-mentioned range, please confirm the standard or mill certificate of a product for details.

4. First-aid measures

In case of inhalation of, ingestion of, or skin contact with the dust or fumes generated during processing of steel materials, immediately give first aid described below, and then seek medical attention or treatment if necessary.

<Inhalation>

Remove person to fresh air and keep at rest in position comfortable for breathing.

<Skin contact>

Remove all contaminated clothing. Wash the affected area immediately with plenty of water and soap.

<Eye contact>

Rinse carefully the affected eye with water for several minutes. In case of using contact lenses, remove them if easy to do so. Continue rinsing.

<Ingestion>

Rinse mouth out thoroughly with water.

5. Fire-fighting measures

When stored or used, this product is in non-flammable solid form. In case of fire in the surrounding area, use fire-extinguishing agent appropriate for fire situation.

<Extinguishing agent>

No restrictions are imposed on uses of normal extinguishing agent such as water sprayers, carbon dioxide and dry chemical powder.

<Peculiar extinguishing method>

If possible, use extinguisher from windward of the fire

<Precautions for fire fighters >

In fire extinguishing, use appropriate protective equipment.

6. Accidental leakage measures

As product is solid, it is not leaked under general conditions. However, take measures below to prevent hazards by dust or fumes generated during steel material processing:

<Personal precautions>

Wear appropriate protective equipment to prevent inhalation of or eye contact with dust or fumes.

<Protective equipment and emergency procedure>

Refer to section 8(exposure controls/personal protection)

<Environmental precautions>

Collect promptly any dust, etc. generated during cutting, grinding, etc.

<Method for containment and cleaning up>

Collect generated dust in appropriate manner during steel materials processing, and then prevent dispersion.

7. Handling and storage

◇**Handling** :

<Technical measures>

Wear appropriate protective equipment in case of generating dust or fumes during welding, weld cutting or grinding. Moreover, be sure to provide local or general ventilation system.

<Precautions for safe handling>

Heavy weights call for great precautions in handling, against toppling, rolling and package collapsing.

Be sure to prevent inhalation or ingestion of the dust or fumes generated during processing of steel materials.

<Prevention of contact>

No limits to the prevention of contact with chemical substances.

◇**Storage** :

<Safety storage conditions>

Avoid contact with water leakage, acid, alkali or substances containing them. Store avoiding a rapid change of temperature and high humidity.

<Safety package>

Use sheets or covers to prevent products from rain water infiltration or pack product, if needed.

8. Exposure controls and personal protection

No limits to exposure prevention and protective measures for steel materials in ordinary circumstances due to solid. However processing such as welding, weld cutting, grinding and cutting can generate fumes or fine particles, thus take preventive and protective measures below.

◇**Allowable concentration** : ※NITE HP: Search result of Chemical Risk Information Platform (CHRIP)

Element		CAS No.	Type	Value
Manganese[Mn]		7439-96-5	TWA	0.2 mg/m^3
Nickel[Ni]		7440-02-0	TWA	1.5 mg/m^3
Chromium[Cr]		7440-47-3	TWA	0.5 mg/m^3
Molybdenum[Mo]	Inhalable fraction	7439-98-7	TWA	10 mg/m^3
	Respirable fraction	〃	TWA	3 mg/m^3
Copper[Cu]	Dusts and mists, as Cu	7440-50-8	TWA	1 mg/m^3
	Fume	〃	TWA	0.5 mg/m^3
Cobalt[Co]		7440-48-4	TWA	0.02 mg/m^3
Tungsten[W]		7440-33-7	TWA	5 mg/m^3

◇**Engineering measures to reduce exposure** :

Provide appropriate ventilation to secure safe work environment in case of generating dust or fumes.

◇**Personal protective equipment** :

<Respiratory protective equipment>

Use of dust protective mask or respiratory protective equipment is recommended.

<Personal protective equipment for hands>

Use of protective gloves is recommended.

<Personal protective equipment for eyes>

Use of safety glasses or goggles is recommended.

<Personal protective equipment for skin and body>

Wear appropriate personal protective clothing to prevent skin contact.

9. Physical and chemical properties

◇**Physical state/color** : Solid steel products/silvery-white

◇**Smell** : Odorless

◇**Melting point** : min. 1400℃

◇**Density** : 7~9 g/cm^3

10. Stability and reactivity

<Chemical stability>

Steel products are stable under normal storage and handling conditions.

<Possibility of hazardous reactions>

Not classified.

<Condition to avoid>

Not determined for product as a whole.

<Incompatible materials>

Not determined for product as a whole.

<Hazardous decomposition products>

Fumes generated during welding and weld cutting may contain metal compounds.

11. Hazard information

	[Mn]	[Ni]	[Cr]	[Mo]	[Cu]	[Co]	[W]
Acute toxicity	-	-	-	-	-	-	-
Skin corrosion/irritation	-	-	-	-	-	-	-
Serious eye damage/eye irritation	Category2B	-	Category2B	-	-	-	-
Respiratory or skin sensitization	-	Category1	Category1	-	-	-	-
Germ cell mutagenicity	-	-	Category2	-	-	-	-
Carcinogenicity	-	Category2	-	-	-	-	-
Reproductive toxicity	Category1B	-	-	-	-	-	-
Specific target organ toxicity -single exposure	Category1	Category1	Category2,3	-	Category3	-	-
Specific target organ toxicity -repeated exposure	Category1	Category1	-	-	Category1	-	-
Aspiration hazard	-	-	-	-	-	-	-

Note 1: The hyphen(-) in the table indicates that the element in question is out of classification or cannot be classified.
Note 2: These categories should be referred to Sec.2 (Hazard identification)

12. Ecological information

	[Mn]	[Ni]	[Cr]	[Mo]	[Cu]	[Co]	[W]
Ecotoxicity	-	-	-	-	-	-	-
Persistence and degradability	-	-	-	-	-	-	-
Bioaccumulative potential	-	-	-	-	-	-	-
Mobility in soil	-	-	-	-	-	-	-
Hazard to the ozone layer	-	-	-	-	-	-	-
Aquatic environment	Category4	Category4	-	-	Category4	-	-

Note 1: The hyphen(-) in the table indicates that the element in question is out of classification or cannot be classified.
Note 2: These categories should be referred to Sec.2 (Hazard identification)

13. Disposal attention

<Waste disposal method>

Dispose in appropriate environmentally friendly manner in compliance with industrial waste disposal law and related ordinances and regulations established by [redacted]

<Container and package disposal>

In case of container or package with adherent contamination, dispose them in the same way described above.

14. Transport information

Not classified as internationally controlled substances regarding transport.

15. Regulatory information

[redacted]

16. Other information

This date sheet was prepared in accordance with [redacted]

In this data sheet, the information which is available at [redacted] at the time of sheet preparation is furnished to the users as the "reference information" for securing safe handling of the product.

This data sheet is not intended for assuring the safety of the product. There is a possibility of hazards which are not described in this data sheet and for which our company does not have any specific information.

In compliance with the related law, ordinance and regulations, it is the user's responsibility to determine to use the product.

[redacted]

High-carbon chromium bearing steel

[redacted]

High-carbon chromium bearing steel, which is easily thermally refined, provides higher hardness by direct quenching, as well as higher machinability through spheroidizing annealing. The hardenability of steel products increases in the following order: SUJ2 < SUJ4 < SUJ 3 < SUJ5. Which one of these types is used depends on the diameter and wall thickness of the bearing.

[redacted] Chemical compositions [redacted]

(%)

[redacted] Grade	C	Si	Mn	P	S	Cr	Mo
SUJ2	0.95~1.10	0.15~0.35	≦0.50	≦0.025	≦0.025	1.30~1.60	—
SUJ3	0.95~1.10	0.40~0.70	0.90~1.15	≦0.025	≦0.025	0.90~1.20	—
SUJ4	0.95~1.10	0.15~0.35	≦0.50	≦0.025	≦0.025	1.30~1.60	0.10~0.25
SUJ5	0.95~1.10	0.40~0.70	0.90~1.15	≦0.025	≦0.025	0.90~1.20	0.10~0.25

"NSK-AKS Bearing material"

[redacted]

Notes: 1.Either Ni or Cu as impurity must not exceed 0.25%. Cu in wire rods must not exceed 0.20%. Mo in SUJ2 and SUJ3 must not exceed 0.08%.
2.Upon agreement between the supplier and the consignee, elements other than those given in the above table may be added up to 0.25%.

[redacted] Characteristics and Applications

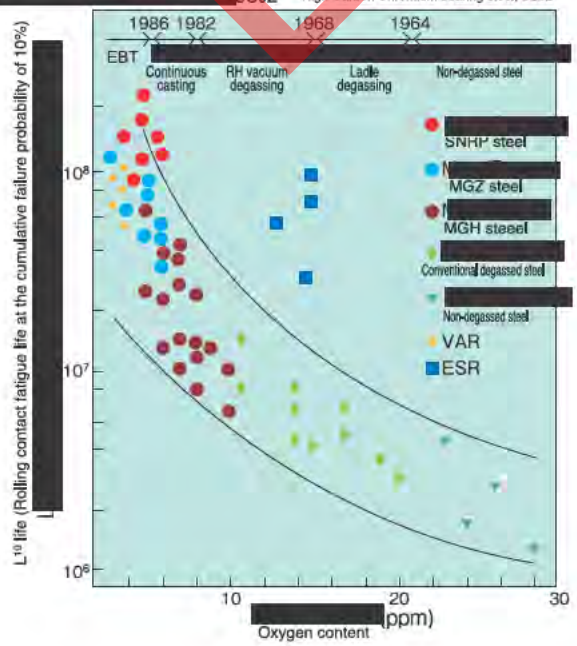
[redacted] Grade	[redacted] Characteristics	[redacted]
SUJ2	The representative grade of the high carbon chromium steels, 90% of which fall into this grade.	Used for almost all the balls and rollers having a diameter of 25 mm or less and races having a wall thickness of 25 mm or less.
SUJ3	Provides better hardenability than SUJ2 because of higher Si and Mn content and lower Cr content.	Used for balls and rollers having a diameter of 25 mm or more and races having a thick wall.
SUJ4	Offers intermediate hardenability between those of SUJ2 and SUJ3.	Used for balls, roller and races with intermediate dimensions between those made of SUJ2 and SUJ3.
SUJ5	Offers better hardenability through the addition of Mo to SUJ3.	Used for large diameter balls and rollers and heavy-wall races where use of SUJ3 will result in insufficient core hardness after heat treatment.

[redacted] Relationship between oxygen content and fatigue life

[redacted]

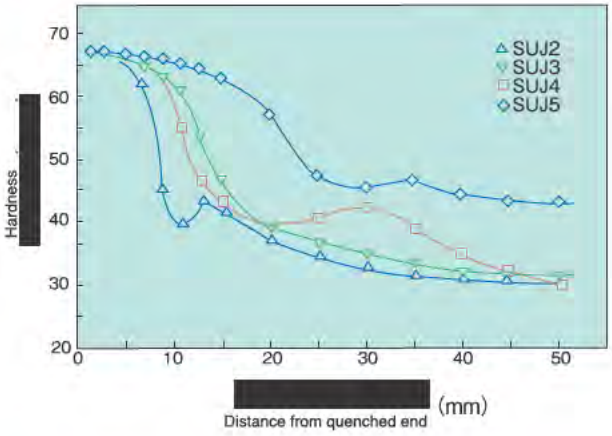
Test condition: Thrust-type rolling contact fatigue life tester

[redacted] SUJ2 High-Carbon Chromium bearing steel, SUJ2

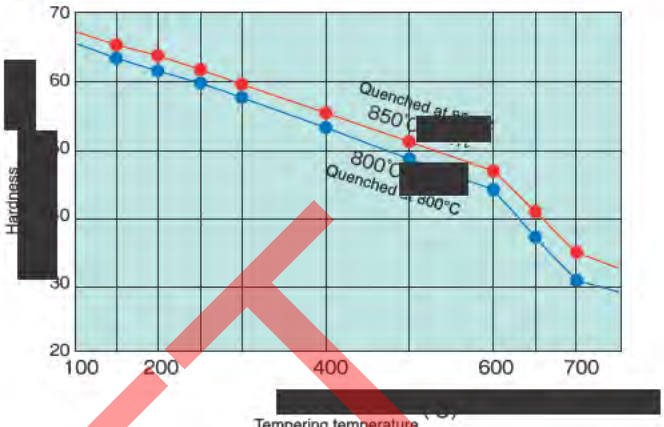


[redacted] is a steel refining process for premium cleanliness steel. This technology, [redacted] minimizes the largest inclusion size in steel to bring out the inherent performance of the steel. [redacted] realizes improved fatigue strength and reliability of the steel by optimizing processes from melting by a 150-t electric arc furnace through continuous casting.

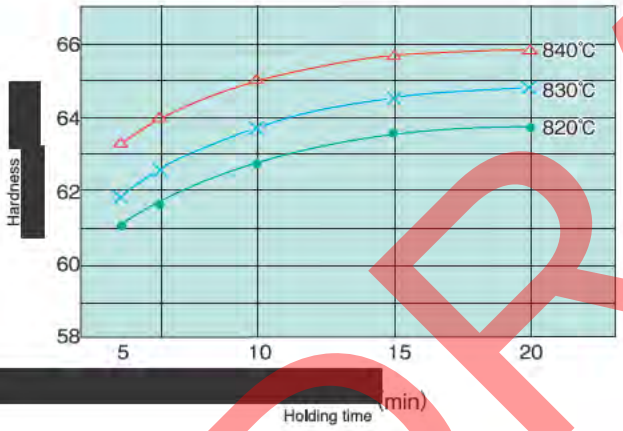
Hardenability



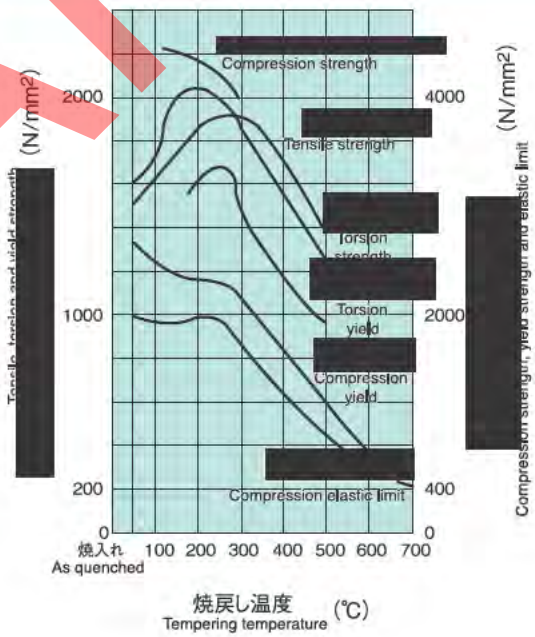
Quenched and tempered hardness of SUJ2



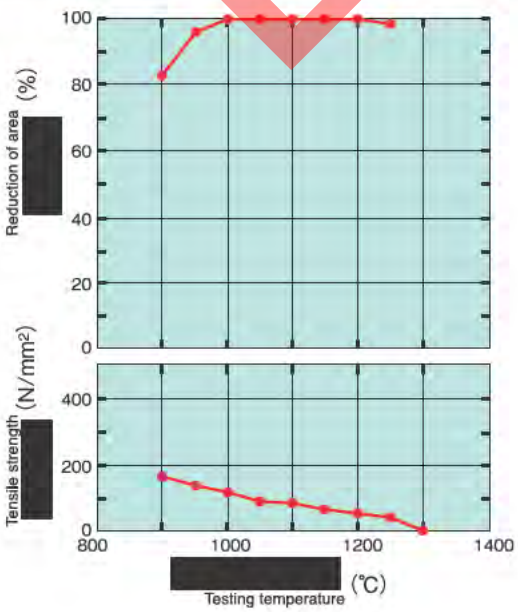
Quenching holding time and hardness of SUJ2



Tempered properties of SUJ2



Hot workability of SUJ2



Heat treatment conditions and hardness

Grade	Normalizing	Annealing	Quenching	Tempering	Quenched and tempered hardness
SUJ2	840~900	760~800	800~840 800~840, oil	150~180	≧62
SUJ3	840~900	760~800	790~830 790~830, oil	150~180	≧63
SUJ4	840~900	760~800	800~840 800~840, oil	150~180	≧63
SUJ5	840~900	760~800	790~830 790~830, oil	150~180	≧63

Appendix 4

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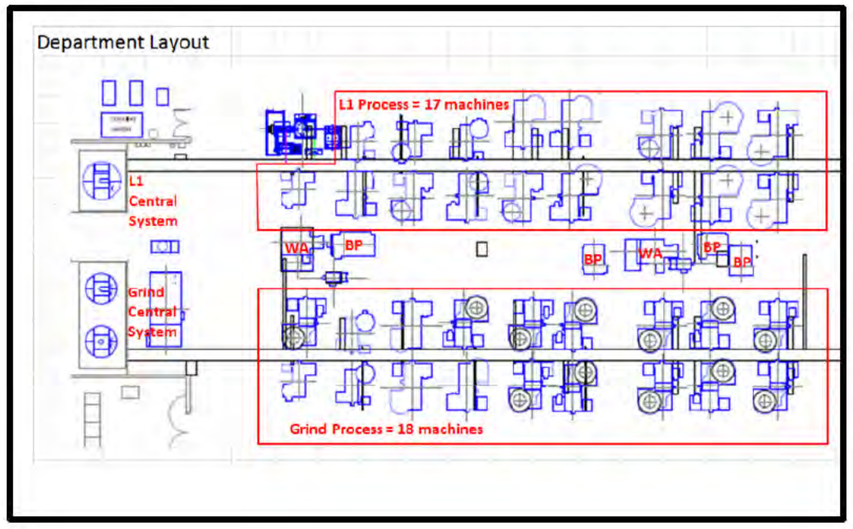
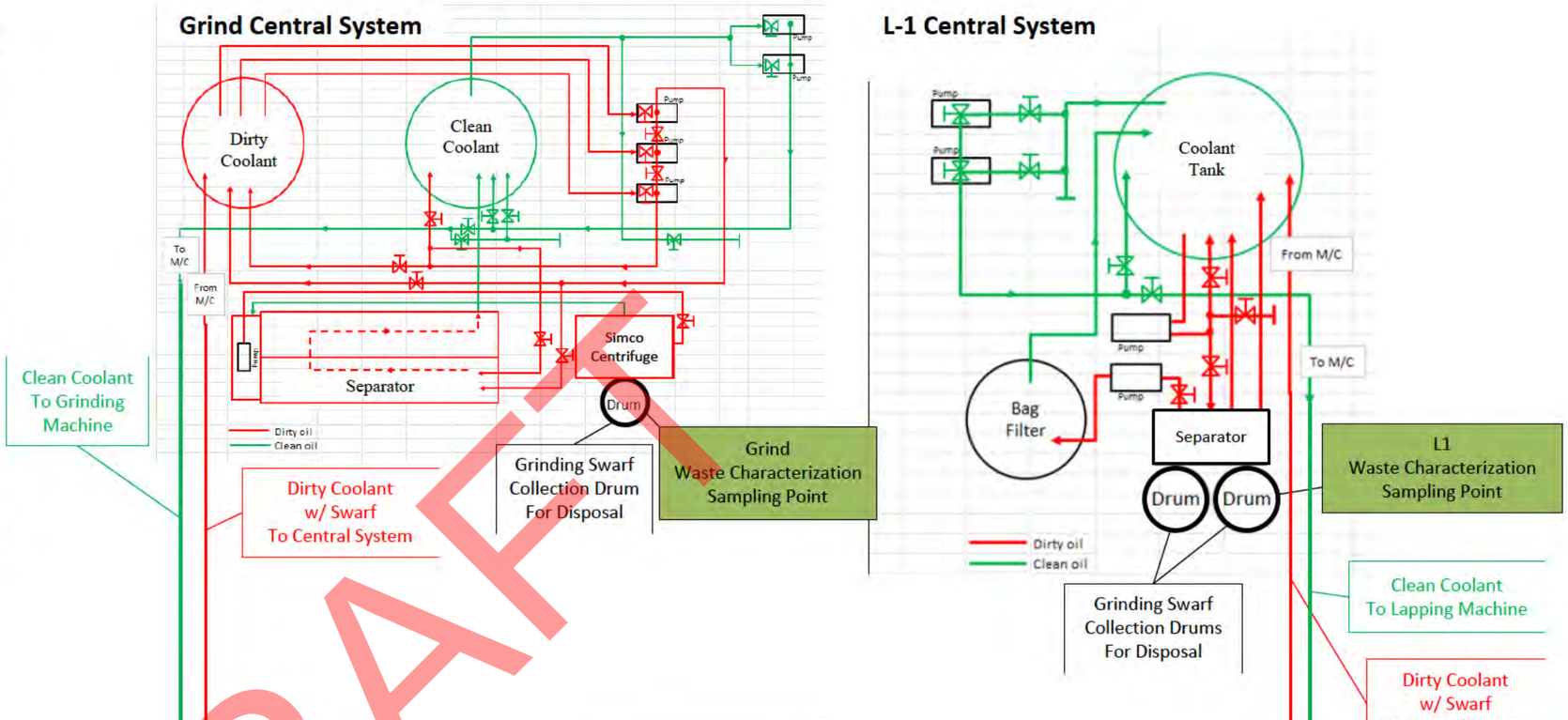
Process Flow Diagram

Figure 2: Process Flow Diagram





Wash Station
Fuchs Daicleaner F 19
Sodium Metasilicate: <10%

Hot Air Dryer

Raw steel received in coils, inspected prior to use

Suppliers:
1. [redacted]
2.
3.

Heading Machine

Steel coil is cut into appropriate size billets and then formed into a ball shape for flashing

Flashing Machine

Rough shaped balls are de-flashed prior to heat treat

Retort Type Batch Heat Treat Furnace

Steel balls heat treated to increase hardness
Temperature: 820° C (1508°F)
Atmospheric Air

Grinding Machine "Grind"

Cycle Time: 10 – 12 Hours

Suppliers:
1. Coolant: [redacted]
2. Stationary Wheel: Cast Iron
3. Rotary Wheel: [redacted]
4. System Hydraulic Oil: [redacted]

Off-Line Wash & Dry

Steel balls are washed and dried

Suppliers:
1. Wash Solution: [redacted]
2. Rinse: Tap Water
3. Dry: hot air

Peening Process

Steel balls are tumbled, abrading against each other. No additives used in process.

Lapping Machine " L-1"

Cycle Time: 10 – 12 Hours

Suppliers:
1. Coolant: [redacted]
2. Stationary Wheel: Cast Iron
3. Rotary Wheel: [redacted]
4. System Hydraulic Oil: [redacted]

Appendix 5

___

Process Materials

Product Bulletins & Safety Data Sheets

___

Grind and L1 Metal Working Fluids

Grind and L1 Abrasive Wheels

Grind and L1 Abrasive Plates

[redacted]

SAFETY DATA SHEET

1. Identification

Product name [redacted]

Other means of identification No data available.

Recommended use: Metalworking fluid

Restrictions on use: Industrial use only

Manufacturer/Importer/Supplier/Distributor Information

Manufacturer

[redacted]

2. Hazard(s) identification

Hazard Classification

Physical Hazards

Flammable liquids — Category 4

Health Hazards

Aspiration Hazard — Category 1

Label Elements

Hazard Symbol:

Signal Word: Danger

Hazard Statement: Combustible liquid.
May be fatal if swallowed and enters airways.

Precautionary Statements

Prevention: Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking. Wear protective gloves/protective clothing/eye protection/face protection.

Response: IF SWALLOWED: Immediately call a POISON CENTER/doctor. Do NOT induce vomiting. In case of fire: Use # to extinguish.

Storage: Store in well-ventilated place. Keep cool. Store locked up.

Disposal: Dispose of contents/container to an appropriate treatment and disposal facility in accordance with applicable laws and regulations, and product characteristics at time of disposal.

Other hazards which do not result in GHS classification: None.

Unknown toxicity - Health

Acute toxicity, oral	0.18 %
Acute toxicity, dermal	0.27 %
Acute toxicity, inhalation, vapor	99.95 %
Acute toxicity, inhalation, dust or mist	85.91 %

3. Composition/information on ingredients

Hazardous Component(s):

Chemical name	CAS-No.	Concentration
Mineral oil	Confidential	60 - 100%
Mineral spirits	Confidential	10 - 20%

Specific chemical identities and/or exact percentages have been withheld as trade secrets.

4. First-aid measures

Ingestion: Call a physician or poison control center immediately. Rinse mouth. Never give liquid to an unconscious person. If vomiting occurs, keep head low so that stomach content doesn't get into the lungs.

Inhalation: Move to fresh air. Call a POISON CENTER/doctor/.../if you feel unwell.

Skin Contact: Remove contaminated/saturated clothing and shoes. Wash contact areas with soap and water. If skin irritation occurs: Get medical advice/attention.

Eye contact: Flush thoroughly with water. If irritation occurs, get medical assistance. Continue to rinse for at least 15 minutes.

Most important symptoms/effects, acute and delayed

Symptoms: No data available.

Indication of immediate medical attention and special treatment needed

Treatment: Get medical attention as appropriate or if symptoms persist.

5. Fire-fighting measures

General Fire Hazards: Move containers from fire area if you can do so without risk.

Suitable (and unsuitable) extinguishing media

Suitable extinguishing media: Water spray, fog, CO2, dry chemical, or regular foam. Use fire-extinguishing media appropriate for surrounding materials.

Unsuitable extinguishing media: Avoid water in straight hose stream as this will scatter and spread fire.

Specific hazards arising from the chemical: Heat may cause the containers to explode. During fire, gases hazardous to health may be formed.

Special protective equipment and precautions for firefighters

Special fire fighting procedures: No data available.

Special protective equipment for fire-fighters: Firefighters must use standard protective equipment including flame retardant coat, helmet with face shield, gloves, rubber boots, and in enclosed spaces, SCBA.

6. Accidental release measures

Personal precautions, protective equipment and emergency procedures: ELIMINATE all ignition sources (no smoking, flares, sparks or flames in immediate area). Ensure adequate ventilation. Keep unauthorized personnel away. See Section 8 of the SDS for Personal Protective Equipment. Do not touch damaged containers or spilled material unless wearing appropriate protective clothing. Ventilate closed spaces before entering them.

Methods and material for containment and cleaning up: Absorb spill with an inert material, then place in a container for safe and proper disposal. Eliminate all ignition sources if safe to do so. Dike far ahead of larger spill for later recovery and disposal. Use only non-sparking tools.

Environmental Precautions: Prevent further leakage or spillage if safe to do so.

7. Handling and storage

Precautions for safe handling: End-users should follow industry best practices for handling and using this product.

Guidance may be found using the current version of ASTM Standard E1497-05: Standard Practice for Selection and Safe Use of Water-Miscible and Straight Oil Metal Removal Fluids Observe good industrial hygiene practices. Wear appropriate personal protective equipment. Do not expose to intense heat as product may expand and pressurize container. Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking. Ground and bond container and receiving equipment. Take precautionary measures against static discharges.

Conditions for safe storage, including any incompatibilities: Store in original tightly closed container. Avoid contact with oxidizing agents. Store away from incompatible materials. Store locked up. Store in a well-ventilated place. Store in a cool place. Flammable liquid storage.

8. Exposure controls/personal protection

Exposure Limits

Chemical name	type	Exposure Limit Values	Source
Mineral oil - Mist.	PEL	5 mg/m3	US. OSHA Table Z-1 Limits for Air Contaminants (29 CFR 1910.1000)
Mineral oil - Mist.	STEL	10 mg/m3	US. OSHA Table Z-1 Limits for Air Contaminants (29 CFR 1910.1000)
Mineral spirits - Non-aerosol. - as total hydrocarbon vapor	TWA	200 mg/m3	US. ACGIH Threshold Limit Values (03 2012)

Protective Measures: Use personal protective equipment as required.

Respiratory Protection: In case of inadequate ventilation use suitable respirator. Seek advice from supervisor on the company's respiratory protection standards.

Eye Protection: Wear safety glasses with side shields (or goggles).

Skin and Body Protection: Wear chemical-resistant gloves, footwear, and protective clothing appropriate for the risk of exposure. Contact health and safety professional or manufacturer for specific information.

Hygiene measures: Always observe good personal hygiene measures, such as washing after handling the material and before eating, drinking, and/or smoking. Contaminated work clothing should be laundered prior to re-use. Discard contaminated footwear that cannot be cleaned. Avoid contact with skin, eyes, and clothing.

9. Physical and chemical properties

Appearance	
Physical state:	Liquid
Form:	No data available.
Color:	Colorless
Odor:	Petroleum
Odor threshold:	No data available.
pH:	No data available.
Melting point/freezing point:	No data available.
Initial boiling point and boiling range:	No data available.
Flash Point:	87.78 °C (190.00 °F)
Evaporation rate:	No data available.
Flammability (solid, gas):	No data available.
Upper/lower limit on flammability or explosive limits	
Flammability limit - upper (%):	No data available.
Flammability limit - lower (%):	No data available.
Explosive limit - upper (%):	No data available.
Explosive limit - lower (%):	No data available.
Vapor pressure:	No data available.
Vapor density:	No data available.
Relative density:	0.82
Solubility(ies)	
Solubility in water:	Insoluble
Solubility (other):	No data available.
Partition coefficient (n-octanol/water):	No data available.
Auto-ignition temperature:	No data available.
Decomposition temperature:	No data available.
Viscosity:	< 20.5 mm2/s (40 °C)

10. Stability and reactivity

Reactivity:	Not reactive during normal use.
Chemical Stability:	Material is stable under normal conditions.
Possibility of hazardous reactions:	None under normal conditions.
Conditions to avoid:	Avoid heat or contamination. Heat, sparks, flames.
Incompatible Materials:	No data available.

Hazardous Decomposition Products: Thermal decomposition or combustion may liberate carbon oxides and other toxic gases or vapors.

11. Toxicological information

Information on likely routes of exposure

Ingestion: May be ingested by accident. Ingestion may cause irritation and malaise. Harmful if swallowed.

Inhalation: Inhalation is the primary route of exposure. In high concentrations, vapors, fumes or mists may irritate nose, throat and mucus membranes. Harmful if inhaled.

Skin Contact: Prolonged skin contact may cause redness and irritation. Prolonged skin contact may cause redness and irritation.

Eye contact: Eye contact is possible and should be avoided.

Symptoms related to the physical, chemical and toxicological characteristics

Ingestion: No data available.

Inhalation: No data available.

Skin Contact: No data available.

Eye contact: No data available.

Information on toxicological effects

Acute toxicity (list all possible routes of exposure)

Oral
Product: Not classified for acute toxicity based on available data.

Dermal
Product: ATEmix (): 2000 - 5000 mg/kg

Inhalation
Product: Not classified for acute toxicity based on available data.

Repeated dose toxicity
Product: No data available.

Skin Corrosion/Irritation
Product: No data available.

Serious Eye Damage/Eye Irritation
Product: No data available.

Respiratory or Skin Sensitization
Product: No data available.

Carcinogenicity
Product: No data available.

IARC Monographs on the Evaluation of Carcinogenic Risks to Humans:
No carcinogenic components identified

US. National Toxicology Program (NTP) Report on Carcinogens:
No carcinogenic components identified

US. OSHA Specifically Regulated Substances (29 CFR 1910.1001-1050):
No carcinogenic components identified

Germ Cell Mutagenicity

In vitro
Product: No data available.

In vivo
Product: No data available.

Reproductive toxicity
Product: No data available.

Specific Target Organ Toxicity - Single Exposure
Product: No data available.

Specific Target Organ Toxicity - Repeated Exposure
Product: No data available.

Aspiration Hazard
Product: May be fatal if swallowed and enters airways.

Other effects: Components may cause a risk to the following :
Hematological effects kidney damage liver damage

12. Ecological information

General information: This product has not been evaluated for ecological toxicity or other environmental effects.

13. Disposal considerations

Disposal instructions: Discharge, treatment, or disposal may be subject to national, state, or local laws. Dispose of waste at an appropriate treatment and disposal facility in accordance with applicable laws and regulations, and product characteristics at time of disposal. It is the responsibility of the product user or owner to determine at the time of disposal, which waste regulations must be applied.

Contaminated Packaging: Empty containers should be taken to an approved waste handling site for recycling or disposal.

14. Transport information

DOT

UN Number:	NA 1993
UN Proper Shipping Name:	Combustible liquid, n.o.s.(Petroleum distillates)
Transport Hazard Class(es)	
Class:	CBL
Label(s):	NONE
Packing Group:	III
Marine Pollutant:	No
Special precautions for user:	–

IMDG

Not regulated.

15. Regulatory information

US Federal Regulations

US. OSHA Specifically Regulated Substances (29 CFR 1910.1001-1050)

None present or none present in regulated quantities.

Superfund Amendments and Reauthorization Act of 1986 (SARA)

Hazard categories

Fire Hazard

Immediate (Acute) Health Hazards

SARA 313 (TRI Reporting)

None present or none present in regulated quantities.

US State Regulations

US. California Proposition 65

No component is regulated by CA Prop 65.

16.Other information, including date of preparation or last revision

Issue Date: 16.09.2016

[redacted]

SAFETY DATA SHEET

Revision Date:	16.09.2016
Version #:	1.1
Further Information:	No data available.
Disclaimer:	This information is provided without warranty. The information is believed to be correct. This information should be used to make an independent determination of the methods to safeguard workers and the environment.

Cutting & Grinding Oil

Description

[redacted] is light colored cutting and honing fluid suitable for use on ferrous and non-ferrous metals including carbon and alloy steels, stainless steels, difficult steel alloys, powdered metals, cast iron, aluminum, copper and brass.

[redacted] is especially effective for honing surfaces where fine finishes are required. It contains high quality base fluids to provide high production rates, superior duty stock removal, and good surface finishes.

Advantages/Benefits

- Effective for honing and superfinishing operations
- Good clarity for workpiece visibility
- Effective wetting properties to maintain clean machines and components
- Easy filtration for sensitive applications
- Low viscosity to minimize drag-out and product usage

How To Use

[redacted]s used as received for all machining operations. Your local [redacted] representative can provide you with specific recommendations for your operation.

The product should be stored in its original sealed container at temperatures between 45ºF and 90ºF.

Safety data sheets are available. Before handling, read the product information and safety data sheets for proper handling and health hazard information.

How To Clean

Residual films are readily cleaned from parts with [redacted] alkaline or solvent-based cleaners. Your local [redacted] representative can provide you with specific recommendations for your operation.

Cutting & Grinding Oil

CHARACTERISTICS

Color	Amber
Specific gravity	0.81
Viscosity @ 40°C	3.0 cSt

[redacted]

SAFETY DATA SHEET

1. Identification

Product name [redacted]

Other means of identification No data available.

Recommended use: Additive

Restrictions on use: Industrial use only

Manufacturer/Importer/Supplier/Distributor Information

Manufacturer

[redacted]

2. Hazard(s) identification

Hazard Classification

Health Hazards

Skin Corrosion/Irritation	Category 2
Serious Eye Damage/Eye Irritation	Category 2A

Label Elements

Hazard Symbol:

Signal Word: Warning

Hazard Statement: Causes skin irritation.
Causes serious eye irritation.

[redacted]

Statement

Prevention: Wash thoroughly after handling. Wear protective gloves/protective clothing/eye protection/face protection.

Response: If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. If eye irritation persists: Get medical advice/attention. IF ON SKIN: Wash with plenty of water. If skin irritation occurs: Get medical advice/attention. Specific treatment (see the specific response guidance provided herein). Take off contaminated clothing.

Other hazards which do not result in GHS classification: None.

Unknown toxicity Health

Acute toxicity, dermal	26.98 %
Acute toxicity, inhalation, vapor	100 %
Acute toxicity, inhalation, dust or mist	100 %

3. Composition/information on ingredients

Hazardous Component(s):

Chemical name	CAS-No.	Concentration
Fatty acid	Confidential	60 - 100%

Specific chemical identities and/or exact percentages have been withheld as trade secrets.

4. First-aid measures

Ingestion: Call a Poison Center or doctor if you feel unwell. Rinse mouth.

Inhalation: Move to fresh air. Call a Poison Center or doctor if you feel unwell.

Skin Contact: Remove contaminated/saturated clothing and shoes. Wash contact areas with soap and water. If skin irritation occurs: Get medical advice/attention.

Eye contact: Immediately flush with plenty of water for at least 15 minutes. If easy to do, remove contact lenses. Get medical attention.

Most important symptoms/effects, acute and delayed

Symptoms: No data available.

Indication of immediate medical attention and special treatment needed

Treatment:	Get medical attention as appropriate or if symptoms persist.

5. Fire-fighting measures

General Fire Hazards:	No unusual fire or explosion hazards noted.

Suitable (and unsuitable) extinguishing media

Suitable extinguishing media:	Water spray, fog, CO_2, dry chemical, or regular foam. Use fire-extinguishing media appropriate for surrounding materials.
Unsuitable extinguishing media:	Do not use water jet as an extinguisher, as this will spread the fire.
Specific hazards arising from the chemical:	Heat may cause the containers to pressurize and possibly rupture. During fire, gases hazardous to health may be formed.

Special protective equipment and precautions for firefighters

Special fire fighting procedures:	No data available.
Special protective equipment for fire-fighters:	Firefighters must use standard protective equipment appropriate for industrial fires.

6. Accidental release measures

Personal precautions, protective equipment and emergency procedures:	See Section 8 of the SDS for Personal Protective Equipment. Do not handle damaged containers or spilled material unless wearing appropriate protective clothing. Keep unauthorized personnel away.
Methods and material for containment and cleaning up:	Absorb spill with an inert material, then place in a container for safe and proper disposal. Dike far ahead of larger spill for later recovery and disposal.
Environmental Precautions:	Do not contaminate water sources or sewer. Prevent further leakage or spillage if safe to do so and protect against releases into the environment. Remediate as appropriate.

7. Handling and storage

Precautions for safe handling:	Observe good industrial hygiene practices. Wear appropriate personal protective equipment. Do not expose to intense heat as product may expand and pressurize container. Wash hands thoroughly after handling. Do not get in eyes and avoid contact with skin and clothing.

Conditions for safe storage, including any incompatibilities:	Store in original tightly closed container. Avoid contact with oxidizing agents. Store away from incompatible materials.

8. Exposure controls/personal protection

Exposure Limits

None of the components have assigned exposure limits.

Protective Measures: Provide easy access to water supply and eye wash facilities. Good general ventilation should be provided. Ventilation rates should be matched to conditions. If applicable, use process enclosures, local exhaust ventilation, or other engineering controls to maintain airborne levels below recommended exposure limits. If exposure limits have not been established, maintain airborne levels to an acceptable level.

Respiratory Protection: In case of inadequate ventilation use suitable respirator. Seek advice from supervisor on the company's respiratory protection standards.

Eye Protection: Wear safety glasses with side shields (or goggles).

Skin and Body Protection: Wear chemical-resistant gloves, footwear, and protective clothing appropriate for the risk of exposure. Contact health and safety professional or manufacturer for specific information.

Hygiene measures: Always observe good personal hygiene measures, such as washing after handling the material and before eating, drinking, and/or smoking. Routinely wash work clothing to remove contaminants. Contaminated work clothing should not be allowed out of the workplace. Discard contaminated footwear that cannot be cleaned. Avoid contact with skin, eyes, and clothing.

9. Physical and chemical properties

Appearance

Physical state:	Liquid
Form:	No data available.
Color:	Yellow
Odor:	Characteristic
Odor threshold:	No data available.
pH:	No data available.
Melting point/freezing point:	No data available.
Initial boiling point and boiling range:	286 °C
Flash Point:	184.5 °C (364.1 °F)
Evaporation rate:	No data available.
Flammability (solid, gas):	No data available.

Upper/lower limit on flammability or explosive limits	
Flammability limit - upper (%):	No data available.
Flammability limit - lower (%):	No data available.
Explosive limit - upper (%):	No data available.
Explosive limit - lower (%):	No data available.
Vapor pressure:	No data available.
Vapor density:	No data available.
Relative density:	0.891
Solubility(ies)	
Solubility in water:	Insoluble
Solubility (other):	No data available.
Partition coefficient (n-octanol/water):	No data available.
Auto-ignition temperature:	No data available.
Decomposition temperature:	No data available.
Viscosity:	No data available.

10. Stability and reactivity

Reactivity:	Not reactive during normal use.
Chemical Stability:	Material is stable under normal conditions.
Possibility of Hazardous Reactions:	None under normal conditions.
Conditions to Avoid:	Avoid heat or contamination.
Incompatible Materials:	No data available.
Hazardous Decomposition Products:	Thermal decomposition or combustion may liberate carbon oxides and other toxic gases or vapors.

11. Toxicological information

Information on likely routes of exposure

Ingestion:	May be harmful if swallowed.
Inhalation:	May cause irritation to the respiratory system.
Skin Contact:	Causes skin irritation.
Eye contact:	Causes serious eye irritation.

Symptoms related to the physical, chemical and toxicological characteristics

Ingestion:	No data available.

Inhalation: No data available.

Skin Contact: No data available.

Eye contact: No data available.

Information on toxicological effects

Acute toxicity (list all possible routes of exposure)

Oral
Product: LD 50 (Rat): > 2000 - 5000 mg/kg

Dermal
Product: ATEmix (): 2000 - 5000 mg/kg

Inhalation
Product: No data available.

Repeated dose toxicity
Product: No data available.

Skin Corrosion/Irritation
Product: No data available.

Serious Eye Damage/Eye Irritation
Product: No data available.

Respiratory or Skin Sensitization
Product: No data available.

Carcinogenicity
Product: No data available.

IARC Monographs on the Evaluation of Carcinogenic Risks to Humans:
No carcinogenic components identified

US. National Toxicology Program (NTP) Report on Carcinogens:
No carcinogenic components identified

US. OSHA Specifically Regulated Substances (29 CFR 1910.1001-1050):
No carcinogenic components identified

Germ Cell Mutagenicity

In vitro
Product: No data available.

In vivo
Product: No data available.

Reproductive toxicity
Product: No data available.

Specific Target Organ Toxicity - Single Exposure
Product: No data available.

Specific Target Organ Toxicity - Repeated Exposure
Product: No data available.

Aspiration Hazard
Product: No data available.

Other effects: No data available.

12. Ecological information

General information: This product has not been evaluated for ecological toxicity or other environmental effects.

13. Disposal considerations

Disposal instructions: Discharge, treatment, or disposal may be subject to national, state, or local laws. Dispose of waste at an appropriate treatment and disposal facility in accordance with applicable laws and regulations, and product characteristics at time of disposal. It is the responsibility of the product user or owner to determine at the time of disposal, which waste regulations must be applied.

Contaminated Packaging: Empty containers should be taken to an approved waste handling site for recycling or disposal.

14. Transport information

This material is not subject to transport regulations.

15. Regulatory information

US Federal Regulations

US. OSHA Specifically Regulated Substances (29 CFR 1910.1001-1050)
None present or none present in regulated quantities.

Superfund Amendments and Reauthorization Act of 1986 (SARA)

Hazard categories
Acute (Immediate)

SARA 313 (TRI Reporting)
None present or none present in regulated quantities.

US State Regulations

US. California Proposition 65
No component is regulated by CA Prop 65.

16.Other information, including date of preparation or last revision

Issue Date:	14.05.2015
Revision Date:	14.05.2015
Version #:	1.0
Further Information:	No data available.
Disclaimer:	**This information is provided without warranty**. The information is believed to be correct. This information should be used to make an independent determination of the methods to safeguard workers and the environment.

[redacted]

MATERIAL SAFETY DATA SHEET

1. PRODUCT IDENTIFICATION:

[redacted] grinding wheel

2. COMPOSITION / INFORMATION ON INGREDIENTS

SUBSTANCE DESCRIPTION	PERCENT	CAS#
Aluminum Oxide, Non-fibrous	2.000- 20.000	1344-28-1
Amorphous Silica, Fused	2.000- 25.000	60676-86-0
Silicon Carbide	18.000- 95.000	409-21-2

OTHER Not Applicable

3. HAZARDS IDENTIFCATION

INHALATION ACUTE EXPOSURE EFFECTS
Dust may be slightly irritating to eyes and respiratory tract at high concentrations.
INHALATION CHRONIC EXPOSURE EFFECTS May affect breathing capacity. For products containing Amorphous Silica, Fused, there is limited evidence in animals that excessive and prolonged exposure to this chemical may cause pulmonary fibrosis.
EYE CONTACT ACUTE EXPOSURE EFFECTS Dust may irritate eyes.
SKIN CONTACT ACUTE EXPOSURE EFFECTS Some may experience skin irritation from dust.
INGESTION ACUTE EXPOSURE EFFECTS No known adverse effects, but ingestion not recommended.

4.FIRST AID MEASURES

NOT APPLICABLE WHEN BONDED ABRASIVES PRODUCTS NOT IN USED ON MACHINES. FOLLOWING RECOMMENDATIONS ARE BASIC RULES DURING A GRINDING OPERATION. THEY MUST BE COMPLETED BY THE INFORMATION APPEARING IN THE SAFETY DATA SHEETS OF THE MATERIAL GROUNDAND OF THE GRINDING FLUID WHEN USED.

DUST INHALATION: REMOVE FROM EXPOSURE, SEEK MEDICAL SERVICE IF SYMPTOMS PERSIST.
-**EYE**: REMOVE FROM EXPOSURE AND FLUSH WITH CLEAN WATER. IF SYMPTOMS PERSIST SEEK, MEDICAL SERVICE.
-**SKIN**: NO HAZARDOUS EFFECT KNOWN.
-**INGESTION**: NO HAZARDOUS EFFECT KNOWN.

[redacted]

5. **FIRE FIGHTING MEASURES**

NOT A FIRE HAZARD
NONE SPECIFIC - WATER, POWDER, FOAM, SAND, CO_2.... CAN BE USED IF COMPATIBLE WITH OPERATING CONDITIONS.

6. **ACCIDENTAL RELEASE MEASURES**

NOT APPLICABLE; Follow normal clean up measures

7.**HANDLING AND STORAGE**

THE FOLLOWING RECOMMENDATIONS SHOULD BE FOLLOWED TO PREVENT DAMAGE TO BONDED ABRASIVES WHICH MAY CREATE A RISK OF RUPTURE WHEN IN USE

-FRAGILE PRODUCTS: HANDLE AND STORE WITH CARE.

-STORE AT MODERATE TEMPERATURE AND HUMIDITY. EXCESSVE HEAT HUMIDITY OR THERMAL SHOCKS MAY MECHANICALLY WEAKENTHE PRODUCTS AND CREATE SAFETY HAZARDS WHEN USED ON MACHINE.

FOR DETAILED RECOMMENDATIONS REFER TO THE FEPA SAFETY CODE AND TO THE SAFETY LEAFLETS GENERAL AND PORTABLE.

8 EXPOSURE CONTROL/PERSONAL PROTECTILION

NOT APPLLICABLE WHEN BONDED ABRASIVE ARE HADNLED OR STORED. THE BONDED ABRASIVES ARE INERT PRODUCTS, WHICH DO NOT CREATE ANY RISK WHEN HANDLED OR STORED. WHEN USED ON GRINDING MACHINES, THEY REQURE SPECIFIC MEASURE TO PORTECT THE OPERATORS. DURING GRINDING OPERATION 90% OR MORE OF THE PARTICULATES OF THE DUST COME FROM THE MATERIAL BEING GROUND AND FOR WET GRINDING, FROM AEREOSOL GENERATED BY THE GRINDING FLUID. SPECIFIC ATTENTION MUST THEREFORE BE GIVEN TO THE NATURE OF THE PART AND OF THE FLUID AND THE

APPROPRIATE EQUIPMENT TO EXTRACT THESE GENERATED MATERIALS MUST BE INSTALLED.

FOR SAFE USE OF BONDED ABRASIVES REFER TO THE FEPA SAFETY CODE AND LEAFLETS AND NATIONAL REGULATIONS.

8.1 THE FOLLOWING PROTECTIVE EQUIPMENT SHOULD BE USED DEPENDENT ON THE OPERATION AND THE MATERIAL BEING GROUND

[redacted]

Recommend using local exhaust ventilation when general ventilation is not keeping the airborne concentration below the TLV.
RESPIRATORY PROTECTION
Respirators or masks to be used when airborne contaminant levels exceed the TLV(s).
EYE PROTECTION
Machine guarding and safety goggles or face shield.
HAND PROTECTION:
Use Of Barrier Cream or Protective Gloves
SKIN PROTECTION:
Use Of Suitable Protective Cloting
OTHER PROTECTION Use of this product may create elevated sound levels. Hearing protection should be worn where required (see OSHA 29 CFR 1910.134 and other applicable regulations).

8.2 **HYGIENE MEASURES**: NO SPECIFIC REQUIREMENTS.

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 PHYSICAL STATE:	SOLID
9.2 COLOUR:	VARIABLE
9.3.ODOUR :	Odorless
9.4 pH:	NOT APPLICABLE
9.5 CHANGE OF PHYSICAL STATE:	NOT APPLICABLE
9.6 BULK DENSITY:	NOT APPLICABLE
9.7 VAPOUR PRESSURE:	NOT APPLICABLE
9.8 FLASH POINT:	NOT APPLICABLE
9.9 EXPLOSION PROPERTIES:	NOT APPLICABLE
9.10 VISCOSITY:	NOT APPLICABLE
9.11 SOLUBILITY IN WATER:	NOT DEFEND

10. STABILITY AND REACTIVITY

BONDED ABRASIVES ARE STABLE AND NON REACTIVE WHEN HANDLED OR STORED

10.1 CONDITIONS TO AVOID: EXCESSIVE HEAT OR HUMIDITY

10.2 MATERIALS TO AVOID: STRONG ACIDS, STRONG BASES & STRONG OXIDISING AGENTS MAY MODIFY THE MECHANICAL CHARACTRISTICS OF THE PRODUCTS AND CREATE SAFETY HAZARDS WHEN USED ON MACHINES

10.3 HAZARDOUS **DECOMPOSITION PRODUCTS**: IF BONDED ABRASIVES ARE USED IN ACCORDANCE WITH INSTRUCTIONS, NO HAZARDOUS DECOMPOSTION PRODUCTS ARE CREATED.

10.4 OTHER **INDICATIONS: NONE**

[redacted]

11. TOXICOLOGICAL INFORMATION

NOT APPLICABLE WHEN HANDLED OR STORED
ACCORDING TO THE EXPERIENCE GATHERED FOR MANY YEARS, THE BONDED ABRASIVES WHEN PROPERLY USED HAVE NO ADVRSE EFFECT ON HEALTH.REFER TO THE PRELIMINARY NOTE ABOUT DUST AND AEREOSOL

12. ECOLOGICAL INFORMATION

12.1 MOBILITY: WHEN THE BONDED ABRASIVES ARE USED, THE GRINDING EBRIS IS EASILY RETAINED WITHIN FIXED MACHINES OR WITH APPROPRIATE SCREENS FOR PORTABLE GRINDING OPERATIONS.

12.2 PERSISTENCE **AND DEGRADABILITY**: NOT BIO-DEGRADABLE

12.3 BIOACCUMULATIVE POTENTIAL: NOT APPLICABLE

12.4 ECOTOXICITY: NOT APPLLICABLE

13.DISPOSAL CONSIDERATIONS:

WASTE DISPOSAL Use standard landfill methods consistent with applicable Federal, State, Provincial and local laws. Products with listed flourides may have slightly soluble flouride swarf.

14. TRANSPORT

THE BONDED ABRASIVES ARE NOT DANGEROUS PRODUCTS AND NO SPECIFIC REGULATIONS FOR ANY TYPE OF TRANSPORTATION ARE REQUIRED. PROTECT FROM RAIN AND EXCESSIVE TEMPERATURE AND HUMIDITY.
NO SPECIAL PRECAUTIONS NECESSARY OTHER THAN TO INSURE THAT NO DAMAGE TO THE PRODUCT OCCURS.

15. REGULATORY INFORMATIONS

EC REGULATIONS: NONE, ANY SPECIFIC MARKING REQUIRED UNDER EC DIRECTIVE N.88/379; **NATIONAL OR LOCAL REGULATIONS:** REFER TO RELEVANT TEXTS.

EXPOSURE LIMITS/REGULATORY INFORMATION

SUBSTANCE DESCRIPTION	UNITS OSHA
Amorphous Silica, Fused MG/M3	0.1000
Silicon Carbide MG/M3	10.0000

[redacted]

16. OTHER INFORMATION

WARNING

THE ABOVE INDICATIONS ARE BASED ON THE EXISTING PRACTICE AND DO NOT CONSTITUTE GUARANTEE. THE LAWS AND REGULATIONS MUST BE STRICTLY FOLLOWED BY THE USERS WHO REMAIN RESPONSIBLE FOR THE USE OF THE BONDED ABRASIVES.

DISCLAIMER The information and recommendations set forth herein are taken from sources believed to be accurate as of the date hereof; however, the Company makes no warranty with respect to the accuracy of the information or the suitability of the recommendations, and assumes no liability to any user thereof

[redacted]

MATERIAL SAFETY DATA SHEET

[redacted]

DATE PRINTED: JUL 14, 2006

[redacted]

SECTION 1. CHEMICAL PRODUCT AND COMPANY INFORMATION

PRODUCT NAME
[redacted]Abrasive Products
TRADE NAME

[redacted]

REVISION DATE
2/01/2006
MSDS PRINT FORMAT
NUSA

SECTION 2. COMPOSITION/INFORMATION ON INGREDIENTS

SUBSTANCE DESCRIPTION		PERCENT	CAS#
Aluminum Oxide, Non-fibrous		40.000- 90.000	1344-28-1
Calcium Oxide		1.000- 5.000	1305-78-8
Carbon Black		0.100- 1.000	1333-86-4
Cured PhenolFormaldehyde Resin		3.000- 12.000	9003-35-4
Fiberglass		0.003- 10.000	65997-17-3
Inorganic Fluorides	**	2.000- 10.000	NA
Manganese Compounds(*)	**	1.000- 5.000	NA
@Crystalline Silica, Quartz		0.001- 1.000	14808-60-7
Silicon Carbide		80.000- 90.000	409-21-2
Sodium Silicate		5.000- 15.000	1344-09-8
Sulfates & Sulfides	**	1.000- 10.000	NA
Zinc Compound(*)	**	1.000- 5.000	NA
Zirconium Oxide		30.000- 50.000	1314-23-4

** SUBSTANCE IS A COMPOUND AND/OR MIXTURE
OTHER
(@) Actual grinding tests with wheels known to contain Crystalline Silica did not produce any detectable amount of respirable free Crystalline Silica. The grinding wheel may be comprised of only some of the above. (*) This substance is regulated under Section 313 of the Emergency Planning and Community Right-to-Know Act of 1986 and the Canadian National Pollution Reduction Initiative (NPRI). The OSHA exposure limit represented in section 15 is for respirable dust and assumed to be worst case exposure to 100% crystalline silica; 10 mg/m3/(%silica+2)

SECTION 3. HAZARDS IDENTIFICATION

INHALATION ACUTE EXPOSURE EFFECTS
Dust may be slightly irritating to eyes and respiratory tract at

[redacted]

high concentrations.
INHALATION CHRONIC EXPOSURE EFFECTS
Chronic: May affect breathing capacity.
For products containing phenol/formaldehyde resin, dust generated from intended use may contain trace amounts of phenol and formaldehyde which under excessive exposure may cause skin sensitization and airway obstruction.

For products containing inorganic fluorides:
Excessive exposure to inorganic fluorides have been shown to increase bone density.
EYE CONTACT ACUTE EXPOSURE EFFECTS
Dust may irritate eyes.
SKIN CONTACT ACUTE EXPOSURE EFFECTS
Some may experience skin irritation from dust.
INGESTION ACUTE EXPOSURE EFFECTS
No known adverse effects, but ingestion not recommended.

SECTION 4. FIRST AID MEASURES

INHALATION
Remove to fresh air. If breathing has stopped, give artificial respiration. Get medical attention immediately.
SKIN CONTACT
Wash affected areas with soap and water. Obtain medical assistance.
EYE CONTACT
Wash with large amounts of water. Obtain first aid and medical assistance, if needed.
INGESTION
Call poison control center, hospital emergency room or physician immediately.

SECTION 5. FIRE FIGHTING MEASURES

FIRE FIGHTING PROCEDURES
Not Applicable
HAZARDOUS PRODUCTS/COMBUSTION
None.
HAZARD RATING SOURCE
NFPA
HEALTH
1
FLAMMABILITY
0
REACTIVITY
0
OTHER

SECTION 6. ACCIDENTAL RELEASE MEASURES

CLEAN-UP
Follow normal clean up procedures.

SECTION 7. HANDLING AND STORAGE

HANDLING
Always HANDLE AND STORE wheels in a CAREFUL manner.
Always VISUALLY INSPECT all wheels before mounting.

Always CHECK MACHINE SPEED against the established maximum safe operating speed MARKED ON THE WHEEL.
Always CHECK MOUNTING FLANGES for equal and correct diameter.
Always USE MOUNTING BLOTTERS.
Always be sure WORK REST is properly adjusted.
Always USE A SAFETY GUARD covering at least one-half of the grinding wheel.
Always allow NEWLY MOUNTED WHEELS to run at operating speed, with guard in place, for at least one minute before grinding.
Always TURN OFF COOLANT before stopping wheel to avoid creating an out-of-balance wheel

SECTION 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

VENTILATION PROTECTION
Handle with adequate ventilation. See OSHA 29 CFR 1910.94 (ventilation) and 29 CFR 1910.1000 (Air contaminants).
RESPIRATORY PROTECTION
Respirators are required when airborne contaminant levels exceed the TLV(s).
EYE PROTECTION
Always WEAR SAFETY GLASSES or some type of eye protection when grinding.
OTHER PROTECTION
Use of this product may create elevated sound levels. Hearing protection should be worn where required (see OSHA 29 CFR 1910.134 and other applicable regulations).

SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

APPEARANCE & ODOR
Solid article. Odorless.

SECTION 10. STABILITY AND REACTIVITY

INCOMPATIBILITIES
Avoid acids of all types with a pH < 4.0.
DECOMPOSITION
In use, dust and decomposing odors may be generated. In most cases, the material removed from the workplace will be significantly greater than the grinding wheel components. Coolants may produce other decomposition products.

For products containing phenol and formaldehyde resin, thermal decomposition may produce trace amounts of phenol and formaldehyde.

For products containing inorganic fluorides, thermal decomposition may produce trace amounts of fluorides.

SECTION 11. TOXICOLOGICAL INFORMATION

CARCINOGENICITY
Fiberglass contained in wheels have fiber diameters greater than 10 um, therefore considered non-respirable.
Crystalline Silica, Quartz - IARC-1, NIOSH-X, NTP-R.
LD50/LC50
Values are not appropriate or available.

SECTION 12. ECOLOGICAL INFORMATION

CHEMICAL FATE
Resin bonded materials demonstrate similar degradation rates as Phenolic plastics.
Vitrified products do not appreciably decay.

SECTION 13. DISPOSAL CONSIDERATIONS

WASTE DISPOSAL
Use standard landfill methods consistent with applicable Federal, State, Provincial and local laws.
Products with listed flourides may have slightly soluble flouride swarf.
RECYCLING PROGRAM - the Company has developed a grinding wheel recycling program. If you are interested in returning your stubs, information can be obtained by dialing Customer Service.

SECTION 14. TRANSPORT INFORMATION

HAZARD CLASS
This product is not hazardous as defined by the Department of Transportation.(USA)
This product is "Not Regulated" under the Transportation of Dangerous Goods Act. (CAN)

SECTION 15. REGULATORY INFORMATION

EXPOSURE LIMITS/REGULATORY INFORMATION

SUBSTANCE DESCRIPTION	UNITS	OSHA	ACGIH	MOL
Aluminum Oxide, Non-fibrous	MG/M3	15.0000	10.0000	10.0000
Calcium Oxide	MG/M3	5.0000	2.0000	0.0000
Carbon Black	MG/M3	3.5000	3.5000	0.0000
Cured PhenolFormaldehyde Resin	PPM	0.0000	0.0000	0.0000
Fiberglass	FBR/CC	1.0000	0.0000	0.0000
Inorganic Fluorides	MG/M3	2.5000	2.5000	2.5000
Manganese Compounds(*)		0.0000	0.0000	0.0000
@Crystalline Silica, Quartz	MG/M3	0.1000	0.1000	0.0000
Silicon Carbide	MG/M3	10.0000	10.0000	10.0000
Sodium Silicate	MG/M3	15.0000	0.0000	0.0000
Sulfates & Sulfides	MG/M3	0.0000	0.0000	0.0000
Zinc Compound(*)		0.0000	0.0000	0.0000

Zirconium Oxide			
MG/M3	5.0000	5.0000	5.0000

LEGEND:

EXPOSURE LIMIT DESCRIPTIONS
CA PROP 65
This product contains chemicals, Crystalline Silica, known to the State of California, to cause cancer.
TSCA
Section 8(b) - Inventory Status

All components of this product are registered under the regulations of the Toxic Substance Control Act.
DOMESTIC SUBSTANCE LIST
All components of this product are found on the Domestic Substance List.

SECTION 16. OTHER INFORMATION

DISCLAIMER
The information and recommendations set forth herein are taken from sources believed to be accurate as of the date hereof; however, the Company makes no warranty with respect to the accuracy of the information or the suitability of the recommendations, and assumes no liability to any user thereof.

KEY TO ABBREVIATIONS:

EQ=EQual	LT=Less Than	GT=Greater Than
AP=APproximately	TR=TRace	ND=No Data available

[redacted]

[redacted] dressing rolls use controlled exposure of the diamond matrix to create a more free-cutting roll. This results in reduced dressing forces which in turn helps reduce vibration and improve part finishes, particularly when dressing vitrified cBN grinding wheels in aerospace and many bearing applications.

[redacted]

FEATURES & BENEFITS

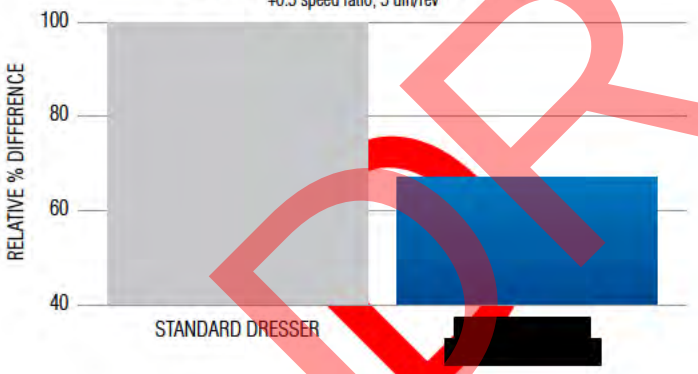
- Dressing of complex, intricate forms (i.e. fuel injection, thread, and aerospace root and tree forms) at realistic, low cost
- The controlled exposure of the diamond matrix, in a precise profile, creates a more free-cutting dressing roll, increases cutting speeds, and ensures smoother contact between diamond and wheel face
- Improved chip clearance promotes better grinding wheel swarf removal
- Decreased grinding power during material removal
- Decreased normal forces during dressing results in reduced vibration, improved size-holding, and improved finished part quality
- Uniformly distributed, high diamond concentration extends diamond dressing roll form-holding and life
- The precise diamond profile needs little or no lapping; close tolerances are achieved "out of the mold" (±0.005mm / ±.0002")
- These sharp natural points provide a superior dressing action, resulting in an open grinding wheel and lower grinding forces

CASE STUDIES

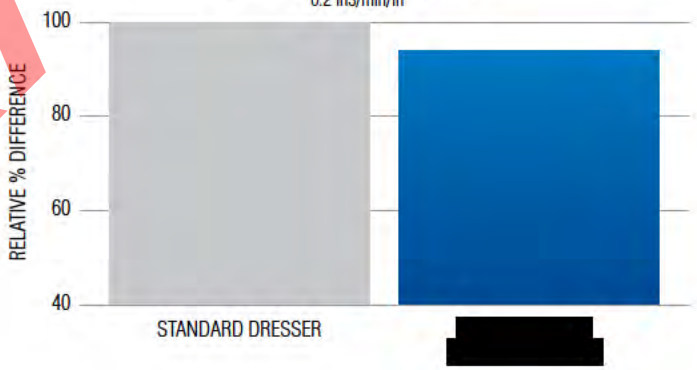
Studies show that both dressing normal forces and resulting grinding power are lower when using our [redacted] diamond dressing roll with controlled exposure of the diamond matrix vs a standard dressing roll.

Abrasive Product: [redacted] Grinding Wheel
Workpiece Material: Inconel 718

DRESSING NORMAL FORCE COMPARISON
+0.5 speed ratio, 5 uin/rev



GRINDING POWER COMPARISON
0.2 in3/min/in



[redacted]

CUSTOM-ENGINEERED AVAILABILITY

[redacted] dressing rolls are custom-engineered to your precise requirements. A [redacted] will analyze your facility's grinding and dressing processes and recommend the most cost-effective, optimum-performing solution. Feature descriptions and tolerances are dependent on specific geometries.

DIAMOND ROLL GEOMETRIC AVAILABILITY

Diameter:
2.000" - 12.000" [50.80mm - 304.80mm]

Width:
1.000" - 8.500" [25.40mm - 215.90mm] (one piece)

Form Tolerances:
Profile: +/- 0.000080" [0.002mm]
Radius: +/- 0.0002" [0.005mm]
Step Relationship: +/-0.00005" [0.0013mm]
Profile Angularity: +/- 0.00005" [0.0013mm]

Concentricity Band to Bore TIR:
0.00008" [0.002mm]

Diamond to Bore TIR:
0.0002" [0.005mm]

Bore Diameter Tolerance:
(+0.0001", -0.0000") [+0.004mm, -0.000mm] up to 4" length

* Availability listed above may not be available for certain diamond roll forms or diamond roll types. All availability is subject to [redacted] design engineering team.

ORDERING ROTARY DRESSING TOOLS

Please provide the following information to your local sales representative or customer service representative.

Legible blueprint of roll, wheel, or part with the following geometry:

- Overall diameter
- Overall length
- Bore size and tolerances required
- Mounting pattern
- Any feature with tolerances less than 0.0002" (5 µm) must be clearly defined for engineering review
- If designing from a part, a fully dimensioned part drawing is required
- Abrasive type (natural diamond, synthetic diamond, CVD stones, etc.)
- Specification of wheel to be dressed (need at least the grit type and size)
- Dressing type (Plunge or CNC Profiling)

[redacted]

Delivering added value
(cost savings)

Strategic partnership

Professional
systematic, disciplined, documented

We understand that to maintain the competitive advantage in tough economic times you have to be leaner and more productive than ever before. Through the [redacted] we can analyze your grinding and dressing operation to significantly reduce rejection and scrap rates.

Assessing cost, quality, safety, and service with our [redacted] will show you how to produce parts faster with fewer rejections and substantially drive down costs to make your operation more profitable.

For more information on rotary dressing products and applications contact your loca[redacted] or authorized distributor.

Our technical account managers are trained in the [redacted] to identify potential cost saving opportunities in your rotary dressing applications.

To learn more about our[redacted]

[redacted]

MATERIAL SAFETY DATA SHEET

Date Issued: March 20, 2003

Section I - Identification and Emergency Information

Manufacturer's Name	[redacted]
Address (Street, Ward, City, Pref., Zip, Country)	
Trade Name	Grinding Wheels
Contact	[redacted]
Address	
Emergency Telephone No.	

Section II - Components and Hazard Information

Hazardous Components None	
Non-Hazardous Components Abrasive Grain (Aluminum Oxide, Silicon Carbide) Vitrified Bond Type (Feldspar and Clays) Resiniod Bond Type (Phenolic resin, Fiberglass mesh reinforcement or fiber backing and other minerals and agents)	ALL NON-TOXIC INGREDIENTS

Section III - Physical and Chemical Data

Boiling Point	N.A.	Specific Gravity (H_2O = 1)	2 - 4
Vapor Pressure (mm Hg)	N.A.	Percent Volatile by Weight (%)	N.A.
Vapor Density (Air = 1)	N.A.	Evaporate Rate	N.A.
Solubility in Water	N.A.	pH	N.A.
Appearance and Odor	N.A.		

Section IV – Fire and Explosion Hazard Data

Flash Point (Method Used) : N.A.	Flammable Limits	LEL N.A.	UEL N.A.
Extinguishing Media : N.A.			
Special Fire Fighting Procedures : N.A.			
Unusual Fire and Explosion Hazards : N.A.			

Section V - Health and Hazard Data, Emergency & First Aid

Route(s) Of Entry :	Inhalation : Yes	Skin : No	Ingestion : N.A.
Health Hazards : A release of nuisance dust may result from the use of this product. Exposure to excessive concentrations may result in respiratory irritation. Excessive contact with eyes and/or skin may result in inflammation or abrasion. Use with adequate ventilation or OSHA approved breathing protection.			
Carcinogen :	NTP : No	IARC Monograph : No	OSHA Regulated : No
Signs And Symptoms Of Exposure :	Respiratory Tract Irritation		
Medical Conditions :	May irritate respiratory tract of person with reduced pulmonary capacity.		
Emergency First Aid : If excessive dust occurs, avoid further contact. Irrigate eyes and skin with copious amounts of water. Seek medical attention.			

Section VI - Reactivity Data

Stability	Unstable		Conditions To Avoid
	Stable	X	
Incompatibility (Materials To Avoid) :	N.A.		
Hazardous Decomposition Products :	N.A.		
Hazardous Polymerization	May Occur		Conditions To Avoid
	Will Not Occur	X	

Section VII - Spill or Leak Procedure

Steps To Be Taken In Case Material Is Released Or Spilled :	N.A.
Waste Disposal Method :	In compliance with state, federal, and local regulations
Precautions To Be Taken In Handling And Storage :	In accordance with ANSI B7.1
Other Precautions : Use in proper ventilation as per OSHA Std.29 CFR-1910.84 or use breathing protection as per OSHA Std. CFR-1910.134	

Section VIII - Special Protection Information

Respiratory Protection (Specify Type) :	Not required but advised per OSHA Std. 29 CFR 1910.134		
Ventilation	Local Exhaust : OSHA Std. 29 CFR-1910.34	Special :	
	Mechanical (General)	Other :	
Protective Gloves :	Recommended	Eye Protection :	Standard Safety Eyewear
Other Protective Clothing Or Equipment :	Use applicable protective guards and clothing		
Work / Hygienic Practice :	Good personal hygiene practices should be followed		

The information and recommendation contained herein are to the best of [redacted] knowledge and belief, accurate and reliable as of the date issued. [redacted]es not warrant or guarantee their accuracy or reliability and [redacted] shall not be liable for any loss or damage arising out of the use thereof.

The information and recommendations are offered for the user's consideration and examination, and it is the user's responsibility to satisfy itself that they are suitable and complete for its particular use.

* N.A. means Not Applicable *

LH9 Grind & LH9 L1 Cast Iron Abrasive Plates

Product Bulletins & Safety Data Sheets

SAFETY DATA SHE[redacted]

1.Identification of substance

Product details

.Trade name: Steel plate

.Application of the substance/the preparation: The steel ball's grinding of initial procedure.

.Manufacturer/supplier:

[redacted]

2.Composition/Data on components:

.Chemical characterization: Iron, Alloy material,

.Description:

Name	Molecular formula or structural formula	CAS number	Content (%)
Iron	Fe	7439-89-6	>90%
Carbon	C	7440-44-0	2.8-3.3%
Silicon	Si	7440-21-3	1.4-2.0%
Manganese	Mn	7439-96-5	0.8-1.2%
Sulfur	S	7704-34-9	<0.05%
Phosphorus	P	7723-14-0	<0.05%
Chromium	Cr	7440-47-3	0.4-0.7%
Molybdenum	Mo	7439-98-7	0.6-1.0%
Copper	Cu	7440-50-8	0.6-1.2%

.Dangerous components:

3.Hazards Identification

By handling of abrasive tools no particular hazard is known when normal precautions and personal protective equipment are kept.

---

4. First Aid Measures

As the form of the product is solid, the ability of Inhalation/Ingestion /Eye contact not easily.

Ingestion:

If swallowed, DO NOT INDUCES VOMITING. Give large quantities of water. Never give anything by mouth to an unconscious person. Get medical attention immediately.

Skin Contact:

In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse.

Eye Contact:

Immediately flush eyes with plenty of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Get medical attention Immediately

---

5. Fire Fighting Measures

Fire: Product is not self-igniting.

Fire Extinguishing Media: Dry chemical, foam or carbon dioxide.

Special Information: In the event of a fire, wear full protective clothing.

---

6. Accidental Release Measures

None

7. Handling and Storage

Handling: The wheels must be handled with care and be kept from coiling and vibrating. It is prohibited to roll the wheels on the ground.

Storage: Grinding wheels must be stored in a dry place and be kept from humid and being frozen .The storing temperature cannot be less 5℃.

---

8. Exposure Controls/Personal Protection

Additional information about design of technical systems:

No further data

Components with critical values that require monitoring at the workplace

Skin Protection:

Wear impervious protective clothing and glove.

---

9. Physical and Chemical Properties:

General Information

Form: Solid

Smell: None

Change in condition

Melting point/Melting range: Not determined

Boiling point/Boiling range: Not applicable or not determined.

Self-inflammability: Product is not self-igniting.

Danger of explosion: Product is not explosive.

Solubility in/Miscibility with water: Not miscible or difficult to mix.

---

10. Stability and Reactivity

Stability: Stable under ordinary conditions of use and storage.

Hazardous Polymerization: Will not occur.

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11. Toxicological Information

No toxicological effect known

When used and handled according to specifications, the product does not have any harmful effects according to our experience and the information provided to us.

---

12. Ecological Information

None.

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13. Disposal Considerations

Recommendation

Smaller quantities have to be disposed in line with local legislation.

Salvaged material can be recycled after.

Uncleaned packaging:

Recommendation:

Empty contaminated packagings throuly. They can be recycled after through and proper cleaning.

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14. Transport information:

Land transport [redacted]

Maritime transport [redacted]

No hazardous substances during transportation.

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15. Regulatory Information

This MSDS has been prepared according to the criteria of the [redacted] and the MSDS contains all of the information required by the [redacted]

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16. Other Information.

Not determined.

[redacted]

Appendix 6

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Swarf Sampling Survey Summary Table

ATS Laboratory TCLP Data Summary Tables: "Grind" and "L1" Swarfs

ATS Laboratory TCLP Data Reports

Swarf Sampling Survey Summary Table

Sample Name	Sample Date	Sample Time	Grab/Composite	ATS Sample Receipt Date
Grind Sludge #G-1	10/14/2014	12:30 PM	Grab	10/22/2014
L-1 Sludge #L-1-01	10/14/2014	12:30 PM	Grab	10/22/2014
Grind Sludge #G-02	10/21/2014	12:30 PM	Grab	10/22/2014
L-1 Sludge #L-1-02	10/21/2014	12:30 PM	Grab	10/22/2015
Grind Sludge #G-3	10/28/2014	12:20 PM	Grab	11/6/2014
L-1 Sludge #L-1-3	10/28/2014	12:20 PM	Grab	11/6/2014
Grind Sludge #G-4	11/4/2014	12:25 PM	Grab	11/6/2014
L-1 Sludge #L-1-4	11/4/2014	12:25 PM	Grab	11/6/2014
Grind Sludge #G-5	11/11/2014	12:35 PM	Grab	11/20/2014
L-1 Sludge #L-1-5	11/11/2014	12:35 PM	Grab	11/20/2014
Grind Sludge #G-6	11/18/2014	12:30 PM	Grab	11/20/2014
L-1 Sludge #L-1-6	11/18/2014	12:30 PM	Grab	11/20/2014
Grind Sludge #G-01	5/3/2016	12:30 PM	Grab	5/13/2016
L-1 Sludge #L-1-01	5/3/2016	12:30 PM	Grab	5/13/2016
Grind Sludge #G-02	5/10/2016	1:00 PM	Grab	5/13/2016
L-1 Sludge #L-1-02	5/10/2016	1:00 PM	Grab	5/13/2016
Grind Sludge #G-03	5/17/2016	12:30 PM	Grab	5/26/2016
L-1 Sludge #L-1-03	5/17/2016	12:30 PM	Grab	5/26/2016
Grind Sludge #G-04	5/24/2016	1:00 PM	Grab	5/26/2016
L-1 Sludge #L-1-04	5/24/2016	1:00 PM	Grab	5/26/2016
Grind Sample	5/31/2016	12:30 PM	Grab	6/13/2016
L-1 Sample	5/31/2016	12:30 PM	Grab	6/13/2016
Grind Sample	6/7/2016	12:15 PM	Grab	6/13/2016
L-1 Sample	6/7/2016	12:15 PM	Grab	6/13/2016
Grind Sludge	6/14/2016	12:00 PM	Grab	6/24/2016
L-1 Sludge	6/14/2016	12:00 PM	Grab	6/24/2016
Grind Sludge	6/21/2016	12:00 PM	Grab	6/24/2016
L-1 Sludge	6/21/2016	12:00 PM	Grab	6/24/2016
Grind Sample	7/19/2016	12:00 PM	Grab	7/28/2016
L-1 Sample	7/19/2016	12:00 PM	Grab	7/28/2016
Grind Sample	7/26/2016	12:00 PM	Grab	7/28/2016
L-1 Sample	7/26/2016	12:00 PM	Grab	7/28/2016
Grind Sample	8/2/2016	12:00 PM	Grab	8/15/2016
L-1 Sample	8/2/2016	12:00 PM	Grab	8/15/2016
Grind Sample	8/9/2016	12:00 PM	Grab	8/15/2016
L-1 Sample	8/9/2016	12:00 PM	Grab	8/15/2016

NSK-AKS "Grind" Swarf TCLP Summary

Sample Date	Composite or Discrete	Oil Content	TCLP Leach Parameters													
			Arsenic	Barium	Cadmium	Chromium	Chromium VI	Chromium II & III	Copper	Iron	Lead	Mercury	Nickel	Selenium	Silver	Zinc
		mg/kg	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
10/14/2014	D	97,000	<0.1	0.36	<0.005	0.57			0.013	140	<0.05	<0.0005	0.069	<0.01	<0.05	0.31
10/21/2014	D	110,000	<0.1	0.43	<0.005	0.77			0.012	190	0.07	<0.0005	0.095	<0.01	<0.05	0.35
10/28/2014	D	140,000	<0.1	0.41	<0.005	0.48			0.028	120	<0.05	<0.0005	0.082	<0.01	<0.05	0.28
11/4/2014	D	120,000	<0.1	0.42	<0.005	0.51			0.030	130	<0.05	<0.0005	0.061	<0.01	<0.05	0.28
11/11/2014	D	140,000	<0.1	0.06	<0.005	0.61			0.008	160	<0.05	<0.0005	0.093	<0.01	<0.05	0.20
11/18/2014	D	130,000	<0.1	0.06	<0.005	0.85			0.005	200	<0.05	<0.0005	0.10	<0.01	<0.05	0.25
May 2016	C	94,000	<0.05	0.14	<0.005	0.95	<0.02	0.83	0.013	180	<0.05	<0.0005	0.11	<0.01	<0.05	0.17
6/7/2016	D	120,000	<0.05	0.26	<0.005	1.1	<0.02	0.83	<0.005	160	<0.05	<0.0005	0.095	<0.01	<0.05	0.14
6/14/2016	D	120,000	<0.05	0.25	<0.005	0.92	<0.02	0.7	<0.005	150	<0.05	<0.0005	0.086	<0.01	<0.05	0.16
6/21/2016	D	160,000	<0.05	0.23	<0.005	0.63	<0.02	0.48	<0.005	120	<0.05	<0.0005	0.07	<0.01	<0.05	0.16
7/19/2016	D	160,000	<0.05	0.22	<0.005	0.60	<0.02	0.48	<0.005	110	<0.05	<0.0005	0.062	<0.01	<0.05	0.17
7/26/2016	D	170,000	<0.05	0.22	<0.005	0.52	<0.02	0.46	<0.005	110	<0.05	<0.0005	0.063	<0.01	<0.05	0.18
8/2/2016	D	120,000	<0.05	0.06	<0.005	0.88	<0.02	0.90	<0.005	160	<0.05	<0.0005	0.088	<0.01	<0.05	0.06
8/9/2016	D	120,000	<0.05	<0.05	<0.005	0.99	<0.02	1.0	<0.005	200	<0.05	<0.0005	0.12	<0.01	<0.05	0.10

NSK-AKS "L-1" Swarf TCLP Summary

Sample Date	Composite or Discrete	Oil Content	TCLP Leach Parameters													
			Arsenic	Barium	Cadmium	Chromium	Chromium VI	Chromium II & III	Copper	Iron	Lead	Mercury	Nickel	Selenium	Silver	Zinc
		mg/kg	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
10/14/2014	D	110,000	<0.1	0.45	<0.005	1.0			0.043	130	<0.05	<0.0005	0.075	<0.01	<0.05	0.32
10/21/2014	D	94,000	<0.1	0.40	<0.005	0.31			0.037	62	<0.05	<0.0005	0.053	<0.01	<0.05	0.24
10/28/2014	D	120,000	<0.1	0.41	<0.005	0.70			0.027	140	<0.05	<0.0005	0.066	<0.01	<0.05	0.23
11/4/2014	D	170,000	<0.1	0.46	<0.005	0.92			0.059	180	<0.05	<0.0005	0.11	<0.01	<0.05	0.28
11/11/2014	D	180,000	<0.1	0.05	<0.005	0.48			0.037	66	<0.05	<0.0005	0.042	<0.01	<0.05	0.14
11/18/2014	D	160,000	<0.01	0.07	<0.005	3.6			<0.005	560	0.09	<0.0005	0.28	<0.01	<0.05	0.25
May 2016	C	164,000	<0.05	0.32	<0.005	4.4	<0.02	4.6	<0.005	780	<0.05	<0.0005	0.30	<0.01	<0.05	0.16
6/7/2016	D	180,000	<0.05	0.26	<0.005	0.46	<0.02	0.40	0.018	38	<0.05	<0.0005	0.026	<0.01	<0.05	0.15
6/14/2016	D	140,000	<0.05	0.24	<0.005	0.32	<0.02	0.33	0.010	28	<0.05	<0.0005	0.013	<0.01	<0.05	0.14
6/21/2016	D	190,000	<0.05	0.26	<0.005	0.67	<0.02	0.63	0.014	60	<0.05	<0.0005	0.034	<0.01	<0.05	0.16
7/19/2016	D	130,000	<0.05	0.20	<0.005	0.21	<0.02	0.21	<0.005	21	<0.05	<0.0005	0.009	<0.01	<0.05	0.15
7/26/2016	D	160,000	<0.05	0.24	<0.005	1.2	<0.02	0.99	<0.005	130	<0.05	<0.0005	0.064	<0.01	<0.05	0.18
8/2/2016	D	170,000	<0.05	0.08	<0.005	0.65	<0.02	0.74	0.013	66	<0.05	<0.0005	0.041	<0.01	<0.05	<0.05
8/9/2016	D	190,000	<0.05	<0.05	<0.005	0.35	<0.02	0.42	0.008	32	<0.05	<0.0005	0.022	<0.01	<0.05	<0.05

LABORATORY OPERATIONS
CASE NARRATIVE

ATS Project Number: H001-NSK
Report Date: 12/12/14 (rev. 4/28/15)

Case Narrative Summary

This case narrative applies to twelve samples that were received at Ann Arbor Technical Services, Inc. (ATS) on 10/22/14, 11/6/14, and 11/20/14. Upon receipt, samples were scheduled for the following analyses.

- TCLP Chromium by USEPA Methods 1311 and 6010C
- TCLP Iron by USEPA Method 6010C
- Oil Content by USEPA Method 9071B

Subsequent reprocessing and/or analysis included:

- TCLP Regulatory Metals by USEPA Methods 1311 and 6010C
- TCLP Mercury by USEPA Methods 1311 and 7470A
- TCLP Copper, Nickel, and Zinc by USEPA Method 6010C

Sample Receipt, Chain of Custody Records, and Holding Times

Samples were delivered to ATS by commercial courier. Samples were received in boxes at ambient temperature with proper chain of custody records. All samples were extracted and analyzed within the holding times as cited in USEPA Method 1311 with the following exceptions:

Analysis	Analytical Method	Holding Time
Mercury	EPA 1311/7470A	28 Days from time of extraction

Data Review and Approval

All data contained in this report have been conducted in accordance with the guidelines provided in the referenced standard test methods, and are consistent with the detailed procedures described in a written standard operating procedure (SOP) specific to ATS, as required by USEPA. All data is peer and management reviewed to ensure compliance with the above referenced SOP's and project specifications. In addition all data conform to the laboratory's Quality Assurance / Quality Control Manuals.

Consultants in Chemistry & Environmental Science
290 South Wagner Road, Ann Arbor, Michigan 48103 Tel 734/995-0995 Fax 734/995-3731

Data Deliverables and Sample Reporting

All data deliverables are generated to be in compliance with the USEPA. This data package constitutes a level II package. There were no hardcopy data summary sheets generated for this project.

Anomalies Noted: **Sample ID's as received for the following samples were changed during report generation in order to ensure naming consistency.**

Sample ID as received	Sample ID as reported
Grind Sludge #G3	Grind Sludge #G-03
Grind Sludge #G4	Grind Sludge #G-04
Grind Sludge #G5	Grind Sludge #G-05
Grind Sludge #G6	Grind Sludge #G-06

Sample Preparation

Metals Analysis (except mercury): Samples were extracted in accordance with USEPA Method 1311 (Toxicity Leaching Characteristic Procedure) followed by a digestion in accordance with USEPA Method 3010A (Acid Digestion of Aqueous Samples and Extracts for Total Metals Analysis by FLAA or ICP Spectroscopy).

Mercury Analysis: Samples were extracted in accordance with USEPA Method 1311 (Toxicity Leaching Characteristic Procedure) followed by a digestion in accordance with USEPA Method 7470A (Mercury in Liquid Waste – Cold Vapor Atomic Absorption Spectrometry).

Oil Content: Samples were extracted in accordance with USEPA Method 9071B (n-Hexane Extractable Material for Sludge, Sediment, and Solid Samples).

Extensive homogenization procedures were implemented due to the nature of the sample matrix.

Anomalies Noted: **None**

Sample Analysis

Metals Analysis (except mercury): Samples were analyzed in accordance with USEPA Method 6010C (Inductively Coupled Plasma – Atomic Emission Spectrometry). An initial calibration with at least five levels was used to quantitate metals. Concentrations were reported to a number corresponding to 1/100 of the maximum leachate concentration where applicable or the method detection limit (MDL). Samples were reported on a mg/L wet weight basis as indicated in USEPA method 1311.

Mercury Analysis: Samples were analyzed in accordance with USEPA Method 7470A (Mercury in Liquid Waste – Cold Vapor Atomic Absorption Spectrometry). An initial calibration with at least five levels was used to quantitate mercury. Concentrations were reported to a number corresponding to 1/100 of the maximum leachate concentration where applicable or the method detection limit (MDL). Samples were reported on a mg/L wet weight basis as indicated in USEPA method 1311.

Oil Content: Samples were analyzed in accordance with USEPA Method 9071B (n-Hexane Extractable Material for Sludge, Sediment, and Solid Samples). Samples were reported on a mg/kg wet weight basis.

Anomalies Noted: **None**

Analytical QA/QC Summary

Calibration Verification

Applicable to ICP/AES and CVAAS analyses only.

Method calibration was verified through the running of a mid-level initial calibration verification (CV) standard at a frequency of every ten samples. All verification standards met the acceptance criteria with the following exceptions:

Sample ID	Analytical Method	Constituent	Recovery	Acceptance Limits
CV 11/26/14	6010C	Iron	110.1%	90-110 %

Interference Checks

Applicable to ICP/AES analyses only.

The lack of spectral interferences was verified through the analysis of interference check standards every running day. All interference standards met the acceptance criteria with the following exceptions:

- **None**

Instrument Blanks

Applicable to ICP/AES and CVAAS analyses only.

Instrument blanks were analyzed at a frequency of every ten samples. All blanks met the acceptance criteria with the following exceptions:

- **None**

Matrix Spikes

Applicable to ICP/AES analyses only.

A matrix spike (MS) and matrix spike duplicate (MSD) was analyzed at a frequency of every ten samples. All MS and MSD's met the acceptance criteria with the following exceptions:

- **Four MS/MSD's for iron are not reportable due to inadequate spiking levels.**

Matrix Duplicates

Applicable to ICP/AES and CVAAS analyses only.

A replicate analysis was performed at a frequency of every ten samples. All replicates met the acceptance criteria with the following exceptions:

- **None**

QA/QC Batch Summary

Laboratory Reagent Blanks

Applicable to all analyses.

A laboratory reagent blank (LRB) was analyzed with each QA/QC batch. All LRB's met the acceptance criteria with the following exceptions:

Sample ID	Analytical Method	Constituent	Analyzed Concentration	Reporting Limit
Laboratory Reagent Blank 11/19/14	EPA 1311/3010A	Copper	0.007 mg/L	0.005 mg/L
Laboratory Reagent Blank 11/19/14	EPA 1311/3010A	Iron	0.50 mg/L	0.005 mg/L
Laboratory Reagent Blank 11/25/14	EPA 1311/3010A	Iron	0.74 mg/L	0.005 mg/L
Laboratory Reagent Blank 11/19/14	EPA 1311/3010A	Zinc	0.16 mg/L	0.005 mg/L

Laboratory Fortified Blanks and Matrix Spikes

Applicable to ICP/AES and CVAAS analyses only.

A laboratory fortified blank (LFB) / laboratory control sample (LCS) was analyzed with each QA/QC batch. For chromium the LCS/LFB's consisted of equal concentrations of trivalent and hexavalent species. All LCS/LFB's met the acceptance criteria with the following exceptions:

Sample ID	Analytical Method	Constituent	Percent Recovery	Acceptance Limits
Laboratory Control Sample 11/17/14	EPA 1311/7470A	Mercury	116.0%	85-115%

A matrix spike (MS) and matrix spike duplicate (MSD) was analyzed with each QA/QC batch. For chromium the MS/MSD's consisted of equal concentrations of trivalent and hexavalent species. All MS/MSD's met the acceptance criteria with the following exceptions:

- **Two MS/MSD pairs for iron were not reportable due to inadequate spiking levels.**

Matrix Duplicates

Applicable to all analyses.

A replicate analysis was performed at a frequency of every ten samples. All replicates met the acceptance criteria with the following exceptions:

Sample ID	Analytical Method	Constituent	Relative Range	Acceptance Limits
L1 Sludge #L1-06 11/18/14 Matrix Spike	EPA 3010A/6010C	Iron	25.0%	≤ 20 %
L1 Sludge #L1-03 10/28/14	EPA 7071B	Oil Content	50.0 %	≤ 20 %

Sample Dilutions

Samples containing compounds at concentrations above the initial calibration curve were diluted and reanalyzed for those compounds. The following samples were diluted:

- **None**

/ April 28, 2015

Mark T. DeLong (Quality Assurance Coordinator)

/ April 28, 2015

Philip B. Simon (Laboratory Director)

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Tel. 734/995-0995 Fax. 734/995-3731Michigan Laboratory ID: 9604
Wisconsin Laboratory ID: 998321720

Toxicity Characteristic Leaching Procedure
Inorganic Analysis
Data Summary Sheet

For: Mr. Duane Strong
NSK-AKS Precision Ball Company
1100A North First Street
Clarinda, Iowa 51632

ATS Project: NSK-AKS #H001-NSK
Report Date: 12/12/14 (rev. 4/28/15)
ATS SRF: 1022141

Sample Identification: Grind Sludge #G-01

Sample Date: 10/14/14
Sample Time: 12:30 PM
Sampled By: Client
Laboratory Receipt Date: 10/22/14
Sample Matrix: Grind Waste

Preparation Method: EPA 1311
Analytical Method(s): EPA 3010A / 6010C
EPA 7470A
EPA 9071B

Parameter (CAS)	Units	Result	Maximum Leachate Concentration*	TCLP Hazardous	Analysis Date	Analysis Time	QC Batch Number
Arsenic (7440-38-2)	mg/L	<0.1	5.0	No	11/20/14	1:20 PM	1117141-N
Barium (7440-39-3)	mg/L	0.36	100	No	11/20/14	1:20 PM	1117141-N
Cadmium (7440-43-9)	mg/L	<0.005	1.0	No	11/20/14	1:20 PM	1117141-N
Chromium (7440-47-3)	mg/L	0.57	5.0	No	11/20/14	1:20 PM	1117141-N
Copper (7440-50-8)	mg/L	0.013	na	na	11/20/14	1:20 PM	1117141-N
Iron (7439-89-6)	mg/L	140	na	na	11/20/14	1:20 PM	1117141-N
Lead (7439-92-1)	mg/L	<0.05	5.0	No	11/20/14	1:20 PM	1117141-N
Mercury (7439-97-6)	mg/L	<0.0005	0.2	No	4/22/15	11:41 AM	1117141-N
Nickel (7440-02-0)	mg/L	0.069	na	na	11/20/14	1:20 PM	1117141-N
Selenium (7782-49-2)	mg/L	<0.01	1.0	No	11/20/14	1:20 PM	1117141-N
Silver (7440-22-4)	mg/L	<0.05	5.0	No	11/20/14	1:20 PM	1117141-N
Zinc (7440-66-6)	mg/L	0.31	na	na	11/20/14	1:20 PM	1117141-N
Oil Content	mg/kg	97,000	na	na	10/22/14	na	1022141-N

Comments

All methods reference USEPA methods unless otherwise noted.
* Reference: 40 CFR, 1998 Part 261.24
Oil content is expressed on a wet weight basis.
na - Indicates not applicable

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Michigan Laboratory ID: 9604
Wisconsin Laboratory ID: 998321720

Toxicity Characteristic Leaching Procedure
Inorganic Analysis
Data Summary Sheet

For: Mr. Duane Strong
NSK-AKS Precision Ball Company
1100A North First Street
Clarinda, Iowa 51632

ATS Project: NSK-AKS #H001-NSK
Report Date: 12/12/14 (rev. 4/28/15)
ATS SRF: 1022141

Sample Identification: Grind Sludge #G-02

Sample Date: 10/21/14
Sample Time: 12:30 PM
Sampled By: Client
Laboratory Receipt Date: 10/22/14
Sample Matrix: Grind Waste

Preparation Method: EPA 1311
Analytical Method(s): EPA 3010A / 6010C
EPA 7470A
EPA 9071B

Parameter (CAS)	Units	Result	Maximum Leachate Concentration*	TCLP Hazardous	Analysis Date	Analysis Time	QC Batch Number
Arsenic (7440-38-2)	mg/L	<0.1	5.0	No	11/20/14	1:41 PM	1117141-N
Barium (7440-39-3)	mg/L	0.43	100	No	11/20/14	1:41 PM	1117141-N
Cadmium (7440-43-9)	mg/L	<0.005	1.0	No	11/20/14	1:41 PM	1117141-N
Chromium (7440-47-3)	mg/L	0.77	5.0	No	11/20/14	1:41 PM	1117141-N
Copper (7440-50-8)	mg/L	0.012	na	na	11/20/14	1:41 PM	1117141-N
Iron (7439-89-6)	mg/L	190	na	na	11/20/14	1:41 PM	1117141-N
Lead (7439-92-1)	mg/L	0.07	5.0	No	11/20/14	1:41 PM	1117141-N
Mercury (7439-97-6)	mg/L	<0.0005	0.2	No	4/22/15	11:54 AM	1117141-N
Nickel (7440-02-0)	mg/L	0.095	na	na	11/20/14	1:41 PM	1117141-N
Selenium (7782-49-2)	mg/L	<0.01	1.0	No	11/20/14	1:41 PM	1117141-N
Silver (7440-22-4)	mg/L	<0.05	5.0	No	11/20/14	1:41 PM	1117141-N
Zinc (7440-66-6)	mg/L	0.35	na	na	11/20/14	1:41 PM	1117141-N
Oil Content	mg/kg	110,000	na	na	10/22/14	na	1022141-N

Comments

All methods reference USEPA methods unless otherwise noted.
* Reference: 40 CFR, 1998 Part 261.24
Oil content is expressed on a wet weight basis.
na - Indicates not applicable

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Toxicity Characteristic Leaching Procedure
Inorganic Analysis
Data Summary Sheet

For: Mr. Duane Strong
NSK-AKS Precision Ball Company
1100A North First Street
Clarinda, Iowa 51632

ATS Project: NSK-AKS #H001-NSK
Report Date: 12/12/14 (rev. 4/28/15)
ATS SRF: 1106141

Sample Identification: Grind Sludge #G-03

Sample Date: 10/28/14
Sample Time: 12:20 PM
Sampled By: Client
Laboratory Receipt Date: 11/6/14
Sample Matrix: Grind Waste

Preparation Method: EPA 1311
Analytical Method(s): EPA 3010A / 6010C
EPA 7470A
EPA 9071B

Parameter (CAS)	Units	Result	Maximum Leachate Concentration*	TCLP Hazardous	Analysis Date	Analysis Time	QC Batch Number
Arsenic (7440-38-2)	mg/L	<0.1	5.0	No	11/20/14	1:51 PM	1117141-N
Barium (7440-39-3)	mg/L	0.41	100	No	11/20/14	1:51 PM	1117141-N
Cadmium (7440-43-9)	mg/L	<0.005	1.0	No	11/20/14	1:51 PM	1117141-N
Chromium (7440-47-3)	mg/L	0.48	5.0	No	11/20/14	1:51 PM	1117141-N
Copper (7440-50-8)	mg/L	0.028	na	na	11/20/14	1:51 PM	1117141-N
Iron (7439-89-6)	mg/L	120	na	na	11/20/14	1:51 PM	1117141-N
Lead (7439-92-1)	mg/L	<0.05	5.0	No	11/20/14	1:51 PM	1117141-N
Mercury (7439-97-6)	mg/L	<0.0005	0.2	No	4/22/15	12:00 PM	1117141-N
Nickel (7440-02-0)	mg/L	0.082	na	na	11/20/14	1:51 PM	1117141-N
Selenium (7782-49-2)	mg/L	<0.01	1.0	No	11/20/14	1:51 PM	1117141-N
Silver (7440-22-4)	mg/L	<0.05	5.0	No	11/20/14	1:51 PM	1117141-N
Zinc (7440-66-6)	mg/L	0.28	na	na	11/20/14	1:51 PM	1117141-N
Oil Content	mg/kg	140,000	na	na	11/10/14	na	1110141-N

Comments

All methods reference USEPA methods unless otherwise noted.
* Reference: 40 CFR, 1998 Part 261.24
Oil content is expressed on a wet weight basis.
na - Indicates not applicable

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Tel. 734/995-0995 Fax. 734/995-3731
Michigan Laboratory ID: 9604
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Toxicity Characteristic Leaching Procedure
Inorganic Analysis
Data Summary Sheet

For: Mr. Duane Strong
NSK-AKS Precision Ball Company
1100A North First Street
Clarinda, Iowa 51632

ATS Project: NSK-AKS #H001-NSK
Report Date: 12/12/14 (rev. 4/28/15)
ATS SRF: 1106141

Sample Identification: Grind Sludge #G-04

Sample Date: 11/4/14
Sample Time: 12:25 PM
Sampled By: Client
Laboratory Receipt Date: 11/6/14
Sample Matrix: Grind Waste

Preparation Method: EPA 1311
Analytical Method(s): EPA 3010A / 6010C
EPA 7470A
EPA 9071B

Parameter (CAS)	Units	Result	Maximum Leachate Concentration*	TCLP Hazardous	Analysis Date	Analysis Time	QC Batch Number
Arsenic (7440-38-2)	mg/L	<0.1	5.0	No	11/20/14	2:44 PM	1117141-N
Barium (7440-39-3)	mg/L	0.42	100	No	11/20/14	2:44 PM	1117141-N
Cadmium (7440-43-9)	mg/L	<0.005	1.0	No	11/20/14	2:44 PM	1117141-N
Chromium (7440-47-3)	mg/L	0.51	5.0	No	11/20/14	2:44 PM	1117141-N
Copper (7440-50-8)	mg/L	0.030	na	na	11/20/14	2:44 PM	1117141-N
Iron (7439-89-6)	mg/L	130	na	na	11/20/14	2:44 PM	1117141-N
Lead (7439-92-1)	mg/L	<0.05	5.0	No	11/20/14	2:44 PM	1117141-N
Mercury (7439-97-6)	mg/L	<0.0005	0.2	No	4/22/15	1:17 PM	1117141-N
Nickel (7440-02-0)	mg/L	0.061	na	na	11/20/14	2:44 PM	1117141-N
Selenium (7782-49-2)	mg/L	<0.01	1.0	No	11/20/14	2:44 PM	1117141-N
Silver (7440-22-4)	mg/L	<0.05	5.0	No	11/20/14	2:44 PM	1117141-N
Zinc (7440-66-6)	mg/L	0.28	na	na	11/20/14	2:44 PM	1117141-N
Oil Content	mg/kg	120,000	na	na	11/10/14	na	1110141-N

Comments

All methods reference USEPA methods unless otherwise noted.
* Reference: 40 CFR, 1998 Part 261.24
Oil content is expressed on a wet weight basis.
na - Indicates not applicable

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Michigan Laboratory ID: 9604
Wisconsin Laboratory ID: 998321720

Toxicity Characteristic Leaching Procedure
Inorganic Analysis
Data Summary Sheet

For: Mr. Duane Strong
NSK-AKS Precision Ball Company
1100A North First Street
Clarinda, Iowa 51632

ATS Project: NSK-AKS #H001-NSK
Report Date: 12/12/14 (rev. 4/28/15)
ATS SRF: 1120141

Sample Identification: Grind Sludge #G-05

Sample Date: 11/11/14
Sample Time: 12:35 PM
Sampled By: Client
Laboratory Receipt Date: 11/20/14
Sample Matrix: Grind Waste

Preparation Method: EPA 1311
Analytical Method(s): EPA 3010A / 6010C
EPA 7470A
EPA 9071B

Parameter (CAS)	Units	Result	Maximum Leachate Concentration*	TCLP Hazardous	Analysis Date	Analysis Time	QC Batch Number
Arsenic (7440-38-2)	mg/L	<0.1	5.0	No	11/26/14	12:06 PM	1124141-N
Barium (7440-39-3)	mg/L	0.06	100	No	11/26/14	12:06 PM	1124141-N
Cadmium (7440-43-9)	mg/L	<0.005	1.0	No	11/26/14	12:06 PM	1124141-N
Chromium (7440-47-3)	mg/L	0.61	5.0	No	11/26/14	12:06 PM	1124141-N
Copper (7440-50-8)	mg/L	0.008	na	na	11/26/14	12:06 PM	1124141-N
Iron (7439-89-6)	mg/L	160	na	na	11/26/14	12:06 PM	1124141-N
Lead (7439-92-1)	mg/L	<0.05	5.0	No	11/26/14	12:06 PM	1124141-N
Mercury (7439-97-6)	mg/L	<0.0005	0.2	No	4/22/15	1:23 PM	1124141-N
Nickel (7440-02-0)	mg/L	0.093	na	na	11/26/14	12:06 PM	1124141-N
Selenium (7782-49-2)	mg/L	<0.01	1.0	No	11/26/14	12:06 PM	1124141-N
Silver (7440-22-4)	mg/L	<0.05	5.0	No	11/26/14	12:06 PM	1124141-N
Zinc (7440-66-6)	mg/L	0.20	na	na	11/26/14	12:06 PM	1124141-N
Oil Content	mg/kg	140,000	na	na	11/21/14	na	1121141-N

Comments

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Oil content is expressed on a wet weight basis.
na - Indicates not applicable

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Toxicity Characteristic Leaching Procedure
Inorganic Analysis
Data Summary Sheet

For: Mr. Duane Strong
NSK-AKS Precision Ball Company
1100A North First Street
Clarinda, Iowa 51632

ATS Project: NSK-AKS #H001-NSK
Report Date: 12/12/14 (rev. 4/28/15)
ATS SRF: 1120141

Sample Identification: Grind Sludge #G-06

Sample Date: 11/18/14
Sample Time: 12:30 PM
Sampled By: Client
Laboratory Receipt Date: 11/20/14
Sample Matrix: Grind Waste

Preparation Method: EPA 1311
Analytical Method(s): EPA 3010A / 6010C
EPA 7470A
EPA 9071B

Parameter (CAS)	Units	Result	Maximum Leachate Concentration*	TCLP Hazardous	Analysis Date	Analysis Time	QC Batch Number
Arsenic (7440-38-2)	mg/L	<0.1	5.0	No	11/26/14	12:11 PM	1124141-N
Barium (7440-39-3)	mg/L	0.06	100	No	11/26/14	12:11 PM	1124141-N
Cadmium (7440-43-9)	mg/L	<0.005	1.0	No	11/26/14	12:11 PM	1124141-N
Chromium (7440-47-3)	mg/L	0.85	5.0	No	11/26/14	12:11 PM	1124141-N
Copper (7440-50-8)	mg/L	0.005	na	na	11/26/14	12:11 PM	1124141-N
Iron (7439-89-6)	mg/L	200	na	na	11/26/14	12:11 PM	1124141-N
Lead (7439-92-1)	mg/L	<0.05	5.0	No	11/26/14	12:11 PM	1124141-N
Mercury (7439-97-6)	mg/L	<0.0005	0.2	No	4/22/15	1:29 PM	1124141-N
Nickel (7440-02-0)	mg/L	0.10	na	na	11/26/14	12:11 PM	1124141-N
Selenium (7782-49-2)	mg/L	<0.01	1.0	No	11/26/14	12:11 PM	1124141-N
Silver (7440-22-4)	mg/L	<0.05	5.0	No	11/26/14	12:11 PM	1124141-N
Zinc (7440-66-6)	mg/L	0.25	na	na	11/26/14	12:11 PM	1124141-N
Oil Content	mg/kg	130,000	na	na	11/21/14	na	1121141-N

Comments

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* Reference: 40 CFR, 1998 Part 261.24
Oil content is expressed on a wet weight basis.
na - Indicates not applicable

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Toxicity Characteristic Leaching Procedure
Inorganic Analysis
Data Summary Sheet

For: Mr. Duane Strong
NSK-AKS Precision Ball Company
1100A North First Street
Clarinda, Iowa 51632

ATS Project: NSK-AKS #H001-NSK
Report Date: 12/12/14 (rev. 4/28/15)
ATS SRF: 1022141

Sample Identification: L1 Sludge #L1-01

Sample Date: 10/14/14
Sample Time: 12:30 PM
Sampled By: Client
Laboratory Receipt Date: 10/22/14
Sample Matrix: L1 Waste

Preparation Method: EPA 1311
Analytical Method(s): EPA 3010A / 6010C
EPA 7470A
EPA 9071B

Parameter (CAS)	Units	Result	Maximum Leachate Concentration*	TCLP Hazardous	Analysis Date	Analysis Time	QC Batch Number
Arsenic (7440-38-2)	mg/L	<0.1	5.0	No	11/20/14	1:01 PM	1117141-N
Barium (7440-39-3)	mg/L	0.45	100	No	11/20/14	1:01 PM	1117141-N
Cadmium (7440-43-9)	mg/L	<0.005	1.0	No	11/20/14	1:01 PM	1117141-N
Chromium (7440-47-3)	mg/L	1.0	5.0	No	11/20/14	1:01 PM	1117141-N
Copper (7440-50-8)	mg/L	0.043	na	na	11/20/14	1:01 PM	1117141-N
Iron (7439-89-6)	mg/L	130	na	na	11/20/14	1:01 PM	1117141-N
Lead (7439-92-1)	mg/L	<0.05	5.0	No	11/20/14	1:01 PM	1117141-N
Mercury (7439-97-6)	mg/L	<0.0005	0.2	No	4/22/15	10:51 AM	1117141-N
Nickel (7440-02-0)	mg/L	0.075	na	na	11/20/14	1:01 PM	1117141-N
Selenium (7782-49-2)	mg/L	<0.01	1.0	No	11/20/14	1:01 PM	1117141-N
Silver (7440-22-4)	mg/L	<0.05	5.0	No	11/20/14	1:01 PM	1117141-N
Zinc (7440-66-6)	mg/L	0.32	na	na	11/20/14	1:01 PM	1117141-N
Oil Content	mg/kg	110,000	na	na	10/22/14	na	1022141-N

Comments

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Oil content is expressed on a wet weight basis.
na - Indicates not applicable

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Toxicity Characteristic Leaching Procedure
Inorganic Analysis
Data Summary Sheet

For: Mr. Duane Strong
NSK-AKS Precision Ball Company
1100A North First Street
Clarinda, Iowa 51632

ATS Project: NSK-AKS #H001-NSK
Report Date: 12/12/14 (rev. 4/28/15)
ATS SRF: 1022141

Sample Identification: L1 Sludge #L1-02

Sample Date: 10/21/14
Sample Time: 12:30 PM
Sampled By: Client
Laboratory Receipt Date: 10/22/14
Sample Matrix: L1 Waste

Preparation Method: EPA 1311
Analytical Method(s): EPA 3010A / 6010C
EPA 7470A
EPA 9071B

Parameter (CAS)	Units	Result	Maximum Leachate Concentration*	TCLP Hazardous	Analysis Date	Analysis Time	QC Batch Number
Arsenic (7440-38-2)	mg/L	<0.1	5.0	No	11/20/14	2:01 PM	1117141-N
Barium (7440-39-3)	mg/L	0.40	100	No	11/20/14	2:01 PM	1117141-N
Cadmium (7440-43-9)	mg/L	<0.005	1.0	No	11/20/14	2:01 PM	1117141-N
Chromium (7440-47-3)	mg/L	0.31	5.0	No	11/20/14	2:01 PM	1117141-N
Copper (7440-50-8)	mg/L	0.037	na	na	11/20/14	2:01 PM	1117141-N
Iron (7439-89-6)	mg/L	62	na	na	11/20/14	2:01 PM	1117141-N
Lead (7439-92-1)	mg/L	<0.05	5.0	No	11/20/14	2:01 PM	1117141-N
Mercury (7439-97-6)	mg/L	<0.0005	0.2	No	4/22/15	11:03 AM	1117141-N
Nickel (7440-02-0)	mg/L	0.053	na	na	11/20/14	2:01 PM	1117141-N
Selenium (7782-49-2)	mg/L	<0.01	1.0	No	11/20/14	2:01 PM	1117141-N
Silver (7440-22-4)	mg/L	<0.05	5.0	No	11/20/14	2:01 PM	1117141-N
Zinc (7440-66-6)	mg/L	0.24	na	na	11/20/14	2:01 PM	1117141-N
Oil Content	mg/kg	94,000	na	na	10/22/14	na	1022141-N

Comments

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* Reference: 40 CFR, 1998 Part 261.24
Oil content is expressed on a wet weight basis.
na - Indicates not applicable

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Toxicity Characteristic Leaching Procedure
Inorganic Analysis
Data Summary Sheet

For: Mr. Duane Strong
NSK-AKS Precision Ball Company
1100A North First Street
Clarinda, Iowa 51632

ATS Project: NSK-AKS #H001-NSK
Report Date: 12/12/14 (rev. 4/28/15)
ATS SRF: 1106141

Sample Identification: L1 Sludge #L1-03

Sample Date:	10/28/14	Preparation Method:	EPA 1311
Sample Time:	12:20 PM	Analytical Method(s):	EPA 3010A / 6010C
Sampled By:	Client		EPA 7470A
Laboratory Receipt Date:	11/6/14		EPA 9071B
Sample Matrix:	L1 Waste		

Parameter (CAS)	Units	Result	Maximum Leachate Concentration*	TCLP Hazardous	Analysis Date	Analysis Time	QC Batch Number
Arsenic (7440-38-2)	mg/L	<0.1	5.0	No	11/20/14	1:10 PM	1117141-N
Barium (7440-39-3)	mg/L	0.41	100	No	11/20/14	1:10 PM	1117141-N
Cadmium (7440-43-9)	mg/L	<0.005	1.0	No	11/20/14	1:10 PM	1117141-N
Chromium (7440-47-3)	mg/L	0.70	5.0	No	11/20/14	1:10 PM	1117141-N
Copper (7440-50-8)	mg/L	0.027	na	na	11/20/14	1:10 PM	1117141-N
Iron (7439-89-6)	mg/L	140	na	na	11/20/14	1:10 PM	1117141-N
Lead (7439-92-1)	mg/L	<0.05	5.0	No	11/20/14	1:10 PM	1117141-N
Mercury (7439-97-6)	mg/L	<0.0005	0.2	No	4/22/15	12:58 PM	1117141-N
Nickel (7440-02-0)	mg/L	0.066	na	na	11/20/14	1:10 PM	1117141-N
Selenium (7782-49-2)	mg/L	<0.01	1.0	No	11/20/14	1:10 PM	1117141-N
Silver (7440-22-4)	mg/L	<0.05	5.0	No	11/20/14	1:10 PM	1117141-N
Zinc (7440-66-6)	mg/L	0.23	na	na	11/20/14	1:10 PM	1117141-N
Oil Content	mg/kg	120,000	na	na	11/10/14	na	1110141-N

Comments

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* Reference: 40 CFR, 1998 Part 261.24
Oil content is expressed on a wet weight basis.
na - Indicates not applicable

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Toxicity Characteristic Leaching Procedure
Inorganic Analysis
Data Summary Sheet

For: Mr. Duane Strong
NSK-AKS Precision Ball Company
1100A North First Street
Clarinda, Iowa 51632

ATS Project: NSK-AKS #H001-NSK
Report Date: 12/12/14 (rev. 4/28/15)
ATS SRF: 1106141

Sample Identification: L1 Sludge #L1-04

Sample Date:	11/4/14	Preparation Method:	EPA 1311
Sample Time:	12:25 PM	Analytical Method(s):	EPA 3010A / 6010C
Sampled By:	Client		EPA 7470A
Laboratory Receipt Date:	11/6/14		EPA 9071B
Sample Matrix:	L1 Waste		

Parameter (CAS)	Units	Result	Maximum Leachate Concentration*	TCLP Hazardous	Analysis Date	Analysis Time	QC Batch Number
Arsenic (7440-38-2)	mg/L	<0.1	5.0	No	11/20/14	1:15 PM	1117141-N
Barium (7440-39-3)	mg/L	0.46	100	No	11/20/14	1:15 PM	1117141-N
Cadmium (7440-43-9)	mg/L	<0.005	1.0	No	11/20/14	1:15 PM	1117141-N
Chromium (7440-47-3)	mg/L	0.92	5.0	No	11/20/14	1:15 PM	1117141-N
Copper (7440-50-8)	mg/L	0.059	na	na	11/20/14	1:15 PM	1117141-N
Iron (7439-89-6)	mg/L	180	na	na	11/20/14	1:15 PM	1117141-N
Lead (7439-92-1)	mg/L	<0.05	5.0	No	11/20/14	1:15 PM	1117141-N
Mercury (7439-97-6)	mg/L	<0.0005	0.2	No	4/22/15	1:04 PM	1117141-N
Nickel (7440-02-0)	mg/L	0.11	na	na	11/20/14	1:15 PM	1117141-N
Selenium (7782-49-2)	mg/L	<0.01	1.0	No	11/20/14	1:15 PM	1117141-N
Silver (7440-22-4)	mg/L	<0.05	5.0	No	11/20/14	1:15 PM	1117141-N
Zinc (7440-66-6)	mg/L	0.28	na	na	11/20/14	1:15 PM	1117141-N
Oil Content	mg/kg	170,000	na	na	11/10/14	na	1110141-N

Comments

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* Reference: 40 CFR, 1998 Part 261.24
Oil content is expressed on a wet weight basis.
na - Indicates not applicable

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Michigan Laboratory ID: 9604
Wisconsin Laboratory ID: 998321720

Toxicity Characteristic Leaching Procedure
Inorganic Analysis
Data Summary Sheet

For: Mr. Duane Strong
NSK-AKS Precision Ball Company
1100A North First Street
Clarinda, Iowa 51632

ATS Project: NSK-AKS #H001-NSK
Report Date: 12/12/14 (rev. 4/28/15)
ATS SRF: 1120141

Sample Identification: L1 Sludge #L1-05

Sample Date: 11/11/14
Sample Time: 12:35 PM
Sampled By: Client
Laboratory Receipt Date: 11/20/14
Sample Matrix: L1 Waste

Preparation Method: EPA 1311
Analytical Method(s): EPA 3010A / 6010C
EPA 7470A
EPA 9071B

Parameter (CAS)	Units	Result	Maximum Leachate Concentration*	TCLP Hazardous	Analysis Date	Analysis Time	QC Batch Number
Arsenic (7440-38-2)	mg/L	<0.1	5.0	No	11/26/14	11:27 AM	1124141-N
Barium (7440-39-3)	mg/L	0.05	100	No	11/26/14	11:27 AM	1124141-N
Cadmium (7440-43-9)	mg/L	<0.005	1.0	No	11/26/14	11:27 AM	1124141-N
Chromium (7440-47-3)	mg/L	0.48	5.0	No	11/26/14	11:27 AM	1124141-N
Copper (7440-50-8)	mg/L	0.037	na	na	11/26/14	11:27 AM	1124141-N
Iron (7439-89-6)	mg/L	66	na	na	11/26/14	11:27 AM	1124141-N
Lead (7439-92-1)	mg/L	<0.05	5.0	No	11/26/14	11:27 AM	1124141-N
Mercury (7439-97-6)	mg/L	<0.0005	0.2	No	4/22/15	1:10 PM	1124141-N
Nickel (7440-02-0)	mg/L	0.042	na	na	11/26/14	11:27 AM	1124141-N
Selenium (7782-49-2)	mg/L	<0.01	1.0	No	11/26/14	11:27 AM	1124141-N
Silver (7440-22-4)	mg/L	<0.05	5.0	No	11/26/14	11:27 AM	1124141-N
Zinc (7440-66-6)	mg/L	0.14	na	na	11/26/14	11:27 AM	1124141-N
Oil Content	mg/kg	180,000	na	na	11/21/14	na	1121141-N

Comments

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* Reference: 40 CFR, 1998 Part 261.24
Oil content is expressed on a wet weight basis.
na - Indicates not applicable

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Toxicity Characteristic Leaching Procedure
Inorganic Analysis
Data Summary Sheet

For: Mr. Duane Strong
NSK-AKS Precision Ball Company
1100A North First Street
Clarinda, Iowa 51632

ATS Project: NSK-AKS #H001-NSK
Report Date: 12/12/14 (rev. 4/28/15)
ATS SRF: 1120141

Sample Identification: L1 Sludge #L1-06

Sample Date:	11/18/14	Preparation Method:	EPA 1311
Sample Time:	12:30 PM	Analytical Method(s):	EPA 3010A / 6010C
Sampled By:	Client		EPA 7470A
Laboratory Receipt Date:	11/20/14		EPA 9071B
Sample Matrix:	L1 Waste		

Parameter (CAS)	Units	Result	Maximum Leachate Concentration*	TCLP Hazardous	Analysis Date	Analysis Time	QC Batch Number
Arsenic (7440-38-2)	mg/L	<0.1	5.0	No	11/26/14	11:37 AM	1124141-N
Barium (7440-39-3)	mg/L	0.07	100	No	11/26/14	11:37 AM	1124141-N
Cadmium (7440-43-9)	mg/L	<0.005	1.0	No	11/26/14	11:37 AM	1124141-N
Chromium (7440-47-3)	mg/L	3.6	5.0	No	11/26/14	11:37 AM	1124141-N
Copper (7440-50-8)	mg/L	<0.005	na	na	11/26/14	11:37 AM	1124141-N
Iron (7439-89-6)	mg/L	560	na	na	11/26/14	11:37 AM	1124141-N
Lead (7439-92-1)	mg/L	0.09	5.0	No	11/26/14	11:37 AM	1124141-N
Mercury (7439-97-6)	mg/L	<0.0005	0.2	No	4/22/15	12:20 PM	1124141-N
Nickel (7440-02-0)	mg/L	0.28	na	na	11/26/14	11:37 AM	1124141-N
Selenium (7782-49-2)	mg/L	<0.01	1.0	No	11/26/14	11:37 AM	1124141-N
Silver (7440-22-4)	mg/L	<0.05	5.0	No	11/26/14	11:37 AM	1124141-N
Zinc (7440-66-6)	mg/L	0.25	na	na	11/26/14	11:37 AM	1124141-N
Oil Content	mg/kg	160,000	na	na	11/21/14	na	1121141-N

Comments

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* Reference: 40 CFR, 1998 Part 261.24
Oil content is expressed on a wet weight basis.
na - Indicates not applicable

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Michigan Laboratory ID: 9604
Wisconsin Laboratory ID: 998321720

Quality Assurance / Quality Control
Digestion Batch Summary

QC Batch Number: 1117141-N
Parameter: Arsenic (EPA 3010A)
ATS Project: NSK-AKS #H001-NSK
Report Date: 12/12/14 (rev. 4/28/15)

Results of QA Samples run concurrently with project samples

REPLICATE ANALYSIS

Sample	Replicate #1	Replicate #2	Mean	Relative Range (percent)
#H001-NSK L1 Sludge #L1-02 10/21/14 Matrix Spike	8.4 mg/L	8.5 mg/L	8.5 mg/L	1.6

SPIKES and/or QC CHECK SAMPLES

Sample/Analyte	Known Concentration	Spike Concentration	Analyzed Concentration	Recovery (percent)
#H001-NSK Laboratory Control Sample 11/19/14	<0.1 mg/L	8.0 mg/L	8.5 mg/L	106.7
#H001-NSK L1 Sludge #L1-02 10/21/14 Matrix Spike	<0.1 mg/L	8.0 mg/L	8.4 mg/L	105.1
L1 Sludge #L1-02 10/21/14 Matrix Spike Duplicate	<0.1 mg/L	8.0 mg/L	8.5 mg/L	106.7

BLANK ANALYSIS

Sample	Analyzed Concentration	QC Decision
#H001-NSK Laboratory Reagent Blank 11/19/14	<0.1 mg/L	Acceptable

Comments:
Calculations performed prior to rounding.

Control Limits:
Spike Recoveries (75 - 125 %)
Laboratory Control Sample Recoveries (85 - 115 %)
Relative Range < or = 20%

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Michigan Laboratory ID: 9604
Wisconsin Laboratory ID: 998321720

Quality Assurance / Quality Control
Digestion Batch Summary

QC Batch Number: 1124141-N
Parameter: Arsenic (EPA 3010A)
ATS Project: NSK-AKS #H001-NSK
Report Date: 12/12/14 (rev. 4/28/15)

Results of QA Samples run concurrently with project samples

REPLICATE ANALYSIS

Sample	Replicate #1	Replicate #2	Mean	Relative Range (percent)
#H001-NSK L1 Sludge #L1-06 11/18/14 Matrix Spike	7.4 mg/L	7.2 mg/L	7.4 mg/L	2.8

SPIKES and/or QC CHECK SAMPLES

Sample/Analyte	Known Concentration	Spike Concentration	Analyzed Concentration	Recovery (percent)
#H001-NSK Laboratory Control Sample 11/25/14	<0.1 mg/L	8.0 mg/L	7.8 mg/L	96.9
#H001-NSK L1 Sludge #L1-06 11/18/14 Matrix Spike	<0.1 mg/L	8.0 mg/L	7.4 mg/L	93.2
L1 Sludge #L1-06 11/18/14 Matrix Spike Duplicate	<0.1 mg/L	8.0 mg/L	7.2 mg/L	90.6

BLANK ANALYSIS

Sample	Analyzed Concentration	QC Decision
#H001-NSK Laboratory Reagent Blank 11/25/14	<0.1 mg/L	Acceptable

Comments:
Calculations performed prior to rounding.

Control Limits:
Spike Recoveries (75 - 125 %)
Laboratory Control Sample Recoveries (85 - 115 %)
Relative Range < or = 20%

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Tel. 734/995-0995 Fax. 734/995-3731
Michigan Laboratory ID: 9604
Wisconsin Laboratory ID: 998321720

Quality Assurance / Quality Control
ICP/AES Summary

QC Batch Number: 1117141-N
Parameter: Arsenic (EPA 6010C)
ATS Project: NSK-AKS #H001-NSK
Report Date: 12/12/14 (rev. 4/28/15)

Results of QA Samples run concurrently with project samples

REPLICATE ANALYSIS

Sample	Replicate #1	Replicate #2	Mean	Relative Range (percent)
#H001-NSK				
L1 Sludge #L1-01 10/14/14	<0.1 mg/L	<0.1 mg/L	<0.1 mg/L	nc
Grind Sludge #G-02 10/21/14	<0.1 mg/L	<0.1 mg/L	<0.1 mg/L	nc
L1 Sludge #L1-02 10/21/14 TCLP Duplicate	<0.1 mg/L	<0.1 mg/L	<0.1 mg/L	nc

SPIKES and/or QC CHECK SAMPLES

Sample/Analyte	Known Concentration	Spike Concentration	Analyzed Concentration	Recovery (percent)
#H001-NSK				
Initial Calibration Verification Standard	<0.1 mg/L	2.0 mg/L	2.0 mg/L	101.4
Interference Check Standard	<0.1 mg/L	2.0 mg/L	2.0 mg/L	102.5
Grind Sludge #G-01 10/14/14 Matrix Spike	<0.1 mg/L	8.0 mg/L	8.1 mg/L	100.8
Calibration Verification Standard	<0.1 mg/L	2.0 mg/L	2.0 mg/L	100.5
Grind Sludge #G-03 10/28/14 Matrix Spike	<0.1 mg/L	8.0 mg/L	7.8 mg/L	96.9
Calibration Verification Standard	<0.1 mg/L	2.0 mg/L	2.0 mg/L	99.5
Grind Sludge #G-04 11/4/14 Matrix Spike	<0.1 mg/L	8.0 mg/L	8.2 mg/L	102.4
Calibration Verification Standard	<0.1 mg/L	2.0 mg/L	2.0 mg/L	99.7

BLANK ANALYSIS

Sample	Analyzed Concentration	QC Decision
#H001-NSK		
Continuing Calibration Blank	<0.1 mg/L	Acceptable
Continuing Calibration Blank	<0.1 mg/L	Acceptable
Continuing Calibration Blank	<0.1 mg/L	Acceptable
Continuing Calibration Blank	<0.1 mg/L	Acceptable

Comments:

Calculations performed prior to rounding.
nc - Indicates not calculable.

Control Limits:

Initial Calibration Verification Recoveries (90 - 110 %)
Calibration Verification Recoveries (90 - 110 %)
Interference Check Recoveries (80 - 120 %)
Spike Recoveries (75 - 125 %)
Relative Range < or = 20%

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Quality Assurance / Quality Control
ICP/AES Summary

QC Batch Number: 1124141-N
Parameter: Arsenic (EPA 6010C)
ATS Project: NSK-AKS #H001-NSK
Report Date: 12/12/14 (rev. 4/28/15)

Results of QA Samples run concurrently with project samples

REPLICATE ANALYSIS

Sample	Replicate #1	Replicate #2	Mean	Relative Range (percent)
#H001-NSK				
L1 Sludge #L1-05 11/11/14	<0.1 mg/L	<0.1 mg/L	<0.1 mg/L	nc

SPIKES and/or QC CHECK SAMPLES

Sample/Analyte	Known Concentration	Spike Concentration	Analyzed Concentration	Recovery (percent)
#H001-NSK				
Initial Cal bration Verification Standard	<0.1 mg/L	2.0 mg/L	1.9 mg/L	96.4
Interference Check Standard	<0.1 mg/L	2.0 mg/L	1.9 mg/L	94.7
Cal bration Verification Standard	<0.1 mg/L	2.0 mg/L	1.9 mg/L	94.2
Grind Sludge #G-06 11/18/14 Matrix Spike	<0.1 mg/L	8.0 mg/L	7.4 mg/L	91.9
Cal bration Verification Standard	<0.1 mg/L	2.0 mg/L	1.9 mg/L	96.2

BLANK ANALYSIS

Sample	Analyzed Concentration	QC Decision
#H001-NSK		
Continuing Calibration Blank	<0.1 mg/L	Acceptable
Continuing Calibration Blank	<0.1 mg/L	Acceptable
Continuing Calibration Blank	<0.1 mg/L	Acceptable

Comments:

Calculations performed prior to rounding.
nc - Indicates not calculable.

Control Limits:

Initial Calibration Verification Recoveries (90 - 110 %)
Calibration Verification Recoveries (90 - 110 %)
Interference Check Recoveries (80 - 120 %)
Spike Recoveries (75 - 125 %)
Relative Range < or = 20%

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Wisconsin Laboratory ID: 998321720

Quality Assurance / Quality Control
Digestion Batch Summary

QC Batch Number: 1117141-N
Parameter: Barium (EPA 3010A)
ATS Project: NSK-AKS #H001-NSK
Report Date: 12/12/14 (rev. 4/28/15)

Results of QA Samples run concurrently with project samples

REPLICATE ANALYSIS

Sample	Replicate #1	Replicate #2	Mean	Relative Range (percent)
#H001-NSK L1 Sludge #L1-02 10/21/14 Matrix Spike	8.9 mg/L	9.0 mg/L	9.0 mg/L	1.6

SPIKES and/or QC CHECK SAMPLES

Sample/Analyte	Known Concentration	Spike Concentration	Analyzed Concentration	Recovery (percent)
#H001-NSK Laboratory Control Sample 11/19/14	<0.05 mg/L	8.0 mg/L	8.7 mg/L	108.8
#H001-NSK L1 Sludge #L1-02 10/21/14 Matrix Spike	0.40 mg/L	8.0 mg/L	8.9 mg/L	106.1
L1 Sludge #L1-02 10/21/14 Matrix Spike Duplicate	0.40 mg/L	8.0 mg/L	9.0 mg/L	108.0

BLANK ANALYSIS

Sample	Analyzed Concentration	QC Decision
#H001-NSK Laboratory Reagent Blank 11/19/14	<0.05 mg/L	Acceptable

Comments:
Calculations performed prior to rounding.

Control Limits:
Spike Recoveries (75 - 125 %)
Laboratory Control Sample Recoveries (85 - 115 %)
Relative Range < or = 20%

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Quality Assurance / Quality Control
Digestion Batch Summary

QC Batch Number: 1124141-N
Parameter: Barium (EPA 3010A)
ATS Project: NSK-AKS #H001-NSK
Report Date: 12/12/14 (rev. 4/28/15)

Results of QA Samples run concurrently with project samples

REPLICATE ANALYSIS

Sample	Replicate #1	Replicate #2	Mean	Relative Range (percent)
#H001-NSK L1 Sludge #L1-06 11/18/14 Matrix Spike	7.6 mg/L	7.3 mg/L	7.4 mg/L	3.1

SPIKES and/or QC CHECK SAMPLES

Sample/Analyte	Known Concentration	Spike Concentration	Analyzed Concentration	Recovery (percent)
#H001-NSK Laboratory Control Sample 11/25/14	<0.05 mg/L	8.0 mg/L	7.8 mg/L	97.1
#H001-NSK L1 Sludge #L1-06 11/18/14 Matrix Spike	0.06 mg/L	8.0 mg/L	7.6 mg/L	93.7
L1 Sludge #L1-06 11/18/14 Matrix Spike Duplicate	0.06 mg/L	8.0 mg/L	7.3 mg/L	90.8

BLANK ANALYSIS

Sample	Analyzed Concentration	QC Decision
#H001-NSK Laboratory Reagent Blank 11/25/14	<0.05 mg/L	Acceptable

Comments:
Calculations performed prior to rounding.

Control Limits:
Spike Recoveries (75 - 125 %)
Laboratory Control Sample Recoveries (85 - 115 %)
Relative Range < or = 20%

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Quality Assurance / Quality Control
ICP/AES Summary

QC Batch Number: 1117141-N
Parameter: Barium (EPA 6010C)
ATS Project: NSK-AKS #H001-NSK
Report Date: 12/12/14 (rev. 4/28/15)

Results of QA Samples run concurrently with project samples

REPLICATE ANALYSIS

Sample	Replicate #1	Replicate #2	Mean	Relative Range (percent)
#H001-NSK				
L1 Sludge #L1-01 10/14/14	0.45 mg/L	0.45 mg/L	0.45 mg/L	0.1
Grind Sludge #G-02 10/21/14	0.43 mg/L	0.43 mg/L	0.43 mg/L	0.1
L1 Sludge #L1-02 10/21/14 TCLP Duplicate	0.40 mg/L	0.40 mg/L	0.40 mg/L	0.1

SPIKES and/or QC CHECK SAMPLES

Sample/Analyte	Known Concentration	Spike Concentration	Analyzed Concentration	Recovery (percent)
#H001-NSK				
Initial Cal bration Verification Standard	<0.05 mg/L	2.0 mg/L	2.0 mg/L	102.6
Interference Check Standard	<0.05 mg/L	0.60 mg/L	2.0 mg/L	106.8
Grind Sludge #G-01 10/14/14 Matrix Spike	0.36 mg/L	2.4 mg/L	2.9 mg/L	107.2
Cal bration Verification Standard	<0.05 mg/L	2.0 mg/L	2.0 mg/L	102.1
Grind Sludge #G-03 10/28/14 Matrix Spike	0.41 mg/L	2.4 mg/L	3.0 mg/L	105.8
Cal bration Verification Standard	<0.05 mg/L	2.0 mg/L	2.0 mg/L	104.5
Grind Sludge #G-04 11/4/14 Matrix Spike	0.42 mg/L	2.4 mg/L	3.1 mg/L	113.2
Cal bration Verification Standard	<0.05 mg/L	2.0 mg/L	2.0 mg/L	103.5

BLANK ANALYSIS

Sample	Analyzed Concentration	QC Decision
#H001-NSK		
Continuing Calibration Blank	<0.05 mg/L	Acceptable
Continuing Calibration Blank	<0.05 mg/L	Acceptable
Continuing Calibration Blank	<0.05 mg/L	Acceptable
Continuing Calibration Blank	<0.05 mg/L	Acceptable

Comments:

Calculations performed prior to rounding.

Control Limits:

Initial Calibration Verification Recoveries (90 - 110 %)
Calibration Verification Recoveries (90 - 110 %)
Interference Check Recoveries (80 - 120 %)
Spike Recoveries (75 - 125 %)
Relative Range < or = 20%

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Quality Assurance / Quality Control
ICP/AES Summary

QC Batch Number: 1124141-N
Parameter: Barium (EPA 6010C)
ATS Project: NSK-AKS #H001-NSK
Report Date: 12/12/14 (rev. 4/28/15)

Results of QA Samples run concurrently with project samples

REPLICATE ANALYSIS

Sample	Replicate #1	Replicate #2	Mean	Relative Range (percent)
#H001-NSK				
L1 Sludge #L1-05 11/11/14	0.05 mg/L	0.05 mg/L	0.05 mg/L	2.5

SPIKES and/or QC CHECK SAMPLES

Sample/Analyte	Known Concentration	Spike Concentration	Analyzed Concentration	Recovery (percent)
#H001-NSK				
Initial Cal bration Verification Standard	<0.05 mg/L	2.0 mg/L	1.9 mg/L	95.1
Interference Check Standard	<0.05 mg/L	0.60 mg/L	0.60 mg/L	100.3
Cal bration Verification Standard	<0.05 mg/L	2.0 mg/L	1.9 mg/L	96.2
Grind Sludge #G-06 11/18/14 Matrix Spike	0.06 mg/L	2.4 mg/L	2.4 mg/L	98.5
Cal bration Verification Standard	<0.05 mg/L	2.0 mg/L	2.0 mg/L	98.7

BLANK ANALYSIS

Sample	Analyzed Concentration	QC Decision
#H001-NSK		
Continuing Calibration Blank	<0.05 mg/L	Acceptable
Continuing Calibration Blank	<0.05 mg/L	Acceptable
Continuing Calibration Blank	<0.05 mg/L	Acceptable

Comments:

Calculations performed prior to rounding.

Control Limits:

Initial Calibration Verification Recoveries (90 - 110 %)
Calibration Verification Recoveries (90 - 110 %)
Interference Check Recoveries (80 - 120 %)
Spike Recoveries (75 - 125 %)
Relative Range < or = 20%

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Quality Assurance / Quality Control
Digestion Batch Summary

QC Batch Number: 1117141-N
Parameter: Cadmium (EPA 3010A)
ATS Project: NSK-AKS #H001-NSK
Report Date: 12/12/14 (rev. 4/28/15)

Results of QA Samples run concurrently with project samples

REPLICATE ANALYSIS

Sample	Replicate #1	Replicate #2	Mean	Relative Range (percent)
#H001-NSK L1 Sludge #L1-02 10/21/14 Matrix Spike	7.4 mg/L	7.5 mg/L	7.5 mg/L	1.5

SPIKES and/or QC CHECK SAMPLES

Sample/Analyte	Known Concentration	Spike Concentration	Analyzed Concentration	Recovery (percent)
#H001-NSK Laboratory Control Sample 11/19/14	<0.005 mg/L	8.0 mg/L	7.7 mg/L	96.8
#H001-NSK L1 Sludge #L1-02 10/21/14 Matrix Spike	<0.005 mg/L	8.0 mg/L	7.4 mg/L	92.5
L1 Sludge #L1-02 10/21/14 Matrix Spike Duplicate	<0.005 mg/L	8.0 mg/L	7.5 mg/L	93.9

BLANK ANALYSIS

Sample	Analyzed Concentration	QC Decision
#H001-NSK Laboratory Reagent Blank 11/19/14	<0.005 mg/L	Acceptable

Comments:
Calculations performed prior to rounding.

Control Limits:
Spike Recoveries (75 - 125 %)
Laboratory Control Sample Recoveries (85 - 115 %)
Relative Range < or = 20%

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Quality Assurance / Quality Control
Digestion Batch Summary

QC Batch Number: 1124141-N
Parameter: Cadmium (EPA 3010A)
ATS Project: NSK-AKS #H001-NSK
Report Date: 12/12/14 (rev. 4/28/15)

Results of QA Samples run concurrently with project samples

REPLICATE ANALYSIS

Sample	Replicate #1	Replicate #2	Mean	Relative Range (percent)
#H001-NSK L1 Sludge #L1-06 11/18/14 Matrix Spike	7.0 mg/L	6.8 mg/L	6.9 mg/L	3.7

SPIKES and/or QC CHECK SAMPLES

Sample/Analyte	Known Concentration	Spike Concentration	Analyzed Concentration	Recovery (percent)
#H001-NSK Laboratory Control Sample 11/25/14	<0.005 mg/L	8.0 mg/L	7.3 mg/L	91.4
#H001-NSK				
L1 Sludge #L1-06 11/18/14 Matrix Spike	<0.005 mg/L	8.0 mg/L	7.0 mg/L	87.7
L1 Sludge #L1-06 11/18/14 Matrix Spike Duplicate	<0.005 mg/L	8.0 mg/L	6.8 mg/L	84.5

BLANK ANALYSIS

Sample	Analyzed Concentration	QC Decision
#H001-NSK Laboratory Reagent Blank 11/25/14	<0.005 mg/L	Acceptable

Comments:
Calculations performed prior to rounding.

Control Limits:
Spike Recoveries (75 - 125 %)
Laboratory Control Sample Recoveries (85 - 115 %)
Relative Range < or = 20%

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Quality Assurance / Quality Control
ICP/AES Summary

QC Batch Number: 1117141-N
Parameter: Cadmium (EPA 6010C)
ATS Project: NSK-AKS #H001-NSK
Report Date: 12/12/14 (rev. 4/28/15)

Results of QA Samples run concurrently with project samples

REPLICATE ANALYSIS

Sample	Replicate #1	Replicate #2	Mean	Relative Range (percent)
#H001-NSK				
L1 Sludge #L1-01 10/14/14	<0.005 mg/L	<0.005 mg/L	<0.005 mg/L	nc
Grind Sludge #G-02 10/21/14	<0.005 mg/L	<0.005 mg/L	<0.005 mg/L	nc
L1 Sludge #L1-02 10/21/14 TCLP Duplicate	<0.005 mg/L	<0.005 mg/L	<0.005 mg/L	nc

SPIKES and/or QC CHECK SAMPLES

Sample/Analyte	Known Concentration	Spike Concentration	Analyzed Concentration	Recovery (percent)
#H001-NSK				
Initial Cal bration Verification Standard	<0.005 mg/L	2.0 mg/L	1.9 mg/L	93.3
Interference Check Standard	<0.005 mg/L	0.60 mg/L	0.57 mg/L	94.5
Grind Sludge #G-01 10/14/14 Matrix Spike	<0.005 mg/L	2.4 mg/L	2.3 mg/L	96.0
Cal bration Verification Standard	<0.005 mg/L	2.0 mg/L	1.9 mg/L	94.1
Grind Sludge #G-03 10/28/14 Matrix Spike	<0.005 mg/L	2.4 mg/L	2.2 mg/L	91.0
Cal bration Verification Standard	<0.005 mg/L	2.0 mg/L	1.8 mg/L	91.0
Grind Sludge #G-04 11/4/14 Matrix Spike	<0.005 mg/L	2.4 mg/L	2.3 mg/L	96.6
Cal bration Verification Standard	<0.005 mg/L	2.0 mg/L	1.8 mg/L	91.3

BLANK ANALYSIS

Sample	Analyzed Concentration	QC Decision
#H001-NSK		
Continuing Calibration Blank	<0.005 mg/L	Acceptable
Continuing Calibration Blank	<0.005 mg/L	Acceptable
Continuing Calibration Blank	<0.005 mg/L	Acceptable
Continuing Calibration Blank	<0.005 mg/L	Acceptable

Comments:

Calculations performed prior to rounding.
nc - Indicates not calculable.

Control Limits:

Initial Calibration Verification Recoveries (90 - 110 %)
Calibration Verification Recoveries (90 - 110 %)
Interference Check Recoveries (80 - 120 %)
Spike Recoveries (75 - 125 %)
Relative Range < or = 20%

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Wisconsin Laboratory ID: 998321720

Quality Assurance / Quality Control
ICP/AES Summary

QC Batch Number: 1124141-N
Parameter: Cadmium (EPA 6010C)
ATS Project: NSK-AKS #H001-NSK
Report Date: 12/12/14 (rev. 4/28/15)

Results of QA Samples run concurrently with project samples

REPLICATE ANALYSIS

Sample	Replicate #1	Replicate #2	Mean	Relative Range (percent)
#H001-NSK				
L1 Sludge #L1-05 11/11/14	<0.005 mg/L	<0.005 mg/L	<0.005 mg/L	nc

SPIKES and/or QC CHECK SAMPLES

Sample/Analyte	Known Concentration	Spike Concentration	Analyzed Concentration	Recovery (percent)
#H001-NSK				
Initial Cal bration Verification Standard	<0.005 mg/L	2.0 mg/L	1.9 mg/L	93.2
Interference Check Standard	<0.005 mg/L	0.60 mg/L	0.57 mg/L	94.7
Cal bration Verification Standard	<0.005 mg/L	2.0 mg/L	1.8 mg/L	90.2
Grind Sludge #G-06 11/18/14 Matrix Spike	<0.005 mg/L	2.4 mg/L	2.2 mg/L	90.0
Cal bration Verification Standard	<0.005 mg/L	2.0 mg/L	1.8 mg/L	90.2

BLANK ANALYSIS

Sample	Analyzed Concentration	QC Decision
#H001-NSK		
Continuing Calibration Blank	<0.005 mg/L	Acceptable
Continuing Calibration Blank	<0.005 mg/L	Acceptable
Continuing Calibration Blank	<0.005 mg/L	Acceptable

Comments:

Calculations performed prior to rounding.
nc - Indicates not calculable.

Control Limits:

Initial Calibration Verification Recoveries (90 - 110 %)
Calibration Verification Recoveries (90 - 110 %)
Interference Check Recoveries (80 - 120 %)
Spike Recoveries (75 - 125 %)
Relative Range < or = 20%

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Quality Assurance / Quality Control
TCLP Batch Summary

QC Batch Number: 1117141-N
Parameter: Chromium (EPA 1311)
ATS Project: NSK-AKS #H001-NSK
Report Date: 12/12/14 (rev. 4/28/15)

Results of QA Samples run concurrently with project samples

REPLICATE ANALYSIS

Sample	Replicate #1	Replicate #2	Mean	Relative Range (percent)
#H001-NSK				
L1 Sludge #L1-02 10/21/14	0.31 mg/L	0.32 mg/L	0.31 mg/L	2.1
L1 Sludge #L1-02 10/21/14 Matrix Spike	5.3 mg/L	5.2 mg/L	5.3 mg/L	1.3

SPIKES and/or QC CHECK SAMPLES

Sample/Analyte	Known Concentration	Spike Concentration	Analyzed Concentration	Recovery (percent)
#H001-NSK				
Laboratory Control Sample 11/17/14	<0.005 mg/L	5.0 mg/L	5.0 mg/L	100.6
#H001-NSK				
L1 Sludge #L1-02 10/21/14 Matrix Spike	0.31 mg/L	5.0 mg/L	5.3 mg/L	99.9
L1 Sludge #L1-02 10/21/14 Matrix Spike Duplicate	0.31 mg/L	5.0 mg/L	5.2 mg/L	98.5

BLANK ANALYSIS

Sample	Analyzed Concentration	QC Decision
#H001-NSK		
Laboratory Reagent Blank 11/17/14	<0.005 mg/L	Acceptable

Comments:
Calculations performed prior to rounding.

Control Limits:
Spike Recoveries (75 - 125 %)
Laboratory Control Sample Recoveries (85 - 115 %)
Relative Range < or = 20%

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Quality Assurance / Quality Control
TCLP Batch Summary

QC Batch Number: 1124141-N
Parameter: Chromium (EPA 1311)
ATS Project: NSK-AKS #H001-NSK
Report Date: 12/12/14 (rev. 4/28/15)

Results of QA Samples run concurrently with project samples

REPLICATE ANALYSIS

Sample	Replicate #1	Replicate #2	Mean	Relative Range (percent)
#H001-NSK				
L1 Sludge #L1-06 11/18/14	3.9 mg/L	3.3 mg/L	3.6 mg/L	17.3
L1 Sludge #L1-06 11/18/14 Matrix Spike	7.9 mg/L	9.0 mg/L	8.4 mg/L	12.3

SPIKES and/or QC CHECK SAMPLES

Sample/Analyte	Known Concentration	Spike Concentration	Analyzed Concentration	Recovery (percent)
#H001-NSK				
Laboratory Control Sample 11/24/14	<0.005 mg/L	5.0 mg/L	5.0 mg/L	92.5
#H001-NSK				
L1 Sludge #L1-06 11/18/14 Matrix Spike	3.6 mg/L	5.0 mg/L	7.9 mg/L	86.9
L1 Sludge #L1-06 11/18/14 Matrix Spike Duplicate	3.6 mg/L	5.0 mg/L	9.0 mg/L	107.6

BLANK ANALYSIS

Sample	Analyzed Concentration	QC Decision
#H001-NSK		
Laboratory Reagent Blank 11/24/14	<0.005 mg/L	Acceptable

Comments:
Calculations performed prior to rounding.

Control Limits:
Spike Recoveries (75 - 125 %)
Laboratory Control Sample Recoveries (85 - 115 %)
Relative Range < or = 20%

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Wisconsin Laboratory ID: 998321720

Quality Assurance / Quality Control
Digestion Batch Summary

QC Batch Number: 1117141-N
Parameter: Chromium (EPA 3010A)
ATS Project: NSK-AKS #H001-NSK
Report Date: 12/12/14 (rev. 4/28/15)

Results of QA Samples run concurrently with project samples

REPLICATE ANALYSIS

Sample	Replicate #1	Replicate #2	Mean	Relative Range (percent)
#H001-NSK L1 Sludge #L1-02 10/21/14 Matrix Spike	13 mg/L	14 mg/L	13 mg/L	2.5

SPIKES and/or QC CHECK SAMPLES

Sample/Analyte	Known Concentration	Spike Concentration	Analyzed Concentration	Recovery (percent)
#H001-NSK Laboratory Control Sample 11/19/14	<0.005 mg/L	13 mg/L	13 mg/L	103.6
#H001-NSK L1 Sludge #L1-02 10/21/14 Matrix Spike	0.31 mg/L	13 mg/L	13 mg/L	99.2
L1 Sludge #L1-02 10/21/14 Matrix Spike Duplicate	0.31 mg/L	13 mg/L	14 mg/L	101.8

BLANK ANALYSIS

Sample	Analyzed Concentration	QC Decision
#H001-NSK Laboratory Reagent Blank 11/19/14	<0.005 mg/L	Acceptable

Comments:
Calculations performed prior to rounding.

Control Limits:
Spike Recoveries (75 - 125 %)
Laboratory Control Sample Recoveries (85 - 115 %)
Relative Range < or = 20%

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Michigan Laboratory ID: 9604
Wisconsin Laboratory ID: 998321720

Quality Assurance / Quality Control
Digestion Batch Summary

QC Batch Number: 1124141-N
Parameter: Chromium (EPA 3010A)
ATS Project: NSK-AKS #H001-NSK
Report Date: 12/12/14 (rev. 4/28/15)

Results of QA Samples run concurrently with project samples

REPLICATE ANALYSIS

Sample	Replicate #1	Replicate #2	Mean	Relative Range (percent)
#H001-NSK L1 Sludge #L1-06 11/18/14 Matrix Spike	16 mg/L	15 mg/L	16 mg/L	11.2

SPIKES and/or QC CHECK SAMPLES

Sample/Analyte	Known Concentration	Spike Concentration	Analyzed Concentration	Recovery (percent)
#H001-NSK Laboratory Control Sample 11/25/14	<0.005 mg/L	13 mg/L	12 mg/L	94.0
#H001-NSK L1 Sludge #L1-06 11/18/14 Matrix Spike	3.6 mg/L	13 mg/L	16 mg/L	98.6
L1 Sludge #L1-06 11/18/14 Matrix Spike Duplicate	3.6 mg/L	13 mg/L	15 mg/L	85.2

BLANK ANALYSIS

Sample	Analyzed Concentration	QC Decision
#H001-NSK Laboratory Reagent Blank 11/25/14	<0.005 mg/L	Acceptable

Comments:
Calculations performed prior to rounding.

Control Limits:
Spike Recoveries (75 - 125 %)
Laboratory Control Sample Recoveries (85 - 115 %)
Relative Range < or = 20%

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Michigan Laboratory ID: 9604
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Quality Assurance / Quality Control
ICP/AES Summary

QC Batch Number: 1117141-N
Parameter: Chromium (EPA 6010C)
ATS Project: NSK-AKS #H001-NSK
Report Date: 12/12/14 (rev. 4/28/15)

Results of QA Samples run concurrently with project samples

REPLICATE ANALYSIS

Sample	Replicate #1	Replicate #2	Mean	Relative Range (percent)
#H001-NSK				
L1 Sludge #L1-01 10/14/14	1.0 mg/L	1.0 mg/L	1.0 mg/L	0.6
Grind Sludge #G-02 10/21/14	0.77 mg/L	0.77 mg/L	0.77 mg/L	1.1
L1 Sludge #L1-02 10/21/14 TCLP Duplicate	0.32 mg/L	0.32 mg/L	0.32 mg/L	<0.1

SPIKES and/or QC CHECK SAMPLES

Sample/Analyte	Known Concentration	Spike Concentration	Analyzed Concentration	Recovery (percent)
#H001-NSK				
Initial Cal bration Verification Standard	<0.005 mg/L	2.0 mg/L	2.0 mg/L	101.4
Interference Check Standard	<0.005 mg/L	0.60 mg/L	0.62 mg/L	103.3
Grind Sludge #G-01 10/14/14 Matrix Spike	0.57 mg/L	2.4 mg/L	3.1 mg/L	105.4
Cal bration Verification Standard	<0.005 mg/L	2.0 mg/L	2.0 mg/L	101.4
Grind Sludge #G-03 10/28/14 Matrix Spike	0.48 mg/L	2.4 mg/L	2.9 mg/L	100.0
Cal bration Verification Standard	<0.005 mg/L	2.0 mg/L	2.0 mg/L	95.8
Grind Sludge #G-04 11/4/14 Matrix Spike	0.51 mg/L	2.4 mg/L	3.0 mg/L	104.5
Cal bration Verification Standard	<0.005 mg/L	2.0 mg/L	2.0 mg/L	97.9

BLANK ANALYSIS

Sample	Analyzed Concentration	QC Decision
#H001-NSK		
Continuing Calibration Blank	<0.005 mg/L	Acceptable
Continuing Calibration Blank	<0.005 mg/L	Acceptable
Continuing Calibration Blank	<0.005 mg/L	Acceptable
Continuing Calibration Blank	<0.005 mg/L	Acceptable

Comments:
Calculations performed prior to rounding.

Control Limits:
Initial Calibration Verification Recoveries (90 - 110 %)
Calibration Verification Recoveries (90 - 110 %)
Interference Check Recoveries (80 - 120 %)
Spike Recoveries (75 - 125 %)
Relative Range < or = 20%

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Quality Assurance / Quality Control
ICP/AES Summary

QC Batch Number: 1124141-N
Parameter: Chromium (EPA 6010C)
ATS Project: NSK-AKS #H001-NSK
Report Date: 12/12/14 (rev. 4/28/15)

Results of QA Samples run concurrently with project samples

REPLICATE ANALYSIS

Sample	Replicate #1	Replicate #2	Mean	Relative Range (percent)
#H001-NSK				
L1 Sludge #L1-05 11/11/14	0.48 mg/L	0.48 mg/L	0.48 mg/L	0.2

SPIKES and/or QC CHECK SAMPLES

Sample/Analyte	Known Concentration	Spike Concentration	Analyzed Concentration	Recovery (percent)
#H001-NSK				
Initial Cal bration Verification Standard	<0.005 mg/L	2.0 mg/L	1.9 mg/L	95.8
Interference Check Standard	<0.005 mg/L	0.6 mg/L	0.59 mg/L	98.4
Cal bration Verification Standard	<0.005 mg/L	2.0 mg/L	1.9 mg/L	93.2
Grind Sludge #G-06 11/18/14 Matrix Spike	0.85 mg/L	2.4 mg/L	3.1 mg/L	94.8
Cal bration Verification Standard	<0.005 mg/L	2.0 mg/L	1.9 mg/L	94.2

BLANK ANALYSIS

Sample	Analyzed Concentration	QC Decision
#H001-NSK		
Continuing Calibration Blank	<0.005 mg/L	Acceptable
Continuing Calibration Blank	<0.005 mg/L	Acceptable
Continuing Calibration Blank	<0.005 mg/L	Acceptable

Comments:
Calculations performed prior to rounding.

Control Limits:
Initial Calibration Verification Recoveries (90 - 110 %)
Calibration Verification Recoveries (90 - 110 %)
Interference Check Recoveries (80 - 120 %)
Spike Recoveries (75 - 125 %)
Relative Range < or = 20%

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Michigan Laboratory ID: 9604
Wisconsin Laboratory ID: 998321720

Quality Assurance / Quality Control
Digestion Batch Summary

QC Batch Number: 1117141-N
Parameter: Copper (EPA 3010A)
ATS Project: NSK-AKS #H001-NSK
Report Date: 12/12/14 (rev. 4/28/15)

Results of QA Samples run concurrently with project samples

REPLICATE ANALYSIS

Sample	Replicate #1	Replicate #2	Mean	Relative Range (percent)
#H001-NSK L1 Sludge #L1-02 10/21/14 Matrix Spike	9.1 mg/L	9.3 mg/L	9.2 mg/L	2.7

SPIKES and/or QC CHECK SAMPLES

Sample/Analyte	Known Concentration	Spike Concentration	Analyzed Concentration	Recovery (percent)
#H001-NSK Laboratory Control Sample 11/19/14	<0.005 mg/L	8.0 mg/L	8.8 mg/L	110.7
#H001-NSK L1 Sludge #L1-02 10/21/14 Matrix Spike	0.040 mg/L	8.0 mg/L	9.1 mg/L	112.9
L1 Sludge #L1-02 10/21/14 Matrix Spike Duplicate	0.040 mg/L	8.0 mg/L	9.2 mg/L	116.1

BLANK ANALYSIS

Sample	Analyzed Concentration	QC Decision
#H001-NSK Laboratory Reagent Blank 11/19/14	0.007 mg/L	Acceptable

Comments:
Calculations performed prior to rounding.

Control Limits:
Spike Recoveries (75 - 125 %)
Laboratory Control Sample Recoveries (85 - 115 %)
Relative Range < or = 20%

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Quality Assurance / Quality Control
Digestion Batch Summary

QC Batch Number: 1124141-N
Parameter: Copper (EPA 3010A)
ATS Project: NSK-AKS #H001-NSK
Report Date: 12/12/14 (rev. 4/28/15)

Results of QA Samples run concurrently with project samples

REPLICATE ANALYSIS

Sample	Replicate #1	Replicate #2	Mean	Relative Range (percent)
#H001-NSK L1 Sludge #L1-06 11/18/14 Matrix Spike	7.9 mg/L	7.6 mg/L	7.8 mg/L	3.6

SPIKES and/or QC CHECK SAMPLES

Sample/Analyte	Known Concentration	Spike Concentration	Analyzed Concentration	Recovery (percent)
#H001-NSK Laboratory Control Sample 11/25/14	<0.005 mg/L	8.0 mg/L	8.1 mg/L	101.5
#H001-NSK L1 Sludge #L1-06 11/18/14 Matrix Spike	<0.005 mg/L	8.0 mg/L	7.9 mg/L	98.8
L1 Sludge #L1-06 11/18/14 Matrix Spike Duplicate	<0.005 mg/L	8.0 mg/L	7.6 mg/L	95.3

BLANK ANALYSIS

Sample	Analyzed Concentration	QC Decision
#H001-NSK Laboratory Reagent Blank 11/25/14	<0.005 mg/L	Acceptable

Comments:
Calculations performed prior to rounding.

Control Limits:
Spike Recoveries (75 - 125 %)
Laboratory Control Sample Recoveries (85 - 115 %)
Relative Range < or = 20%

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Quality Assurance / Quality Control
ICP/AES Summary

QC Batch Number: 1117141-N
Parameter: Copper (EPA 6010C)
ATS Project: NSK-AKS #H001-NSK
Report Date: 12/12/14 (rev. 4/28/15)

Results of QA Samples run concurrently with project samples

REPLICATE ANALYSIS

Sample	Replicate #1	Replicate #2	Mean	Relative Range (percent)
#H001-NSK				
L1 Sludge #L1-01 10/14/14	0.043 mg/L	0.043 mg/L	0.043 mg/L	0.5
Grind Sludge #G-02 10/21/14	0.012 mg/L	0.012 mg/L	0.012 mg/L	3.4
L1 Sludge #L1-02 10/21/14 TCLP Duplicate	0.036 mg/L	0.036 mg/L	0.036 mg/L	nc

SPIKES and/or QC CHECK SAMPLES

Sample/Analyte	Known Concentration	Spike Concentration	Analyzed Concentration	Recovery (percent)
#H001-NSK				
Initial Cal bration Verification Standard	<0.005 mg/L	2.0 mg/L	2.1 mg/L	106.2
Interference Check Standard	<0.005 mg/L	0.60 mg/L	0.65 mg/L	108.6
Grind Sludge #G-01 10/14/14 Matrix Spike	0.013 mg/L	2.4 mg/L	2.6 mg/L	110.2
Cal bration Verification Standard	<0.005 mg/L	2.0 mg/L	2.1 mg/L	105.7
Grind Sludge #G-03 10/28/14 Matrix Spike	0.028 mg/L	2.4 mg/L	2.6 mg/L	109.1
Cal bration Verification Standard	<0.005 mg/L	2.0 mg/L	2.2 mg/L	109.7
Grind Sludge #G-04 11/4/14 Matrix Spike	0.030 mg/L	2.4 mg/L	2.8 mg/L	116.9
Cal bration Verification Standard	<0.005 mg/L	2.0 mg/L	2.1 mg/L	107.4

BLANK ANALYSIS

Sample	Analyzed Concentration	QC Decision
#H001-NSK		
Continuing Calibration Blank	<0.005 mg/L	Acceptable
Continuing Calibration Blank	<0.005 mg/L	Acceptable
Continuing Calibration Blank	<0.005 mg/L	Acceptable
Continuing Calibration Blank	<0.005 mg/L	Acceptable

Comments:

Calculations performed prior to rounding.
nc - Indicates not calculable.

Control Limits:

Initial Calibration Verification Recoveries (90 - 110 %)
Calibration Verification Recoveries (90 - 110 %)
Interference Check Recoveries (80 - 120 %)
Spike Recoveries (75 - 125 %)
Relative Range < or = 20%

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Quality Assurance / Quality Control
ICP/AES Summary

QC Batch Number: 1124141-N
Parameter: Copper (EPA 6010C)
ATS Project: NSK-AKS #H001-NSK
Report Date: 12/12/14 (rev. 4/28/15)

Results of QA Samples run concurrently with project samples

REPLICATE ANALYSIS

Sample	Replicate #1	Replicate #2	Mean	Relative Range (percent)
#H001-NSK				
L1 Sludge #L1-05 11/11/14	0.038 mg/L	0.037 mg/L	0.037 mg/L	2.2

SPIKES and/or QC CHECK SAMPLES

Sample/Analyte	Known Concentration	Spike Concentration	Analyzed Concentration	Recovery (percent)
#H001-NSK				
Initial Cal bration Verification Standard	<0.005 mg/L	2.0 mg/L	1.9 mg/L	97.2
Interference Check Standard	<0.005 mg/L	0.60 mg/L	0.60 mg/L	100.0
Cal bration Verification Standard	<0.005 mg/L	2.0 mg/L	2.0 mg/L	97.9
Grind Sludge #G-06 11/18/14 Matrix Spike	0.005 mg/L	2.4 mg/L	2.4 mg/L	99.0
Cal bration Verification Standard	<0.005 mg/L	2.0 mg/L	2.0 mg/L	101.1

BLANK ANALYSIS

Sample	Analyzed Concentration	QC Decision
#H001-NSK		
Continuing Calibration Blank	<0.005 mg/L	Acceptable
Continuing Calibration Blank	<0.005 mg/L	Acceptable
Continuing Calibration Blank	<0.005 mg/L	Acceptable

Comments:
Calculations performed prior to rounding.

Control Limits:
Initial Calibration Verification Recoveries (90 - 110 %)
Calibration Verification Recoveries (90 - 110 %)
Interference Check Recoveries (80 - 120 %)
Spike Recoveries (75 - 125 %)
Relative Range < or = 20%

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Quality Assurance / Quality Control
Digestion Batch Summary

QC Batch Number: 1117141-N
Parameter: Iron (EPA 3010A)
ATS Project: NSK-AKS #H001-NSK
Report Date: 12/12/14 (rev. 4/28/15)

Results of QA Samples run concurrently with project samples

REPLICATE ANALYSIS

Sample	Replicate #1	Replicate #2	Mean	Relative Range (percent)
#H001-NSK L1 Sludge #L1-02 10/21/14 Matrix Spike	93 mg/L	92 mg/L	93 mg/L	1.0

SPIKES and/or QC CHECK SAMPLES

Sample/Analyte	Known Concentration	Spike Concentration	Analyzed Concentration	Recovery (percent)
#H001-NSK Laboratory Control Sample 11/19/14	<0.05 mg/L	8.0 mg/L	8.8 mg/L	110.3
#H001-NSK L1 Sludge #L1-02 10/21/14 Matrix Spike	62 mg/L	8.0 mg/L	-	NA
L1 Sludge #L1-02 10/21/14 Matrix Spike Duplicate	62 mg/L	8.0 mg/L	-	NA

BLANK ANALYSIS

Sample	Analyzed Concentration	QC Decision
#H001-NSK Laboratory Reagent Blank 11/19/14	0.50 mg/L	Acceptable

Comments:
Calculations performed prior to rounding.
NA - Indicates not applicable due to inadequate spiking level.

Control Limits:
Spike Recoveries (75 - 125 %)
Laboratory Control Sample Recoveries (85 - 115 %)
Relative Range < or = 20%

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Quality Assurance / Quality Control
Digestion Batch Summary

QC Batch Number: 1124141-N
Parameter: Iron (EPA 3010A)
ATS Project: NSK-AKS #H001-NSK
Report Date: 12/12/14 (rev. 4/28/15)

Results of QA Samples run concurrently with project samples

REPLICATE ANALYSIS

Sample	Replicate #1	Replicate #2	Mean	Relative Range (percent)
#H001-NSK L1 Sludge #L1-06 11/18/14 Matrix Spike	650 mg/L	500 mg/L	580 mg/L	25.0*

SPIKES and/or QC CHECK SAMPLES

Sample/Analyte	Known Concentration	Spike Concentration	Analyzed Concentration	Recovery (percent)
#H001-NSK Laboratory Control Sample 11/25/14	<0.005 mg/L	8.0 mg/L	9.1 mg/L	114.3
#H001-NSK L1 Sludge #L1-06 11/18/14 Matrix Spike	560 mg/L	8.0 mg/L	-	NA
L1 Sludge #L1-06 11/18/14 Matrix Spike Duplicate	560 mg/L	8.0 mg/L	-	NA

BLANK ANALYSIS

Sample	Analyzed Concentration	QC Decision
#H001-NSK Laboratory Reagent Blank 11/25/14	0.74 mg/L	Acceptable

Comments:

Calculations performed prior to rounding.
NA - Indicates not applicable due to inadequate spiking level.
* Value outside standard control limits.

Control Limits:

Spike Recoveries (75 - 125 %)
Laboratory Control Sample Recoveries (85 - 115 %)
Relative Range < or = 20%

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Quality Assurance / Quality Control
ICP/AES Summary

QC Batch Number: 1117141-N
Parameter: Iron (EPA 6010C)
ATS Project: NSK-AKS #H001-NSK
Report Date: 12/12/14 (rev. 4/28/15)

Results of QA Samples run concurrently with project samples

REPLICATE ANALYSIS

Sample	Replicate #1	Replicate #2	Mean	Relative Range (percent)
#H001-NSK				
L1 Sludge #L1-01 10/14/14	130 mg/L	130 mg/L	130 mg/L	0.2
Grind Sludge #G-02 10/21/14	190 mg/L	190 mg/L	190 mg/L	0.3
L1 Sludge #L1-02 10/21/14 TCLP Duplicate	62 mg/L	62 mg/L	62 mg/L	0.1

SPIKES and/or QC CHECK SAMPLES

Sample/Analyte	Known Concentration	Spike Concentration	Analyzed Concentration	Recovery (percent)
#H001-NSK				
Initial Calibration Verification Standard	<0.05 mg/L	2.0 mg/L	2.2 mg/L	109.2
Interference Check Standard	<0.05 mg/L	25 mg/L	26 mg/L	102.9
Grind Sludge #G-01 10/14/14 Matrix Spike	140 mg/L	100 mg/L	-	NA
Calibration Verification Standard	<0.05 mg/L	2.0 mg/L	2.2 mg/L	110.1*
Grind Sludge #G-03 10/28/14 Matrix Spike	120 mg/L	100 mg/L	-	NA
Calibration Verification Standard	<0.05 mg/L	2.0 mg/L	2.1 mg/L	106.7
Grind Sludge #G-04 11/4/14 Matrix Spike	130 mg/L	100 mg/L	-	NA
Calibration Verification Standard	<0.05 mg/L	2.0 mg/L	2.2 mg/L	108.3

BLANK ANALYSIS

Sample	Analyzed Concentration	QC Decision
#H001-NSK		
Continuing Calibration Blank	<0.05 mg/L	Acceptable
Continuing Calibration Blank	<0.05 mg/L	Acceptable
Continuing Calibration Blank	<0.05 mg/L	Acceptable
Continuing Calibration Blank	<0.05 mg/L	Acceptable

Comments:

Calculations performed prior to rounding.
NA - Indicates not applicable due to inadequate spiking level.
* Value outside standard control limits.

Control Limits:

Initial Calibration Verification Recoveries (90 - 110 %)
Calibration Verification Recoveries (90 - 110 %)
Interference Check Recoveries (80 - 120 %)
Spike Recoveries (75 - 125 %)
Relative Range < or = 20%

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Quality Assurance / Quality Control
ICP/AES Summary

QC Batch Number: 1124141-N
Parameter: Iron (EPA 6010C)
ATS Project: NSK-AKS #H001-NSK
Report Date: 12/12/14 (rev. 4/28/15)

Results of QA Samples run concurrently with project samples

REPLICATE ANALYSIS

Sample	Replicate #1	Replicate #2	Mean	Relative Range (percent)
#H001-NSK				
L1 Sludge #L1-05 11/11/14	66 mg/L	65 mg/L	66 mg/L	1.7

SPIKES and/or QC CHECK SAMPLES

Sample/Analyte	Known Concentration	Spike Concentration	Analyzed Concentration	Recovery (percent)
#H001-NSK				
Initial Cal bration Verification Standard	<0.05 mg/L	2.0 mg/L	2.2 mg/L	107.6
Interference Check Standard	<0.05 mg/L	25 mg/L	27 mg/L	107.6
Cal bration Verification Standard	<0.05 mg/L	2.0 mg/L	2.2 mg/L	109.7
Grind Sludge #G-06 11/18/14 Matrix Spike	200 mg/L	100 mg/L	-	NA
Cal bration Verification Standard	<0.05 mg/L	2.0 mg/L	2.2 mg/L	110.0

BLANK ANALYSIS

Sample	Analyzed Concentration	QC Decision
#H001-NSK		
Continuing Calibration Blank	<0.05 mg/L	Acceptable
Continuing Calibration Blank	<0.05 mg/L	Acceptable
Continuing Calibration Blank	<0.05 mg/L	Acceptable

Comments:

Calculations performed prior to rounding.
NA - Indicates not applicable due to inadequate spiking level.

Control Limits:

Initial Calibration Verification Recoveries (90 - 110 %)
Calibration Verification Recoveries (90 - 110 %)
Interference Check Recoveries (80 - 120 %)
Spike Recoveries (75 - 125 %)
Relative Range < or = 20%

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Quality Assurance / Quality Control
Digestion Batch Summary

QC Batch Number: 1117141-N
Parameter: Lead (EPA 3010A)
ATS Project: NSK-AKS #H001-NSK
Report Date: 12/12/14 (rev. 4/28/15)

Results of QA Samples run concurrently with project samples

REPLICATE ANALYSIS

Sample	Replicate #1	Replicate #2	Mean	Relative Range (percent)
#H001-NSK L1 Sludge #L1-02 10/21/14 Matrix Spike	7.3 mg/L	7.4 mg/L	7.4 mg/L	0.9

SPIKES and/or QC CHECK SAMPLES

Sample/Analyte	Known Concentration	Spike Concentration	Analyzed Concentration	Recovery (percent)
#H001-NSK Laboratory Control Sample 11/19/14	<0.05 mg/L	8.0 mg/L	7.6 mg/L	94.9
#H001-NSK L1 Sludge #L1-02 10/21/14 Matrix Spike	<0.05 mg/L	8.0 mg/L	7.3 mg/L	91.7
L1 Sludge #L1-02 10/21/14 Matrix Spike Duplicate	<0.05 mg/L	8.0 mg/L	7.4 mg/L	92.6

BLANK ANALYSIS

Sample	Analyzed Concentration	QC Decision
#H001-NSK Laboratory Reagent Blank 11/19/14	<0.05 mg/L	Acceptable

Comments:
Calculations performed prior to rounding.

Control Limits:
Spike Recoveries (75 - 125 %)
Laboratory Control Sample Recoveries (85 - 115 %)
Relative Range < or = 20%

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Quality Assurance / Quality Control
Digestion Batch Summary

QC Batch Number: 1124141-N
Parameter: Lead (EPA 3010A)
ATS Project: NSK-AKS #H001-NSK
Report Date: 12/12/14 (rev. 4/28/15)

Results of QA Samples run concurrently with project samples

REPLICATE ANALYSIS

Sample	Replicate #1	Replicate #2	Mean	Relative Range (percent)
#H001-NSK L1 Sludge #L1-06 11/18/14 Matrix Spike	6.7 mg/L	6.5 mg/L	6.6 mg/L	3.0

SPIKES and/or QC CHECK SAMPLES

Sample/Analyte	Known Concentration	Spike Concentration	Analyzed Concentration	Recovery (percent)
#H001-NSK Laboratory Control Sample 11/25/14	<0.005 mg/L	8.0 mg/L	7.4 mg/L	92.5
#H001-NSK L1 Sludge #L1-06 11/18/14 Matrix Spike	0.095 mg/L	8.0 mg/L	6.7 mg/L	83.0
L1 Sludge #L1-06 11/18/14 Matrix Spike Duplicate	0.095 mg/L	8.0 mg/L	6.5 mg/L	80.6

BLANK ANALYSIS

Sample	Analyzed Concentration	QC Decision
#H001-NSK Laboratory Reagent Blank 11/25/14	<0.05 mg/L	Acceptable

Comments:
Calculations performed prior to rounding.

Control Limits:
Spike Recoveries (75 - 125 %)
Laboratory Control Sample Recoveries (85 - 115 %)
Relative Range < or = 20%

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Quality Assurance / Quality Control
ICP/AES Summary

QC Batch Number: 1117141-N
Parameter: Lead (EPA 6010C)
ATS Project: NSK-AKS #H001-NSK
Report Date: 12/12/14 (rev. 4/28/15)

Results of QA Samples run concurrently with project samples

REPLICATE ANALYSIS

Sample	Replicate #1	Replicate #2	Mean	Relative Range (percent)
#H001-NSK				
L1 Sludge #L1-01 10/14/14	<0.05 mg/L	<0.05 mg/L	<0.05 mg/L	nc
Grind Sludge #G-02 10/21/14	0.075 mg/L	0.072 mg/L	0.073 mg/L	4.5
L1 Sludge #L1-02 10/21/14 TCLP Duplicate	<0.05 mg/L	<0.05 mg/L	<0.05 mg/L	nc

SPIKES and/or QC CHECK SAMPLES

Sample/Analyte	Known Concentration	Spike Concentration	Analyzed Concentration	Recovery (percent)
#H001-NSK				
Initial Calibration Verification Standard	<0.05 mg/L	2.0 mg/L	1.9 mg/L	94.9
Interference Check Standard	<0.05 mg/L	2.0 mg/L	1.9 mg/L	96.1
Grind Sludge #G-01 10/14/14 Matrix Spike	<0.05 mg/L	8.0 mg/L	7.7 mg/L	96.5
Calibration Verification Standard	<0.05 mg/L	2.0 mg/L	1.9 mg/L	95.6
Grind Sludge #G-03 10/28/14 Matrix Spike	<0.05 mg/L	8.0 mg/L	7.3 mg/L	90.8
Calibration Verification Standard	<0.05 mg/L	2.0 mg/L	1.8 mg/L	91.4
Grind Sludge #G-04 11/4/14 Matrix Spike	<0.05 mg/L	8.0 mg/L	7.7 mg/L	96.3
Calibration Verification Standard	<0.05 mg/L	2.0 mg/L	1.9 mg/L	93.1

BLANK ANALYSIS

Sample	Analyzed Concentration	QC Decision
#H001-NSK		
Continuing Calibration Blank	<0.05 mg/L	Acceptable
Continuing Calibration Blank	<0.05 mg/L	Acceptable
Continuing Calibration Blank	<0.05 mg/L	Acceptable
Continuing Calibration Blank	<0.05 mg/L	Acceptable

Comments:

Calculations performed prior to rounding.
nc - Indicates not calculable.

Control Limits:

Initial Calibration Verification Recoveries (90 - 110 %)
Calibration Verification Recoveries (90 - 110 %)
Interference Check Recoveries (80 - 120 %)
Spike Recoveries (75 - 125 %)
Relative Range < or = 20%

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Michigan Laboratory ID: 9604
Wisconsin Laboratory ID: 998321720

Quality Assurance / Quality Control
ICP/AES Summary

QC Batch Number: 1124141-N
Parameter: Lead (EPA 6010C)
ATS Project: NSK-AKS #H001-NSK
Report Date: 12/12/14 (rev. 4/28/15)

Results of QA Samples run concurrently with project samples

REPLICATE ANALYSIS

Sample	Replicate #1	Replicate #2	Mean	Relative Range (percent)
#H001-NSK				
L1 Sludge #L1-05 11/11/14	<0.05 mg/L	<0.05 mg/L	<0.05 mg/L	nc

SPIKES and/or QC CHECK SAMPLES

Sample/Analyte	Known Concentration	Spike Concentration	Analyzed Concentration	Recovery (percent)
#H001-NSK				
Initial Calibration Verification Standard	<0.05 mg/L	2.0 mg/L	1.8 mg/L	90.9
Interference Check Standard	<0.05 mg/L	2.0 mg/L	1.8 mg/L	91.5
Calibration Verification Standard	<0.05 mg/L	2.0 mg/L	1.8 mg/L	90.1
Grind Sludge #G-06 11/18/14 Matrix Spike	<0.05 mg/L	8.0 mg/L	7.0 mg/L	88.0
Calibration Verification Standard	<0.05 mg/L	2.0 mg/L	1.8 mg/L	90.9

BLANK ANALYSIS

Sample	Analyzed Concentration	QC Decision
#H001-NSK		
Continuing Calibration Blank	<0.05 mg/L	Acceptable
Continuing Calibration Blank	<0.05 mg/L	Acceptable
Continuing Calibration Blank	<0.05 mg/L	Acceptable

Comments:

Calculations performed prior to rounding.
nc - Indicates not calculable.

Control Limits:

Initial Calibration Verification Recoveries (90 - 110 %)
Calibration Verification Recoveries (90 - 110 %)
Interference Check Recoveries (80 - 120 %)
Spike Recoveries (75 - 125 %)
Relative Range < or = 20%

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Quality Assurance / Quality Control
Digestion Batch Summary

QC Batch Number: 1117141-N
Parameter: Mercury (EPA 7470A)
ATS Project: NSK-AKS #H001-NSK
Report Date: 12/12/14 (rev. 4/28/15)

Results of QA Samples run concurrently with project samples

REPLICATE ANALYSIS

Sample	Replicate #1	Replicate #2	Mean	Relative Range (percent)
#H001-NSK L1 Sludge #L1-02 10/21/14 Matrix Spike	0.0011 mg/L	0.0011 mg/L	0.0011 mg/L	3.7

SPIKES and/or QC CHECK SAMPLES

Sample/Analyte	Known Concentration	Spike Concentration	Analyzed Concentration	Recovery (percent)
#H001-NSK Laboratory Control Sample 11/17/14	<0.0005 mg/L	0.0010 mg/L	0.0012 mg/L	116.0*
#H001-NSK L1 Sludge #L1-02 10/21/14 Matrix Spike	<0.0005 mg/L	0.0010 mg/L	0.0011 mg/L	110.0
L1 Sludge #L1-02 10/21/14 Matrix Spike Duplicate	<0.0005 mg/L	0.0010 mg/L	0.0011 mg/L	106.0

BLANK ANALYSIS

Sample	Analyzed Concentration	QC Decision
#H001-NSK Laboratory Reagent Blank 11/17/14	<0.0005 mg/L	Acceptable

Comments:
Calculations performed prior to rounding.
* Value outside standard control limits.

Control Limits:
Spike Recoveries (80 - 120 %)
Laboratory Control Sample Recoveries (85 - 115 %)
Relative Range < or = 10%

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Quality Assurance / Quality Control
Digestion Batch Summary

QC Batch Number: 1124141-N
Parameter: Mercury (EPA 7470A)
ATS Project: NSK-AKS #H001-NSK
Report Date: 12/12/14 (rev. 4/28/15)

Results of QA Samples run concurrently with project samples

REPLICATE ANALYSIS

Sample	Replicate #1	Replicate #2	Mean	Relative Range (percent)
#H001-NSK L1 Sludge #L1-06 11/18/14 Matrix Spike	0.0010 mg/L	0.0011 mg/L	0.0011 mg/L	8.3

SPIKES and/or QC CHECK SAMPLES

Sample/Analyte	Known Concentration	Spike Concentration	Analyzed Concentration	Recovery (percent)
#H001-NSK Laboratory Control Sample 11/24/14	<0.0005 mg/L	0.0010 mg/L	0.0011 mg/L	114.0
#H001-NSK L1 Sludge #L1-06 11/18/14 Matrix Spike	<0.0005 mg/L	0.0010 mg/L	0.0010 mg/L	103.0
L1 Sludge #L1-06 11/18/14 Matrix Spike Duplicate	<0.0005 mg/L	0.0010 mg/L	0.0011 mg/L	112.0

BLANK ANALYSIS

Sample	Analyzed Concentration	QC Decision
#H001-NSK Laboratory Reagent Blank 11/24/14	<0.0005 mg/L	Acceptable

Comments:
Calculations performed prior to rounding.

Control Limits:
Spike Recoveries (80 - 120 %)
Laboratory Control Sample Recoveries (85 - 115 %)
Relative Range < or = 10%

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Quality Assurance / Quality Control
CVAAS Summary

QC Batch Number: 1117141-N / 1124141-N
Parameter: Mercury (EPA 7470A)
ATS Project: NSK-AKS #H001-NSK
Report Date: 12/12/14 (rev. 4/28/15)

Results of QA Samples run concurrently with project samples

REPLICATE ANALYSIS

Sample	Replicate #1	Replicate #2	Mean	Relative Range (percent)
#H001-NSK				
L1 Sludge #L1-01 10/14/14	<0.0005 mg/L	<0.005 mg/L	<0.005 mg/L	nc
Grind Sludge #G-01 10/14/14	<0.0005 mg/L	<0.005 mg/L	<0.005 mg/L	nc
Grind Sludge #G-06 11/18/14	<0.0005 mg/L	<0.005 mg/L	<0.005 mg/L	nc

SPIKES and/or QC CHECK SAMPLES

Sample/Analyte	Known Concentration	Spike Concentration	Analyzed Concentration	Recovery (percent)
#H001-NSK				
Initial Cal bration Verification Standard	<0.0005 mg/L	0.0040 mg/L	0.0039 mg/L	94.6
Laboratory Control Sample 4/20/15	<0.0005 mg/L	0.0010 mg/L	0.0009 mg/L	89.1
Cal bration Verification Standard	<0.0005 mg/L	0.0010 mg/L	0.0009 mg/L	92.5
Cal bration Verification Standard	<0.0005 mg/L	0.0010 mg/L	0.0010 mg/L	98.2
Cal bration Verification Standard	<0.0005 mg/L	0.0010 mg/L	0.0010 mg/L	101.0

BLANK ANALYSIS

Sample	Analyzed Concentration	QC Decision
#H001-NSK		
Laboratory Reagent Blank 4/20/15	<0.0005 mg/L	Acceptable
Continuing Calibration Blank	<0.0005 mg/L	Acceptable
Continuing Calibration Blank	<0.0005 mg/L	Acceptable
Continuing Calibration Blank	<0.0005 mg/L	Acceptable

Comments:

Calculations performed prior to rounding.
nc - Indicates not calculable.

Control Limits:

Initial Calibration Verification Recoveries (90 - 110 %)
Calibration Verification Recoveries (90 - 110 %)
Laboratory Control Sample Recoveries (85 - 115 %)
Relative Range < or = 10%

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Quality Assurance / Quality Control
Digestion Batch Summary

QC Batch Number: 1117141-N
Parameter: Nickel (EPA 3010A)
ATS Project: NSK-AKS #H001-NSK
Report Date: 12/12/14 (rev. 4/28/15)

Results of QA Samples run concurrently with project samples

REPLICATE ANALYSIS

Sample	Replicate #1	Replicate #2	Mean	Relative Range (percent)
#H001-NSK L1 Sludge #L1-02 10/21/14 Matrix Spike	7.8 mg/L	8.0 mg/L	7.9 mg/L	1.9

SPIKES and/or QC CHECK SAMPLES

Sample/Analyte	Known Concentration	Spike Concentration	Analyzed Concentration	Recovery (percent)
#H001-NSK Laboratory Control Sample 11/19/14	<0.005 mg/L	8.0 mg/L	8.1 mg/L	101.7
#H001-NSK L1 Sludge #L1-02 10/21/14 Matrix Spike	0.056 mg/L	8.0 mg/L	7.8 mg/L	97.1
L1 Sludge #L1-02 10/21/14 Matrix Spike Duplicate	0.056 mg/L	8.0 mg/L	8.0 mg/L	98.9

BLANK ANALYSIS

Sample	Analyzed Concentration	QC Decision
#H001-NSK Laboratory Reagent Blank 11/19/14	<0.005 mg/L	Acceptable

Comments:
Calculations performed prior to rounding.

Control Limits:
Spike Recoveries (75 - 125 %)
Laboratory Control Sample Recoveries (85 - 115 %)
Relative Range < or = 20%

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Quality Assurance / Quality Control
Digestion Batch Summary

QC Batch Number: 1124141-N
Parameter: Nickel (EPA 3010A)
ATS Project: NSK-AKS #H001-NSK
Report Date: 12/12/14 (rev. 4/28/15)

Results of QA Samples run concurrently with project samples

REPLICATE ANALYSIS

Sample	Replicate #1	Replicate #2	Mean	Relative Range (percent)
#H001-NSK L1 Sludge #L1-06 11/18/14 Matrix Spike	7.5 mg/L	7.2 mg/L	7.4 mg/L	3.8

SPIKES and/or QC CHECK SAMPLES

Sample/Analyte	Known Concentration	Spike Concentration	Analyzed Concentration	Recovery (percent)
#H001-NSK Laboratory Control Sample 11/25/14	<0.005 mg/L	8.0 mg/L	7.6 mg/L	94.5
#H001-NSK L1 Sludge #L1-06 11/18/14 Matrix Spike	0.28 mg/L	8.0 mg/L	7.5 mg/L	90.3
L1 Sludge #L1-06 11/18/14 Matrix Spike Duplicate	0.28 mg/L	8.0 mg/L	7.2 mg/L	86.8

BLANK ANALYSIS

Sample	Analyzed Concentration	QC Decision
#H001-NSK Laboratory Reagent Blank 11/25/14	<0.005 mg/L	Acceptable

Comments:
Calculations performed prior to rounding.

Control Limits:
Spike Recoveries (75 - 125 %)
Laboratory Control Sample Recoveries (85 - 115 %)
Relative Range < or = 20%

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Quality Assurance / Quality Control
ICP/AES Summary

QC Batch Number: 1117141-N
Parameter: Nickel (EPA 6010C)
ATS Project: NSK-AKS #H001-NSK
Report Date: 12/12/14 (rev. 4/28/15)

Results of QA Samples run concurrently with project samples

REPLICATE ANALYSIS

Sample	Replicate #1	Replicate #2	Mean	Relative Range (percent)
#H001-NSK				
L1 Sludge #L1-01 10/14/14	0.071 mg/L	0.078 mg/L	0.075 mg/L	9.3
Grind Sludge #G-02 10/21/14	0.096 mg/L	0.094 mg/L	0.095 mg/L	1.8
L1 Sludge #L1-02 10/21/14 TCLP Duplicate	0.056 mg/L	0.048 mg/L	0.052 mg/L	15.5

SPIKES and/or QC CHECK SAMPLES

Sample/Analyte	Known Concentration	Spike Concentration	Analyzed Concentration	Recovery (percent)
#H001-NSK				
Initial Calibration Verification Standard	<0.005 mg/L	2.0 mg/L	2.0 mg/L	102.6
Interference Check Standard	<0.005 mg/L	0.60 mg/L	0.62 mg/L	103.0
Grind Sludge #G-01 10/14/14 Matrix Spike	0.069 mg/L	2.4 mg/L	2.5 mg/L	102.0
Calibration Verification Standard	<0.005 mg/L	2.0 mg/L	2.0 mg/L	101.7
Grind Sludge #G-03 10/28/14 Matrix Spike	0.082 mg/L	2.4 mg/L	2.4 mg/L	96.2
Calibration Verification Standard	<0.005 mg/L	2.0 mg/L	1.9 mg/L	97.4
Grind Sludge #G-04 11/4/14 Matrix Spike	0.061 mg/L	2.4 mg/L	2.5 mg/L	103.5
Calibration Verification Standard	<0.005 mg/L	2.0 mg/L	2.0 mg/L	98.5

BLANK ANALYSIS

Sample	Analyzed Concentration	QC Decision
#H001-NSK		
Continuing Calibration Blank	<0.005 mg/L	Acceptable
Continuing Calibration Blank	<0.005 mg/L	Acceptable
Continuing Calibration Blank	<0.005 mg/L	Acceptable
Continuing Calibration Blank	<0.005 mg/L	Acceptable

Comments:
Calculations performed prior to rounding.

Control Limits:
Initial Calibration Verification Recoveries (90 - 110 %)
Calibration Verification Recoveries (90 - 110 %)
Interference Check Recoveries (80 - 120 %)
Spike Recoveries (75 - 125 %)
Relative Range < or = 20%

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Quality Assurance / Quality Control
ICP/AES Summary

QC Batch Number: 1124141-N
Parameter: Nickel (EPA 6010C)
ATS Project: NSK-AKS #H001-NSK
Report Date: 12/12/14 (rev. 4/28/15)

Results of QA Samples run concurrently with project samples

REPLICATE ANALYSIS

Sample	Replicate #1	Replicate #2	Mean	Relative Range (percent)
#H001-NSK				
L1 Sludge #L1-05 11/11/14	0.041 mg/L	0.043 mg/L	0.042 mg/L	4.8

SPIKES and/or QC CHECK SAMPLES

Sample/Analyte	Known Concentration	Spike Concentration	Analyzed Concentration	Recovery (percent)
#H001-NSK				
Initial Cal bration Verification Standard	<0.005 mg/L	2.0 mg/L	1.9 mg/L	96.6
Interference Check Standard	<0.005 mg/L	0.60 mg/L	0.59 mg/L	98.4
Cal bration Verification Standard	<0.005 mg/L	2.0 mg/L	1.9 mg/L	94.5
Grind Sludge #G-06 11/18/14 Matrix Spike	0.10 mg/L	2.4 mg/L	2.3 mg/L	93.5
Cal bration Verification Standard	<0.005 mg/L	2.0 mg/L	1.9 mg/L	95.7

BLANK ANALYSIS

Sample	Analyzed Concentration	QC Decision
#H001-NSK		
Continuing Calibration Blank	<0.005 mg/L	Acceptable
Continuing Calibration Blank	<0.005 mg/L	Acceptable
Continuing Calibration Blank	<0.005 mg/L	Acceptable

Comments:
Calculations performed prior to rounding.

Control Limits:
Initial Calibration Verification Recoveries (90 - 110 %)
Calibration Verification Recoveries (90 - 110 %)
Interference Check Recoveries (80 - 120 %)
Spike Recoveries (75 - 125 %)
Relative Range < or = 20%

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Quality Assurance / Quality Control
Digestion Batch Summary

QC Batch Number: 1117141-N
Parameter: Selenium (EPA 3010A)
ATS Project: NSK-AKS #H001-NSK
Report Date: 12/12/14 (rev. 4/28/15)

Results of QA Samples run concurrently with project samples

REPLICATE ANALYSIS

Sample	Replicate #1	Replicate #2	Mean	Relative Range (percent)
#H001-NSK L1 Sludge #L1-02 10/21/14 Matrix Spike	7.8 mg/L	7.8 mg/L	7.8 mg/L	0.5

SPIKES and/or QC CHECK SAMPLES

Sample/Analyte	Known Concentration	Spike Concentration	Analyzed Concentration	Recovery (percent)
#H001-NSK Laboratory Control Sample 11/19/14	<0.01 mg/L	8.0 mg/L	7.8 mg/L	97.8
#H001-NSK				
L1 Sludge #L1-02 10/21/14 Matrix Spike	<0.01 mg/L	8.0 mg/L	7.8 mg/L	97.6
L1 Sludge #L1-02 10/21/14 Matrix Spike Duplicate	<0.01 mg/L	8.0 mg/L	7.8 mg/L	98.1

BLANK ANALYSIS

Sample	Analyzed Concentration	QC Decision
#H001-NSK Laboratory Reagent Blank 11/19/14	<0.01 mg/L	Acceptable

Comments:
Calculations performed prior to rounding.

Control Limits:
Spike Recoveries (75 - 125 %)
Laboratory Control Sample Recoveries (85 - 115 %)
Relative Range < or = 20%

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Quality Assurance / Quality Control
Digestion Batch Summary

QC Batch Number: 1124141-N
Parameter: Selenium (EPA 3010A)
ATS Project: NSK-AKS #H001-NSK
Report Date: 12/12/14 (rev. 4/28/15)

Results of QA Samples run concurrently with project samples

REPLICATE ANALYSIS

Sample	Replicate #1	Replicate #2	Mean	Relative Range (percent)
#H001-NSK L1 Sludge #L1-06 11/18/14 Matrix Spike	6.9 mg/L	6.7 mg/L	6.8 mg/L	3.1

SPIKES and/or QC CHECK SAMPLES

Sample/Analyte	Known Concentration	Spike Concentration	Analyzed Concentration	Recovery (percent)
#H001-NSK Laboratory Control Sample 11/25/14	<0.01 mg/L	8.0 mg/L	7.2 mg/L	89.6
#H001-NSK L1 Sludge #L1-06 11/18/14 Matrix Spike	<0.01 mg/L	8.0 mg/L	6.9 mg/L	86.1
L1 Sludge #L1-06 11/18/14 Matrix Spike Duplicate	<0.01 mg/L	8.0 mg/L	6.7 mg/L	83.5

BLANK ANALYSIS

Sample	Analyzed Concentration	QC Decision
#H001-NSK Laboratory Reagent Blank 11/25/14	<0.01 mg/L	Acceptable

Comments:
Calculations performed prior to rounding.

Control Limits:
Spike Recoveries (75 - 125 %)
Laboratory Control Sample Recoveries (85 - 115 %)
Relative Range < or = 20%

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Quality Assurance / Quality Control
ICP/AES Summary

QC Batch Number: 1117141-N
Parameter: Selenium (EPA 6010C)
ATS Project: NSK-AKS #H001-NSK
Report Date: 12/12/14 (rev. 4/28/15)

Results of QA Samples run concurrently with project samples

REPLICATE ANALYSIS

Sample	Replicate #1	Replicate #2	Mean	Relative Range (percent)
#H001-NSK				
L1 Sludge #L1-01 10/14/14	<0.01 mg/L	<0.01 mg/L	<0.01 mg/L	nc
Grind Sludge #G-02 10/21/14	<0.01 mg/L	<0.01 mg/L	<0.01 mg/L	nc
L1 Sludge #L1-02 10/21/14 TCLP Duplicate	<0.01 mg/L	<0.01 mg/L	<0.01 mg/L	nc

SPIKES and/or QC CHECK SAMPLES

Sample/Analyte	Known Concentration	Spike Concentration	Analyzed Concentration	Recovery (percent)
#H001-NSK				
Initial Calibration Verification Standard	<0.01 mg/L	2.0 mg/L	1.9 mg/L	96.0
Interference Check Standard	<0.01 mg/L	1.0 mg/L	1.0 mg/L	105.5
Grind Sludge #G-01 10/14/14 Matrix Spike	<0.01 mg/L	4.0 mg/L	4.1 mg/L	101.8
Calibration Verification Standard	<0.01 mg/L	2.0 mg/L	1.9 mg/L	96.5
Grind Sludge #G-03 10/28/14 Matrix Spike	<0.01 mg/L	4.0 mg/L	3.9 mg/L	97.1
Calibration Verification Standard	<0.01 mg/L	2.0 mg/L	1.9 mg/L	95.6
Grind Sludge #G-04 11/4/14 Matrix Spike	<0.01 mg/L	4.0 mg/L	4.2 mg/L	105.6
Calibration Verification Standard	<0.01 mg/L	2.0 mg/L	1.9 mg/L	95.3

BLANK ANALYSIS

Sample	Analyzed Concentration	QC Decision
#H001-NSK		
Continuing Calibration Blank	<0.01 mg/L	Acceptable
Continuing Calibration Blank	<0.01 mg/L	Acceptable
Continuing Calibration Blank	<0.01 mg/L	Acceptable
Continuing Calibration Blank	<0.01 mg/L	Acceptable

Comments:

Calculations performed prior to rounding.
nc - Indicates not calculable.

Control Limits:

Initial Calibration Verification Recoveries (90 - 110 %)
Calibration Verification Recoveries (90 - 110 %)
Interference Check Recoveries (80 - 120 %)
Spike Recoveries (75 - 125 %)
Relative Range < or = 20%

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Quality Assurance / Quality Control
ICP/AES Summary

QC Batch Number: 1124141-N
Parameter: Selenium (EPA 6010C)
ATS Project: NSK-AKS #H001-NSK
Report Date: 12/12/14 (rev. 4/28/15)

Results of QA Samples run concurrently with project samples

REPLICATE ANALYSIS

Sample	Replicate #1	Replicate #2	Mean	Relative Range (percent)
#H001-NSK				
L1 Sludge #L1-05 11/11/14	<0.01 mg/L	<0.01 mg/L	<0.01 mg/L	nc

SPIKES and/or QC CHECK SAMPLES

Sample/Analyte	Known Concentration	Spike Concentration	Analyzed Concentration	Recovery (percent)
#H001-NSK				
Initial Cal bration Verification Standard	<0.01 mg/L	2.0 mg/L	1.8 mg/L	91.8
Interference Check Standard	<0.01 mg/L	1.0 mg/L	1.0 mg/L	100.1
Cal bration Verification Standard	<0.01 mg/L	2.0 mg/L	1.8 mg/L	91.2
Grind Sludge #G-06 11/18/14 Matrix Spike	<0.01 mg/L	4.0 mg/L	3.9 mg/L	94.6
Cal bration Verification Standard	<0.01 mg/L	2.0 mg/L	1.9 mg/L	93.3

BLANK ANALYSIS

Sample	Analyzed Concentration	QC Decision
#H001-NSK		
Continuing Calibration Blank	<0.01 mg/L	Acceptable
Continuing Calibration Blank	<0.01 mg/L	Acceptable
Continuing Calibration Blank	<0.01 mg/L	Acceptable

Comments:

Calculations performed prior to rounding.
nc - Indicates not calculable.

Control Limits:

Initial Calibration Verification Recoveries (90 - 110 %)
Calibration Verification Recoveries (90 - 110 %)
Interference Check Recoveries (80 - 120 %)
Spike Recoveries (75 - 125 %)
Relative Range < or = 20%

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Quality Assurance / Quality Control
Digestion Batch Summary

QC Batch Number: 1117141-N
Parameter: Zinc (EPA 3010A)
ATS Project: NSK-AKS #H001-NSK
Report Date: 12/12/14 (rev. 4/28/15)

Results of QA Samples run concurrently with project samples

REPLICATE ANALYSIS

Sample	Replicate #1	Replicate #2	Mean	Relative Range (percent)
#H001-NSK L1 Sludge #L1-02 10/21/14 Matrix Spike	7.8 mg/L	8.0 mg/L	7.9 mg/L	2.4

SPIKES and/or QC CHECK SAMPLES

Sample/Analyte	Known Concentration	Spike Concentration	Analyzed Concentration	Recovery (percent)
#H001-NSK Laboratory Control Sample 11/19/14	<0.05 mg/L	8.0 mg/L	8.0 mg/L	100.2
#H001-NSK L1 Sludge #L1-02 10/21/14 Matrix Spike	0.24 mg/L	8.0 mg/L	7.8 mg/L	94.2
L1 Sludge #L1-02 10/21/14 Matrix Spike Duplicate	0.24 mg/L	8.0 mg/L	8.0 mg/L	96.6

BLANK ANALYSIS

Sample	Analyzed Concentration	QC Decision
#H001-NSK Laboratory Reagent Blank 11/19/14	0.16 mg/L	Acceptable

Comments:
Calculations performed prior to rounding.

Control Limits:
Spike Recoveries (75 - 125 %)
Laboratory Control Sample Recoveries (85 - 115 %)
Relative Range < or = 20%

290 South Wagner Road
Ann Arbor, Michigan 48103
Tel. 734/995-0995 Fax. 734/995-3731
Michigan Laboratory ID: 9604
Wisconsin Laboratory ID: 998321720

Quality Assurance / Quality Control
Digestion Batch Summary

QC Batch Number: 1124141-N
Parameter: Zinc (EPA 3010A)
ATS Project: NSK-AKS #H001-NSK
Report Date: 12/12/14 (rev. 4/28/15)

Results of QA Samples run concurrently with project samples

REPLICATE ANALYSIS

Sample	Replicate #1	Replicate #2	Mean	Relative Range (percent)
#H001-NSK L1 Sludge #L1-06 11/18/14 Matrix Spike	7.2 mg/L	6.9 mg/L	7.1 mg/L	4.1

SPIKES and/or QC CHECK SAMPLES

Sample/Analyte	Known Concentration	Spike Concentration	Analyzed Concentration	Recovery (percent)
#H001-NSK Laboratory Control Sample 11/25/14	<0.05 mg/L	8.0 mg/L	7.4 mg/L	92.1
#H001-NSK L1 Sludge #L1-06 11/18/14 Matrix Spike	0.25 mg/L	8.0 mg/L	7.2 mg/L	86.8
L1 Sludge #L1-06 11/18/14 Matrix Spike Duplicate	0.25 mg/L	8.0 mg/L	6.9 mg/L	83.1

BLANK ANALYSIS

Sample	Analyzed Concentration	QC Decision
#H001-NSK Laboratory Reagent Blank 11/25/14	<0.05 mg/L	Acceptable

Comments:
Calculations performed prior to rounding.

Control Limits:
Spike Recoveries (75 - 125 %)
Laboratory Control Sample Recoveries (85 - 115 %)
Relative Range < or = 20%

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Michigan Laboratory ID: 9604
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Quality Assurance / Quality Control
ICP/AES Summary

QC Batch Number: 1117141-N
Parameter: Zinc (EPA 6010C)
ATS Project: NSK-AKS #H001-NSK
Report Date: 12/12/14 (rev. 4/28/15)

Results of QA Samples run concurrently with project samples

REPLICATE ANALYSIS

Sample	Replicate #1	Replicate #2	Mean	Relative Range (percent)
#H001-NSK				
L1 Sludge #L1-01 10/14/14	0.32 mg/L	0.32 mg/L	0.32 mg/L	0.8
Grind Sludge #G-02 10/21/14	0.35 mg/L	0.34 mg/L	0.35 mg/L	0.5
L1 Sludge #L1-02 10/21/14 TCLP Duplicate	0.25 mg/L	0.24 mg/L	0.25 mg/L	0.5

SPIKES and/or QC CHECK SAMPLES

Sample/Analyte	Known Concentration	Spike Concentration	Analyzed Concentration	Recovery (percent)
#H001-NSK				
Initial Cal bration Verification Standard	<0.05 mg/L	2.0 mg/L	1.9 mg/L	96.1
Interference Check Standard	<0.05 mg/L	0.60 mg/L	0.60 mg/L	99.8
Grind Sludge #G-01 10/14/14 Matrix Spike	0.31 mg/L	2.4 mg/L	2.7 mg/L	99.9
Cal bration Verification Standard	<0.05 mg/L	2.0 mg/L	1.9 mg/L	95.4
Grind Sludge #G-03 10/28/14 Matrix Spike	0.28 mg/L	2.4 mg/L	2.6 mg/L	96.8
Cal bration Verification Standard	<0.05 mg/L	2.0 mg/L	1.9 mg/L	93.3
Grind Sludge #G-04 11/4/14 Matrix Spike	0.28 mg/L	2.4 mg/L	2.7 mg/L	101.3
Cal bration Verification Standard	<0.05 mg/L	2.0 mg/L	1.9 mg/L	93.2

BLANK ANALYSIS

Sample	Analyzed Concentration	QC Decision
#H001-NSK		
Continuing Calibration Blank	<0.05 mg/L	Acceptable
Continuing Calibration Blank	<0.05 mg/L	Acceptable
Continuing Calibration Blank	<0.05 mg/L	Acceptable
Continuing Calibration Blank	<0.05 mg/L	Acceptable

Comments:
Calculations performed prior to rounding.

Control Limits:
Initial Calibration Verification Recoveries (90 - 110 %)
Calibration Verification Recoveries (90 - 110 %)
Interference Check Recoveries (80 - 120 %)
Spike Recoveries (75 - 125 %)
Relative Range < or = 20%

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Wisconsin Laboratory ID: 998321720

Quality Assurance / Quality Control
ICP/AES Summary

QC Batch Number: 1124141-N
Parameter: Zinc (EPA 6010C)
ATS Project: NSK-AKS #H001-NSK
Report Date: 12/12/14 (rev. 4/28/15)

Results of QA Samples run concurrently with project samples

REPLICATE ANALYSIS

Sample	Replicate #1	Replicate #2	Mean	Relative Range (percent)
#H001-NSK				
L1 Sludge #L1-05 11/11/14	0.14 mg/L	0.14 mg/L	0.14 mg/L	2.6

SPIKES and/or QC CHECK SAMPLES

Sample/Analyte	Known Concentration	Spike Concentration	Analyzed Concentration	Recovery (percent)
#H001-NSK				
Initial Cal bration Verification Standard	<0.05 mg/L	2.0 mg/L	1.8 mg/L	92.2
Interference Check Standard	<0.05 mg/L	0.60 mg/L	0.58 mg/L	96.9
Cal bration Verification Standard	<0.05 mg/L	2.0 mg/L	1.8 mg/L	90.5
Grind Sludge #G-06 11/18/14 Matrix Spike	0.25 mg/L	2.4 mg/L	2.4 mg/L	91.4
Cal bration Verification Standard	<0.05 mg/L	2.0 mg/L	1.8 mg/L	91.0

BLANK ANALYSIS

Sample	Analyzed Concentration	QC Decision
#H001-NSK		
Continuing Calibration Blank	<0.05 mg/L	Acceptable
Continuing Calibration Blank	<0.05 mg/L	Acceptable
Continuing Calibration Blank	<0.05 mg/L	Acceptable

Comments:

Calculations performed prior to rounding.

Control Limits:

Initial Calibration Verification Recoveries (90 - 110 %)
Calibration Verification Recoveries (90 - 110 %)
Interference Check Recoveries (80 - 120 %)
Spike Recoveries (75 - 125 %)
Relative Range < or = 20%

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Michigan Laboratory ID: 9604
Wisconsin Laboratory ID: 998321720

Quality Assurance / Quality Control
Extraction Batch Summary

QC Batch Number: 1022141-N
Parameter: Oil Content (EPA 9071B)
ATS Project: NSK-AKS #H001-NSK
Report Date: 12/12/14 (rev. 4/28/15)

Results of QA Samples run concurrently with project samples

REPLICATE ANALYSIS

Sample	Replicate #1	Replicate #2	Mean	Relative Range (percent)
#H001-NSK L1 Sludge #L1-02 10/21/14	85,000 mg/kg	100,000 mg/kg	94,000 mg/L	18.4

SPIKES and/or QC CHECK SAMPLES

Sample/Analyte	Known Concentration	Spike Concentration	Analyzed Concentration	Recovery (percent)

BLANK ANALYSIS

Sample	Analyzed Concentration	QC Decision
#H001-NSK Extraction Blank 10/22/14	<500 mg/kg	Acceptable

Comments:
Calculations performed prior to rounding.

Control Limits:
Relative Range < or = 20%

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Michigan Laboratory ID: 9604
Wisconsin Laboratory ID: 998321720

Quality Assurance / Quality Control
Extraction Batch Summary

QC Batch Number: 1110141-N
Parameter: Oil Content (EPA 9071B)
ATS Project: NSK-AKS #H001-NSK
Report Date: 12/12/14 (rev. 4/28/15)

Results of QA Samples run concurrently with project samples

REPLICATE ANALYSIS

Sample	Replicate #1	Replicate #2	Mean	Relative Range (percent)
#H001-NSK L1 Sludge #L1-03 10/28/14	86,000 mg/kg	150,000 mg/kg	120,000 mg/kg	50.0*

SPIKES and/or QC CHECK SAMPLES

Sample/Analyte	Known Concentration	Spike Concentration	Analyzed Concentration	Recovery (percent)

BLANK ANALYSIS

Sample	Analyzed Concentration	QC Decision
#H001-NSK Extraction Blank 11/10/14	<500 mg/kg	Acceptable

Comments:
Calculations performed prior to rounding.
* Value outside standard control limits.

Control Limits:
Relative Range < or = 20%

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Michigan Laboratory ID: 9604
Wisconsin Laboratory ID: 998321720

Quality Assurance / Quality Control
Extraction Batch Summary

QC Batch Number: 1121141-N
Parameter: Oil Content (EPA 9071B)
ATS Project: NSK-AKS #H001-NSK
Report Date: 12/12/14 (rev. 4/28/15)

Results of QA Samples run concurrently with project samples

REPLICATE ANALYSIS

Sample	Replicate #1	Replicate #2	Mean	Relative Range (percent)
#H001-NSK L1 Sludge #L1-05 11/11/14	17,000 mg/kg	18,000 mg/kg	18,000 mg/kg	8.1

SPIKES and/or QC CHECK SAMPLES

Sample/Analyte	Known Concentration	Spike Concentration	Analyzed Concentration	Recovery (percent)

BLANK ANALYSIS

Sample	Analyzed Concentration	QC Decision
#H001-NSK Extraction Blank 11/21/14	<500 mg/kg	Acceptable

Comments:
Calculations performed prior to rounding.

Control Limits:
Relative Range < or = 20%

ATS
ANN ARBOR TECHNICAL SERVICES INC.
290 South Wagner Road
Ann Arbor, MI 48103
Tel 734/995-0995
Fax 734/995-3731

CHAIN OF CUSTODY RECORD

PROJECT NO.: H001-NSK

PROJECT NAME: NSK-AKS Precision Ball Co

SAMPLERS (SIGNATURE): Dale Davidson

STA. NO.	DATE	TIME	COMP.	GRAB	STATION LOCATION	NO. OF CONTAINERS	SAMPLE TYPE: 8oz Poly Bottle	REMARKS: INDICATE SOIL/WATER/AIR SEDIMENT/ SLUDGE
	10/14/14	12:30 pm		✓	Grind Sludge # G-01	1	✓	Grind Waste
	10/14/14	12:30 pm		✓	LI Sludge # LI-01	1	✓	LI Waste
	10/21/14	12:30 PM		✓	Grind Sludge # G-02	1	✓	Grind Waste
	10/21/14	12:30 PM		✓	LI Sludge # LI-02	1	✓	LI Waste

RELINQUISHED BY: (SIGNATURE)	DATE/TIME	RECEIVED BY: (SIGNATURE)	RELINQUISHED BY: (SIGNATURE)	DATE/TIME	RECEIVED BY: (SIGNATURE)
[signature]	10/21/14 1:00 PM	[signature]	[signature]	10.22.14 10:15	[signature]
RELINQUISHED BY: (SIGNATURE)	DATE/TIME	RECEIVED BY: (SIGNATURE)	RELINQUISHED BY: (SIGNATURE)	DATE/TIME	RECEIVED BY: (SIGNATURE)

RELINQUISHED BY: (SIGNATURE)	DATE/TIME	RECEIVED FOR DISPOSAL BY: (SIGNATURE)	DATE/TIME	REMARKS

ATS
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Ann Arbor, MI 48103
Tel 734/995-0995
Fax 734/995-3731

CHAIN OF CUSTODY RECORD

PROJECT NO. H001-NSK | PROJECT NAME NSK-AKS

SAMPLERS (SIGNATURE) Dale Davis

STA. NO.	DATE	TIME	COMP.	GRAB	STATION LOCATION	NO. OF CONTAINERS	SAMPLE TYPE: 8oz Poly Bottle	REMARKS: INDICATE SOIL/WATER/AIR SEDIMENT/ SLUDGE
	10/28	12:20 pm		✓	Grind Sludge # G3	1	✓	Grind Waste
	11/4	12:25 pm		✓	Grind Sludge # G4	1	✓	" "
	10/28	12:20 pm		✓	L1 Sludge # L1-3	1	✓	L1 Waste
	11/4	12:25 pm		✓	L1 Sludge # L1-4	1	✓	L1 Waste

RELINQUISHED BY: (SIGNATURE)	DATE/TIME	RECEIVED BY: (SIGNATURE)	RELINQUISHED BY: (SIGNATURE)	DATE/TIME	RECEIVED BY: (SIGNATURE)
Duane Strong	11/5/14 2pm				
RELINQUISHED BY: (SIGNATURE)	DATE/TIME	RECEIVED BY: (SIGNATURE)	RELINQUISHED BY: (SIGNATURE)	DATE/TIME	RECEIVED BY: (SIGNATURE)
	11/6/14 8AM				
RELINQUISHED BY: (SIGNATURE)	DATE/TIME	RECEIVED FOR DISPOSAL BY: (SIGNATURE)	DATE/TIME	REMARKS	

ATS
ANN ARBOR TECHNICAL SERVICES INC.
290 South Wagner Road
Ann Arbor, MI 48103
Tel 734/995-0995
Fax 734/995-3731

CHAIN OF CUSTODY RECORD

PROJECT NO.: H001-NSK
PROJECT NAME: NSK-AKS
SAMPLERS (SIGNATURE): Jack Davis

STA. NO.	DATE	TIME	COMP.	GRAB	STATION LOCATION	NO. OF CONTAINERS	SAMPLE TYPE: 8oz Poly Bottle	REMARKS: INDICATE SOIL/WATER/AIR SEDIMENT/ SLUDGE
	11/11	12:35 pm		✓	Grind Sludge # G-5		✓	Grind Waste
	11/18	12:30 pm		✓	Grind Sludge # G6		✓	Grind Waste
	11/11	12:35 pm		✓	Li Sludge # LI-5		✓	Li Waste
	11/18	12:30 pm		✓	Li Sludge # LI-6		✓	Li Waste

RELINQUISHED BY: (SIGNATURE)	DATE/TIME	RECEIVED BY: (SIGNATURE)	RELINQUISHED BY: (SIGNATURE)	DATE/TIME	RECEIVED BY: (SIGNATURE)
Duane Strong	11/19/2014 9:48 AM			11-20-14 11:00	
RELINQUISHED BY: (SIGNATURE)	DATE/TIME	RECEIVED BY: (SIGNATURE)	RELINQUISHED BY: (SIGNATURE)	DATE/TIME	RECEIVED BY: (SIGNATURE)
RELINQUISHED BY: (SIGNATURE)	DATE/TIME	RECEIVED FOR DISPOSAL BY: (SIGNATURE)	DATE/TIME	REMARKS	

LABORATORY OPERATIONS
CASE NARRATIVE

ATS Project Number: H001-NSK
Report Date: 7/11/16

Case Narrative Summary

This case narrative applies to ten samples that were received at Ann Arbor Technical Services, Inc. (ATS) on 5/13/16, 5/26/16, and 6/10/16. Upon receipt, samples were to be composited and scheduled for the following analyses.

- TCLP Regulatory Metals by US EPA methods 1311 and 6010C
- TCLP Mercury by US EPA methods 1311 and 7470A
- TCLP Copper, Iron, Nickel, and Zinc by US EPA method 6010C
- Chromium Speciation by US EPA methods 9056A and 6020B
- Oil Content by US EPA method 9071B

Sample Receipt, Chain of Custody Records, and Holding Times

Samples were delivered to ATS by commercial courier. Samples were received in boxes at ambient temperature with proper chain of custody records. All samples were extracted and analyzed within the holding times as cited in US EPA method 1311.

Data Review and Approval

All data contained in this report have been conducted in accordance with the guidelines provided in the referenced standard test methods, and are consistent with the detailed procedures described in a written standard operating procedure (SOP) specific to the ATS laboratory, as required by US EPA. All data are peer and management reviewed to ensure compliance with the above referenced SOP's and project specifications. In addition all data conform to the laboratory's Quality Assurance / Quality Control Manuals.

Data Deliverables and Sample Reporting

All data deliverables are generated to be in compliance with the US EPA. This data package constitutes a level II package. There were no hardcopy data summary sheets generated for this project.

Consultants in Chemistry & Environmental Science
290 South Wagner Road, Ann Arbor, Michigan 48103 Tel 734/995-0995 Fax 734/995-3731

Sample Preparation

Sample Compositing: Approximately 10g of the weekly sample from each of the two waste streams (Grind Sludge #G and L1 Sludge) was combined to produce a month composite. These two month composites were submitted for analysis.

Metals Analysis (except mercury): Samples were extracted in accordance with US EPA method 1311 (Toxicity Leaching Characteristic Procedure) followed by a digestion in accordance with US EPA method 3010A (Acid Digestion of Aqueous Samples and Extracts for Total Metals Analysis by FLAA or ICP Spectroscopy).

Mercury Analysis: Samples were extracted in accordance with US EPA method 1311 (Toxicity Leaching Characteristic Procedure) followed by a digestion in accordance with US EPA method 7470A (Mercury in Liquid Waste – Cold Vapor Atomic Absorption Spectrometry).

Chromium Speciation Analysis: Samples were extracted in accordance with US EPA method 1311 (Toxicity Leaching Characteristic Procedure) followed by dilution and digestion in an alkaline mobile phase formulated for speciation of Chromium II, Chromium III, and Chromium VI.

Oil Content: Samples were extracted in accordance with US EPA method 9071B (n-Hexane Extractable Material for Sludge, Sediment, and Solid Samples).

Extensive homogenization procedures were implemented due to the nature of the sample matrix.

Anomalies Noted: **None**

Sample Analysis

Metals Analysis (except mercury): Samples were analyzed in accordance with US EPA method 6010C (Inductively Coupled Plasma – Atomic Emission Spectrometry). An initial calibration with at least five levels was used to quantitate metals. Concentrations were reported to a number corresponding to 1/100 of the maximum leachate concentration where applicable or the method detection limit (MDL). Samples were reported on a mg/L wet weight basis as indicated in US EPA method 1311.

Mercury Analysis: Samples were analyzed in accordance with US EPA method 7470A (Mercury in Liquid Waste – Cold Vapor Atomic Absorption Spectrometry). An initial calibration with at least five levels was used to quantitate mercury. Concentrations were reported to a number corresponding to 1/100 of the maximum leachate concentration where applicable or the method detection limit (MDL). Samples were reported on a mg/L wet weight basis as indicated in US EPA method 1311.

Chromium Speciation Analysis: Samples were analyzed in accordance with US EPA method 9056A (Inorganic Anions by Ion Chromatography) / US EPA method 6020B (Inductively Coupled Plasma – Mass Spectrometry). An initial calibration with at least five levels was used to quantitate chromium species. Concentrations were reported to the lowest calibration standard. Samples were reported on a mg/L wet weight basis as indicated in US EPA method 1311.

Oil Content: Samples were analyzed in accordance with US EPA method 9071B (n-Hexane Extractable Material for Sludge, Sediment, and Solid Samples). Samples were reported on a mg/kg wet weight basis.

Anomalies Noted: **None**

Analytical QA/QC Summary

Calibration Verification

Applicable to ICP/AES, IC/ICP/MS, and CVAAS analyses only.

Method calibration was verified through the running of a mid-level initial calibration verification (CV) standard at a frequency of every ten samples. All verification standards met the acceptance criteria with the following exceptions:

- **None**

Interference Checks

Applicable to ICP/AES analyses only.

The lack of spectral interferences was verified through the analysis of interference check standards every running day. All interference standards met the acceptance criteria with the following exceptions:

- **None**

Instrument Blanks

Applicable to ICP/AES, IC/ICP/MS, and CVAAS analyses only.

Instrument blanks were analyzed at a frequency of every ten samples. All blanks met the acceptance criteria with the following exceptions:

Sample ID	Analytical method	Constituent	Analyzed Concentration	Reporting Limit
Continuing Calibration Blank-2	EPA 1311/6010C	Iron	0.09 mg/L	0.05 mg/L

Matrix Spikes

Applicable to ICP/AES and CVAAS analyses only.

A matrix spike (MS) was analyzed at a frequency of every ten samples. All MS's met the acceptance criteria with the following exceptions:

- **None**

Matrix Duplicates

Applicable to ICP/AES and CVAAS analyses only

A replicate analysis was performed at a frequency of every ten samples. All replicates met the acceptance criteria with the following exceptions:

- **None**

QA/QC Batch Summary

Laboratory Reagent Blanks

Applicable to all analyses.

A laboratory reagent blank (LRB) was analyzed with each QA/QC batch. All LRB's met the acceptance criteria with the following exceptions:

- **None**

Laboratory Fortified Blanks and Matrix Spikes

Applicable to ICP/AES, IC/ICPMS, and CVAAS analyses only.

A laboratory fortified blank (LFB) / laboratory control sample (LCS) was analyzed with each QA/QC batch. For chromium speciation the LCS/LFB's consisted of equal concentrations of trivalent and hexavalent species. All LCS/LFB's met the acceptance criteria with the following exceptions:

- **None**

A matrix spike (MS) was analyzed with each QA/QC batch. For chromium speciation the MS's consisted of equal concentrations of trivalent and hexavalent species. All MS's met the acceptance criteria with the following exceptions:

- **One MS for iron was not reportable due to inadequate spiking levels.**

Matrix Duplicates

Applicable to all analyses.

A replicate analysis was analyzed with each QA/QC batch. All replicates met the acceptance criteria with the following exceptions:

Sample ID	Analytical method	Constituent	Relative Range	Acceptance Limits
L1 Sludge #L1 May Composite	EPA 3010A/6010C	Barium	21.9	≤ 20 %

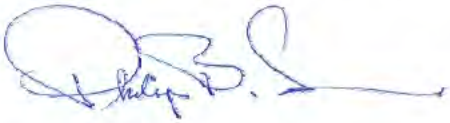
Sample Dilutions

Samples containing compounds at concentrations above the initial calibration curve were diluted and reanalyzed for those compounds. The following samples were diluted:

- **None**

/ July 11, 2016

Mark T. DeLong (Quality Assurance Coordinator)



/ July 11, 2016

Philip B. Simon (Laboratory Director)

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Tel. 734/995-0995 Fax. 734/995-3731Michigan Laboratory ID: 9604
Wisconsin Laboratory ID: 998321720

Toxicity Characteristic Leaching Procedure
Inorganic Analysis
Data Summary Sheet

For: Mr. Duane Strong
NSK-AKS Precision Ball Company
1100A North First Street
Clarinda, Iowa 51632

ATS Project: NSK-AKS #H001-NSK
Report Date: 7/11/16
ATS SRF: 0513161, 0526161, 0613161

Sample Identification: Grind Sludge #G "May Composite"

Sample Date:	Various, See Comments Below	Preparation Method:	EPA 1311
Sample Time:	Various, See COC	Analytical Method(s):	EPA 3010A / 6010C
Sampled By:	Client		EPA 7470A
Laboratory Receipt Date:	Various, See COC		EPA 9071B
Sample Matrix:	Grind Waste		EPA 9056A / 6020B

Parameter (CAS)	Units	Result	Maximum Leachate Concentration*	TCLP Hazardous	Analysis Date	Analysis Time	QC Batch Number
Arsenic (7440-38-2)	mg/L	<0.05	5.0	No	7/7/16	8:56 AM	0705161-N
Barium (7440-39-3)	mg/L	0.14	100	No	7/7/16	8:56 AM	0705161-N
Cadmium (7440-43-9)	mg/L	<0.005	1.0	No	7/7/16	8:56 AM	0705161-N
Chromium (7440-47-3)	mg/L	0.95	5.0	No	7/7/16	8:56 AM	0705161-N
Chromium VI (18540-29-9)	mg/L	<0.02	na	No	7/5/16	3:24 PM	0705162-N
Chromium II & III	mg/L	0.83	na	No	7/5/16	3:24 PM	0705162-N
Copper (7440-50-8)	mg/L	0.013	na	na	7/7/16	8:56 AM	0705161-N
Iron (7439-89-6)	mg/L	180	na	na	7/7/16	8:56 AM	0705161-N
Lead (7439-92-1)	mg/L	<0.05	5.0	No	7/7/16	8:56 AM	0705161-N
Mercury (7439-97-6)	mg/L	<0.0005	0.2	No	7/8/16	3:32 PM	0708161-N
Nickel (7440-02-0)	mg/L	0.11	na	na	7/7/16	8:56 AM	0705161-N
Selenium (7782-49-2)	mg/L	<0.01	1.0	No	7/7/16	8:56 AM	0705161-N
Silver (7440-22-4)	mg/L	<0.05	5.0	No	7/7/16	8:56 AM	0705161-N
Zinc (7440-66-6)	mg/L	0.17	na	na	7/7/16	8:56 AM	0705161-N
Oil Content	mg/kg	94,000	na	na	7/11/16	na	0711161-N

Comments

All methods reference USEPA methods unless otherwise noted.
* Reference: 40 CFR, 1998 Part 261.24
Oil content is expressed on a wet weight basis.
na - Indicates not applicable
May Composite Sample Dates: 5/3/16, 5/10/16, 5/17/16, 5/24/16, and 5/31/16

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Ann Arbor, Michigan 48103
Tel. 734/995-0995 Fax. 734/995-3731Michigan Laboratory ID: 9604
Wisconsin Laboratory ID: 998321720

Toxicity Characteristic Leaching Procedure
Inorganic Analysis
Data Summary Sheet

For: Mr. Duane Strong
NSK-AKS Precision Ball Company
1100A North First Street
Clarinda, Iowa 51632

ATS Project: NSK-AKS #H001-NSK
Report Date: 7/11/16
ATS SRF: 0513161, 0526161, 0613161

Sample Identification: L1 Sludge #L1 "May Composite"

Sample Date:	Various, See Comments Below	Preparation Method:	EPA 1311
Sample Time:	Various, See COC	Analytical Method(s):	EPA 3010A / 6010C
Sampled By:	Client		EPA 7470A
Laboratory Receipt Date:	Various, See COC		EPA 9071B
Sample Matrix:	Grind Waste		EPA 9056A / 6020B

Parameter (CAS)	Units	Result	Maximum Leachate Concentration*	TCLP Hazardous	Analysis Date	Analysis Time	QC Batch Number
Arsenic (7440-38-2)	mg/L	<0.05	5.0	No	7/7/16	9:04 AM	0705161-N
Barium (7440-39-3)	mg/L	0.32	100	No	7/7/16	9:04 AM	0705161-N
Cadmium (7440-43-9)	mg/L	<0.005	1.0	No	7/7/16	9:04 AM	0705161-N
Chromium (7440-47-3)	mg/L	4.4	5.0	No	7/7/16	9:04 AM	0705161-N
Chromium VI (18540-29-9)	mg/L	<0.02	na	No	7/5/16	3:17 PM	0705162-N
Chromium II & III	mg/L	4.6	na	No	7/5/16	3:17 PM	0705162-N
Copper (7440-50-8)	mg/L	<0.005	na	na	7/7/16	9:04 AM	0705161-N
Iron (7439-89-6)	mg/L	780	na	na	7/7/16	9:04 AM	0705161-N
Lead (7439-92-1)	mg/L	<0.05	5.0	No	7/7/16	9:04 AM	0705161-N
Mercury (7439-97-6)	mg/L	<0.0005	0.2	No	7/8/16	3:20 PM	0708161-N
Nickel (7440-02-0)	mg/L	0.30	na	na	7/7/16	9:04 AM	0705161-N
Selenium (7782-49-2)	mg/L	<0.01	1.0	No	7/7/16	9:04 AM	0705161-N
Silver (7440-22-4)	mg/L	<0.05	5.0	No	7/7/16	9:04 AM	0705161-N
Zinc (7440-66-6)	mg/L	0.16	na	na	7/7/16	9:04 AM	0705161-N
Oil Content	mg/kg	164,000	na	na	7/11/16	na	0711161-N

Comments

All methods reference USEPA methods unless otherwise noted.
* Reference: 40 CFR, 1998 Part 261.24
Oil content is expressed on a wet weight basis.
na - Indicates not applicable
May Composite Sample Dates: 5/3/16, 5/10/16, 5/17/16, 5/24/16, and 5/31/16

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Quality Assurance / Quality Control
Digestion Batch Summary

QC Batch Number: 0705161-N
Parameter: Arsenic (EPA 3010A)
ATS Project: NSK-AKS #H001-NSK
Report Date: 7/11/16

Results of QA Samples run concurrently with project samples

REPLICATE ANALYSIS

Sample	Replicate #1	Replicate #2	Mean	Relative Range (percent)
#H001-NSK L1 Sludge #L1 May Composite	<0.05 mg/L	<0.05 mg/L	<0.05 mg/L	nc

SPIKES and/or QC CHECK SAMPLES

Sample/Analyte	Known Concentration	Spike Concentration	Analyzed Concentration	Recovery (percent)
#H001-NSK Laboratory Control Sample 7/5/16	<0.05 mg/L	0.16 mg/L	0.17 mg/L	105.2
#H001-NSK L1 Sludge #L1 May Composite Matrix Spike	<0.05 mg/L	1.0 mg/L	0.96 mg/L	96.5

BLANK ANALYSIS

Sample	Analyzed Concentration	QC Decision
#H001-NSK Laboratory Reagent Blank 7/5/16	<0.05 mg/L	Acceptable

Comments:
Calculations performed prior to rounding.
nc - Indicates not calculable.

Control Limits:
Spike Recoveries (75 - 125 %)
Laboratory Control Sample Recoveries (85 - 115 %)
Relative Range < or = 20%

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Quality Assurance / Quality Control
ICP/AES Summary

QC Batch Number: 0705161-N
Parameter: Arsenic (EPA 6010C)
ATS Project: NSK-AKS #H001-NSK
Report Date: 7/11/16

Results of QA Samples run concurrently with project samples

REPLICATE ANALYSIS

Sample	Replicate #1	Replicate #2	Mean	Relative Range (percent)
#A002-000				
Effluent 6/28/16	<0.05 mg/L	<0.05 mg/L	<0.05 mg/L	nc

SPIKES and/or QC CHECK SAMPLES

Sample/Analyte	Known Concentration	Spike Concentration	Analyzed Concentration	Recovery (percent)
#A002-000, #H001-NSK				
Initial Calibration Verification Standard	<0.05 mg/L	2.0 mg/L	1.9 mg/L	97.4
Interference Check Standard	<0.05 mg/L	0.80 mg/L	0.82 mg/L	102.8
#A002-000				
Effluent 6/28/16 Matrix Spike	<0.05 mg/L	2.0 mg/L	2.2 mg/L	110.9
#A002-000, #H001-NSK				
Calibration Verification Standard	<0.05 mg/L	2.0 mg/L	2.0 mg/L	100.0

BLANK ANALYSIS

Sample	Analyzed Concentration	QC Decision
#A002-000, #H001-NSK		
Continuing Calibration Blank	<0.05 mg/L	Acceptable
Continuing Calibration Blank	<0.05 mg/L	Acceptable

Comments:

Calculations performed prior to rounding.
nc - Indicates not calculable.

Control Limits:

Initial Calibration Verification Recoveries (90 - 110 %)
Calibration Verification Recoveries (90 - 110 %)
Interference Check Recoveries (80 - 120 %)
Spike Recoveries (75 - 125 %)
Relative Range < or = 20%

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Quality Assurance / Quality Control
Digestion Batch Summary

QC Batch Number: 0705161-N
Parameter: Barium (EPA 3010A)
ATS Project: NSK-AKS #H001-NSK
Report Date: 7/11/16

Results of QA Samples run concurrently with project samples

REPLICATE ANALYSIS

Sample	Replicate #1	Replicate #2	Mean	Relative Range (percent)
#H001-NSK L1 Sludge #L1 May Composite	0.36 mg/L	0.29 mg/L	0.32 mg/L	21.9*

SPIKES and/or QC CHECK SAMPLES

Sample/Analyte	Known Concentration	Spike Concentration	Analyzed Concentration	Recovery (percent)
#H001-NSK Laboratory Control Sample 7/5/16	<0.05 mg/L	0.16 mg/L	0.16 mg/L	101.1
#H001-NSK L1 Sludge #L1 May Composite Matrix Spike	0.32 mg/L	1.0 mg/L	0.94 mg/L	90.6

BLANK ANALYSIS

Sample	Analyzed Concentration	QC Decision
#H001-NSK Laboratory Reagent Blank 7/5/16	<0.05 mg/L	Acceptable

Comments:
Calculations performed prior to rounding.
* Value outside standard control limits.

Control Limits:
Spike Recoveries (75 - 125 %)
Laboratory Control Sample Recoveries (85 - 115 %)
Relative Range < or = 20%

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Quality Assurance / Quality Control
ICP/AES Summary

QC Batch Number: 0705161-N
Parameter: Barium (EPA 6010C)
ATS Project: NSK-AKS #H001-NSK
Report Date: 7/11/16

Results of QA Samples run concurrently with project samples

REPLICATE ANALYSIS

Sample	Replicate #1	Replicate #2	Mean	Relative Range (percent)
#A002-000				
Effluent 6/28/16	0.06 mg/L	0.05 mg/L	0.05 mg/L	9.6

SPIKES and/or QC CHECK SAMPLES

Sample/Analyte	Known Concentration	Spike Concentration	Analyzed Concentration	Recovery (percent)
#A002-000, #H001-NSK				
Initial Cal bration Verification Standard	<0.05 mg/L	2.0 mg/L	1.9 mg/L	97.0
Interference Check Standard	<0.05 mg/L	0.80 mg/L	0.84 mg/L	104.8
#A002-000				
Effluent 6/28/16 Matrix Spike	0.05 mg/L	2.0 mg/L	2.0 mg/L	96.9
#A002-000, #H001-NSK				
Cal bration Verification Standard	<0.05 mg/L	2.0 mg/L	2.0 mg/L	100.4

BLANK ANALYSIS

Sample	Analyzed Concentration	QC Decision
#A002-000, #H001-NSK		
Continuing Calibration Blank	<0.05 mg/L	Acceptable
Continuing Calibration Blank	<0.05 mg/L	Acceptable

Comments:
Calculations performed prior to rounding.

Control Limits:
Initial Calibration Verification Recoveries (90 - 110 %)
Calibration Verification Recoveries (90 - 110 %)
Interference Check Recoveries (80 - 120 %)
Spike Recoveries (75 - 125 %)
Relative Range < or = 20%

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Quality Assurance / Quality Control
Digestion Batch Summary

QC Batch Number: 0705161-N
Parameter: Cadmium (EPA 3010A)
ATS Project: NSK-AKS #H001-NSK
Report Date: 7/11/16

Results of QA Samples run concurrently with project samples

REPLICATE ANALYSIS

Sample	Replicate #1	Replicate #2	Mean	Relative Range (percent)
#H001-NSK L1 Sludge #L1 May Composite	<0.005 mg/L	<0.005 mg/L	<0.005 mg/L	nc

SPIKES and/or QC CHECK SAMPLES

Sample/Analyte	Known Concentration	Spike Concentration	Analyzed Concentration	Recovery (percent)
#H001-NSK Laboratory Control Sample 7/5/16	<0.005 mg/L	0.16 mg/L	0.16 mg/L	97.3
#H001-NSK L1 Sludge #L1 May Composite Matrix Spike	<0.005 mg/L	1.0 mg/L	0.92 mg/L	92.5

BLANK ANALYSIS

Sample	Analyzed Concentration	QC Decision
#H001-NSK Laboratory Reagent Blank 7/5/16	<0.005 mg/L	Acceptable

Comments:
Calculations performed prior to rounding.
nc - Indicates not calculable.

Control Limits:
Spike Recoveries (75 - 125 %)
Laboratory Control Sample Recoveries (85 - 115 %)
Relative Range < or = 20%

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Quality Assurance / Quality Control
ICP/AES Summary

QC Batch Number: 0705161-N
Parameter: Cadmium (EPA 6010C)
ATS Project: NSK-AKS #H001-NSK
Report Date: 7/11/16

Results of QA Samples run concurrently with project samples

REPLICATE ANALYSIS

Sample	Replicate #1	Replicate #2	Mean	Relative Range (percent)
#A002-000				
Effluent 6/28/16	<0.005 mg/L	<0.005 mg/L	<0.005 mg/L	nc

SPIKES and/or QC CHECK SAMPLES

Sample/Analyte	Known Concentration	Spike Concentration	Analyzed Concentration	Recovery (percent)
#A002-000, #H001-NSK				
Initial Calibration Verification Standard	<0.005 mg/L	2.0 mg/L	1.9 mg/L	95.8
Interference Check Standard	<0.005 mg/L	0.80 mg/L	0.81 mg/L	101.6
#A002-000				
Effluent 6/28/16 Matrix Spike	<0.005 mg/L	2.0 mg/L	2.3 mg/L	113.6
#A002-000, #H001-NSK				
Calibration Verification Standard	<0.005 mg/L	2.0 mg/L	1.9 mg/L	96.6

BLANK ANALYSIS

Sample	Analyzed Concentration	QC Decision
#A002-000, #H001-NSK		
Continuing Calibration Blank	<0.005 mg/L	Acceptable
Continuing Calibration Blank	<0.005 mg/L	Acceptable

Comments:

Calculations performed prior to rounding.
nc - Indicates not calculable.

Control Limits:

Initial Calibration Verification Recoveries (90 - 110 %)
Calibration Verification Recoveries (90 - 110 %)
Interference Check Recoveries (80 - 120 %)
Spike Recoveries (75 - 125 %)
Relative Range < or = 20%

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Quality Assurance / Quality Control
Digestion Batch Summary

QC Batch Number: 0705161-N
Parameter: Chromium (EPA 3010A)
ATS Project: NSK-AKS #H001-NSK
Report Date: 7/11/16

Results of QA Samples run concurrently with project samples

REPLICATE ANALYSIS

Sample	Replicate #1	Replicate #2	Mean	Relative Range (percent)
#H001-NSK L1 Sludge #L1 May Composite	4.4 mg/L	4.4 mg/L	4.4 mg/L	1.5

SPIKES and/or QC CHECK SAMPLES

Sample/Analyte	Known Concentration	Spike Concentration	Analyzed Concentration	Recovery (percent)
#H001-NSK Laboratory Control Sample 7/5/16	<0.005 mg/L	0.16 mg/L	0.16 mg/L	98.0
#H001-NSK L1 Sludge #L1 May Composite Matrix Spike	4.4 mg/L	1.0 mg/L	1.4 mg/L	95.5

BLANK ANALYSIS

Sample	Analyzed Concentration	QC Decision
#H001-NSK Laboratory Reagent Blank 7/5/16	<0.005 mg/L	Acceptable

Comments:
Calculations performed prior to rounding.

Control Limits:
Spike Recoveries (75 - 125 %)
Laboratory Control Sample Recoveries (85 - 115 %)
Relative Range < or = 20%

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Quality Assurance / Quality Control
ICP/AES Summary

QC Batch Number: 0705161-N
Parameter: Chromium (EPA 6010C)
ATS Project: NSK-AKS #H001-NSK
Report Date: 7/11/16

Results of QA Samples run concurrently with project samples

REPLICATE ANALYSIS

Sample	Replicate #1	Replicate #2	Mean	Relative Range (percent)
#A002-000				
Effluent 6/28/16	0.048 mg/L	0.047 mg/L	0.048 mg/L	3.9

SPIKES and/or QC CHECK SAMPLES

Sample/Analyte	Known Concentration	Spike Concentration	Analyzed Concentration	Recovery (percent)
#A002-000, #H001-NSK				
Initial Calibration Verification Standard	<0.005 mg/L	2.0 mg/L	2.1 mg/L	105.0
Interference Check Standard	<0.005 mg/L	0.80 mg/L	0.82 mg/L	102.3
#A002-000				
Effluent 6/28/16 Matrix Spike	0.048 mg/L	2.0 mg/L	2.2 mg/L	107.8
#A002-000, #H001-NSK				
Calibration Verification Standard	<0.005 mg/L	2.0 mg/L	2.1 mg/L	105.9

BLANK ANALYSIS

Sample	Analyzed Concentration	QC Decision
#A002-000, #H001-NSK		
Continuing Calibration Blank	<0.005 mg/L	Acceptable
Continuing Calibration Blank	<0.005 mg/L	Acceptable

Comments:

Calculations performed prior to rounding.

Control Limits:

Initial Calibration Verification Recoveries (90 - 110 %)
Calibration Verification Recoveries (90 - 110 %)
Interference Check Recoveries (80 - 120 %)
Spike Recoveries (75 - 125 %)
Relative Range < or = 20%

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Quality Assurance / Quality Control
Digestion Batch Summary

QC Batch Number: 0705162-N
Parameter: Chromium Speciation (EPA 9056A / 6020B)
ATS Project: NSK-AKS #H001-NSK
Report Date: 7/11/16

Results of QA Samples run concurrently with project samples

REPLICATE ANALYSIS

Sample	Replicate #1	Replicate #2	Mean	Relative Range (percent)
#H001-NSK Grind Sludge #G May Composite	0.86 mg/L	0.80 mg/L	0.83 mg/L	7.0

SPIKES and/or QC CHECK SAMPLES

Sample/Analyte	Known Concentration	Spike Concentration	Analyzed Concentration	Recovery (percent)
#H001-NSK Laboratory Control Sample 7/5/16	<0.02 mg/L	0.40 mg/L	0.37 mg/L	92.4
#H001-NSK Grind Sludge #G May Composite Matrix Spike	0.83 mg/L	2.0 mg/L	2.7 mg/L	92.6

BLANK ANALYSIS

Sample	Analyzed Concentration	QC Decision
#H001-NSK Laboratory Reagent Blank 7/5/16	<0.02 mg/L	Acceptable

Comments:

Calculations performed prior to rounding.

Samples spiked with equal amounts chromium III and VI, calculated as total chromium.

Control Limits:

Spike Recoveries (75 - 125 %)
Laboratory Control Sample Recoveries (85 - 115 %)
Relative Range < or = 20%

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Quality Assurance / Quality Control
ICP/MS Summary

QC Batch Number: 0705162-N
Parameter: Chromium Speciation (EPA 9056A / 6020B)
ATS Project: NSK-AKS #H001-NSK
Report Date: 7/11/16

Results of QA Samples run concurrently with project samples

REPLICATE ANALYSIS

Sample	Replicate #1	Replicate #2	Mean	Relative Range (percent)

SPIKES and/or QC CHECK SAMPLES

Sample/Analyte	Known Concentration	Spike Concentration	Analyzed Concentration	Recovery (percent)
#H001-NSK				
Initial Calibration Verification Standard	<0.02 mg/L	0.20 mg/L	0.18 mg/L	90.6
Calibration Verification Standard	<0.02 mg/L	0.40 mg/L	0.37 mg/L	92.5

BLANK ANALYSIS

Sample	Analyzed Concentration	QC Decision
#H001-NSK		
Continuing Calibration Blank	<0.02 mg/L	Acceptable
Continuing Calibration Blank	<0.02 mg/L	Acceptable

Comments:
Calculations performed prior to rounding.

Control Limits:
Initial Calibration Verification Recoveries (90 - 110 %)
Calibration Verification Recoveries (90 - 110 %)

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Quality Assurance / Quality Control
Digestion Batch Summary

QC Batch Number: 0705161-N
Parameter: Copper (EPA 3010A)
ATS Project: NSK-AKS #H001-NSK
Report Date: 7/11/16

Results of QA Samples run concurrently with project samples

REPLICATE ANALYSIS

Sample	Replicate #1	Replicate #2	Mean	Relative Range (percent)
#H001-NSK L1 Sludge #L1 May Composite	<0.005 mg/L	<0.005 mg/L	<0.005 mg/L	nc

SPIKES and/or QC CHECK SAMPLES

Sample/Analyte	Known Concentration	Spike Concentration	Analyzed Concentration	Recovery (percent)
#H001-NSK Laboratory Control Sample 7/5/16	<0.005 mg/L	0.16 mg/L	0.16 mg/L	102.7
#H001-NSK L1 Sludge #L1 May Composite Matrix Spike	<0.005 mg/L	1.0 mg/L	1.0 mg/L	105.3

BLANK ANALYSIS

Sample	Analyzed Concentration	QC Decision
#H001-NSK Laboratory Reagent Blank 7/5/16	<0.005 mg/L	Acceptable

Comments:
Calculations performed prior to rounding.

Control Limits:
Spike Recoveries (75 - 125 %)
Laboratory Control Sample Recoveries (85 - 115 %)
Relative Range < or = 20%

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Quality Assurance / Quality Control
ICP/AES Summary

QC Batch Number: 0705161-N
Parameter: Copper (EPA 6010C)
ATS Project: NSK-AKS #H001-NSK
Report Date: 7/11/16

Results of QA Samples run concurrently with project samples

REPLICATE ANALYSIS

Sample	Replicate #1	Replicate #2	Mean	Relative Range (percent)
#A002-000				
Effluent 6/28/16	0.053 mg/L	0.048 mg/L	0.050 mg/L	9.1

SPIKES and/or QC CHECK SAMPLES

Sample/Analyte	Known Concentration	Spike Concentration	Analyzed Concentration	Recovery (percent)
#A002-000, #H001-NSK				
Initial Calibration Verification Standard	<0.005 mg/L	2.0 mg/L	2.1 mg/L	106.3
Interference Check Standard	<0.005 mg/L	0.80 mg/L	0.84 mg/L	104.8
#A002-000				
Effluent 6/28/16 Matrix Spike	0.048 mg/L	2.0 mg/L	2.4 mg/L	117.1
#A002-000, #H001-NSK				
Calibration Verification Standard	<0.005 mg/L	2.0 mg/L	2.2 mg/L	107.1

BLANK ANALYSIS

Sample	Analyzed Concentration	QC Decision
#A002-000, #H001-NSK		
Continuing Calibration Blank	<0.005 mg/L	Acceptable
Continuing Calibration Blank	<0.005 mg/L	Acceptable

Comments:
Calculations performed prior to rounding.

Control Limits:
Initial Calibration Verification Recoveries (90 - 110 %)
Calibration Verification Recoveries (90 - 110 %)
Interference Check Recoveries (80 - 120 %)
Spike Recoveries (75 - 125 %)
Relative Range < or = 20%

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Quality Assurance / Quality Control
Digestion Batch Summary

QC Batch Number: 0705161-N
Parameter: Iron (EPA 3010A)
ATS Project: NSK-AKS #H001-NSK
Report Date: 7/11/16

Results of QA Samples run concurrently with project samples

REPLICATE ANALYSIS

Sample	Replicate #1	Replicate #2	Mean	Relative Range (percent)
#H001-NSK L1 Sludge #L1 May Composite	790 mg/L	770 mg/L	780 mg/L	1.8

SPIKES and/or QC CHECK SAMPLES

Sample/Analyte	Known Concentration	Spike Concentration	Analyzed Concentration	Recovery (percent)
#H001-NSK Laboratory Control Sample 7/5/16	<0.05 mg/L	1.6 mg/L	1.6 mg/L	97.5
#H001-NSK L1 Sludge #L1 May Composite Matrix Spike	780 mg/L	10 mg/L	-	NA

BLANK ANALYSIS

Sample	Analyzed Concentration	QC Decision
#H001-NSK Laboratory Reagent Blank 7/5/16	<0.05 mg/L	Acceptable

Comments:
Calculations performed prior to rounding.
NA - Indicates not applicable due to inadequate spiking level.

Control Limits:
Spike Recoveries (75 - 125 %)
Laboratory Control Sample Recoveries (85 - 115 %)
Relative Range < or = 20%

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Quality Assurance / Quality Control
ICP/AES Summary

QC Batch Number: 0705161-N
Parameter: Iron (EPA 6010C)
ATS Project: NSK-AKS #H001-NSK
Report Date: 7/11/16

Results of QA Samples run concurrently with project samples

REPLICATE ANALYSIS

Sample	Replicate #1	Replicate #2	Mean	Relative Range (percent)
#A002-000				
Effluent 6/28/16	0.15 mg/L	0.16 mg/L	0.16 mg/L	6.8

SPIKES and/or QC CHECK SAMPLES

Sample/Analyte	Known Concentration	Spike Concentration	Analyzed Concentration	Recovery (percent)
#A002-000, #H001-NSK				
Initial Calibration Verification Standard	<0.05 mg/L	2.0 mg/L	2.2 mg/L	108.3
Interference Check Standard	<0.05 mg/L	8.0 mg/L	8.2 mg/L	102.6
#A002-000				
Effluent 6/28/16 Matrix Spike	0.16 mg/L	2.0 mg/L	2.2 mg/L	104.2
#A002-000, #H001-NSK				
Calibration Verification Standard	<0.05 mg/L	2.0 mg/L	2.1 mg/L	106.8

BLANK ANALYSIS

Sample	Analyzed Concentration	QC Decision
#A002-000, #H001-NSK		
Continuing Calibration Blank	<0.05 mg/L	Acceptable
Continuing Calibration Blank	0.09 mg/L	Acceptable

Comments:
Calculations performed prior to rounding.

Control Limits:
Initial Calibration Verification Recoveries (90 - 110 %)
Calibration Verification Recoveries (90 - 110 %)
Interference Check Recoveries (80 - 120 %)
Spike Recoveries (75 - 125 %)
Relative Range < or = 20%

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Quality Assurance / Quality Control
Digestion Batch Summary

QC Batch Number: 0705161-N
Parameter: Lead (EPA 3010A)
ATS Project: NSK-AKS #H001-NSK
Report Date: 7/11/16

Results of QA Samples run concurrently with project samples

REPLICATE ANALYSIS

Sample	Replicate #1	Replicate #2	Mean	Relative Range (percent)
#H001-NSK L1 Sludge #L1 May Composite	<0.05 mg/L	<0.05 mg/L	<0.05 mg/L	nc

SPIKES and/or QC CHECK SAMPLES

Sample/Analyte	Known Concentration	Spike Concentration	Analyzed Concentration	Recovery (percent)
#H001-NSK Laboratory Control Sample 7/5/16	<0.05 mg/L	0.16 mg/L	0.16 mg/L	101.6
#H001-NSK L1 Sludge #L1 May Composite Matrix Spike	<0.05 mg/L	1.0 mg/L	0.90 mg/L	90.5

BLANK ANALYSIS

Sample	Analyzed Concentration	QC Decision
#H001-NSK Laboratory Reagent Blank 7/5/16	<0.05 mg/L	Acceptable

Comments:
Calculations performed prior to rounding.
nc - Indicates not calculable.

Control Limits:
Spike Recoveries (75 - 125 %)
Laboratory Control Sample Recoveries (85 - 115 %)
Relative Range < or = 20%

290 South Wagner Road
Ann Arbor, Michigan 48103
Tel. 734/995-0995 Fax. 734/995-3731
Michigan Laboratory ID: 9604
Wisconsin Laboratory ID: 998321720

Quality Assurance / Quality Control
ICP/AES Summary

QC Batch Number: 0705161-N
Parameter: Lead (EPA 6010C)
ATS Project: NSK-AKS #H001-NSK
Report Date: 7/11/16

Results of QA Samples run concurrently with project samples

REPLICATE ANALYSIS

Sample	Replicate #1	Replicate #2	Mean	Relative Range (percent)
#A002-000				
Effluent 6/28/16	<0.05 mg/L	<0.05 mg/L	<0.05 mg/L	nc

SPIKES and/or QC CHECK SAMPLES

Sample/Analyte	Known Concentration	Spike Concentration	Analyzed Concentration	Recovery (percent)
#A002-000, #H001-NSK				
Initial Calibration Verification Standard	<0.05 mg/L	2.0 mg/L	1.9 mg/L	96.3
Interference Check Standard	<0.05 mg/L	0.80 mg/L	0.82 mg/L	102.9
#A002-000				
Effluent 6/28/16 Matrix Spike	<0.05 mg/L	2.0 mg/L	1.9 mg/L	93.7
#A002-000, #H001-NSK				
Calibration Verification Standard	<0.05 mg/L	2.0 mg/L	2.0 mg/L	98.6

BLANK ANALYSIS

Sample	Analyzed Concentration	QC Decision
#A002-000, #H001-NSK		
Continuing Calibration Blank	<0.05 mg/L	Acceptable
Continuing Calibration Blank	<0.05 mg/L	Acceptable

Comments:

Calculations performed prior to rounding.
nc - Indicates not calculable.

Control Limits:

Initial Calibration Verification Recoveries (90 - 110 %)
Calibration Verification Recoveries (90 - 110 %)
Interference Check Recoveries (80 - 120 %)
Spike Recoveries (75 - 125 %)
Relative Range < or = 20%

290 South Wagner Road
Ann Arbor, Michigan 48103
Tel. 734/995-0995 Fax. 734/995-3731
Michigan Laboratory ID: 9604
Wisconsin Laboratory ID: 998321720

Quality Assurance / Quality Control
Digestion Batch Summary

QC Batch Number: 0708161-N
Parameter: Mercury (EPA 7470A)
ATS Project: NSK-AKS #H001-NSK
Report Date: 7/11/16

Results of QA Samples run concurrently with project samples

REPLICATE ANALYSIS

Sample	Replicate #1	Replicate #2	Mean	Relative Range (percent)
#H001-NSK Grind Sludge #G May Composite	<0.0005 mg/L	<0.0005 mg/L	<0.0005 mg/L	nc

SPIKES and/or QC CHECK SAMPLES

Sample/Analyte	Known Concentration	Spike Concentration	Analyzed Concentration	Recovery (percent)
#H001-NSK Laboratory Control Sample 7/8/16	<0.0005 mg/L	0.0020 mg/L	0.0020 mg/L	101.5
#H001-NSK L1 Sludge #L1 May Composite Matrix Spike	<0.0005 mg/L	0.0050 mg/L	0.0049 mg/L	98.8

BLANK ANALYSIS

Sample	Analyzed Concentration	QC Decision
#H001-NSK Laboratory Reagent Blank 7/8/16	<0.0005 mg/L	Acceptable

Comments:
Calculations performed prior to rounding.
* Value outside standard control limits.

Control Limits:
Spike Recoveries (80 - 120 %)
Laboratory Control Sample Recoveries (85 - 115 %)
Relative Range < or = 10%

290 South Wagner Road
Ann Arbor, Michigan 48103
Tel. 734/995-0995 Fax. 734/995-3731
Michigan Laboratory ID: 9604
Wisconsin Laboratory ID: 998321720

Quality Assurance / Quality Control
Digestion Batch Summary

QC Batch Number: 0705161-N
Parameter: Nickel (EPA 3010A)
ATS Project: NSK-AKS #H001-NSK
Report Date: 7/11/16

Results of QA Samples run concurrently with project samples

REPLICATE ANALYSIS

Sample	Replicate #1	Replicate #2	Mean	Relative Range (percent)
#H001-NSK L1 Sludge #L1 May Composite	0.31 mg/L	0.28 mg/L	0.30 mg/L	7.5

SPIKES and/or QC CHECK SAMPLES

Sample/Analyte	Known Concentration	Spike Concentration	Analyzed Concentration	Recovery (percent)
#H001-NSK Laboratory Control Sample 7/5/16	<0.005 mg/L	0.16 mg/L	0.16 mg/L	102.6
#H001-NSK L1 Sludge #L1 May Composite Matrix Spike	0.30 mg/L	1.0 mg/L	0.98 mg/L	95.1

BLANK ANALYSIS

Sample	Analyzed Concentration	QC Decision
#H001-NSK Laboratory Reagent Blank 7/5/16	<0.005 mg/L	Acceptable

Comments:
Calculations performed prior to rounding.

Control Limits:
Spike Recoveries (75 - 125 %)
Laboratory Control Sample Recoveries (85 - 115 %)
Relative Range < or = 20%

290 South Wagner Road
Ann Arbor, Michigan 48103
Tel. 734/995-0995 Fax. 734/995-3731
Michigan Laboratory ID: 9604
Wisconsin Laboratory ID: 998321720

Quality Assurance / Quality Control
ICP/AES Summary

QC Batch Number: 0705161-N
Parameter: Nickel (EPA 6010C)
ATS Project: NSK-AKS #H001-NSK
Report Date: 7/11/16

Results of QA Samples run concurrently with project samples

REPLICATE ANALYSIS

Sample	Replicate #1	Replicate #2	Mean	Relative Range (percent)
#A002-000				
Effluent 6/28/16	0.048 mg/L	0.048 mg/L	0.048 mg/L	0.4

SPIKES and/or QC CHECK SAMPLES

Sample/Analyte	Known Concentration	Spike Concentration	Analyzed Concentration	Recovery (percent)
#A002-000, #H001-NSK				
Initial Calibration Verification Standard	<0.005 mg/L	2.0 mg/L	2.0 mg/L	100.7
Interference Check Standard	<0.005 mg/L	0.80 mg/L	0.82 mg/L	102.1
#A002-000				
Effluent 6/28/16 Matrix Spike	0.048 mg/L	2.0 mg/L	2.0 mg/L	97.2
#A002-000, #H001-NSK				
Calibration Verification Standard	<0.005 mg/L	2.0 mg/L	2.0 mg/L	102.9

BLANK ANALYSIS

Sample	Analyzed Concentration	QC Decision
#A002-000, #H001-NSK		
Continuing Calibration Blank	<0.005 mg/L	Acceptable
Continuing Calibration Blank	<0.005 mg/L	Acceptable

Comments:
Calculations performed prior to rounding.

Control Limits:
Initial Calibration Verification Recoveries (90 - 110 %)
Calibration Verification Recoveries (90 - 110 %)
Interference Check Recoveries (80 - 120 %)
Spike Recoveries (75 - 125 %)
Relative Range < or = 20%

290 South Wagner Road
Ann Arbor, Michigan 48103
Tel. 734/995-0995 Fax. 734/995-3731
Michigan Laboratory ID: 9604
Wisconsin Laboratory ID: 998321720

Quality Assurance / Quality Control
Digestion Batch Summary

QC Batch Number: 0705161-N
Parameter: Selenium (EPA 3010A)
ATS Project: NSK-AKS #H001-NSK
Report Date: 7/11/16

Results of QA Samples run concurrently with project samples

REPLICATE ANALYSIS

Sample	Replicate #1	Replicate #2	Mean	Relative Range (percent)
#H001-NSK L1 Sludge #L1 May Composite	<0.01 mg/L	<0.01 mg/L	<0.01 mg/L	nc

SPIKES and/or QC CHECK SAMPLES

Sample/Analyte	Known Concentration	Spike Concentration	Analyzed Concentration	Recovery (percent)
#H001-NSK Laboratory Control Sample 7/5/16	<0.01 mg/L	0.16 mg/L	0.18 mg/L	110.9
#H001-NSK L1 Sludge #L1 May Composite Matrix Spike	<0.01 mg/L	5.0 mg/L	4.9 mg/L	97.9

BLANK ANALYSIS

Sample	Analyzed Concentration	QC Decision
#H001-NSK Laboratory Reagent Blank 7/5/16	<0.01 mg/L	Acceptable

Comments:
Calculations performed prior to rounding.
nc - Indicates not calculable.

Control Limits:
Spike Recoveries (75 - 125 %)
Laboratory Control Sample Recoveries (85 - 115 %)
Relative Range < or = 20%

290 South Wagner Road
Ann Arbor, Michigan 48103
Tel. 734/995-0995 Fax. 734/995-3731
Michigan Laboratory ID: 9604
Wisconsin Laboratory ID: 998321720

Quality Assurance / Quality Control
ICP/AES Summary

QC Batch Number: 0705161-N
Parameter: Selenium (EPA 6010C)
ATS Project: NSK-AKS #H001-NSK
Report Date: 7/11/16

Results of QA Samples run concurrently with project samples

REPLICATE ANALYSIS

Sample	Replicate #1	Replicate #2	Mean	Relative Range (percent)
#A002-000				
Effluent 6/28/16	<0.01 mg/L	<0.01 mg/L	<0.01 mg/L	nc

SPIKES and/or QC CHECK SAMPLES

Sample/Analyte	Known Concentration	Spike Concentration	Analyzed Concentration	Recovery (percent)
#A002-000, #H001-NSK				
Initial Calibration Verification Standard	<0.01 mg/L	10 mg/L	9.7 mg/L	96.6
Interference Check Standard	<0.01 mg/L	0.80 mg/L	0.84 mg/L	105.6
#A002-000				
Effluent 6/28/16 Matrix Spike	<0.01 mg/L	10 mg/L	12 mg/L	118.4
#A002-000, #H001-NSK				
Calibration Verification Standard	<0.01 mg/L	10 mg/L	9.9 mg/L	99.3

BLANK ANALYSIS

Sample	Analyzed Concentration	QC Decision
#A002-000, #H001-NSK		
Continuing Calibration Blank	<0.01 mg/L	Acceptable
Continuing Calibration Blank	<0.01 mg/L	Acceptable

Comments:

Calculations performed prior to rounding.
nc - Indicates not calculable.

Control Limits:

Initial Calibration Verification Recoveries (90 - 110 %)
Calibration Verification Recoveries (90 - 110 %)
Interference Check Recoveries (80 - 120 %)
Spike Recoveries (75 - 125 %)
Relative Range < or = 20%

290 South Wagner Road
Ann Arbor, Michigan 48103
Tel. 734/995-0995 Fax. 734/995-3731
Michigan Laboratory ID: 9604
Wisconsin Laboratory ID: 998321720

Quality Assurance / Quality Control
Digestion Batch Summary

QC Batch Number: 0705161-N
Parameter: Zinc (EPA 3010A)
ATS Project: NSK-AKS #H001-NSK
Report Date: 7/11/16

Results of QA Samples run concurrently with project samples

REPLICATE ANALYSIS

Sample	Replicate #1	Replicate #2	Mean	Relative Range (percent)
#H001-NSK L1 Sludge #L1 May Composite	0.16 mg/L	0.15 mg/L	0.16 mg/L	10.5

SPIKES and/or QC CHECK SAMPLES

Sample/Analyte	Known Concentration	Spike Concentration	Analyzed Concentration	Recovery (percent)
#H001-NSK Laboratory Control Sample 7/5/16	<0.05 mg/L	0.16 mg/L	0.16 mg/L	101.4
#H001-NSK L1 Sludge #L1 May Composite Matrix Spike	0.16 mg/L	1.0 mg/L	0.95 mg/L	93.6

BLANK ANALYSIS

Sample	Analyzed Concentration	QC Decision
#H001-NSK Laboratory Reagent Blank 7/5/16	<0.05 mg/L	Acceptable

Comments:
Calculations performed prior to rounding.

Control Limits:
Spike Recoveries (75 - 125 %)
Laboratory Control Sample Recoveries (85 - 115 %)
Relative Range < or = 20%

290 South Wagner Road
Ann Arbor, Michigan 48103
Tel. 734/995-0995 Fax. 734/995-3731
Michigan Laboratory ID: 9604
Wisconsin Laboratory ID: 998321720

Quality Assurance / Quality Control
ICP/AES Summary

QC Batch Number: 0705161-N
Parameter: Zinc (EPA 6010C)
ATS Project: NSK-AKS #H001-NSK
Report Date: 7/11/16

Results of QA Samples run concurrently with project samples

REPLICATE ANALYSIS

Sample	Replicate #1	Replicate #2	Mean	Relative Range (percent)
#A002-000				
Effluent 6/28/16	0.09 mg/L	0.10 mg/L	0.09 mg/L	5.0

SPIKES and/or QC CHECK SAMPLES

Sample/Analyte	Known Concentration	Spike Concentration	Analyzed Concentration	Recovery (percent)
#A002-000, #H001-NSK				
Initial Cal bration Verification Standard	<0.05 mg/L	2.0 mg/L	1.9 mg/L	94.5
Interference Check Standard	<0.05 mg/L	0.80 mg/L	0.82 mg/L	102.4
#A002-000				
Effluent 6/28/16 Matrix Spike	0.05 mg/L	2.0 mg/L	2.0 mg/L	93.6
#A002-000, #H001-NSK				
Cal bration Verification Standard	<0.05 mg/L	2.0 mg/L	1.9 mg/L	93.5

BLANK ANALYSIS

Sample	Analyzed Concentration	QC Decision
#A002-000, #H001-NSK		
Continuing Calibration Blank	<0.05 mg/L	Acceptable
Continuing Calibration Blank	<0.05 mg/L	Acceptable

Comments:

Calculations performed prior to rounding.

Control Limits:

Initial Calibration Verification Recoveries (90 - 110 %)
Calibration Verification Recoveries (90 - 110 %)
Interference Check Recoveries (80 - 120 %)
Spike Recoveries (75 - 125 %)
Relative Range < or = 20%

ANN ARBOR TECHNICAL SERVICES, INC.
290 South Wagner Road
Ann Arbor, Michigan 48103
Tel. 734/995-0995 Fax.
734/995-3731
Michigan Laboratory ID: 9604
Wisconsin Laboratory ID:

CHAIN OF CUSTODY RECORD

PROJECT ID / NUMBER	LABORATORY INFORMATION
H001-AKS	Ann Arbor Technical Services, Inc.

SHIPPING INFORMATION: SHIPPER (Check one) / TRACKING NUMBER(S) (If applicable)

Date	5.12.16	Fed Ex		UPS	X	DHL		Courier		Tracking Number	
Date		Fed Ex		UPS		DHL		Courier		Tracking Number	
Date		Fed Ex		UPS		DHL		Courier		Tracking Number	
Date		Fed Ex		UPS		DHL		Courier		Tracking Number	

SAMPLE CUSTODIAN (Print & Signature)

RELINQUISHED BY (Print & Signature)	DATE / TIME	RECEIVED BY (Print & Signature)	DATE / TIME	RELINQUISHED BY (Print & Signature)	DATE / TIME	RECEIVED BY (Print & Signature)	DATE / TIME
	5/12/16 7:00 AM		5/13/16 11:30				
RELINQUISHED BY (Print & Signature)	DATE / TIME	RECEIVED BY (Print & Signature)	DATE / TIME	RELINQUISHED BY (Print & Signature)	DATE / TIME	RECEIVED BY (Print & Signature)	DATE / TIME

COMMENTS (Preservation, etc.)

LINE NO.	BAR CODE	DATE	TIME	COMP.	GRAB	SAMPLE IDENTIFICATION	NO. OF CONTAINERS	PRIORITY NUMBER	ANALYSIS: 8 oz.	MATRIX Indicate Soil/Water/Air Sediment/Sludge Extract
1.		5.3.16	12:30:00 PM		X	Grind Sludge #G-01	1		x	Grinding Swarf
2.		5.3.16	12:30:00 PM		X	L1 Sludge #L1-01	1		x	Grinding Swarf
3.		5.10.16	1:00:00 PM		X	Grind Sludge #G-02	1		x	Grinding Swarf
4.		5.10.16	1:00:00 PM		X	L1 Sludge #L1-02	1		x	Grinding Swarf
5.										
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20.										

AKS
PRECISION BALL COMPANY

1100 A NORTH FIRST STREET
CLARINDA, IOWA 51632
(712) 542-6515 FAX (712) 542-4067

PURCHASE SHIPPER
13715

TO: ATS
290 South Wagner Road
Ann Arbor, MI 48103

DK

DATE ISSUED	TO BE SHIPPED PRE-	VIA		DATE SHIPPED	VIA
5.12.16	PAID (X) COLLECT ( )	UPS (Red)		5-12-16	UPS NDA

QUANTITY	DESCRIPTION
4	Bottles of Sludge for testing

1Z 535 745 01 5697 4313

- ☐ REJECTION - ISSUE CREDIT (SEE RPMIR# _____)
- ☐ THIS MATERIAL SENT TO YOU FOR REPAIR AT AKS EXPENSE
- ☐ THIS MATERIAL SENT TO YOU FOR ADDITIONAL OPERATIONS AT AKS EXPENSE
- ☒ OTHER testing

DO NOT WRITE IN THIS AREA.
VENDOR MUST SIGN AND DATE
HERE ON #2 COPY.

PACKING SLIP

NSK-AKS
PRECISION BALL COMPANY
1100A North First Street
Clarinda, IA 51632

290 South Wagner Road
Ann Arbor, Michigan 48103
Tel. 734/995-0995 Fax.
734/995-3731
Michigan Laboratory ID: 9604
Wisconsin Laboratory ID:

CHAIN OF CUSTODY RECORD

PROJECT ID / NUMBER: H001-AKS H001-NSK

LABORATORY INFORMATION: Ann Arbor Technical Services, Inc.

SAMPLE CUSTODIAN (Print & Signature)

SHIPPING INFORMATION: SHIPPER (Check one) / TRACKING NUMBER(S) (If applicable)

Date	5.25.16	Fed Ex		UPS	X	DHL		Courier		Tracking Number	
Date		Fed Ex		UPS		DHL		Courier		Tracking Number	
Date		Fed Ex		UPS		DHL		Courier		Tracking Number	
Date		Fed Ex		UPS		DHL		Courier		Tracking Number	

RELINQUISHED BY (Print & Signature)	DATE / TIME	RECEIVED BY (Print & Signature)	DATE / TIME
TERRY KINMAN	5/25/16 8:49 AM		
	DATE / TIME	RELINQUISHED BY (Print & Signature)	DATE / TIME	RECEIVED BY (Print & Signature)	DATE / TIME
RELINQUISHED BY (Print & Signature)	DATE / TIME	RECEIVED BY (Print & Signature)	DATE / TIME
	5/25/16 8:49 AM	Mark Lelong	5/26/16 10:20 AM
	DATE / TIME	RELINQUISHED BY (Print & Signature)	DATE / TIME	RECEIVED BY (Print & Signature)	DATE / TIME

COMMENTS (Preservation, etc.)

LINE NO.	BAR CODE	DATE	TIME	COMP.	GRAB	SAMPLE IDENTIFICATION	NO. OF CONTAINERS	PRIORITY NUMBER	ANALYSIS: 8 OZ.	MATRIX Indicate Soil/Water/Air Sediment/Sludge Extract
1.		5.17.16	12:30pm		x	Grind sludge #G-03	1		x	Grinding Swarf
2.		5.17.16	12:30pm		x	L1 Sludge #L1-03	1		x	Grinding Swarf
3.		5.24.16	1:00:00 PM		x	Grind sludge #G-04	1		x	Grinding Swarf
4.		5.24.16	1:00:00 PM		x	L1 Sludge #L1-04	1		x	Grinding Swarf
5.										
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15.										
16.										
17.										
18.										
19.										
20.										

BUYER	MATERIAL COMING FROM	RETURN OR REPLACE REFERENCING PURCHASE ORDER:
	D. Strong	

[X] 1100 A NORTH FIRST STREET
CLARINDA, IOWA 51632
(712) 542-6515 FAX (712) 542-4067

AKS
PRECISION BALL COMPANY

PURCHASE SHIPPER
13721

TO: ATS
290 South Wagner Road
Ann Arbor, MI 48103

02

DATE ISSUED	TO BE SHIPPED PRE-	VIA	DATE SHIPPED	VIA
5-25-16	PAID (✓) COLLECT ( )	UPS (Red)	5-25-16	UPS NDA

QUANTITY	DESCRIPTION
4	Sample bottles of sludge samples for testing
	1Z 535 745 01 5618 5667

- [ ] REJECTION - ISSUE CREDIT (SEE RPMIR# _____)
- [ ] THIS MATERIAL SENT TO YOU FOR REPAIR AT AKS EXPENSE
- [ ] THIS MATERIAL SENT TO YOU FOR ADDITIONAL OPERATIONS AT AKS EXPENSE
- [x] OTHER

DO NOT WRITE IN THIS AREA.
VENDOR MUST SIGN AND DATE HERE ON #2 COPY.

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290 South Wagner Road
Ann Arbor, Michigan 48103
Tel. 734/995-0995 Fax.
734/995-3731
Michigan Laboratory ID: 9604
Wisconsin Laboratory ID:

CHAIN OF CUSTODY RECORD

PROJECT ID / NUMBER	LABORATORY INFORMATION	SHIPPING INFORMATION: SHIPPER (Check one) / TRACKING NUMBER(S) (If applicable)
	Ann Arbor Technical Services, Inc.	Date / Fed Ex / UPS / DHL / Courier / Tracking Number
SAMPLE CUSTODIAN (Print & Signature)	Terry Kinman/	Date / Fed Ex / UPS / DHL / Courier / Tracking Number
		Date / Fed Ex / UPS / DHL / Courier / Tracking Number
		Date / Fed Ex / UPS / DHL / Courier / Tracking Number

RELINQUISHED BY (Print & Signature)	DATE / TIME	RECEIVED BY (Print & Signature)	DATE / TIME	RELINQUISHED BY (Print & Signature)	DATE / TIME	RECEIVED BY (Print & Signature)	DATE / TIME
Terry Kinman/	6/8/16 14:30		6/10/16 12:30				
RELINQUISHED BY (Print & Signature)	DATE / TIME	RECEIVED BY (Print & Signature)	DATE / TIME	RELINQUISHED BY (Print & Signature)	DATE / TIME	RECEIVED BY (Print & Signature)	DATE / TIME

COMMENTS (Preservation, etc.)

LINE NO.	BAR CODE	DATE	TIME	COMP.	GRAB	SAMPLE IDENTIFICATION	NO. OF CONTAINERS	PRIORITY NUMBER	ANALYSIS	MATRIX Indicate Soil/Water/Air Sediment/Sludge Extract
1.		5/31/2016	12:30:00 PM			Grind Sample from 5/31/16	1			
2.		5/31/2016	12:30:00 PM			L1 Sample from 5/31/16	1			
3.		6/7/2016	12:15:00 PM			Grind Sample from 6/7/16	1			
4.		6/7/2016	12:15:00 PM			L1 Sample from 6/7/16	1			
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17.										
18.										
19.										
20.										

ORIGINALLY REC'D ON P.O.	BUYER	MATERIAL COMING FROM	RETURN OR REPLACE REFERENCING PURCHASE ORDER:
		T. Kinman	

☐ 1100 A NORTH FIRST STREET
CLARINDA, IOWA 51632
(712) 542-6515 FAX (712) 542-4067

AKS
PRECISION BALL COMPANY

PURCHASE SHIPPER
13726

TO: Ann Arbor Technical Services Inc.
290 South Wagner Road
Ann Arbor, MI 48103

OK

DATE ISSUED	TO BE SHIPPED	VIA	DATE SHIPPED	VIA
6.9.16	PRE-PAID (X) COLLECT ( )		6-9-16	UPS Ground

QUANTITY	DESCRIPTION
4	Samples of Sludge For Analysis
	1Z 535 745 03 5605 8194

☐ REJECTION - ISSUE CREDIT (SEE RPMIR# _____)

☐ THIS MATERIAL SENT TO YOU FOR REPAIR AT AKS EXPENSE

☐ THIS MATERIAL SENT TO YOU FOR ADDITIONAL OPERATIONS AT AKS EXPENSE

☒ OTHER For Analysis

DO NOT WRITE IN THIS AREA.
VENDOR MUST SIGN AND DATE
HERE ON #2 COPY.

PACKING SLIP

LABORATORY OPERATIONS
CASE NARRATIVE

ATS Project Number: H001-NSK
Report Date: 8/10/16

Case Narrative Summary

This case narrative applies to ten samples that were received at Ann Arbor Technical Services, Inc. (ATS) on 6/13/16, 6/24/16, and 7/28/16. Upon receipt, samples were scheduled for the following analyses.

- TCLP Regulatory Metals by US EPA methods 1311 and 6010C
- TCLP Mercury by US EPA methods 1311 and 7470A
- TCLP Copper, Iron, Nickel, and Zinc by US EPA method 6010C
- Chromium Speciation by US EPA methods 9056A and 6020B
- Oil Content by US EPA method 9071B

Sample Receipt, Chain of Custody Records, and Holding Times

Samples were delivered to ATS by commercial courier. Samples were received in boxes at ambient temperature with proper chain of custody records. All samples were extracted and analyzed within the holding times as cited in US EPA method 1311.

Data Review and Approval

All data contained in this report have been conducted in accordance with the guidelines provided in the referenced standard test methods, and are consistent with the detailed procedures described in a written standard operating procedure (SOP) specific to the ATS laboratory, as required by US EPA. All data are peer and management reviewed to ensure compliance with the above referenced SOP's and project specifications. In addition all data conform to the laboratory's Quality Assurance / Quality Control Manuals.

Data Deliverables and Sample Reporting

All data deliverables are generated to be in compliance with the US EPA. This data package constitutes a level II package. There were no hardcopy data summary sheets generated for this project.

Consultants in Chemistry & Environmental Science
290 South Wagner Road, Ann Arbor, Michigan 48103 Tel 734/995-0995 Fax 734/995-3731

Sample Preparation

Metals Analysis (except mercury): Samples were extracted in accordance with US EPA method 1311 (Toxicity Leaching Characteristic Procedure) followed by a digestion in accordance with US EPA method 3010A (Acid Digestion of Aqueous Samples and Extracts for Total Metals Analysis by FLAA or ICP Spectroscopy).

Mercury Analysis: Samples were extracted in accordance with US EPA method 1311 (Toxicity Leaching Characteristic Procedure) followed by a digestion in accordance with US EPA method 7470A (Mercury in Liquid Waste – Cold Vapor Atomic Absorption Spectrometry).

Chromium Speciation Analysis: Samples were extracted in accordance with US EPA method 1311 (Toxicity Leaching Characteristic Procedure) followed by dilution and digestion in an alkaline mobile phase formulated for speciation of Chromium II, Chromium III, and Chromium VI.

Oil Content: Samples were extracted in accordance with US EPA method 9071B (n-Hexane Extractable Material for Sludge, Sediment, and Solid Samples).

Extensive homogenization procedures were implemented due to the nature of the sample matrix.

Anomalies Noted: **None**

Sample Analysis

Metals Analysis (except mercury): Samples were analyzed in accordance with US EPA method 6010C (Inductively Coupled Plasma – Atomic Emission Spectrometry). An initial calibration with at least five levels was used to quantitate metals. Concentrations were reported to a number corresponding to 1/100 of the maximum leachate concentration where applicable or the method detection limit (MDL). Samples were reported on a mg/L wet weight basis as indicated in US EPA method 1311.

Mercury Analysis: Samples were analyzed in accordance with US EPA method 7470A (Mercury in Liquid Waste – Cold Vapor Atomic Absorption Spectrometry). An initial calibration with at least five levels was used to quantitate mercury. Concentrations were reported to a number corresponding to 1/100 of the maximum leachate concentration where applicable or the method detection limit (MDL). Samples were reported on a mg/L wet weight basis as indicated in US EPA method 1311.

Chromium Speciation Analysis: Samples were analyzed in accordance with US EPA method 9056A (Inorganic Anions by Ion Chromatography) / US EPA method 6020B (Inductively Coupled Plasma – Mass Spectrometry). An initial calibration with at least five levels was used to quantitate chromium species. Concentrations were reported to the lowest calibration standard. Samples were reported on a mg/L wet weight basis as indicated in US EPA method 1311.

Oil Content: Samples were analyzed in accordance with US EPA method 9071B (n-Hexane Extractable Material for Sludge, Sediment, and Solid Samples). Samples were reported on a mg/kg wet weight basis.

Anomalies Noted: **None**

Analytical QA/QC Summary

Calibration Verification

Applicable to ICP/AES, IC/ICP/MS, and CVAAS analyses only.

Method calibration was verified through the running of a mid-level initial calibration verification (CV) standard at a frequency of every ten samples. All verification standards met the acceptance criteria with the following exceptions:

Sample ID	Analytical method	Constituent	Percent Recovery	Acceptance Limits
Continuing Calibration Verification-2	EPA 1311/6020B	Cr VI	89.9	90-110%

Interference Checks

Applicable to ICP/AES analyses only.

The lack of spectral interferences was verified through the analysis of interference check standards every running day. All interference standards met the acceptance criteria with the following exceptions:

- **None**

Instrument Blanks

Applicable to ICP/AES, IC/ICP/MS, and CVAAS analyses only.

Instrument blanks were analyzed at a frequency of every ten samples. All blanks met the acceptance criteria with the following exceptions:

- **None**

Matrix Spikes

Applicable to ICP/AES analyses only.

A matrix spike (MS) was analyzed at a frequency of every ten samples. All MS's met the acceptance criteria with the following exceptions:

Sample ID	Analytical method	Constituent	Percent Recovery	Acceptance Limits
L1 Sludge 6/14/16 Matrix Spike Duplicate	EPA 1311/6010C	Lead	74.2	75-135%
L1 Sludge 6/14/16 Matrix Spike Duplicate	EPA 1311/6010C	Nickel	73.2	75-135%

- **One MS for iron was not reportable due to inadequate spiking levels.**

Matrix Duplicates

Applicable to ICP/AES analyses only.

A replicate analysis was performed at a frequency of every ten samples. All replicates met the acceptance criteria with the following exceptions:

- **None**

QA/QC Batch Summary

Laboratory Reagent Blanks

Applicable to all analyses.

A laboratory reagent blank (LRB) was analyzed with each QA/QC batch. All LRB's met the acceptance criteria with the following exceptions:

Sample ID	Analytical method	Constituent	Analyzed Concentration	Reporting Limit
Laboratory Reagent Blank	EPA 1311/6010C	Copper	0.017 mg/L	0.005 mg/L

Laboratory Fortified Blanks and Matrix Spikes

Applicable to ICP/AES, IC/ICPMS, and CVAAS analyses only.

A laboratory fortified blank (LFB) / laboratory control sample (LCS) was analyzed with each QA/QC batch. For chromium speciation the LCS/LFB's consisted of equal concentrations of trivalent and hexavalent species. All LCS/LFB's met the acceptance criteria with the following exceptions:

Sample ID	Analytical method	Constituent	Percent Recovery	Acceptance Limits
Laboratory Control Sample 8/4/16	EPA 1311/6010C	Barium	117.6	85-115%
Laboratory Control Sample 8/4/16	EPA 1311/6010C	Selenium	115.4	85-115%

A matrix spike (MS) was analyzed with each QA/QC batch. For chromium speciation the MS's consisted of equal concentrations of trivalent and hexavalent species. All MS's met the acceptance criteria with the following exceptions:

Sample ID	Analytical method	Constituent	Percent Recovery	Acceptance Limits
L1 Sludge 6/14/16 Matrix Spike	EPA 1311/6020B	Cr VI	69.0	75-125%
L1 Sludge 6/14/16 Matrix Spike Duplicate	EPA 1311/6020B	Cr VI	66.7	75-125%
Grind Sludge 6/14/16 Matrix Spike	EPA 1311/6010C	Copper	126.4	75-125%

- **One MS for iron was not reportable due to inadequate spiking levels.**

Matrix Duplicates

Applicable to all analyses.

A replicate analysis was analyzed with each QA/QC batch. All replicates met the acceptance criteria with the following exceptions:

- **None**

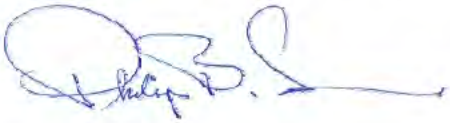
Sample Dilutions

Samples containing compounds at concentrations above the initial calibration curve were diluted and reanalyzed for those compounds. The following samples were diluted:

- **None**

/ August 10, 2016

Mark T. DeLong (Quality Assurance Coordinator)



/ August 10, 2016

Philip B. Simon (Laboratory Director)

290 South Wagner Road
Ann Arbor, Michigan 48103
Tel. 734/995-0995 Fax. 734/995-3731Michigan Laboratory ID: 9604
Wisconsin Laboratory ID: 998321720

Toxicity Characteristic Leaching Procedure
Inorganic Analysis
Data Summary Sheet

For: Mr. Aaron Davidshofen
NSK-AKS Precision Ball Company
1100A North First Street
Clarinda, Iowa 51632

ATS Project: NSK-AKS #H001-NSK
Report Date: 8/10/16
ATS SRF: 0613161

Sample Identification: Grind Sludge

Sample Date: 6/7/16
Sample Time: 12:15
Sampled By: Client
Laboratory Receipt Date: 6/13/16
Sample Matrix: Grind Waste

Preparation Method: EPA 1311
Analytical Method(s): EPA 3010A / 6010C
EPA 7470A
EPA 9071B
EPA 9056A / 6020B

Parameter (CAS)	Units	Result	Maximum Leachate Concentration*	TCLP Hazardous	Analysis Date	Analysis Time	QC Batch Number
Arsenic (7440-38-2)	mg/L	<0.05	5.0	No	8/5/16	6:16 PM	0804162-N
Barium (7440-39-3)	mg/L	0.26	100	No	8/5/16	6:16 PM	0804162-N
Cadmium (7440-43-9)	mg/L	<0.005	1.0	No	8/5/16	6:16 PM	0804162-N
Chromium (7440-47-3)	mg/L	1.1	5.0	No	8/5/16	6:16 PM	0804162-N
Chromium VI (18540-29-9)	mg/L	<0.02	na	No	8/8/16	1:48 PM	0804161-N
Chromium II & III	mg/L	0.83	na	No	8/8/16	1:48 PM	0804161-N
Copper (7440-50-8)	mg/L	<0.005	na	na	8/5/16	6:16 PM	0804162-N
Iron (7439-89-6)	mg/L	160	na	na	8/5/16	6:16 PM	0804162-N
Lead (7439-92-1)	mg/L	<0.05	5.0	No	8/5/16	6:16 PM	0804162-N
Mercury (7439-97-6)	mg/L	<0.0005	0.2	No	8/9/16	5:33 PM	0808161-N
Nickel (7440-02-0)	mg/L	0.095	na	na	8/5/16	6:16 PM	0804162-N
Selenium (7782-49-2)	mg/L	<0.01	1.0	No	8/5/16	6:16 PM	0804162-N
Silver (7440-22-4)	mg/L	<0.05	5.0	No	8/5/16	6:16 PM	0804162-N
Zinc (7440-66-6)	mg/L	0.14	na	na	8/5/16	6:16 PM	0804162-N
Oil Content	mg/kg	120,000	na	na	8/8/16	na	0808162-N

Comments

All methods reference USEPA methods unless otherwise noted.
* Reference: 40 CFR, 1998 Part 261.24
Oil content is expressed on a wet weight basis.
na - Indicates not applicable

290 South Wagner Road
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Tel. 734/995-0995 Fax. 734/995-3731Michigan Laboratory ID: 9604
Wisconsin Laboratory ID: 998321720

Toxicity Characteristic Leaching Procedure
Inorganic Analysis
Data Summary Sheet

For: Mr. Aaron Davidshofen
NSK-AKS Precision Ball Company
1100A North First Street
Clarinda, Iowa 51632

ATS Project: NSK-AKS #H001-NSK
Report Date: 8/10/16
ATS SRF: 0624161

Sample Identification: Grind Sludge

Sample Date: 6/14/16
Sample Time: 12:00
Sampled By: Client
Laboratory Receipt Date: 6/24/16
Sample Matrix: Grind Waste

Preparation Method: EPA 1311
Analytical Method(s): EPA 3010A / 6010C
EPA 7470A
EPA 9071B
EPA 9056A / 6020B

Parameter (CAS)	Units	Result	Maximum Leachate Concentration*	TCLP Hazardous	Analysis Date	Analysis Time	QC Batch Number
Arsenic (7440-38-2)	mg/L	<0.05	5.0	No	8/5/16	6:20 PM	0804162-N
Barium (7440-39-3)	mg/L	0.25	100	No	8/5/16	6:20 PM	0804162-N
Cadmium (7440-43-9)	mg/L	<0.005	1.0	No	8/5/16	6:20 PM	0804162-N
Chromium (7440-47-3)	mg/L	0.92	5.0	No	8/5/16	6:20 PM	0804162-N
Chromium VI (18540-29-9)	mg/L	<0.02	na	No	8/8/16	1:55 PM	0804161-N
Chromium II & III	mg/L	0.70	na	No	8/8/16	1:55 PM	0804161-N
Copper (7440-50-8)	mg/L	<0.005	na	na	8/5/16	6:20 PM	0804162-N
Iron (7439-89-6)	mg/L	150	na	na	8/5/16	6:20 PM	0804162-N
Lead (7439-92-1)	mg/L	<0.05	5.0	No	8/5/16	6:20 PM	0804162-N
Mercury (7439-97-6)	mg/L	<0.0005	0.2	No	8/9/16	5:40 PM	0808161-N
Nickel (7440-02-0)	mg/L	0.086	na	na	8/5/16	6:20 PM	0804162-N
Selenium (7782-49-2)	mg/L	<0.01	1.0	No	8/5/16	6:20 PM	0804162-N
Silver (7440-22-4)	mg/L	<0.05	5.0	No	8/5/16	6:20 PM	0804162-N
Zinc (7440-66-6)	mg/L	0.16	na	na	8/5/16	6:20 PM	0804162-N
Oil Content	mg/kg	120,000	na	na	8/8/16	na	0808162-N

Comments

All methods reference USEPA methods unless otherwise noted.
* Reference: 40 CFR, 1998 Part 261.24
Oil content is expressed on a wet weight basis.
na - Indicates not applicable

290 South Wagner Road
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Tel. 734/995-0995 Fax. 734/995-3731Michigan Laboratory ID: 9604
Wisconsin Laboratory ID: 998321720

Toxicity Characteristic Leaching Procedure
Inorganic Analysis
Data Summary Sheet

For: Mr. Aaron Davidshofen
NSK-AKS Precision Ball Company
1100A North First Street
Clarinda, Iowa 51632

ATS Project: NSK-AKS #H001-NSK
Report Date: 8/10/16
ATS SRF: 0624161

Sample Identification: Grind Sludge

Sample Date: 6/21/16
Sample Time: 12:00
Sampled By: Client
Laboratory Receipt Date: 6/24/16
Sample Matrix: Grind Waste

Preparation Method: EPA 1311
Analytical Method(s): EPA 3010A / 6010C
EPA 7470A
EPA 9071B
EPA 9056A / 6020B

Parameter (CAS)	Units	Result	Maximum Leachate Concentration*	TCLP Hazardous	Analysis Date	Analysis Time	QC Batch Number
Arsenic (7440-38-2)	mg/L	<0.05	5.0	No	8/5/16	6:37 PM	0804162-N
Barium (7440-39-3)	mg/L	0.23	100	No	8/5/16	6:37 PM	0804162-N
Cadmium (7440-43-9)	mg/L	<0.005	1.0	No	8/5/16	6:37 PM	0804162-N
Chromium (7440-47-3)	mg/L	0.63	5.0	No	8/5/16	6:37 PM	0804162-N
Chromium VI (18540-29-9)	mg/L	<0.02	na	No	8/8/16	2:09 PM	0804161-N
Chromium II & III	mg/L	0.48	na	No	8/8/16	2:09 PM	0804161-N
Copper (7440-50-8)	mg/L	<0.005	na	na	8/5/16	6:37 PM	0804162-N
Iron (7439-89-6)	mg/L	120	na	na	8/5/16	6:37 PM	0804162-N
Lead (7439-92-1)	mg/L	<0.05	5.0	No	8/5/16	6:37 PM	0804162-N
Mercury (7439-97-6)	mg/L	<0.0005	0.2	No	8/9/16	5:59 PM	0808161-N
Nickel (7440-02-0)	mg/L	0.070	na	na	8/5/16	6:37 PM	0804162-N
Selenium (7782-49-2)	mg/L	<0.01	1.0	No	8/5/16	6:37 PM	0804162-N
Silver (7440-22-4)	mg/L	<0.05	5.0	No	8/5/16	6:37 PM	0804162-N
Zinc (7440-66-6)	mg/L	0.16	na	na	8/5/16	6:37 PM	0804162-N
Oil Content	mg/kg	160,000	na	na	8/8/16	na	0808162-N

Comments

All methods reference USEPA methods unless otherwise noted.
* Reference: 40 CFR, 1998 Part 261.24
Oil content is expressed on a wet weight basis.
na - Indicates not applicable

290 South Wagner Road
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Wisconsin Laboratory ID: 998321720

Toxicity Characteristic Leaching Procedure
Inorganic Analysis
Data Summary Sheet

For: Mr. Aaron Davidshofen
NSK-AKS Precision Ball Company
1100A North First Street
Clarinda, Iowa 51632

ATS Project: NSK-AKS #H001-NSK
Report Date: 8/10/16
ATS SRF: 0728161

Sample Identification: Grind Sludge

Sample Date: 7/19/16
Sample Time: 12:00
Sampled By: Client
Laboratory Receipt Date: 7/28/16
Sample Matrix: Grind Waste

Preparation Method: EPA 1311
Analytical Method(s): EPA 3010A / 6010C
EPA 7470A
EPA 9071B
EPA 9056A / 6020B

Parameter (CAS)	Units	Result	Maximum Leachate Concentration*	TCLP Hazardous	Analysis Date	Analysis Time	QC Batch Number
Arsenic (7440-38-2)	mg/L	<0.05	5.0	No	8/5/16	6:40 PM	0804162-N
Barium (7440-39-3)	mg/L	0.22	100	No	8/5/16	6:40 PM	0804162-N
Cadmium (7440-43-9)	mg/L	<0.005	1.0	No	8/5/16	6:40 PM	0804162-N
Chromium (7440-47-3)	mg/L	0.60	5.0	No	8/5/16	6:40 PM	0804162-N
Chromium VI (18540-29-9)	mg/L	<0.02	na	No	8/8/16	2:16 PM	0804161-N
Chromium II & III	mg/L	0.48	na	No	8/8/16	2:16 PM	0804161-N
Copper (7440-50-8)	mg/L	<0.005	na	na	8/5/16	6:40 PM	0804162-N
Iron (7439-89-6)	mg/L	110	na	na	8/5/16	6:40 PM	0804162-N
Lead (7439-92-1)	mg/L	<0.05	5.0	No	8/5/16	6:40 PM	0804162-N
Mercury (7439-97-6)	mg/L	<0.0005	0.2	No	8/9/16	6:05 PM	0808161-N
Nickel (7440-02-0)	mg/L	0.062	na	na	8/5/16	6:40 PM	0804162-N
Selenium (7782-49-2)	mg/L	<0.01	1.0	No	8/5/16	6:40 PM	0804162-N
Silver (7440-22-4)	mg/L	<0.05	5.0	No	8/5/16	6:40 PM	0804162-N
Zinc (7440-66-6)	mg/L	0.17	na	na	8/5/16	6:40 PM	0804162-N
Oil Content	mg/kg	160,000	na	na	8/8/16	na	0808162-N

Comments

All methods reference USEPA methods unless otherwise noted.
* Reference: 40 CFR, 1998 Part 261.24
Oil content is expressed on a wet weight basis.
na - Indicates not applicable

290 South Wagner Road
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Wisconsin Laboratory ID: 998321720

Toxicity Characteristic Leaching Procedure
Inorganic Analysis
Data Summary Sheet

For: Mr. Aaron Davidshofen
NSK-AKS Precision Ball Company
1100A North First Street
Clarinda, Iowa 51632

ATS Project: NSK-AKS #H001-NSK
Report Date: 8/10/16
ATS SRF: 0728161

Sample Identification: Grind Sludge

Sample Date: 7/26/16
Sample Time: 12:00
Sampled By: Client
Laboratory Receipt Date: 7/28/16
Sample Matrix: Grind Waste

Preparation Method: EPA 1311
Analytical Method(s): EPA 3010A / 6010C
EPA 7470A
EPA 9071B
EPA 9056A / 6020B

Parameter (CAS)	Units	Result	Maximum Leachate Concentration*	TCLP Hazardous	Analysis Date	Analysis Time	QC Batch Number
Arsenic (7440-38-2)	mg/L	<0.05	5.0	No	8/5/16	6:44 PM	0804162-N
Barium (7440-39-3)	mg/L	0.22	100	No	8/5/16	6:44 PM	0804162-N
Cadmium (7440-43-9)	mg/L	<0.005	1.0	No	8/5/16	6:44 PM	0804162-N
Chromium (7440-47-3)	mg/L	0.52	5.0	No	8/5/16	6:44 PM	0804162-N
Chromium VI (18540-29-9)	mg/L	<0.02	na	No	8/8/16	2:23 PM	0804161-N
Chromium II & III	mg/L	0.46	na	No	8/8/16	2:23 PM	0804161-N
Copper (7440-50-8)	mg/L	<0.005	na	na	8/5/16	6:44 PM	0804162-N
Iron (7439-89-6)	mg/L	110	na	na	8/5/16	6:44 PM	0804162-N
Lead (7439-92-1)	mg/L	<0.05	5.0	No	8/5/16	6:44 PM	0804162-N
Mercury (7439-97-6)	mg/L	<0.0005	0.2	No	8/9/16	6:12 PM	0808161-N
Nickel (7440-02-0)	mg/L	0.063	na	na	8/5/16	6:44 PM	0804162-N
Selenium (7782-49-2)	mg/L	<0.01	1.0	No	8/5/16	6:44 PM	0804162-N
Silver (7440-22-4)	mg/L	<0.05	5.0	No	8/5/16	6:44 PM	0804162-N
Zinc (7440-66-6)	mg/L	0.18	na	na	8/5/16	6:44 PM	0804162-N
Oil Content	mg/kg	170,000	na	na	8/8/16	na	0808162-N

Comments

All methods reference USEPA methods unless otherwise noted.
* Reference: 40 CFR, 1998 Part 261.24
Oil content is expressed on a wet weight basis.
na - Indicates not applicable

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Tel. 734/995-0995 Fax. 734/995-3731Michigan Laboratory ID: 9604
Wisconsin Laboratory ID: 998321720

Toxicity Characteristic Leaching Procedure
Inorganic Analysis
Data Summary Sheet

For: Mr. Aaron Davidshofen
NSK-AKS Precision Ball Company
1100A North First Street
Clarinda, Iowa 51632

ATS Project: NSK-AKS #H001-NSK
Report Date: 8/10/16
ATS SRF: 0613161

Sample Identification: L1 Sludge

Sample Date:	6/7/16	Preparation Method:	EPA 1311
Sample Time:	12:15	Analytical Method(s):	EPA 3010A / 6010C
Sampled By:	Client		EPA 7470A
Laboratory Receipt Date:	6/13/16		EPA 9071B
Sample Matrix:	Grind Waste		EPA 9056A / 6020B

Parameter (CAS)	Units	Result	Maximum Leachate Concentration*	TCLP Hazardous	Analysis Date	Analysis Time	QC Batch Number
Arsenic (7440-38-2)	mg/L	<0.05	5.0	No	8/5/16	6:56 PM	0804162-N
Barium (7440-39-3)	mg/L	0.26	100	No	8/5/16	6:56 PM	0804162-N
Cadmium (7440-43-9)	mg/L	<0.005	1.0	No	8/5/16	6:56 PM	0804162-N
Chromium (7440-47-3)	mg/L	0.46	5.0	No	8/5/16	6:56 PM	0804162-N
Chromium VI (18540-29-9)	mg/L	<0.02	na	No	8/8/16	2:44 PM	0804161-N
Chromium II & III	mg/L	0.40	na	No	8/8/16	2:44 PM	0804161-N
Copper (7440-50-8)	mg/L	0.018	na	na	8/5/16	6:56 PM	0804162-N
Iron (7439-89-6)	mg/L	38	na	na	8/5/16	6:56 PM	0804162-N
Lead (7439-92-1)	mg/L	<0.05	5.0	No	8/5/16	6:56 PM	0804162-N
Mercury (7439-97-6)	mg/L	<0.0005	0.2	No	8/9/16	6:31 PM	0808161-N
Nickel (7440-02-0)	mg/L	0.026	na	na	8/5/16	6:56 PM	0804162-N
Selenium (7782-49-2)	mg/L	<0.01	1.0	No	8/5/16	6:56 PM	0804162-N
Silver (7440-22-4)	mg/L	<0.05	5.0	No	8/5/16	6:56 PM	0804162-N
Zinc (7440-66-6)	mg/L	0.15	na	na	8/5/16	6:56 PM	0804162-N
Oil Content	mg/kg	180,000	na	na	8/8/16	na	0808162-N

Comments

All methods reference USEPA methods unless otherwise noted.
* Reference: 40 CFR, 1998 Part 261.24
Oil content is expressed on a wet weight basis.
na - Indicates not applicable

290 South Wagner Road
Ann Arbor, Michigan 48103
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Wisconsin Laboratory ID: 998321720

Toxicity Characteristic Leaching Procedure
Inorganic Analysis
Data Summary Sheet

For: Mr. Aaron Davidshofen
NSK-AKS Precision Ball Company
1100A North First Street
Clarinda, Iowa 51632

ATS Project: NSK-AKS #H001-NSK
Report Date: 8/10/16
ATS SRF: 0624161

Sample Identification: L1 Sludge

Sample Date:	6/14/16	Preparation Method:	EPA 1311
Sample Time:	12:00	Analytical Method(s):	EPA 3010A / 6010C
Sampled By:	Client		EPA 7470A
Laboratory Receipt Date:	6/24/16		EPA 9071B
Sample Matrix:	Grind Waste		EPA 9056A / 6020B

Parameter (CAS)	Units	Result	Maximum Leachate Concentration*	TCLP Hazardous	Analysis Date	Analysis Time	QC Batch Number
Arsenic (7440-38-2)	mg/L	<0.05	5.0	No	8/5/16	7:00 PM	0804162-N
Barium (7440-39-3)	mg/L	0.24	100	No	8/5/16	7:00 PM	0804162-N
Cadmium (7440-43-9)	mg/L	<0.005	1.0	No	8/5/16	7:00 PM	0804162-N
Chromium (7440-47-3)	mg/L	0.32	5.0	No	8/5/16	7:00 PM	0804162-N
Chromium VI (18540-29-9)	mg/L	<0.02	na	No	8/8/16	2:51 PM	0804161-N
Chromium II & III	mg/L	0.33	na	No	8/8/16	2:51 PM	0804161-N
Copper (7440-50-8)	mg/L	0.010	na	na	8/5/16	7:00 PM	0804162-N
Iron (7439-89-6)	mg/L	28	na	na	8/5/16	7:00 PM	0804162-N
Lead (7439-92-1)	mg/L	<0.05	5.0	No	8/5/16	7:00 PM	0804162-N
Mercury (7439-97-6)	mg/L	<0.0005	0.2	No	8/9/16	6:37 PM	0808161-N
Nickel (7440-02-0)	mg/L	0.013	na	na	8/5/16	7:00 PM	0804162-N
Selenium (7782-49-2)	mg/L	<0.01	1.0	No	8/5/16	7:00 PM	0804162-N
Silver (7440-22-4)	mg/L	<0.05	5.0	No	8/5/16	7:00 PM	0804162-N
Zinc (7440-66-6)	mg/L	0.14	na	na	8/5/16	7:00 PM	0804162-N
Oil Content	mg/kg	140,000	na	na	8/8/16	na	0808162-N

Comments

All methods reference USEPA methods unless otherwise noted.
* Reference: 40 CFR, 1998 Part 261.24
Oil content is expressed on a wet weight basis.
na - Indicates not applicable

290 South Wagner Road
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Wisconsin Laboratory ID: 998321720

Toxicity Characteristic Leaching Procedure
Inorganic Analysis
Data Summary Sheet

For: Mr. Aaron Davidshofen
NSK-AKS Precision Ball Company
1100A North First Street
Clarinda, Iowa 51632

ATS Project: NSK-AKS #H001-NSK
Report Date: 8/10/16
ATS SRF: 0624161

Sample Identification: L1 Sludge

Sample Date:	6/21/16	Preparation Method:	EPA 1311
Sample Time:	12:00	Analytical Method(s):	EPA 3010A / 6010C
Sampled By:	Client		EPA 7470A
Laboratory Receipt Date:	6/24/16		EPA 9071B
Sample Matrix:	Grind Waste		EPA 9056A / 6020B

Parameter (CAS)	Units	Result	Maximum Leachate Concentration*	TCLP Hazardous	Analysis Date	Analysis Time	QC Batch Number
Arsenic (7440-38-2)	mg/L	<0.05	5.0	No	8/5/16	7:11 PM	0804162-N
Barium (7440-39-3)	mg/L	0.26	100	No	8/5/16	7:11 PM	0804162-N
Cadmium (7440-43-9)	mg/L	<0.005	1.0	No	8/5/16	7:11 PM	0804162-N
Chromium (7440-47-3)	mg/L	0.67	5.0	No	8/5/16	7:11 PM	0804162-N
Chromium VI (18540-29-9)	mg/L	<0.02	na	No	8/8/16	3:12 PM	0804161-N
Chromium II & III	mg/L	0.63	na	No	8/8/16	3:12 PM	0804161-N
Copper (7440-50-8)	mg/L	0.014	na	na	8/5/16	7:11 PM	0804162-N
Iron (7439-89-6)	mg/L	60	na	na	8/5/16	7:11 PM	0804162-N
Lead (7439-92-1)	mg/L	<0.05	5.0	No	8/5/16	7:11 PM	0804162-N
Mercury (7439-97-6)	mg/L	<0.0005	0.2	No	8/9/16	6:56 PM	0808161-N
Nickel (7440-02-0)	mg/L	0.034	na	na	8/5/16	7:11 PM	0804162-N
Selenium (7782-49-2)	mg/L	<0.01	1.0	No	8/5/16	7:11 PM	0804162-N
Silver (7440-22-4)	mg/L	<0.05	5.0	No	8/5/16	7:11 PM	0804162-N
Zinc (7440-66-6)	mg/L	0.16	na	na	8/5/16	7:11 PM	0804162-N
Oil Content	mg/kg	190,000	na	na	8/8/16	na	0808162-N

Comments

All methods reference USEPA methods unless otherwise noted.
* Reference: 40 CFR, 1998 Part 261.24
Oil content is expressed on a wet weight basis.
na - Indicates not applicable

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Toxicity Characteristic Leaching Procedure
Inorganic Analysis
Data Summary Sheet

For: Mr. Aaron Davidshofen
NSK-AKS Precision Ball Company
1100A North First Street
Clarinda, Iowa 51632

ATS Project: NSK-AKS #H001-NSK
Report Date: 8/10/16
ATS SRF: 0728161

Sample Identification: L1 Sludge

Sample Date:	7/19/16	Preparation Method:	EPA 1311
Sample Time:	12:00	Analytical Method(s):	EPA 3010A / 6010C
Sampled By:	Client		EPA 7470A
Laboratory Receipt Date:	7/28/16		EPA 9071B
Sample Matrix:	Grind Waste		EPA 9056A / 6020B

Parameter (CAS)	Units	Result	Maximum Leachate Concentration*	TCLP Hazardous	Analysis Date	Analysis Time	QC Batch Number
Arsenic (7440-38-2)	mg/L	<0.05	5.0	No	8/5/16	7:15 PM	0804162-N
Barium (7440-39-3)	mg/L	0.20	100	No	8/5/16	7:15 PM	0804162-N
Cadmium (7440-43-9)	mg/L	<0.005	1.0	No	8/5/16	7:15 PM	0804162-N
Chromium (7440-47-3)	mg/L	0.21	5.0	No	8/5/16	7:15 PM	0804162-N
Chromium VI (18540-29-9)	mg/L	<0.02	na	No	8/8/16	3:19 PM	0804161-N
Chromium II & III	mg/L	0.21	na	No	8/8/16	3:19 PM	0804161-N
Copper (7440-50-8)	mg/L	<0.005	na	na	8/5/16	7:15 PM	0804162-N
Iron (7439-89-6)	mg/L	21	na	na	8/5/16	7:15 PM	0804162-N
Lead (7439-92-1)	mg/L	<0.05	5.0	No	8/5/16	7:15 PM	0804162-N
Mercury (7439-97-6)	mg/L	<0.0005	0.2	No	8/9/16	7:02 PM	0808161-N
Nickel (7440-02-0)	mg/L	0.009	na	na	8/5/16	7:15 PM	0804162-N
Selenium (7782-49-2)	mg/L	<0.01	1.0	No	8/5/16	7:15 PM	0804162-N
Silver (7440-22-4)	mg/L	<0.05	5.0	No	8/5/16	7:15 PM	0804162-N
Zinc (7440-66-6)	mg/L	0.15	na	na	8/5/16	7:15 PM	0804162-N
Oil Content	mg/kg	130,000	na	na	8/8/16	na	0808162-N

Comments

All methods reference USEPA methods unless otherwise noted.
* Reference: 40 CFR, 1998 Part 261.24
Oil content is expressed on a wet weight basis.
na - Indicates not applicable

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Toxicity Characteristic Leaching Procedure
Inorganic Analysis
Data Summary Sheet

For: Mr. Aaron Davidshofen
NSK-AKS Precision Ball Company
1100A North First Street
Clarinda, Iowa 51632

ATS Project: NSK-AKS #H001-NSK
Report Date: 8/10/16
ATS SRF: 0728161

Sample Identification: L1 Sludge

Sample Date:	7/26/16	Preparation Method:	EPA 1311
Sample Time:	12:00	Analytical Method(s):	EPA 3010A / 6010C
Sampled By:	Client		EPA 7470A
Laboratory Receipt Date:	7/28/16		EPA 9071B
Sample Matrix:	Grind Waste		EPA 9056A / 6020B

Parameter (CAS)	Units	Result	Maximum Leachate Concentration*	TCLP Hazardous	Analysis Date	Analysis Time	QC Batch Number
Arsenic (7440-38-2)	mg/L	<0.05	5.0	No	8/5/16	7:19 PM	0804162-N
Barium (7440-39-3)	mg/L	0.24	100	No	8/5/16	7:19 PM	0804162-N
Cadmium (7440-43-9)	mg/L	<0.005	1.0	No	8/5/16	7:19 PM	0804162-N
Chromium (7440-47-3)	mg/L	1.2	5.0	No	8/5/16	7:19 PM	0804162-N
Chromium VI (18540-29-9)	mg/L	<0.02	na	No	8/8/16	3:26 PM	0804161-N
Chromium II & III	mg/L	0.99	na	No	8/8/16	3:26 PM	0804161-N
Copper (7440-50-8)	mg/L	<0.005	na	na	8/5/16	7:19 PM	0804162-N
Iron (7439-89-6)	mg/L	130	na	na	8/5/16	7:19 PM	0804162-N
Lead (7439-92-1)	mg/L	<0.05	5.0	No	8/5/16	7:19 PM	0804162-N
Mercury (7439-97-6)	mg/L	<0.0005	0.2	No	8/9/16	7:09 PM	0808161-N
Nickel (7440-02-0)	mg/L	0.064	na	na	8/5/16	7:19 PM	0804162-N
Selenium (7782-49-2)	mg/L	<0.01	1.0	No	8/5/16	7:19 PM	0804162-N
Silver (7440-22-4)	mg/L	<0.05	5.0	No	8/5/16	7:19 PM	0804162-N
Zinc (7440-66-6)	mg/L	0.18	na	na	8/5/16	7:19 PM	0804162-N
Oil Content	mg/kg	160,000	na	na	8/8/16	na	0808162-N

Comments

All methods reference USEPA methods unless otherwise noted.
* Reference: 40 CFR, 1998 Part 261.24
Oil content is expressed on a wet weight basis.
na - Indicates not applicable

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Quality Assurance / Quality Control
Digestion Batch Summary

QC Batch Number: 0804162-N
Parameter: Arsenic (EPA 3010A)
ATS Project: NSK-AKS #H001-NSK
Report Date: 8/10/16

Results of QA Samples run concurrently with project samples

REPLICATE ANALYSIS

Sample	Replicate #1	Replicate #2	Mean	Relative Range (percent)
#H001-NSK				
Grind Sludge 6/14/16 Matrix Spike	0.98 mg/L	0.82 mg/L	0.90 mg/L	18.1

SPIKES and/or QC CHECK SAMPLES

Sample/Analyte	Known Concentration	Spike Concentration	Analyzed Concentration	Recovery (percent)
#H001-NSK				
Laboratory Control Sample 8/4/16	<0.05 mg/L	0.80 mg/L	0.86 mg/L	108.0
#H001-NSK				
Grind Sludge 6/14/16 Matrix Spike	<0.05 mg/L	0.80 mg/L	0.98 mg/L	122.3
Grind Sludge 6/14/16 Matrix Spike Duplicate	<0.05 mg/L	0.80 mg/L	0.82 mg/L	102.0

BLANK ANALYSIS

Sample	Analyzed Concentration	QC Decision
#H001-NSK		
Laboratory Reagent Blank 8/4/16	<0.05 mg/L	Acceptable

Comments:
Calculations performed prior to rounding.

Control Limits:
Spike Recoveries (75 - 125 %)
Laboratory Control Sample Recoveries (85 - 115 %)
Relative Range < or = 20%

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Quality Assurance / Quality Control
ICP/AES Summary

QC Batch Number: 0804162-N
Parameter: Arsenic (EPA 6010C)
ATS Project: NSK-AKS #H001-NSK
Report Date: 8/10/16

Results of QA Samples run concurrently with project samples

REPLICATE ANALYSIS

Sample	Replicate #1	Replicate #2	Mean	Relative Range (percent)
#H001-NSK				
L1 Sludge 6/14/16 Matrix Spike	0.79 mg/L	0.76 mg/L	0.77 mg/L	3.5

SPIKES and/or QC CHECK SAMPLES

Sample/Analyte	Known Concentration	Spike Concentration	Analyzed Concentration	Recovery (percent)
#A002-000, #H001-NSK				
Initial Cal bration Verification Standard	<0.05 mg/L	2.0 mg/L	2.0 mg/L	98.4
Interference Check Standard	<0.05 mg/L	0.80 mg/L	0.81 mg/L	101.1
Cal bration Verification Standard	<0.05 mg/L	2.0 mg/L	1.9 mg/L	95.6
Cal bration Verification Standard	<0.05 mg/L	2.0 mg/L	1.8 mg/L	91.1
#H001-NSK				
L1 Sludge 6/14/16 Matrix Spike	<0.05 mg/L	0.80 mg/L	0.79 mg/L	98.5
L1 Sludge 6/14/16 Matrix Spike Duplicate	<0.05 mg/L	0.80 mg/L	0.76 mg/L	95.1
#A002-000, #H001-NSK				
Cal bration Verification Standard	<0.05 mg/L	2.0 mg/L	1.8 mg/L	90.9

BLANK ANALYSIS

Sample	Analyzed Concentration	QC Decision
#A002-000, #H001-NSK		
Continuing Calibration Blank	<0.05 mg/L	Acceptable
Continuing Calibration Blank	<0.05 mg/L	Acceptable
Continuing Calibration Blank	<0.05 mg/L	Acceptable
Continuing Calibration Blank	<0.05 mg/L	Acceptable

Comments:
Calculations performed prior to rounding.

Control Limits:
Initial Calibration Verification Recoveries (90 - 110 %)
Calibration Verification Recoveries (90 - 110 %)
Interference Check Recoveries (80 - 120 %)
Spike Recoveries (75 - 125 %)
Relative Range < or = 20%

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Quality Assurance / Quality Control
Digestion Batch Summary

QC Batch Number: 0804162-N
Parameter: Barium (EPA 3010A)
ATS Project: NSK-AKS #H001-NSK
Report Date: 8/10/16

Results of QA Samples run concurrently with project samples

REPLICATE ANALYSIS

Sample	Replicate #1	Replicate #2	Mean	Relative Range (percent)
#H001-NSK				
Grind Sludge 6/14/16 Matrix Spike	1.1 mg/L	0.92 mg/L	1.0 mg/L	19.3

SPIKES and/or QC CHECK SAMPLES

Sample/Analyte	Known Concentration	Spike Concentration	Analyzed Concentration	Recovery (percent)
#H001-NSK				
Laboratory Control Sample 8/4/16	<0.05 mg/L	0.80 mg/L	0.94 mg/L	117.6*
#H001-NSK				
Grind Sludge 6/14/16 Matrix Spike	0.25 mg/L	0.80 mg/L	1.1 mg/L	107.5
Grind Sludge 6/14/16 Matrix Spike Duplicate	0.25 mg/L	0.80 mg/L	0.92 mg/L	83.1

BLANK ANALYSIS

Sample	Analyzed Concentration	QC Decision
#H001-NSK		
Laboratory Reagent Blank 8/4/16	<0.05 mg/L	Acceptable

Comments:
Calculations performed prior to rounding.
*Outside standard control limits.

Control Limits:
Spike Recoveries (75 - 125 %)
Laboratory Control Sample Recoveries (85 - 115 %)
Relative Range < or = 20%

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Quality Assurance / Quality Control
ICP/AES Summary

QC Batch Number: 0804162-N
Parameter: Barium (EPA 6010C)
ATS Project: NSK-AKS #H001-NSK
Report Date: 8/10/16

Results of QA Samples run concurrently with project samples

REPLICATE ANALYSIS

Sample	Replicate #1	Replicate #2	Mean	Relative Range (percent)
#H001-NSK				
L1 Sludge 6/14/16 Matrix Spike	0.90 mg/L	0.85 mg/L	0.87 mg/L	4.8

SPIKES and/or QC CHECK SAMPLES

Sample/Analyte	Known Concentration	Spike Concentration	Analyzed Concentration	Recovery (percent)
#A002-000, #H001-NSK				
Initial Cal bration Verification Standard	<0.05 mg/L	2.0 mg/L	2.0 mg/L	99.0
Interference Check Standard	<0.05 mg/L	0.80 mg/L	0.83 mg/L	103.3
Cal bration Verification Standard	<0.05 mg/L	2.0 mg/L	1.9 mg/L	95.8
Cal bration Verification Standard	<0.05 mg/L	2.0 mg/L	1.8 mg/L	90.2
#H001-NSK				
L1 Sludge 6/14/16 Matrix Spike	0.24 mg/L	0.80 mg/L	0.90 mg/L	81.9
L1 Sludge 6/14/16 Matrix Spike Duplicate	0.24 mg/L	0.80 mg/L	0.85 mg/L	76.6
#A002-000, #H001-NSK				
Cal bration Verification Standard	<0.05 mg/L	2.0 mg/L	1.8 mg/L	91.0

BLANK ANALYSIS

Sample	Analyzed Concentration	QC Decision
#A002-000, #H001-NSK		
Continuing Calibration Blank	<0.05 mg/L	Acceptable
Continuing Calibration Blank	<0.05 mg/L	Acceptable
Continuing Calibration Blank	<0.05 mg/L	Acceptable
Continuing Calibration Blank	<0.05 mg/L	Acceptable

Comments:
Calculations performed prior to rounding.

Control Limits:
Initial Calibration Verification Recoveries (90 - 110 %)
Calibration Verification Recoveries (90 - 110 %)
Interference Check Recoveries (80 - 120 %)
Spike Recoveries (75 - 125 %)
Relative Range < or = 20%

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Quality Assurance / Quality Control
Digestion Batch Summary

QC Batch Number: 0804162-N
Parameter: Cadmium (EPA 3010A)
ATS Project: NSK-AKS #H001-NSK
Report Date: 8/10/16

Results of QA Samples run concurrently with project samples

REPLICATE ANALYSIS

Sample	Replicate #1	Replicate #2	Mean	Relative Range (percent)
#H001-NSK				
Grind Sludge 6/14/16 Matrix Spike	0.96 mg/L	0.82 mg/L	0.89 mg/L	15.2

SPIKES and/or QC CHECK SAMPLES

Sample/Analyte	Known Concentration	Spike Concentration	Analyzed Concentration	Recovery (percent)
#H001-NSK				
Laboratory Control Sample 8/4/16	<0.005 mg/L	0.80 mg/L	0.89 mg/L	111.6
#H001-NSK				
Grind Sludge 6/14/16 Matrix Spike	<0.005 mg/L	0.80 mg/L	0.96 mg/L	119.6
Grind Sludge 6/14/16 Matrix Spike Duplicate	<0.005 mg/L	0.80 mg/L	0.82 mg/L	102.8

BLANK ANALYSIS

Sample	Analyzed Concentration	QC Decision
#H001-NSK		
Laboratory Reagent Blank 8/4/16	<0.005 mg/L	Acceptable

Comments:
Calculations performed prior to rounding.

Control Limits:
Spike Recoveries (75 - 125 %)
Laboratory Control Sample Recoveries (85 - 115 %)
Relative Range < or = 20%

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Quality Assurance / Quality Control
ICP/AES Summary

QC Batch Number: 0804162-N
Parameter: Cadmium (EPA 6010C)
ATS Project: NSK-AKS #H001-NSK
Report Date: 8/10/16

Results of QA Samples run concurrently with project samples

REPLICATE ANALYSIS

Sample	Replicate #1	Replicate #2	Mean	Relative Range (percent)
#H001-NSK				
L1 Sludge 6/14/16 Matrix Spike	0.79 mg/L	0.74 mg/L	0.77 mg/L	6.3

SPIKES and/or QC CHECK SAMPLES

Sample/Analyte	Known Concentration	Spike Concentration	Analyzed Concentration	Recovery (percent)
#A002-000, #H001-NSK				
Initial Cal bration Verification Standard	<0.005 mg/L	2.0 mg/L	2.0 mg/L	102.8
Interference Check Standard	<0.005 mg/L	0.80 mg/L	0.86 mg/L	107.1
Cal bration Verification Standard	<0.005 mg/L	2.0 mg/L	1.9 mg/L	96.9
Cal bration Verification Standard	<0.005 mg/L	2.0 mg/L	1.8 mg/L	92.9
#H001-NSK				
L1 Sludge 6/14/16 Matrix Spike	<0.005 mg/L	0.80 mg/L	0.79 mg/L	98.9
L1 Sludge 6/14/16 Matrix Spike Duplicate	<0.005 mg/L	0.80 mg/L	0.74 mg/L	92.9
#A002-000, #H001-NSK				
Cal bration Verification Standard	<0.005 mg/L	2.0 mg/L	1.8 mg/L	91.4

BLANK ANALYSIS

Sample	Analyzed Concentration	QC Decision
#A002-000, #H001-NSK		
Continuing Calibration Blank	<0.005 mg/L	Acceptable
Continuing Calibration Blank	<0.005 mg/L	Acceptable
Continuing Calibration Blank	<0.005 mg/L	Acceptable
Continuing Calibration Blank	<0.005 mg/L	Acceptable

Comments:
Calculations performed prior to rounding.

Control Limits:
Initial Calibration Verification Recoveries (90 - 110 %)
Calibration Verification Recoveries (90 - 110 %)
Interference Check Recoveries (80 - 120 %)
Spike Recoveries (75 - 125 %)
Relative Range < or = 20%

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Quality Assurance / Quality Control
Digestion Batch Summary

QC Batch Number: 0804162-N
Parameter: Chromium (EPA 3010A)
ATS Project: NSK-AKS #H001-NSK
Report Date: 8/10/16

Results of QA Samples run concurrently with project samples

REPLICATE ANALYSIS

Sample	Replicate #1	Replicate #2	Mean	Relative Range (percent)
#H001-NSK				
Grind Sludge 6/14/16 Matrix Spike	1.7 mg/L	1.6 mg/L	1.6 mg/L	6.4

SPIKES and/or QC CHECK SAMPLES

Sample/Analyte	Known Concentration	Spike Concentration	Analyzed Concentration	Recovery (percent)
#H001-NSK				
Laboratory Control Sample 8/4/16	<0.005 mg/L	0.80 mg/L	0.74 mg/L	92.1
#H001-NSK				
Grind Sludge 6/14/16 Matrix Spike	0.92 mg/L	0.80 mg/L	1.7 mg/L	96.6
Grind Sludge 6/14/16 Matrix Spike Duplicate	0.92 mg/L	0.80 mg/L	1.6 mg/L	83.5

BLANK ANALYSIS

Sample	Analyzed Concentration	QC Decision
#H001-NSK		
Laboratory Reagent Blank 8/4/16	<0.005 mg/L	Acceptable

Comments:
Calculations performed prior to rounding.

Control Limits:
Spike Recoveries (75 - 125 %)
Laboratory Control Sample Recoveries (85 - 115 %)
Relative Range < or = 20%

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Quality Assurance / Quality Control
ICP/AES Summary

QC Batch Number: 0804162-N
Parameter: Chromium (EPA 6010C)
ATS Project: NSK-AKS #H001-NSK
Report Date: 8/10/16

Results of QA Samples run concurrently with project samples

REPLICATE ANALYSIS

Sample	Replicate #1	Replicate #2	Mean	Relative Range (percent)
#H001-NSK				
L1 Sludge 6/14/16 Matrix Spike	0.98 mg/L	0.94 mg/L	0.96 mg/L	4.0

SPIKES and/or QC CHECK SAMPLES

Sample/Analyte	Known Concentration	Spike Concentration	Analyzed Concentration	Recovery (percent)
#A002-000, #H001-NSK				
Initial Cal bration Verification Standard	<0.005 mg/L	2.0 mg/L	2.1 mg/L	103.3
Interference Check Standard	<0.005 mg/L	0.80 mg/L	0.80 mg/L	99.5
Cal bration Verification Standard	<0.005 mg/L	2.0 mg/L	1.9 mg/L	97.4
Cal bration Verification Standard	<0.005 mg/L	2.0 mg/L	2.0 mg/L	97.8
#H001-NSK				
L1 Sludge 6/14/16 Matrix Spike	0.32 mg/L	0.80 mg/L	0.98 mg/L	81.5
L1 Sludge 6/14/16 Matrix Spike Duplicate	0.32 mg/L	0.80 mg/L	0.94 mg/L	76.7
#A002-000, #H001-NSK				
Cal bration Verification Standard	<0.005 mg/L	2.0 mg/L	1.9 mg/L	94.7

BLANK ANALYSIS

Sample	Analyzed Concentration	QC Decision
#A002-000, #H001-NSK		
Continuing Calibration Blank	<0.005 mg/L	Acceptable
Continuing Calibration Blank	<0.005 mg/L	Acceptable
Continuing Calibration Blank	<0.005 mg/L	Acceptable
Continuing Calibration Blank	<0.005 mg/L	Acceptable

Comments:

Calculations performed prior to rounding.

Control Limits:

Initial Calibration Verification Recoveries (90 - 110 %)
Calibration Verification Recoveries (90 - 110 %)
Interference Check Recoveries (80 - 120 %)
Spike Recoveries (75 - 125 %)
Relative Range < or = 20%

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Wisconsin Laboratory ID: 998321720

Quality Assurance / Quality Control
Digestion Batch Summary

QC Batch Number: 0804161-N
ATS Project: NSK-AKS #H001-NSK
Parameter: Chromium Speciation (EPA 9056A / 6020B)
Report Date: 8/10/16

Results of QA Samples run concurrently with project samples

REPLICATE ANALYSIS

Sample	Replicate #1	Replicate #2	Mean	Relative Range (percent)
#H001-NSK				
L1 Sludge 6/14/16 Matrix Spike				
Trivalent Chromium	2.4 mg/L	2.4 mg/L	2.4 mg/L	1.1
Hexavalent Chromium	1.4 mg/L	1.3 mg/L	1.4 mg/L	3.4

SPIKES and/or QC CHECK SAMPLES

Sample/Analyte	Known Concentration	Spike Concentration	Analyzed Concentration	Recovery (percent)
#H001-NSK				
Laboratory Control Sample 8/4/16				
Trivalent Chromium	<0.02 mg/L	2.0 mg/L	1.9 mg/L	96.1
Hexavalent Chromium	<0.02 mg/L	2.0 mg/L	1.9 mg/L	93.5
#H001-NSK				
L1 Sludge 6/14/16 Matrix Spike				
Trivalent Chromium	0.33 mg/L	2.0 mg/L	2.4 mg/L	103.6
Hexavalent Chromium	<0.02 mg/L	2.0 mg/L	1.4 mg/L	69.0*
L1 Sludge 6/14/16 Matrix Spike Duplicate				
Trivalent Chromium	0.33 mg/L	2.0 mg/L	2.4 mg/L	102.3
Hexavalent Chromium	<0.02 mg/L	2.0 mg/L	1.3 mg/L	66.7*

BLANK ANALYSIS

Sample	Analyzed Concentration	QC Decision
#H001-NSK		
Laboratory Reagent Blank 8/4/16		
Trivalent Chromium	<0.02 mg/L	Acceptable
Hexavalent Chromium	<0.02 mg/L	Acceptable

Comments:

Calculations performed prior to rounding.
*Outside standard control limits.

Control Limits:

Spike Recoveries (75 - 125 %)
Laboratory Control Sample Recoveries (85 - 115 %)
Relative Range < or = 20%

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Quality Assurance / Quality Control
ICP/MS Summary

QC Batch Number: 0804161-N
ATS Project: NSK-AKS #H001-NSK
Parameter: Chromium Speciation (EPA 9056A / 6020B)
Report Date: 8/10/16

Results of QA Samples run concurrently with project samples

REPLICATE ANALYSIS

Sample	Replicate #1	Replicate #2	Mean	Relative Range (percent)

SPIKES and/or QC CHECK SAMPLES

Sample/Analyte	Known Concentration	Spike Concentration	Analyzed Concentration	Recovery (percent)
#H001-NSK				
Cal bration Verification Standard				
Trivalent Chromium	<0.02 mg/L	0.20 mg/L	0.19 mg/L	96.6
Hexavalent Chromium	<0.02 mg/L	0.20 mg/L	0.18 mg/L	90.6
Cal bration Verification Standard				
Trivalent Chromium	<0.02 mg/L	0.20 mg/L	0.18 mg/L	93.1
Hexavalent Chromium	<0.02 mg/L	0.20 mg/L	0.18 mg/L	89.9*
Cal bration Verification Standard				
Trivalent Chromium	<0.02 mg/L	0.20 mg/L	0.18 mg/L	92.7
Hexavalent Chromium	<0.02 mg/L	0.20 mg/L	0.19 mg/L	95.0

BLANK ANALYSIS

Sample	Analyzed Concentration	QC Decision
#H001-NSK		
Continuing Calibration Blank	<0.02 mg/L	Acceptable
Continuing Calibration Blank	<0.02 mg/L	Acceptable
Continuing Calibration Blank	<0.02 mg/L	Acceptable

Comments:
Calculations performed prior to rounding.
*Outside standard control limits.

Control Limits:
Initial Calibration Verification Recoveries (90 - 110 %)
Calibration Verification Recoveries (90 - 110 %)

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Quality Assurance / Quality Control
Digestion Batch Summary

QC Batch Number: 0804162-N
Parameter: Copper (EPA 3010A)
ATS Project: NSK-AKS #H001-NSK
Report Date: 8/10/16

Results of QA Samples run concurrently with project samples

REPLICATE ANALYSIS

Sample	Replicate #1	Replicate #2	Mean	Relative Range (percent)
#H001-NSK				
Grind Sludge 6/14/16 Matrix Spike	1.0 mg/L	0.85 mg/L	0.93 mg/L	17.2

SPIKES and/or QC CHECK SAMPLES

Sample/Analyte	Known Concentration	Spike Concentration	Analyzed Concentration	Recovery (percent)
#H001-NSK				
Laboratory Control Sample 8/4/16	<0.005 mg/L	0.80 mg/L	0.86 mg/L	108.1
#H001-NSK				
Grind Sludge 6/14/16 Matrix Spike	<0.005 mg/L	0.80 mg/L	1.0 mg/L	126.4*
Grind Sludge 6/14/16 Matrix Spike Duplicate	<0.005 mg/L	0.80 mg/L	0.85 mg/L	106.3

BLANK ANALYSIS

Sample	Analyzed Concentration	QC Decision
#H001-NSK		
Laboratory Reagent Blank 8/4/16	0.017 mg/L	Acceptable

Comments:
Calculations performed prior to rounding.
*Outside standard control limits.

Control Limits:
Spike Recoveries (75 - 125 %)
Laboratory Control Sample Recoveries (85 - 115 %)
Relative Range < or = 20%

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Quality Assurance / Quality Control
ICP/AES Summary

QC Batch Number: 0804162-N
Parameter: Copper (EPA 6010C)
ATS Project: NSK-AKS #H001-NSK
Report Date: 8/10/16

Results of QA Samples run concurrently with project samples

REPLICATE ANALYSIS

Sample	Replicate #1	Replicate #2	Mean	Relative Range (percent)
#H001-NSK				
L1 Sludge 6/14/16 Matrix Spike	0.89 mg/L	0.83 mg/L	0.86 mg/L	6.3

SPIKES and/or QC CHECK SAMPLES

Sample/Analyte	Known Concentration	Spike Concentration	Analyzed Concentration	Recovery (percent)
#A002-000, #H001-NSK				
Initial Cal bration Verification Standard	<0.005 mg/L	2.0 mg/L	2.1 mg/L	105.4
Interference Check Standard	<0.005 mg/L	0.80 mg/L	0.84 mg/L	105.0
Cal bration Verification Standard	<0.005 mg/L	2.0 mg/L	2.1 mg/L	103.3
Cal bration Verification Standard	<0.005 mg/L	2.0 mg/L	2.1 mg/L	105.2
#H001-NSK				
L1 Sludge 6/14/16 Matrix Spike	0.010 mg/L	0.80 mg/L	0.89 mg/L	109.7
L1 Sludge 6/14/16 Matrix Spike Duplicate	0.010 mg/L	0.80 mg/L	0.83 mg/L	102.8
#A002-000, #H001-NSK				
Cal bration Verification Standard	<0.005 mg/L	2.0 mg/L	2.2 mg/L	110.0

BLANK ANALYSIS

Sample	Analyzed Concentration	QC Decision
#A002-000, #H001-NSK		
Continuing Calibration Blank	<0.005 mg/L	Acceptable
Continuing Calibration Blank	<0.005 mg/L	Acceptable
Continuing Calibration Blank	<0.005 mg/L	Acceptable
Continuing Calibration Blank	<0.005 mg/L	Acceptable

Comments:
Calculations performed prior to rounding.

Control Limits:
Initial Calibration Verification Recoveries (90 - 110 %)
Calibration Verification Recoveries (90 - 110 %)
Interference Check Recoveries (80 - 120 %)
Spike Recoveries (75 - 125 %)
Relative Range < or = 20%

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Quality Assurance / Quality Control
Digestion Batch Summary

QC Batch Number: 0804162-N
Parameter: Iron (EPA 3010A)
ATS Project: NSK-AKS #H001-NSK
Report Date: 8/10/16

Results of QA Samples run concurrently with project samples

REPLICATE ANALYSIS

Sample	Replicate #1	Replicate #2	Mean	Relative Range (percent)
#H001-NSK				
Grind Sludge 6/14/16 Matrix Spike	150 mg/L	150 mg/L	150 mg/L	0.3

SPIKES and/or QC CHECK SAMPLES

Sample/Analyte	Known Concentration	Spike Concentration	Analyzed Concentration	Recovery (percent)
#H001-NSK				
Laboratory Control Sample 8/4/16	<0.05 mg/L	8.0 mg/L	7.2 mg/L	90.6
#H001-NSK				
Grind Sludge 6/14/16 Matrix Spike	150 mg/L	8.0 mg/L	-	NA
Grind Sludge 6/14/16 Matrix Spike Duplicate	150 mg/L	8.0 mg/L	-	NA

BLANK ANALYSIS

Sample	Analyzed Concentration	QC Decision
#H001-NSK		
Laboratory Reagent Blank 8/4/16	<0.05 mg/L	Acceptable

Comments:

Calculations performed prior to rounding.
NA - Indicates not applicable due to inadequate spiking level.

Control Limits:

Spike Recoveries (75 - 125 %)
Laboratory Control Sample Recoveries (85 - 115 %)
Relative Range < or = 20%

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Quality Assurance / Quality Control
ICP/AES Summary

QC Batch Number: 0804162-N
Parameter: Iron (EPA 6010C)
ATS Project: NSK-AKS #H001-NSK
Report Date: 8/10/16

Results of QA Samples run concurrently with project samples

REPLICATE ANALYSIS

Sample	Replicate #1	Replicate #2	Mean	Relative Range (percent)
#H001-NSK				
L1 Sludge 6/14/16 Matrix Spike	34 mg/L	34 mg/L	34 mg/L	0.4

SPIKES and/or QC CHECK SAMPLES

Sample/Analyte	Known Concentration	Spike Concentration	Analyzed Concentration	Recovery (percent)
#A002-000, #H001-NSK				
Initial Cal bration Verification Standard	<0.05 mg/L	2.0 mg/L	2.0 mg/L	100.4
Interference Check Standard	<0.05 mg/L	8.0 mg/L	8.4 mg/L	104.8
Cal bration Verification Standard	<0.05 mg/L	2.0 mg/L	1.9 mg/L	95.0
Cal bration Verification Standard	<0.05 mg/L	2.0 mg/L	2.0 mg/L	99.0
#H001-NSK				
L1 Sludge 6/14/16 Matrix Spike	28 mg/L	8.0 mg/L	-	NA
L1 Sludge 6/14/16 Matrix Spike Duplicate	28 mg/L	8.0 mg/L	-	NA
#A002-000, #H001-NSK				
Cal bration Verification Standard	<0.05 mg/L	2.0 mg/L	1.9 mg/L	94.6

BLANK ANALYSIS

Sample	Analyzed Concentration	QC Decision
#A002-000, #H001-NSK		
Continuing Calibration Blank	<0.05 mg/L	Acceptable
Continuing Calibration Blank	<0.05 mg/L	Acceptable
Continuing Calibration Blank	<0.05 mg/L	Acceptable
Continuing Calibration Blank	<0.05 mg/L	Acceptable

Comments:

Calculations performed prior to rounding.
NA - Indicates not applicable due to inadequate spiking level.

Control Limits:

Initial Calibration Verification Recoveries (90 - 110 %)
Calibration Verification Recoveries (90 - 110 %)
Interference Check Recoveries (80 - 120 %)
Spike Recoveries (75 - 125 %)
Relative Range < or = 20%

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Quality Assurance / Quality Control
Digestion Batch Summary

QC Batch Number: 0804162-N
Parameter: Lead (EPA 3010A)
ATS Project: NSK-AKS #H001-NSK
Report Date: 8/10/16

Results of QA Samples run concurrently with project samples

REPLICATE ANALYSIS

Sample	Replicate #1	Replicate #2	Mean	Relative Range (percent)
#H001-NSK				
Grind Sludge 6/14/16 Matrix Spike	0.76 mg/L	0.63 mg/L	0.70 mg/L	18.4

SPIKES and/or QC CHECK SAMPLES

Sample/Analyte	Known Concentration	Spike Concentration	Analyzed Concentration	Recovery (percent)
#H001-NSK				
Laboratory Control Sample 8/4/16	<0.05 mg/L	0.80 mg/L	0.69 mg/L	86.1
#H001-NSK				
Grind Sludge 6/14/16 Matrix Spike	<0.05 mg/L	0.80 mg/L	0.76 mg/L	95.2
Grind Sludge 6/14/16 Matrix Spike Duplicate	<0.05 mg/L	0.80 mg/L	0.63 mg/L	79.1

BLANK ANALYSIS

Sample	Analyzed Concentration	QC Decision
#H001-NSK		
Laboratory Reagent Blank 8/4/16	<0.05 mg/L	Acceptable

Comments:
Calculations performed prior to rounding.

Control Limits:
Spike Recoveries (75 - 125 %)
Laboratory Control Sample Recoveries (85 - 115 %)
Relative Range < or = 20%

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Quality Assurance / Quality Control
ICP/AES Summary

QC Batch Number: 0804162-N
Parameter: Lead (EPA 6010C)
ATS Project: NSK-AKS #H001-NSK
Report Date: 8/10/16

Results of QA Samples run concurrently with project samples

REPLICATE ANALYSIS

Sample	Replicate #1	Replicate #2	Mean	Relative Range (percent)
#H001-NSK				
L1 Sludge 6/14/16 Matrix Spike	0.62 mg/L	0.59 mg/L	0.60 mg/L	3.8

SPIKES and/or QC CHECK SAMPLES

Sample/Analyte	Known Concentration	Spike Concentration	Analyzed Concentration	Recovery (percent)
#A002-000, #H001-NSK				
Initial Calibration Verification Standard	<0.05 mg/L	2.0 mg/L	2.0 mg/L	101.4
Interference Check Standard	<0.05 mg/L	0.80 mg/L	0.84 mg/L	104.8
Calibration Verification Standard	<0.05 mg/L	2.0 mg/L	1.9 mg/L	96.6
Calibration Verification Standard	<0.05 mg/L	2.0 mg/L	1.9 mg/L	94.3
#H001-NSK				
L1 Sludge 6/14/16 Matrix Spike	<0.05 mg/L	0.80 mg/L	0.62 mg/L	77.1
L1 Sludge 6/14/16 Matrix Spike Duplicate	<0.05 mg/L	0.80 mg/L	0.59 mg/L	74.2*
#A002-000, #H001-NSK				
Calibration Verification Standard	<0.05 mg/L	2.0 mg/L	1.9 mg/L	96.0

BLANK ANALYSIS

Sample	Analyzed Concentration	QC Decision
#A002-000, #H001-NSK		
Continuing Calibration Blank	<0.05 mg/L	Acceptable
Continuing Calibration Blank	<0.05 mg/L	Acceptable
Continuing Calibration Blank	<0.05 mg/L	Acceptable
Continuing Calibration Blank	<0.05 mg/L	Acceptable

Comments:

Calculations performed prior to rounding.
*Outside standard control limits.

Control Limits:

Initial Calibration Verification Recoveries (90 - 110 %)
Calibration Verification Recoveries (90 - 110 %)
Interference Check Recoveries (80 - 120 %)
Spike Recoveries (75 - 125 %)
Relative Range < or = 20%

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Quality Assurance / Quality Control
Digestion Batch Summary

QC Batch Number: 0808161-N
Parameter: Mercury (EPA 7470A)
ATS Project: NSK-AKS #H001-NSK
Report Date: 8/10/16

Results of QA Samples run concurrently with project samples

REPLICATE ANALYSIS

Sample	Replicate #1	Replicate #2	Mean	Relative Range (percent)
#H001-NSK				
Grind Sludge 6/14/16 Matrix Spike	0.0020 mg/L	0.0022 mg/L	0.0021 mg/L	9.6
L1 Sludge 6/14/16 Matrix Spike	0.0020 mg/L	0.0021 mg/L	0.0021 mg/L	4.3

SPIKES and/or QC CHECK SAMPLES

Sample/Analyte	Known Concentration	Spike Concentration	Analyzed Concentration	Recovery (percent)
#H001-NSK				
Laboratory Control Sample 8/8/16	<0.0005 mg/L	0.0020 mg/L	0.0021 mg/L	106.0
#H001-NSK				
Grind Sludge 6/14/16 Matrix Spike	<0.0005 mg/L	0.0020 mg/L	0.0020 mg/L	99.5
Grind Sludge 6/14/16 Matrix Spike Duplicate	<0.0005 mg/L	0.0020 mg/L	0.0022 mg/L	109.5
L1 Sludge 6/14/16 Matrix Spike	<0.0005 mg/L	0.0020 mg/L	0.0020 mg/L	102.5
L1 Sludge 6/14/16 Matrix Spike Duplicate	<0.0005 mg/L	0.0020 mg/L	0.0021 mg/L	107.0

BLANK ANALYSIS

Sample	Analyzed Concentration	QC Decision
#H001-NSK		
Laboratory Reagent Blank 8/8/16	<0.0005 mg/L	Acceptable

Comments:
Calculations performed prior to rounding.

Control Limits:
Spike Recoveries (80 - 120 %)
Laboratory Control Sample Recoveries (85 - 115 %)
Relative Range < or = 10%

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Quality Assurance / Quality Control
CVAAS Summary

QC Batch Number: 0808161-N
Parameter: Mercury (EPA 7470A)
ATS Project: NSK-AKS #H001-NSK
Report Date: 8/10/16

Results of QA Samples run concurrently with project samples

REPLICATE ANALYSIS

Sample	Replicate #1	Replicate #2	Mean	Relative Range (percent)

SPIKES and/or QC CHECK SAMPLES

Sample/Analyte	Known Concentration	Spike Concentration	Analyzed Concentration	Recovery (percent)
#H001-NSK				
Initial Cal bration Verification Standard	<0.0005 mg/L	0.0050 mg/L	0.0046 mg/L	91.2
Cal bration Verification Standard	<0.0005 mg/L	0.0010 mg/L	0.0010 mg/L	96.8
Cal bration Verification Standard	<0.0005 mg/L	0.0010 mg/L	0.0010 mg/L	101.0

BLANK ANALYSIS

Sample	Analyzed Concentration	QC Decision
#H001-NSK		
Continuing Calibration Blank	<0.0005 mg/L	Acceptable
Continuing Calibration Blank	<0.0005 mg/L	Acceptable

Comments:
Calculations performed prior to rounding.

Control Limits:
Initial Calibration Verification Recoveries (90 - 110 %)
Calibration Verification Recoveries (90 - 110 %)

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Quality Assurance / Quality Control
Digestion Batch Summary

QC Batch Number: 0804162-N
ATS Project: NSK-AKS #H001-NSK
Parameter: Nickel (EPA 3010A)
Report Date: 8/10/16

Results of QA Samples run concurrently with project samples

REPLICATE ANALYSIS

Sample	Replicate #1	Replicate #2	Mean	Relative Range (percent)
#H001-NSK				
Grind Sludge 6/14/16 Matrix Spike	0.83 mg/L	0.70 mg/L	0.76 mg/L	16.5

SPIKES and/or QC CHECK SAMPLES

Sample/Analyte	Known Concentration	Spike Concentration	Analyzed Concentration	Recovery (percent)
#H001-NSK				
Laboratory Control Sample 8/4/16	<0.005 mg/L	0.80 mg/L	0.68 mg/L	85.0
#H001-NSK				
Grind Sludge 6/14/16 Matrix Spike	0.086 mg/L	0.80 mg/L	0.83 mg/L	92.8
Grind Sludge 6/14/16 Matrix Spike Duplicate	0.086 mg/L	0.80 mg/L	0.76 mg/L	77.0

BLANK ANALYSIS

Sample	Analyzed Concentration	QC Decision
#H001-NSK		
Laboratory Reagent Blank 8/4/16	<0.005 mg/L	Acceptable

Comments:
Calculations performed prior to rounding.

Control Limits:
Spike Recoveries (75 - 125 %)
Laboratory Control Sample Recoveries (85 - 115 %)
Relative Range < or = 20%

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Quality Assurance / Quality Control
ICP/AES Summary

QC Batch Number: 0804162-N
Parameter: Nickel (EPA 6010C)
ATS Project: NSK-AKS #H001-NSK
Report Date: 8/10/16

Results of QA Samples run concurrently with project samples

REPLICATE ANALYSIS

Sample	Replicate #1	Replicate #2	Mean	Relative Range (percent)
#H001-NSK				
L1 Sludge 6/14/16 Matrix Spike	0.62 mg/L	0.60 mg/L	0.61 mg/L	3.6

SPIKES and/or QC CHECK SAMPLES

Sample/Analyte	Known Concentration	Spike Concentration	Analyzed Concentration	Recovery (percent)
#A002-000, #H001-NSK				
Initial Cal bration Verification Standard	<0.005 mg/L	2.0 mg/L	2.0 mg/L	102.9
Interference Check Standard	<0.005 mg/L	0.80 mg/L	0.82 mg/L	102.3
Cal bration Verification Standard	<0.005 mg/L	2.0 mg/L	1.9 mg/L	97.2
Cal bration Verification Standard	<0.005 mg/L	2.0 mg/L	1.9 mg/L	93.9
#H001-NSK				
L1 Sludge 6/14/16 Matrix Spike	0.013 mg/L	0.80 mg/L	0.62 mg/L	76.0
L1 Sludge 6/14/16 Matrix Spike Duplicate	0.013 mg/L	0.80 mg/L	0.60 mg/L	73.2*
#A002-000, #H001-NSK				
Cal bration Verification Standard	<0.005 mg/L	2.0 mg/L	1.9 mg/L	94.2

BLANK ANALYSIS

Sample	Analyzed Concentration	QC Decision
#A002-000, #H001-NSK		
Continuing Calibration Blank	<0.005 mg/L	Acceptable
Continuing Calibration Blank	<0.005 mg/L	Acceptable
Continuing Calibration Blank	<0.005 mg/L	Acceptable
Continuing Calibration Blank	<0.005 mg/L	Acceptable

Comments:

Calculations performed prior to rounding.
*Outside standard control limits.

Control Limits:

Initial Calibration Verification Recoveries (90 - 110 %)
Calibration Verification Recoveries (90 - 110 %)
Interference Check Recoveries (80 - 120 %)
Spike Recoveries (75 - 125 %)
Relative Range < or = 20%

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Quality Assurance / Quality Control
Digestion Batch Summary

QC Batch Number: 0804162-N
Parameter: Selenium (EPA 3010A)
ATS Project: NSK-AKS #H001-NSK
Report Date: 8/10/16

Results of QA Samples run concurrently with project samples

REPLICATE ANALYSIS

Sample	Replicate #1	Replicate #2	Mean	Relative Range (percent)
#H001-NSK				
Grind Sludge 6/14/16 Matrix Spike	0.96 mg/L	0.80 mg/L	0.88 mg/L	18.9

SPIKES and/or QC CHECK SAMPLES

Sample/Analyte	Known Concentration	Spike Concentration	Analyzed Concentration	Recovery (percent)
#H001-NSK				
Laboratory Control Sample 8/4/16	<0.01 mg/L	0.80 mg/L	0.92 mg/L	115.4*
#H001-NSK				
Grind Sludge 6/14/16 Matrix Spike	<0.01 mg/L	0.80 mg/L	0.96 mg/L	120.3
Grind Sludge 6/14/16 Matrix Spike Duplicate	<0.01 mg/L	0.80 mg/L	0.80 mg/L	99.5

BLANK ANALYSIS

Sample	Analyzed Concentration	QC Decision
#H001-NSK		
Laboratory Reagent Blank 8/4/16	<0.01 mg/L	Acceptable

Comments:
Calculations performed prior to rounding.
*Outside standard control limits.

Control Limits:
Spike Recoveries (75 - 125 %)
Laboratory Control Sample Recoveries (85 - 115 %)
Relative Range < or = 20%

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Quality Assurance / Quality Control
ICP/AES Summary

QC Batch Number: 0804162-N
Parameter: Selenium (EPA 6010C)
ATS Project: NSK-AKS #H001-NSK
Report Date: 8/10/16

Results of QA Samples run concurrently with project samples

REPLICATE ANALYSIS

Sample	Replicate #1	Replicate #2	Mean	Relative Range (percent)
#H001-NSK				
L1 Sludge 6/14/16 Matrix Spike	0.86 mg/L	0.81 mg/L	0.83 mg/L	5.7

SPIKES and/or QC CHECK SAMPLES

Sample/Analyte	Known Concentration	Spike Concentration	Analyzed Concentration	Recovery (percent)
#A002-000, #H001-NSK				
Initial Cal bration Verification Standard	<0.01 mg/L	10 mg/L	9.6 mg/L	96.6
Interference Check Standard	<0.01 mg/L	0.80 mg/L	0.84 mg/L	104.4
Cal bration Verification Standard	<0.01 mg/L	10 mg/L	9.3 mg/L	93.0
Cal bration Verification Standard	<0.01 mg/L	10 mg/L	9.1 mg/L	91.1
#H001-NSK				
L1 Sludge 6/14/16 Matrix Spike	<0.01 mg/L	0.80 mg/L	0.86 mg/L	106.9
L1 Sludge 6/14/16 Matrix Spike Duplicate	<0.01 mg/L	0.80 mg/L	0.81 mg/L	101.0
#A002-000, #H001-NSK				
Cal bration Verification Standard	<0.01 mg/L	10 mg/L	9.2 mg/L	92.4

BLANK ANALYSIS

Sample	Analyzed Concentration	QC Decision
#A002-000, #H001-NSK		
Continuing Calibration Blank	<0.01 mg/L	Acceptable
Continuing Calibration Blank	<0.01 mg/L	Acceptable
Continuing Calibration Blank	<0.01 mg/L	Acceptable
Continuing Calibration Blank	<0.01 mg/L	Acceptable

Comments:
Calculations performed prior to rounding.

Control Limits:
Initial Calibration Verification Recoveries (90 - 110 %)
Calibration Verification Recoveries (90 - 110 %)
Interference Check Recoveries (80 - 120 %)
Spike Recoveries (75 - 125 %)
Relative Range < or = 20%

290 South Wagner Road
Ann Arbor, Michigan 48103
Tel. 734/995-0995 Fax. 734/995-3731
Michigan Laboratory ID: 9604
Wisconsin Laboratory ID: 998321720

Quality Assurance / Quality Control
Digestion Batch Summary

QC Batch Number: 0804162-N
Parameter: Zinc (EPA 3010A)
ATS Project: NSK-AKS #H001-NSK
Report Date: 8/10/16

Results of QA Samples run concurrently with project samples

REPLICATE ANALYSIS

Sample	Replicate #1	Replicate #2	Mean	Relative Range (percent)
#H001-NSK				
Grind Sludge 6/14/16 Matrix Spike	0.90 mg/L	0.79 mg/L	0.84 mg/L	13.4

SPIKES and/or QC CHECK SAMPLES

Sample/Analyte	Known Concentration	Spike Concentration	Analyzed Concentration	Recovery (percent)
#H001-NSK				
Laboratory Control Sample 8/4/16	<0.05 mg/L	0.80 mg/L	0.81 mg/L	101.7
#H001-NSK				
Grind Sludge 6/14/16 Matrix Spike	0.16 mg/L	0.80 mg/L	0.90 mg/L	92.4
Grind Sludge 6/14/16 Matrix Spike Duplicate	0.16 mg/L	0.80 mg/L	0.79 mg/L	78.3

BLANK ANALYSIS

Sample	Analyzed Concentration	QC Decision
#H001-NSK		
Laboratory Reagent Blank 8/4/16	<0.05 mg/L	Acceptable

Comments:
Calculations performed prior to rounding.

Control Limits:
Spike Recoveries (75 - 125 %)
Laboratory Control Sample Recoveries (85 - 115 %)
Relative Range < or = 20%

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Tel. 734/995-0995 Fax. 734/995-3731
Michigan Laboratory ID: 9604
Wisconsin Laboratory ID: 998321720

Quality Assurance / Quality Control
ICP/AES Summary

QC Batch Number: 0804162-N
Parameter: Zinc (EPA 6010C)
ATS Project: NSK-AKS #H001-NSK
Report Date: 8/10/16

Results of QA Samples run concurrently with project samples

REPLICATE ANALYSIS

Sample	Replicate #1	Replicate #2	Mean	Relative Range (percent)
#H001-NSK				
L1 Sludge 6/14/16 Matrix Spike	0.75 mg/L	0.75 mg/L	0.75 mg/L	0.5

SPIKES and/or QC CHECK SAMPLES

Sample/Analyte	Known Concentration	Spike Concentration	Analyzed Concentration	Recovery (percent)
#A002-000, #H001-NSK				
Initial Cal bration Verification Standard	<0.05 mg/L	2.0 mg/L	2.0 mg/L	98.0
Interference Check Standard	<0.05 mg/L	0.80 mg/L	0.83 mg/L	103.9
Cal bration Verification Standard	<0.05 mg/L	2.0 mg/L	1.8 mg/L	91.6
Cal bration Verification Standard	<0.05 mg/L	2.0 mg/L	1.8 mg/L	92.7
#H001-NSK				
L1 Sludge 6/14/16 Matrix Spike	0.14 mg/L	0.80 mg/L	0.75 mg/L	76.8
L1 Sludge 6/14/16 Matrix Spike Duplicate	0.14 mg/L	0.80 mg/L	0.75 mg/L	76.3
#A002-000, #H001-NSK				
Cal bration Verification Standard	<0.05 mg/L	2.0 mg/L	1.8 mg/L	90.0

BLANK ANALYSIS

Sample	Analyzed Concentration	QC Decision
#A002-000, #H001-NSK		
Continuing Calibration Blank	<0.05 mg/L	Acceptable
Continuing Calibration Blank	<0.05 mg/L	Acceptable
Continuing Calibration Blank	<0.05 mg/L	Acceptable
Continuing Calibration Blank	<0.05 mg/L	Acceptable

Comments:
Calculations performed prior to rounding.

Control Limits:
Initial Calibration Verification Recoveries (90 - 110 %)
Calibration Verification Recoveries (90 - 110 %)
Interference Check Recoveries (80 - 120 %)
Spike Recoveries (75 - 125 %)
Relative Range < or = 20%

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Ann Arbor, Michigan 48103
Tel. 734/995-0995 Fax. 734/995-3731
Michigan Laboratory ID: 9604
Wisconsin Laboratory ID: 998321720

Quality Assurance / Quality Control
Extraction Batch Summary

QC Batch Number: 0808162-N
Parameter: Oil Content (EPA 9071B)
ATS Project: NSK-AKS #H001-NSK
Report Date: 8/10/16

Results of QA Samples run concurrently with project samples

REPLICATE ANALYSIS

Sample	Replicate #1	Replicate #2	Mean	Relative Range (percent)
#H001-NSK L1 Sludge 6/7/16	180,000 mg/kg	170,000 mg/kg	94,000 mg/L	4.2

SPIKES and/or QC CHECK SAMPLES

Sample/Analyte	Known Concentration	Spike Concentration	Analyzed Concentration	Recovery (percent)

BLANK ANALYSIS

Sample	Analyzed Concentration	QC Decision
#H001-NSK Extraction Blank 8/8/16	<500 mg/kg	Acceptable

Comments:
Calculations performed prior to rounding.

Control Limits:
Relative Range < or = 20%

290 South Wagner Road
Ann Arbor, Michigan 48103
Tel. 734/995-0995 Fax.
734/995-3731
Michigan Laboratory ID: 9604
Wisconsin Laboratory ID:

CHAIN OF CUSTODY RECORD

PROJECT ID / NUMBER	LABORATORY INFORMATION	SHIPPING INFORMATION: SHIPPER (Check one) / TRACKING NUMBER(S) (If applicable)
	Ann Arbor Technical Services, Inc.	Date / Fed Ex / UPS / DHL / Courier / Tracking Number
SAMPLE CUSTODIAN (Print & Signature)	Terry Kinman/	Date / Fed Ex / UPS / DHL / Courier / Tracking Number
		Date / Fed Ex / UPS / DHL / Courier / Tracking Number
		Date / Fed Ex / UPS / DHL / Courier / Tracking Number

RELINQUISHED BY (Print & Signature)	DATE / TIME	RECEIVED BY (Print & Signature)	DATE / TIME	RELINQUISHED BY (Print & Signature)	DATE / TIME	RECEIVED BY (Print & Signature)	DATE / TIME
Terry Kinman/	6/8/16 14:30		6/10/16 12:30				
RELINQUISHED BY (Print & Signature)	DATE / TIME	RECEIVED BY (Print & Signature)	DATE / TIME	RELINQUISHED BY (Print & Signature)	DATE / TIME	RECEIVED BY (Print & Signature)	DATE / TIME

COMMENTS (Preservation, etc.)

LINE NO.	BAR CODE	DATE	TIME	COMP.	GRAB	SAMPLE IDENTIFICATION	NO. OF CONTAINERS	PRIORITY NUMBER	ANALYSIS	MATRIX Indicate Soil/Water/Air Sediment/Sludge Extract
1.		5/31/2016	12:30:00 PM			Grind Sample from 5/31/16	1			
2.		5/31/2016	12:30:00 PM			L1 Sample from 5/31/16	1			
3.		6/7/2016	12:15:00 PM			Grind Sample from 6/7/16	1			
4.		6/7/2016	12:15:00 PM			L1 Sample from 6/7/16	1			
5.										
6.										
7.										
8.										
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14.										
15.										
16.										
17.										
18.										
19.										
20.										

ORIGINALLY REC'D ON P.O.	BUYER	MATERIAL COMING FROM	RETURN OR REPLACE REFERENCING PURCHASE ORDER:
		T. Kinman	

☐ 1100 A NORTH FIRST STREET
CLARINDA, IOWA 51632
(712) 542-6515 FAX (712) 542-4067

AKS
PRECISION BALL COMPANY

PURCHASE SHIPPER
13726

TO: Ann Arbor Technical Services Inc.
290 South Wagner Road
Ann Arbor, MI 48103

OK

DATE ISSUED	TO BE SHIPPED	VIA	DATE SHIPPED	VIA
6.9.16	PRE-PAID (X) COLLECT ( )		6-9-16	UPS Ground

QUANTITY	DESCRIPTION
4	Samples of Sludge For Analysis
	1Z 535 745 03 5605 8194

☐ REJECTION - ISSUE CREDIT (SEE RPMIR# _____)

☐ THIS MATERIAL SENT TO YOU FOR REPAIR AT AKS EXPENSE

☐ THIS MATERIAL SENT TO YOU FOR ADDITIONAL OPERATIONS AT AKS EXPENSE

☒ OTHER For Analysis

DO NOT WRITE IN THIS AREA.
VENDOR MUST SIGN AND DATE
HERE ON #2 COPY.

PACKING SLIP

290 South Wagner Road
Ann Arbor, Michigan 48103
Tel. 734/995-0995 Fax.
734/995-3731
Michigan Laboratory ID: 9604
Wisconsin Laboratory ID:

CHAIN OF CUSTODY RECORD

PROJECT ID / NUMBER: H001-NSK

LABORATORY INFORMATION: Ann Arbor Technical Services, Inc.

SAMPLE CUSTODIAN (Print & Signature): Terry Kinman

SHIPPING INFORMATION: SHIPPER (Check one) / TRACKING NUMBER(S) (If applicable)

Date		Fed Ex		UPS		DHL		Courier		Tracking Number	
Date		Fed Ex		UPS		DHL		Courier		Tracking Number	
Date		Fed Ex		UPS		DHL		Courier		Tracking Number	
Date		Fed Ex		UPS		DHL		Courier		Tracking Number	

RELINQUISHED BY (Print & Signature)	DATE / TIME	RECEIVED BY (Print & Signature)	DATE / TIME	RELINQUISHED BY (Print & Signature)	DATE / TIME	RECEIVED BY (Print & Signature)	DATE / TIME
Terry Kinman	6/22/16 - 11:15	Mark DeLong 6/24/16 14:20					

COMMENTS (Preservation, etc.)

ANALYSIS

LINE NO.	BAR CODE	DATE	TIME	COMP.	GRAB	SAMPLE IDENTIFICATION	NO. OF CONTAINERS	PRIORITY NUMBER	MATRIX Indicate Soil/Water/Air Sediment/Sludge Extract
1.	MTI	6/14/2016	12:00:00 PM			Grind Sludge	1		
2.	MTO	6/14/2016	12:00:00 PM			L1 Sludge	1		
3.		6/21/2016	12:00:00 PM			Grind Sludge	1		
4.		6/21/2016	12:00:00 PM			L1 Sludge	1		
5.									
6.									
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20.									

290 South Wagner Road
Ann Arbor, Michigan 48103
Tel. 734/995-0916 Fax. 734/995-3731
Michigan Laboratory ID: 9934
Wisconsin Laboratory ID: 998321720

ANN ARBOR TECHNICAL SERVICES, INC.
SAMPLE RECEIPT ANOMALY FORM (rev 072610)

ATS Project Number: HOOF-NISK
SRF Number: 002416
Page: 1 of 1
Analyst:

Sample Identification Discrepancy

Sample Identification per COC	Sample Identification per Sample Label	Proposed Corrective Action	QA Approval *(name and date)*
GRIND SLUDGE 6/7/10	GRIND SLUDGE 6/14/10	CHANGE COC	6/27
HI SLUDGE 6/7/10	HI SLUDGE 6/14/10	↓	

Sample Integrity Issues

Problem Identified	Proposed Corrective Action	QA Approval *(name and date)*

Sample Preservation Issues

Problem Identified	Proposed Corrective Action	QA Approval *(name and date)*

Mark DeLong

From: Terry Kinman <kinmant@aksball-us.com>
Sent: Monday, June 27, 2016 7:54 AM
To: Mark DeLong
Subject: Re: NSK Grinding Swarf Samples

Mark,

Sorry for error, the date should be 6/14 instead of 6/7.

Thanks

Terry Kinman | Technical Specialist
NSK-AKS Precision Ball Co.
[Email] kinmant@nsk-corp.com
[Office] 712-542-6515 Ext. 6491
[Mailing] 1100A North 1st St Clarinda, IA 51632 USA

From: "Mark DeLong" <Mark.DeLong@annarbortechnicalservices.com>
To: "Terry Kinman" <kinmant@aksball-us.com>,
Cc: "Sarah Stubblefield" <Sarah.Stubblefield@annarbortechnicalservices.com>
Date: 06/24/2016 01:41 PM
Subject: NSK Grinding Swarf Samples

Terry,

At 2:20 PM today UPS dropped off 4 bottles containing grinding swarf from Grind and L-1 locations. They are labeled as follows:

Grind Sludge 6/14/2016
L-1 Sludge 6/14/2016
Grind Sludge 6/21/2016
L-1 Sludge 6/21/2016

The Chain of Custody (attached) that accompanied the above samples was labeled as follows:

Grind Sludge 6/7/2016
L-1 Sludge 6/7/2016
Grind Sludge 6/21/2016
L-1 Sludge 6/21/2016

My belief is the bottle labels are correct, but the entries related to samples collected on 6/7/2016 should be dated 6/14/2016. Please advise via email, and we'll make the correction on our end.

Thanks,

Mark DeLong | Senior Scientist
Office: 734-995-0995 Fax: 734-995-3731 Cell: 734-368-4748

mark.delong@annarbortechnicalservices.com

Ann Arbor Technical Services, Inc.
290 South Wagner Road
Ann Arbor, Michigan 48103
Web: www.annarbortechnicalservices.com

Consultants in Chemistry & Environmental Science

[attachment "COC Jun 24 Error.pdf" deleted by Terry Kinman/UAK/AMERICAS/NSKCOM]

BUYER	MATERIAL COMING FROM	RETURN OR REPLACE REFERENCING PURCHASE ORDER:
	T. Kinman	

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CLARINDA, IOWA 51632
(712) 542-6515 FAX (712) 542-4067

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PRECISION BALL COMPANY

PURCHASE SHIPPER
13732

TO: Ann Arbor Technical Service Inc.
290 South Wagner Road
Ann Arbor, MI 48103

DATE ISSUED	TO BE SHIPPED	VIA	DATE SHIPPED	VIA
6.22.16	PRE-PAID (X) COLLECT ( )		6-22-16	UPS Ground

QUANTITY	DESCRIPTION
4	Samples of Sludge For Analysis
	1Z 535 745 03 5676 2306

☐ REJECTION - ISSUE CREDIT (SEE RPMIR# _____)

☐ THIS MATERIAL SENT TO YOU FOR REPAIR AT AKS EXPENSE

☐ THIS MATERIAL SENT TO YOU FOR ADDITIONAL OPERATIONS AT AKS EXPENSE

☒ OTHER For Analysis

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HERE ON #2 COPY.

R-d 6.24.16 15:00 MS

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Ann Arbor, Michigan 48103
Tel. 734/995-0995 Fax.
734/995-3731
Michigan Laboratory ID: 9604
Wisconsin Laboratory ID:

CHAIN OF CUSTODY RECORD

PROJECT ID / NUMBER	LABORATORY INFORMATION
	Ann Arbor Technical Services, Inc.
SAMPLE CUSTODIAN (Print & Signature)	Terry Kinman

RELINQUISHED BY (Print & Signature)	DATE / TIME	RECEIVED BY (Print & Signature)
Terry Kinman	7/26/16 0:00	
RELINQUISHED BY (Print & Signature)	DATE / TIME	RECEIVED BY (Print & Signature)

SHIPPING INFORMATION: SHIPPER (Check one) / TRACKING NUMBER(S) (If applicable)

Date		Fed Ex		UPS		DHL		Courier		Tracking Number
Date		Fed Ex		UPS		DHL		Courier		Tracking Number
Date		Fed Ex		UPS		DHL		Courier		Tracking Number
Date		Fed Ex		UPS		DHL		Courier		Tracking Number

DATE / TIME	RELINQUISHED BY (Print & Signature)	DATE / TIME	RECEIVED BY (Print & Signature)	DATE / TIME
7/28/16 10:00				
DATE / TIME	RELINQUISHED BY (Print & Signature)	DATE / TIME	RECEIVED BY (Print & Signature)	DATE / TIME

COMMENTS (Preservation, etc.)

LINE NO.	BAR CODE	DATE	TIME	COMP.	GRAB	SAMPLE IDENTIFICATION	NO. OF CONTAINERS	PRIORITY NUMBER	ANALYSIS	MATRIX Indicate Soil/Water/Air Sediment/Sludge Extract
1.	Grind Sample	7/19/2016	12:00:00 PM							
2.	L1 Sample	7/19/2016	12:00:00 PM							
3.	Grind Sample	7/26/2016	12:00:00 PM							
4.	L1 Sample	7/26/2016	12:00:00 PM							
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20.										

AKS
PRECISION BALL COMPANY

1100 A NORTH FIRST STREET
CLARINDA, IOWA 51632
(712) 542-6515 FAX (712) 542-4067

PURCHASE SHIPPER
13745

TO: Ann Arbor Technical Service Inc.
290 South Wagner Road
Ann Arbor, MI 48103

NEXT DAY IF POSSIBLE
DK

DATE ISSUED	TO BE SHIPPED	VIA	DATE SHIPPED	VIA
7.27.16	PRE-PAID (X) COLLECT ( )		7-27-16	UPS NBA

QUANTITY	DESCRIPTION
4	Samples of Sludge For Analysis
	12 535 745 01 5691 3638

☐ REJECTION - ISSUE CREDIT (SEE RPMIR# _____)
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☐ THIS MATERIAL SENT TO YOU FOR ADDITIONAL OPERATIONS AT AKS EXPENSE
☒ OTHER For Analysis

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LABORATORY OPERATIONS
CASE NARRATIVE

ATS Project Number: H001-NSK
Report Date: 9/27/16

Case Narrative Summary

This case narrative applies to the following four samples that were received at Ann Arbor Technical Services, Inc. (ATS) on 8/15/16, and associated matrix-specific QA/QC:

Client Sample Identification	Sample Date	Laboratory Identification	Matrix
Grind Sludge	8/2/16	ATS	Grind Waste
Grind Sludge	8/9/16	ATS	Grind Waste
L1 Sludge	8/2/16	ATS	Grind Waste
L1 Sludge	8/9/16	ATS	Grind Waste

Matrix Specific QC

Client Sample Identification	Sample Date	Laboratory Identification	Matrix
Grind Sludge Matrix Spike	8/2/16	ATS	Grind Waste
L1 Sludge Laboratory Duplicate	8/9/16	ATS	Grind Waste

. Upon receipt, samples were scheduled for the following analyses.

- TCLP Regulatory Metals by US EPA methods 1311 and 6010C
- TCLP Mercury by US EPA methods 1311 and 7470A
- TCLP Copper, Iron, Nickel, and Zinc by US EPA method 6010C
- Chromium Speciation by US EPA methods 9056A and 6020B
- Oil Content by US EPA method 9071B

Sample Receipt, Chain of Custody Records, and Holding Times

Samples were delivered to ATS by commercial courier. Samples were received in boxes at ambient temperature with proper chain of custody records. All samples were extracted and analyzed within the holding times as cited in US EPA method 1311.

Data Review and Approval

All data contained in this report have been conducted in accordance with the guidelines provided in the referenced standard test methods, and are consistent with the detailed procedures described in a written standard operating procedure (SOP) specific to the ATS laboratory, as required by US EPA. All data are peer and management reviewed to ensure compliance with the above referenced SOP's and project specifications. In addition all data conform to the laboratory's Quality Assurance / Quality Control Manuals.

Consultants in Chemistry & Environmental Science
290 South Wagner Road, Ann Arbor, Michigan 48103 Tel 734/995-0995 Fax 734/995-3731

Data Deliverables and Sample Reporting

All data deliverables are generated to be in compliance with the US EPA. This data package constitutes a level II package. There were no hardcopy data summary sheets generated for this project.

Sample Preparation

Metals Analysis (except mercury): Samples were extracted in accordance with US EPA method 1311 (Toxicity Leaching Characteristic Procedure) followed by a digestion in accordance with US EPA method 3010A (Acid Digestion of Aqueous Samples and Extracts for Total Metals Analysis by FLAA or ICP Spectroscopy).

Mercury Analysis: Samples were extracted in accordance with US EPA method 1311 (Toxicity Leaching Characteristic Procedure) followed by a digestion in accordance with US EPA method 7470A (Mercury in Liquid Waste – Cold Vapor Atomic Absorption Spectrometry).

Chromium Speciation Analysis: Samples were extracted in accordance with US EPA method 1311 (Toxicity Leaching Characteristic Procedure) followed by dilution and digestion in an alkaline mobile phase formulated for speciation of Chromium II, Chromium III, and Chromium VI.

Oil Content: Samples were extracted in accordance with US EPA method 9071B (n-Hexane Extractable Material for Sludge, Sediment, and Solid Samples).

Extensive homogenization procedures were implemented due to the nature of the sample matrix.

Anomalies Noted: **None**

Sample Analysis

Metals Analysis (except mercury): Samples were analyzed in accordance with US EPA method 6010C (Inductively Coupled Plasma – Atomic Emission Spectrometry). An initial calibration with at least five levels was used to quantitate metals. Concentrations were reported to a number corresponding to 1/100 of the maximum leachate concentration where applicable or the method detection limit (MDL). Samples were reported on a mg/L wet weight basis as indicated in US EPA method 1311.

Mercury Analysis: Samples were analyzed in accordance with US EPA method 7470A (Mercury in Liquid Waste – Cold Vapor Atomic Absorption Spectrometry). An initial calibration with at least five levels was used to quantitate mercury. Concentrations were reported to a number corresponding to 1/100 of the maximum leachate concentration where applicable or the method detection limit (MDL). Samples were reported on a mg/L wet weight basis as indicated in US EPA method 1311.

Chromium Speciation Analysis: Samples were analyzed in accordance with US EPA method 9056A (Inorganic Anions by Ion Chromatography) / US EPA method 6020B (Inductively Coupled Plasma – Mass Spectrometry). An initial calibration with at least five levels was used to quantitate chromium species. Concentrations were reported to the lowest calibration standard. Samples were reported on a mg/L wet weight basis as indicated in US EPA method 1311.

Oil Content: Samples were analyzed in accordance with US EPA method 9071B (n-Hexane Extractable Material for Sludge, Sediment, and Solid Samples). Samples were reported on a mg/kg wet weight basis.

Anomalies Noted: **None**

Analytical QA/QC Summary

Calibration Verification

Applicable to ICP/AES, IC/ICP/MS, and CVAAS analyses only.

Method calibration was verified through the running of a mid-level initial calibration verification (CV) standard at a frequency of every ten samples. All verification standards met the acceptance criteria with the following exceptions:

Sample ID	Analytical method	Constituent	Percent Recovery	Acceptance Limits
Continuing Calibration Verification-3	EPA 1311/6010C	Barium	89.6	90-110%
Continuing Calibration Verification-3	EPA 1311/6010C	Lead	89.7	90-110%
Continuing Calibration Verification-3	EPA 1311/6010C	Zinc	87.7	90-110%
Continuing Calibration Verification-1	EPA 1311/6020B	Cr VI	88.7	90-110%

Interference Checks

Applicable to ICP/AES analyses only.

The lack of spectral interferences was verified through the analysis of interference check standards every running day. All interference standards met the acceptance criteria with the following exceptions:

- **None**

Instrument Blanks

Applicable to ICP/AES, IC/ICP/MS, and CVAAS analyses only.

Instrument blanks were analyzed at a frequency of every ten samples. All blanks met the acceptance criteria with the following exceptions:

- **None**

Matrix Spikes

Applicable to ICP/AES analyses only.

A matrix spike (MS) was analyzed at a frequency of every ten samples. All MS's met the acceptance criteria with the following exceptions:

- **None**

Matrix Duplicates

Applicable to ICP/AES analyses only.

A replicate analysis was performed at a frequency of every ten samples. All replicates met the acceptance criteria with the following exceptions:

- **None**

QA/QC Batch Summary

Laboratory Reagent Blanks

Applicable to all analyses.

A laboratory reagent blank (LRB) was analyzed with each QA/QC batch. All LRB's met the acceptance criteria with the following exceptions:

Sample ID	Analytical method	Constituent	Analyzed Concentration	Reporting Limit
Laboratory Reagent Blank 9/23/16	EPA 1311/6010C	Copper	0.008 mg/L	0.005 mg/L

Laboratory Fortified Blanks and Matrix Spikes

Applicable to ICP/AES, IC/ICPMS, and CVAAS analyses only.

A laboratory fortified blank (LFB) / laboratory control sample (LCS) was analyzed with each QA/QC batch. For chromium speciation the LCS/LFB's consisted of equal concentrations of trivalent and hexavalent species. All LCS/LFB's met the acceptance criteria with the following exceptions:

Sample ID	Analytical method	Constituent	Percent Recovery	Acceptance Limits
Laboratory Control Sample 9/23/16	EPA 1311/6010C	Chromium	115.2	85-115%

A matrix spike (MS) was analyzed with each QA/QC batch. For chromium speciation the MS's consisted of equal concentrations of trivalent and hexavalent species. All MS's met the acceptance criteria with the following exceptions:

Sample ID	Analytical method	Constituent	Percent Recovery	Acceptance Limits
Grind Sludge 8/2/16 Matrix Spike	EPA 1311/6020B	Cr III	125.8	75-125%

- **One MS for iron was not reportable due to inadequate spiking levels.**

Matrix Duplicates

Applicable to all analyses.

A replicate analysis was analyzed with each QA/QC batch. All replicates met the acceptance criteria with the following exceptions:

Sample ID	Analytical method	Constituent	Percent Recovery	Acceptance Limits
L1 Sludge 8/9/16 Laboratory Duplicate	EPA 1311/6010C	Nickel	22.2	<20%

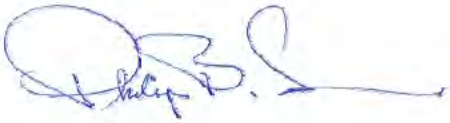
Sample Dilutions

Samples containing compounds at concentrations above the initial calibration curve were diluted and reanalyzed for those compounds. The following samples were diluted:

- **None**

/ September 27, 2016

Mark T. DeLong (Quality Assurance Coordinator)



/ September 27, 2016

Philip B. Simon (Laboratory Director)

290 South Wagner Road
Ann Arbor, Michigan 48103
Tel. 734/995-0995 Fax. 734/995-3731Michigan Laboratory ID: 9604
Wisconsin Laboratory ID: 998321720

Toxicity Characteristic Leaching Procedure
Inorganic Analysis
Data Summary Sheet

For: Mr. Aaron Davidshofen
NSK-AKS Precision Ball Company
1100A North First Street
Clarinda, Iowa 51632

ATS Project: NSK-AKS #H001-NSK
Report Date: 9/27/16
ATS SRF: 0815161

Sample Identification: Grind Sludge

Sample Date:	8/2/16	Preparation Method:	EPA 1311
Sample Time:	12:00	Analytical Method(s):	EPA 3010A / 6010C
Sampled By:	Client		EPA 7470A
Laboratory Receipt Date:	8/15/16		EPA 9071B
Sample Matrix:	Grind Waste		EPA 9056A / 6020B

Parameter (CAS)	Units	Result	Maximum Leachate Concentration*	TCLP Hazardous	Analysis Date	Analysis Time	QC Batch Number
Arsenic (7440-38-2)	mg/L	<0.05	5.0	No	9/23/16	11:02 AM	0923161-N
Barium (7440-39-3)	mg/L	0.06	100	No	9/23/16	11:02 AM	0923161-N
Cadmium (7440-43-9)	mg/L	<0.005	1.0	No	9/23/16	11:02 AM	0923161-N
Chromium (7440-47-3)	mg/L	0.88	5.0	No	9/23/16	11:02 AM	0923161-N
Chromium VI (18540-29-9)	mg/L	<0.02	na	No	9/22/16	3:14 PM	0922161-N
Chromium II & III	mg/L	0.90	na	No	9/22/16	3:14 PM	0922161-N
Copper (7440-50-8)	mg/L	<0.005	na	na	9/23/16	11:02 AM	0923161-N
Iron (7439-89-6)	mg/L	160	na	na	9/23/16	11:02 AM	0923161-N
Lead (7439-92-1)	mg/L	<0.05	5.0	No	9/23/16	11:02 AM	0923161-N
Mercury (7439-97-6)	mg/L	<0.0005	0.2	No	9/23/16	11:31 AM	0922162-N
Nickel (7440-02-0)	mg/L	0.088	na	na	9/23/16	11:02 AM	0923161-N
Selenium (7782-49-2)	mg/L	<0.01	1.0	No	9/23/16	11:02 AM	0923161-N
Silver (7440-22-4)	mg/L	<0.05	5.0	No	9/23/16	11:02 AM	0923161-N
Zinc (7440-66-6)	mg/L	0.06	na	na	9/23/16	11:02 AM	0923161-N
Oil Content	mg/kg	120,000	na	na	9/23/16	na	0923162-N

Comments

All methods reference USEPA methods unless otherwise noted.
* Reference: 40 CFR, 1998 Part 261.24
Oil content is expressed on a wet weight basis.
na - Indicates not applicable

290 South Wagner Road
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Wisconsin Laboratory ID: 998321720

Toxicity Characteristic Leaching Procedure
Inorganic Analysis
Data Summary Sheet

For: Mr. Aaron Davidshofen
NSK-AKS Precision Ball Company
1100A North First Street
Clarinda, Iowa 51632

ATS Project: NSK-AKS #H001-NSK
Report Date: 9/27/16
ATS SRF: 0815161

Sample Identification: Grind Sludge

Sample Date: 8/9/16
Sample Time: 12:00
Sampled By: Client
Laboratory Receipt Date: 8/15/16
Sample Matrix: Grind Waste

Preparation Method: EPA 1311
Analytical Method(s): EPA 3010A / 6010C
EPA 7470A
EPA 9071B
EPA 9056A / 6020B

Parameter (CAS)	Units	Result	Maximum Leachate Concentration*	TCLP Hazardous	Analysis Date	Analysis Time	QC Batch Number
Arsenic (7440-38-2)	mg/L	<0.05	5.0	No	9/23/16	11:10 AM	0923161-N
Barium (7440-39-3)	mg/L	<0.05	100	No	9/23/16	11:10 AM	0923161-N
Cadmium (7440-43-9)	mg/L	<0.005	1.0	No	9/23/16	11:10 AM	0923161-N
Chromium (7440-47-3)	mg/L	0.99	5.0	No	9/23/16	11:10 AM	0923161-N
Chromium VI (18540-29-9)	mg/L	<0.02	na	No	9/22/16	3:21 PM	0922161-N
Chromium II & III	mg/L	1.0	na	No	9/22/16	3:21 PM	0922161-N
Copper (7440-50-8)	mg/L	<0.005	na	na	9/23/16	11:10 AM	0923161-N
Iron (7439-89-6)	mg/L	200	na	na	9/23/16	11:10 AM	0923161-N
Lead (7439-92-1)	mg/L	<0.05	5.0	No	9/23/16	11:10 AM	0923161-N
Mercury (7439-97-6)	mg/L	<0.0005	0.2	No	9/23/16	11:57 AM	0922162-N
Nickel (7440-02-0)	mg/L	0.12	na	na	9/23/16	11:10 AM	0923161-N
Selenium (7782-49-2)	mg/L	<0.01	1.0	No	9/23/16	11:10 AM	0923161-N
Silver (7440-22-4)	mg/L	<0.05	5.0	No	9/23/16	11:10 AM	0923161-N
Zinc (7440-66-6)	mg/L	0.10	na	na	9/23/16	11:10 AM	0923161-N
Oil Content	mg/kg	120,000	na	na	9/23/16	na	0923162-N

Comments

All methods reference USEPA methods unless otherwise noted.
* Reference: 40 CFR, 1998 Part 261.24
Oil content is expressed on a wet weight basis.
na - Indicates not applicable

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Toxicity Characteristic Leaching Procedure
Inorganic Analysis
Data Summary Sheet

For: Mr. Aaron Davidshofen
NSK-AKS Precision Ball Company
1100A North First Street
Clarinda, Iowa 51632

ATS Project: NSK-AKS #H001-NSK
Report Date: 9/27/16
ATS SRF: 0815161

Sample Identification: L1 Sludge

Sample Date:	8/2/16	Preparation Method:	EPA 1311
Sample Time:	12:00	Analytical Method(s):	EPA 3010A / 6010C
Sampled By:	Client		EPA 7470A
Laboratory Receipt Date:	8/15/16		EPA 9071B
Sample Matrix:	Grind Waste		EPA 9056A / 6020B

Parameter (CAS)	Units	Result	Maximum Leachate Concentration*	TCLP Hazardous	Analysis Date	Analysis Time	QC Batch Number
Arsenic (7440-38-2)	mg/L	<0.05	5.0	No	9/23/16	10:50 AM	0923161-N
Barium (7440-39-3)	mg/L	0.08	100	No	9/23/16	10:50 AM	0923161-N
Cadmium (7440-43-9)	mg/L	<0.005	1.0	No	9/23/16	10:50 AM	0923161-N
Chromium (7440-47-3)	mg/L	0.65	5.0	No	9/23/16	10:50 AM	0923161-N
Chromium VI (18540-29-9)	mg/L	<0.02	na	No	9/22/16	2:52 PM	0922161-N
Chromium II & III	mg/L	0.74	na	No	9/22/16	2:52 PM	0922161-N
Copper (7440-50-8)	mg/L	0.013	na	na	9/23/16	10:50 AM	0923161-N
Iron (7439-89-6)	mg/L	66	na	na	9/23/16	10:50 AM	0923161-N
Lead (7439-92-1)	mg/L	<0.05	5.0	No	9/23/16	10:50 AM	0923161-N
Mercury (7439-97-6)	mg/L	<0.0005	0.2	No	9/23/16	11:44 AM	0922162-N
Nickel (7440-02-0)	mg/L	0.041	na	na	9/23/16	10:50 AM	0923161-N
Selenium (7782-49-2)	mg/L	<0.01	1.0	No	9/23/16	10:50 AM	0923161-N
Silver (7440-22-4)	mg/L	<0.05	5.0	No	9/23/16	10:50 AM	0923161-N
Zinc (7440-66-6)	mg/L	<0.05	na	na	9/23/16	10:50 AM	0923161-N
Oil Content	mg/kg	170,000	na	na	9/23/16	na	0923162-N

Comments

All methods reference USEPA methods unless otherwise noted.
* Reference: 40 CFR, 1998 Part 261.24
Oil content is expressed on a wet weight basis.
na - Indicates not applicable

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Wisconsin Laboratory ID: 998321720

Toxicity Characteristic Leaching Procedure
Inorganic Analysis
Data Summary Sheet

For: Mr. Aaron Davidshofen
NSK-AKS Precision Ball Company
1100A North First Street
Clarinda, Iowa 51632

ATS Project: NSK-AKS #H001-NSK
Report Date: 9/27/16
ATS SRF: 0815161

Sample Identification: L1 Sludge

Sample Date: 8/9/16
Sample Time: 12:00
Sampled By: Client
Laboratory Receipt Date: 8/15/16
Sample Matrix: Grind Waste

Preparation Method: EPA 1311
Analytical Method(s): EPA 3010A / 6010C
EPA 7470A
EPA 9071B
EPA 9056A / 6020B

Parameter (CAS)	Units	Result	Maximum Leachate Concentration*	TCLP Hazardous	Analysis Date	Analysis Time	QC Batch Number
Arsenic (7440-38-2)	mg/L	<0.05	5.0	No	9/23/16	10:58 AM	0923161-N
Barium (7440-39-3)	mg/L	<0.05	100	No	9/23/16	10:58 AM	0923161-N
Cadmium (7440-43-9)	mg/L	<0.005	1.0	No	9/23/16	10:58 AM	0923161-N
Chromium (7440-47-3)	mg/L	0.35	5.0	No	9/23/16	10:58 AM	0923161-N
Chromium VI (18540-29-9)	mg/L	<0.02	na	No	9/22/16	3:06 PM	0922161-N
Chromium II & III	mg/L	0.42	na	No	9/22/16	3:06 PM	0922161-N
Copper (7440-50-8)	mg/L	0.008	na	na	9/23/16	10:58 AM	0923161-N
Iron (7439-89-6)	mg/L	32	na	na	9/23/16	10:58 AM	0923161-N
Lead (7439-92-1)	mg/L	<0.05	5.0	No	9/23/16	10:58 AM	0923161-N
Mercury (7439-97-6)	mg/L	<0.0005	0.2	No	9/23/16	12:03 PM	0922162-N
Nickel (7440-02-0)	mg/L	0.022	na	na	9/23/16	10:58 AM	0923161-N
Selenium (7782-49-2)	mg/L	<0.01	1.0	No	9/23/16	10:58 AM	0923161-N
Silver (7440-22-4)	mg/L	<0.05	5.0	No	9/23/16	10:58 AM	0923161-N
Zinc (7440-66-6)	mg/L	<0.05	na	na	9/23/16	10:58 AM	0923161-N
Oil Content	mg/kg	190,000	na	na	9/23/16	na	0923162-N

Comments

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* Reference: 40 CFR, 1998 Part 261.24
Oil content is expressed on a wet weight basis.
na - Indicates not applicable

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Quality Assurance / Quality Control
Digestion Batch Summary

QC Batch Number: 0923161-N
Parameter: Arsenic (EPA 3010A)
ATS Project: NSK-AKS #H001-NSK
Report Date: 9/27/16

Results of QA Samples run concurrently with project samples

REPLICATE ANALYSIS

Sample	Replicate #1	Replicate #2	Mean	Relative Range (percent)
#H001-NSK L1 Sludge 8/9/16 Laboratory Duplicate	<0.05 mg/L	<0.05 mg/L	<0.05 mg/L	nc

SPIKES and/or QC CHECK SAMPLES

Sample/Analyte	Known Concentration	Spike Concentration	Analyzed Concentration	Recovery (percent)
#H001-NSK Laboratory Control Sample 9/23/16	<0.05 mg/L	0.20 mg/L	0.21 mg/L	111.0
#H001-NSK Grind Sludge 8/2/16 Matrix Spike	<0.05 mg/L	0.20 mg/L	0.19 mg/L	105.5

BLANK ANALYSIS

Sample	Analyzed Concentration	QC Decision
#H001-NSK Laboratory Reagent Blank 9/23/16	<0.05 mg/L	Acceptable

Comments:
Calculations performed prior to rounding.
nc - Indicates not calculable.

Control Limits:
Spike Recoveries (75 - 125 %)
Laboratory Control Sample Recoveries (85 - 115 %)
Relative Range < or = 20%

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Quality Assurance / Quality Control
ICP/AES Summary

QC Batch Number: 0923161-N
Parameter: Arsenic (EPA 6010C)
ATS Project: NSK-AKS #H001-NSK
Report Date: 9/27/16

Results of QA Samples run concurrently with project samples

REPLICATE ANALYSIS

Sample	Replicate #1	Replicate #2	Mean	Relative Range (percent)
#Z999-001				
HO - Lind 9/20/16 Laboratory Duplicate	<0.05 mg/L	<0.05 mg/L	<0.05 mg/L	nc

SPIKES and/or QC CHECK SAMPLES

Sample/Analyte	Known Concentration	Spike Concentration	Analyzed Concentration	Recovery (percent)
#H001-NSK, #Z999-001, #Z999-NOT				
Initial Cal bration Verification Standard	<0.05 mg/L	2.0 mg/L	1.8 mg/L	92.6
Interference Check Standard	<0.05 mg/L	1.0 mg/L	0.98 mg/L	97.7
Cal bration Verification Standard	<0.05 mg/L	2.0 mg/L	1.8 mg/L	91.0
Cal bration Verification Standard	<0.05 mg/L	2.0 mg/L	1.8 mg/L	90.4
#Z999-001				
HO - Kauf 9/19/16 Matrix Spike	<0.05 mg/L	2.0 mg/L	2.1 mg/L	105.6
#H001-NSK, #Z999-001, #Z999-NOT				
Cal bration Verification Standard	<0.05 mg/L	2.0 mg/L	2.0 mg/L	99.4

BLANK ANALYSIS

Sample	Analyzed Concentration	QC Decision
#H001-NSK, #Z999-001, #Z999-NOT		
Continuing Calibration Blank	<0.05 mg/L	Acceptable
Continuing Calibration Blank	<0.05 mg/L	Acceptable
Continuing Calibration Blank	<0.05 mg/L	Acceptable

Comments:

Calculations performed prior to rounding.
nc - Indicates not calculable.

Control Limits:

Initial Calibration Verification Recoveries (90 - 110 %)
Calibration Verification Recoveries (90 - 110 %)
Interference Check Recoveries (80 - 120 %)
Spike Recoveries (75 - 125 %)
Relative Range < or = 20%

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Quality Assurance / Quality Control
Digestion Batch Summary

QC Batch Number: 0923161-N
Parameter: Barium (EPA 3010A)
ATS Project: NSK-AKS #H001-NSK
Report Date: 9/27/16

Results of QA Samples run concurrently with project samples

REPLICATE ANALYSIS

Sample	Replicate #1	Replicate #2	Mean	Relative Range (percent)
#H001-NSK L1 Sludge 8/9/16 Laboratory Duplicate	0.05 mg/L	<0.05 mg/L	<0.05 mg/L	nc

SPIKES and/or QC CHECK SAMPLES

Sample/Analyte	Known Concentration	Spike Concentration	Analyzed Concentration	Recovery (percent)
#H001-NSK Laboratory Control Sample 9/23/16	<0.05 mg/L	0.20 mg/L	0.23 mg/L	114.1
#H001-NSK Grind Sludge 8/2/16 Matrix Spike	0.06 mg/L	0.20 mg/L	0.28 mg/L	110.0

BLANK ANALYSIS

Sample	Analyzed Concentration	QC Decision
#H001-NSK Laboratory Reagent Blank 9/23/16	<0.05 mg/L	Acceptable

Comments:

Calculations performed prior to rounding.
nc - Indicates not calculable.

Control Limits:

Spike Recoveries (75 - 125 %)
Laboratory Control Sample Recoveries (85 - 115 %)
Relative Range < or = 20%

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Quality Assurance / Quality Control
ICP/AES Summary

QC Batch Number: 0923161-N
Parameter: Barium (EPA 6010C)
ATS Project: NSK-AKS #H001-NSK
Report Date: 9/27/16

Results of QA Samples run concurrently with project samples

REPLICATE ANALYSIS

Sample	Replicate #1	Replicate #2	Mean	Relative Range (percent)
#Z999-001				
HO - Lind 9/20/16 Laboratory Duplicate	<0.05 mg/L	<0.05 mg/L	<0.05 mg/L	nc

SPIKES and/or QC CHECK SAMPLES

Sample/Analyte	Known Concentration	Spike Concentration	Analyzed Concentration	Recovery (percent)
#H001-NSK, #Z999-001, #Z999-NOT				
Initial Calibration Verification Standard	<0.05 mg/L	2.0 mg/L	1.8 mg/L	92.0
Interference Check Standard	<0.05 mg/L	1.0 mg/L	0.94 mg/L	94.3
Calibration Verification Standard	<0.05 mg/L	2.0 mg/L	1.8 mg/L	91.4
Calibration Verification Standard	<0.05 mg/L	2.0 mg/L	1.8 mg/L	89.6*
#Z999-001				
HO - Kauf 9/19/16 Matrix Spike	<0.05 mg/L	2.0 mg/L	2.0 mg/L	98.5
#H001-NSK, #Z999-001, #Z999-NOT				
Calibration Verification Standard	<0.05 mg/L	2.0 mg/L	2.0 mg/L	100.8

BLANK ANALYSIS

Sample	Analyzed Concentration	QC Decision
#H001-NSK, #Z999-001, #Z999-NOT		
Continuing Calibration Blank	<0.05 mg/L	Acceptable
Continuing Calibration Blank	<0.05 mg/L	Acceptable
Continuing Calibration Blank	<0.05 mg/L	Acceptable

Comments:

Calculations performed prior to rounding.
nc - Indicates not calculable.
* Outside standard control limits.

Control Limits:

Initial Calibration Verification Recoveries (90 - 110 %)
Calibration Verification Recoveries (90 - 110 %)
Interference Check Recoveries (80 - 120 %)
Spike Recoveries (75 - 125 %)
Relative Range < or = 20%

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Michigan Laboratory ID: 9604
Wisconsin Laboratory ID: 998321720

Quality Assurance / Quality Control
Digestion Batch Summary

QC Batch Number: 0923161-N
Parameter: Cadmium (EPA 3010A)
ATS Project: NSK-AKS #H001-NSK
Report Date: 9/27/16

Results of QA Samples run concurrently with project samples

REPLICATE ANALYSIS

Sample	Replicate #1	Replicate #2	Mean	Relative Range (percent)
#H001-NSK L1 Sludge 8/9/16 Laboratory Duplicate	<0.005 mg/L	<0.005 mg/L	<0.005 mg/L	nc

SPIKES and/or QC CHECK SAMPLES

Sample/Analyte	Known Concentration	Spike Concentration	Analyzed Concentration	Recovery (percent)
#H001-NSK Laboratory Control Sample 9/23/16	<0.005 mg/L	0.20 mg/L	0.22 mg/L	112.9
#H001-NSK Grind Sludge 8/2/16 Matrix Spike	<0.005 mg/L	0.20 mg/L	0.23 mg/L	113.6

BLANK ANALYSIS

Sample	Analyzed Concentration	QC Decision
#H001-NSK Laboratory Reagent Blank 9/23/16	<0.005 mg/L	Acceptable

Comments:
Calculations performed prior to rounding.
nc - Indicates not calculable.

Control Limits:
Spike Recoveries (75 - 125 %)
Laboratory Control Sample Recoveries (85 - 115 %)
Relative Range < or = 20%

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Michigan Laboratory ID: 9604
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Quality Assurance / Quality Control
ICP/AES Summary

QC Batch Number: 0923161-N
Parameter: Cadmium (EPA 6010C)
ATS Project: NSK-AKS #H001-NSK
Report Date: 9/27/16

Results of QA Samples run concurrently with project samples

REPLICATE ANALYSIS

Sample	Replicate #1	Replicate #2	Mean	Relative Range (percent)
#Z999-001				
HO - Lind 9/20/16 Laboratory Duplicate	<0.005 mg/L	<0.005 mg/L	<0.005 mg/L	nc

SPIKES and/or QC CHECK SAMPLES

Sample/Analyte	Known Concentration	Spike Concentration	Analyzed Concentration	Recovery (percent)
#H001-NSK, #Z999-001, #Z999-NOT				
Initial Cal bration Verification Standard	<0.005 mg/L	2.0 mg/L	1.8 mg/L	90.5
Interference Check Standard	<0.005 mg/L	1.0 mg/L	1.0 mg/L	99.0
Cal bration Verification Standard	<0.005 mg/L	2.0 mg/L	1.8 mg/L	91.4
Cal bration Verification Standard	<0.005 mg/L	2.0 mg/L	1.9 mg/L	92.7
#Z999-001				
HO - Kauf 9/19/16 Matrix Spike	<0.005 mg/L	2.0 mg/L	2.1 mg/L	104.3
#H001-NSK, #Z999-001, #Z999-NOT				
Cal bration Verification Standard	<0.005 mg/L	2.0 mg/L	2.0 mg/L	101.2

BLANK ANALYSIS

Sample	Analyzed Concentration	QC Decision
#H001-NSK, #Z999-001, #Z999-NOT		
Continuing Calibration Blank	<0.005 mg/L	Acceptable
Continuing Calibration Blank	<0.005 mg/L	Acceptable
Continuing Calibration Blank	<0.005 mg/L	Acceptable

Comments:

Calculations performed prior to rounding.
nc - Indicates not calculable.

Control Limits:

Initial Calibration Verification Recoveries (90 - 110 %)
Calibration Verification Recoveries (90 - 110 %)
Interference Check Recoveries (80 - 120 %)
Spike Recoveries (75 - 125 %)
Relative Range < or = 20%

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Michigan Laboratory ID: 9604
Wisconsin Laboratory ID: 998321720

Quality Assurance / Quality Control
Digestion Batch Summary

QC Batch Number: 0923161-N
Parameter: Chromium (EPA 3010A)
ATS Project: NSK-AKS #H001-NSK
Report Date: 9/27/16

Results of QA Samples run concurrently with project samples

REPLICATE ANALYSIS

Sample	Replicate #1	Replicate #2	Mean	Relative Range (percent)
#H001-NSK L1 Sludge 8/9/16 Laboratory Duplicate	0.35 mg/L	0.35 mg/L	0.35 mg/L	0.1

SPIKES and/or QC CHECK SAMPLES

Sample/Analyte	Known Concentration	Spike Concentration	Analyzed Concentration	Recovery (percent)
#H001-NSK Laboratory Control Sample 9/23/16	<0.005 mg/L	0.20 mg/L	0.23 mg/L	115.2*
#H001-NSK Grind Sludge 8/2/16 Matrix Spike	0.88 mg/L	0.20 mg/L	1.1 mg/L	123.8

BLANK ANALYSIS

Sample	Analyzed Concentration	QC Decision
#H001-NSK Laboratory Reagent Blank 9/23/16	<0.005 mg/L	Acceptable

Comments:
Calculations performed prior to rounding.
* Outside standard control limits.

Control Limits:
Spike Recoveries (75 - 125 %)
Laboratory Control Sample Recoveries (85 - 115 %)
Relative Range < or = 20%

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Quality Assurance / Quality Control
ICP/AES Summary

QC Batch Number: 0923161-N
Parameter: Chromium (EPA 6010C)
ATS Project: NSK-AKS #H001-NSK
Report Date: 9/27/16

Results of QA Samples run concurrently with project samples

REPLICATE ANALYSIS

Sample	Replicate #1	Replicate #2	Mean	Relative Range (percent)
#Z999-001				
HO - Lind 9/20/16 Laboratory Duplicate	<0.005 mg/L	<0.005 mg/L	<0.005 mg/L	nc

SPIKES and/or QC CHECK SAMPLES

Sample/Analyte	Known Concentration	Spike Concentration	Analyzed Concentration	Recovery (percent)
#H001-NSK, #Z999-001, #Z999-NOT				
Initial Cal bration Verification Standard	<0.005 mg/L	2.0 mg/L	2.0 mg/L	99.4
Interference Check Standard	<0.005 mg/L	1.0 mg/L	1.1 mg/L	111.2
Cal bration Verification Standard	<0.005 mg/L	2.0 mg/L	2.2 mg/L	108.6
Cal bration Verification Standard	<0.005 mg/L	2.0 mg/L	1.9 mg/L	94.3
#Z999-001				
HO - Kauf 9/19/16 Matrix Spike	<0.005 mg/L	2.0 mg/L	2.5 mg/L	123.8
#H001-NSK, #Z999-001, #Z999-NOT				
Cal bration Verification Standard	<0.005 mg/L	2.0 mg/L	2.0 mg/L	102.1

BLANK ANALYSIS

Sample	Analyzed Concentration	QC Decision
#H001-NSK, #Z999-001, #Z999-NOT		
Continuing Calibration Blank	<0.005 mg/L	Acceptable
Continuing Calibration Blank	<0.005 mg/L	Acceptable
Continuing Calibration Blank	<0.005 mg/L	Acceptable

Comments:

Calculations performed prior to rounding.
nc - Indicates not calculable.

Control Limits:

Initial Calibration Verification Recoveries (90 - 110 %)
Calibration Verification Recoveries (90 - 110 %)
Interference Check Recoveries (80 - 120 %)
Spike Recoveries (75 - 125 %)
Relative Range < or = 20%

290 South Wagner Road
Ann Arbor, Michigan 48103
Tel. 734/995-0995 Fax. 734/995-3731
Michigan Laboratory ID: 9604
Wisconsin Laboratory ID: 998321720

Quality Assurance / Quality Control
Digestion Batch Summary

QC Batch Number: 0922161-N
Parameter: Chromium Speciation (EPA 9056A / 6020B)
ATS Project: NSK-AKS #H001-NSK
Report Date: 9/27/16

Results of QA Samples run concurrently with project samples

REPLICATE ANALYSIS

Sample	Replicate #1	Replicate #2	Mean	Relative Range (percent)
#H001-NSK				
L1 Sludge 8/9/16 Laboratory Duplicate				
Trivalent Chromium	0.42 mg/L	0.41 mg/L	0.43 mg/L	5.4
Hexavalent Chromium	<0.02 mg/L	<0.02 mg/L	<0.02 mg/L	nc

SPIKES and/or QC CHECK SAMPLES

Sample/Analyte	Known Concentration	Spike Concentration	Analyzed Concentration	Recovery (percent)
#H001-NSK				
Laboratory Control Sample 9/22/16				
Trivalent Chromium	<0.02 mg/L	2.0 mg/L	2.0 mg/L	99.6
Hexavalent Chromium	<0.02 mg/L	2.0 mg/L	1.9 mg/L	96.8
#H001-NSK				
Grind Sludge 8/2/16 Matrix Spike				
Trivalent Chromium	0.90 mg/L	2.0 mg/L	3.4 mg/L	125.8*
Hexavalent Chromium	<0.02 mg/L	2.0 mg/L	2.2 mg/L	110.8

BLANK ANALYSIS

Sample	Analyzed Concentration	QC Decision
#H001-NSK		
Laboratory Reagent Blank 9/22/16		
Trivalent Chromium	<0.02 mg/L	Acceptable
Hexavalent Chromium	<0.02 mg/L	Acceptable

Comments:

Calculations performed prior to rounding.
nc - Indicates not calculable.

Control Limits:

Spike Recoveries (75 - 125 %)
Laboratory Control Sample Recoveries (85 - 115 %)
Relative Range < or = 20%

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Wisconsin Laboratory ID: 998321720

Quality Assurance / Quality Control
ICP/MS Summary

QC Batch Number: 0922161-N
ATS Project: NSK-AKS #H001-NSK
Parameter: Chromium Speciation (EPA 9056A / 6020B)
Report Date: 9/27/16

Results of QA Samples run concurrently with project samples

REPLICATE ANALYSIS

Sample	Replicate #1	Replicate #2	Mean	Relative Range (percent)

SPIKES and/or QC CHECK SAMPLES

Sample/Analyte	Known Concentration	Spike Concentration	Analyzed Concentration	Recovery (percent)
#H001-NSK				
Cal bration Verification Standard				
Trivalent Chromium	<0.02 mg/L	0.20 mg/L	0.19 mg/L	95.2
Hexavalent Chromium	<0.02 mg/L	0.20 mg/L	0.18 mg/L	88.7*

BLANK ANALYSIS

Sample	Analyzed Concentration	QC Decision
#H001-NSK		
Continuing Calibration Blank	<0.02 mg/L	Acceptable
Continuing Calibration Blank	<0.02 mg/L	Acceptable

Comments:
Calculations performed prior to rounding.
*Outside standard control limits.

Control Limits:
Initial Calibration Verification Recoveries (90 - 110 %)
Calibration Verification Recoveries (90 - 110 %)

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Quality Assurance / Quality Control
Digestion Batch Summary

QC Batch Number: 0923161-N
Parameter: Copper (EPA 3010A)
ATS Project: NSK-AKS #H001-NSK
Report Date: 9/27/16

Results of QA Samples run concurrently with project samples

REPLICATE ANALYSIS

Sample	Replicate #1	Replicate #2	Mean	Relative Range (percent)
#H001-NSK L1 Sludge 8/9/16 Laboratory Duplicate	0.008 mg/L	0.008 mg/L	0.008 mg/L	4.8

SPIKES and/or QC CHECK SAMPLES

Sample/Analyte	Known Concentration	Spike Concentration	Analyzed Concentration	Recovery (percent)
#H001-NSK Laboratory Control Sample 9/23/16	<0.005 mg/L	0.20 mg/L	0.23 mg/L	114.9
#H001-NSK Grind Sludge 8/2/16 Matrix Spike	<0.005 mg/L	0.20 mg/L	0.21 mg/L	104.4

BLANK ANALYSIS

Sample	Analyzed Concentration	QC Decision
#H001-NSK Laboratory Reagent Blank 9/23/16	0.008 mg/L	Acceptable

Comments:
Calculations performed prior to rounding.

Control Limits:
Spike Recoveries (75 - 125 %)
Laboratory Control Sample Recoveries (85 - 115 %)
Relative Range < or = 20%

290 South Wagner Road
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Wisconsin Laboratory ID: 998321720

Quality Assurance / Quality Control
ICP/AES Summary

QC Batch Number: 0923161-N
Parameter: Copper (EPA 6010C)
ATS Project: NSK-AKS #H001-NSK
Report Date: 9/27/16

Results of QA Samples run concurrently with project samples

REPLICATE ANALYSIS

Sample	Replicate #1	Replicate #2	Mean	Relative Range (percent)
#Z999-001				
HO - Lind 9/20/16 Laboratory Duplicate	0.011 mg/L	0.011 mg/L	0.011 mg/L	1.8

SPIKES and/or QC CHECK SAMPLES

Sample/Analyte	Known Concentration	Spike Concentration	Analyzed Concentration	Recovery (percent)
#H001-NSK, #Z999-001, #Z999-NOT				
Initial Cal bration Verification Standard	<0.005 mg/L	2.0 mg/L	1.8 mg/L	92.8
Interference Check Standard	<0.005 mg/L	1.0 mg/L	0.92 mg/L	91.6
Cal bration Verification Standard	<0.005 mg/L	2.0 mg/L	1.8 mg/L	91.8
Cal bration Verification Standard	<0.005 mg/L	2.0 mg/L	1.8 mg/L	90.2
#Z999-001				
HO - Kauf 9/19/16 Matrix Spike	<0.005 mg/L	2.0 mg/L	1.9 mg/L	97.1
#H001-NSK, #Z999-001, #Z999-NOT				
Cal bration Verification Standard	<0.005 mg/L	2.0 mg/L	2.0 mg/L	98.6

BLANK ANALYSIS

Sample	Analyzed Concentration	QC Decision
#H001-NSK, #Z999-001, #Z999-NOT		
Continuing Calibration Blank	<0.005 mg/L	Acceptable
Continuing Calibration Blank	<0.005 mg/L	Acceptable
Continuing Calibration Blank	<0.005 mg/L	Acceptable

Comments:
Calculations performed prior to rounding.

Control Limits:
Initial Calibration Verification Recoveries (90 - 110 %)
Calibration Verification Recoveries (90 - 110 %)
Interference Check Recoveries (80 - 120 %)
Spike Recoveries (75 - 125 %)
Relative Range < or = 20%

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Quality Assurance / Quality Control
Digestion Batch Summary

QC Batch Number: 0923161-N
Parameter: Iron (EPA 3010A)
ATS Project: NSK-AKS #H001-NSK
Report Date: 9/27/16

Results of QA Samples run concurrently with project samples

REPLICATE ANALYSIS

Sample	Replicate #1	Replicate #2	Mean	Relative Range (percent)
#H001-NSK L1 Sludge 8/9/16 Laboratory Duplicate	32 mg/L	30 mg/L	32 mg/L	6.3

SPIKES and/or QC CHECK SAMPLES

Sample/Analyte	Known Concentration	Spike Concentration	Analyzed Concentration	Recovery (percent)
#H001-NSK Laboratory Control Sample 9/23/16	<0.05 mg/L	2.0 mg/L	1.8 mg/L	89.5
#H001-NSK Grind Sludge 8/2/16 Matrix Spike	160 mg/L	20 mg/L	-	NA

BLANK ANALYSIS

Sample	Analyzed Concentration	QC Decision
#H001-NSK Laboratory Reagent Blank 9/23/16	<0.05 mg/L	Acceptable

Comments:

Calculations performed prior to rounding.
NA - Indicates not applicable due to inadequate spiking level.

Control Limits:

Spike Recoveries (75 - 125 %)
Laboratory Control Sample Recoveries (85 - 115 %)
Relative Range < or = 20%

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Quality Assurance / Quality Control
ICP/AES Summary

QC Batch Number: 0923161-N
Parameter: Iron (EPA 6010C)
ATS Project: NSK-AKS #H001-NSK
Report Date: 9/27/16

Results of QA Samples run concurrently with project samples

REPLICATE ANALYSIS

Sample	Replicate #1	Replicate #2	Mean	Relative Range (percent)
#Z999-001				
HO - Lind 9/20/16 Laboratory Duplicate	0.43 mg/L	0.43 mg/L	0.43 mg/L	0.6

SPIKES and/or QC CHECK SAMPLES

Sample/Analyte	Known Concentration	Spike Concentration	Analyzed Concentration	Recovery (percent)
#H001-NSK, #Z999-001, #Z999-NOT				
Initial Cal bration Verification Standard	<0.05 mg/L	2.0 mg/L	1.8 mg/L	90.6
Interference Check Standard	<0.05 mg/L	10 mg/L	9.9 mg/L	99.1
Cal bration Verification Standard	<0.05 mg/L	2.0 mg/L	1.8 mg/L	91.1
Cal bration Verification Standard	<0.05 mg/L	2.0 mg/L	1.9 mg/L	93.4
#Z999-001				
HO - Kauf 9/19/16 Matrix Spike	<0.05 mg/L	2.0 mg/L	2.2 mg/L	109.0
#H001-NSK, #Z999-001, #Z999-NOT				
Cal bration Verification Standard	<0.05 mg/L	2.0 mg/L	2.2 mg/L	108.2

BLANK ANALYSIS

Sample	Analyzed Concentration	QC Decision
#H001-NSK, #Z999-001, #Z999-NOT		
Continuing Calibration Blank	<0.05 mg/L	Acceptable
Continuing Calibration Blank	<0.05 mg/L	Acceptable
Continuing Calibration Blank	<0.05 mg/L	Acceptable

Comments:
Calculations performed prior to rounding.

Control Limits:
Initial Calibration Verification Recoveries (90 - 110 %)
Calibration Verification Recoveries (90 - 110 %)
Interference Check Recoveries (80 - 120 %)
Spike Recoveries (75 - 125 %)
Relative Range < or = 20%

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Quality Assurance / Quality Control
Digestion Batch Summary

QC Batch Number: 0923161-N
Parameter: Lead (EPA 3010A)
ATS Project: NSK-AKS #H001-NSK
Report Date: 9/27/16

Results of QA Samples run concurrently with project samples

REPLICATE ANALYSIS

Sample	Replicate #1	Replicate #2	Mean	Relative Range (percent)
#H001-NSK L1 Sludge 8/9/16 Laboratory Duplicate	<0.05 mg/L	<0.05 mg/L	<0.05 mg/L	nc

SPIKES and/or QC CHECK SAMPLES

Sample/Analyte	Known Concentration	Spike Concentration	Analyzed Concentration	Recovery (percent)
#H001-NSK Laboratory Control Sample 9/23/16	<0.05 mg/L	0.20 mg/L	0.22 mg/L	109.4
#H001-NSK Grind Sludge 8/2/16 Matrix Spike	<0.05 mg/L	0.20 mg/L	0.18 mg/L	89.2

BLANK ANALYSIS

Sample	Analyzed Concentration	QC Decision
#H001-NSK Laboratory Reagent Blank 9/23/16	<0.05 mg/L	Acceptable

Comments:
Calculations performed prior to rounding.
nc - Indicates not calculable.

Control Limits:
Spike Recoveries (75 - 125 %)
Laboratory Control Sample Recoveries (85 - 115 %)
Relative Range < or = 20%

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Quality Assurance / Quality Control
ICP/AES Summary

QC Batch Number: 0923161-N
Parameter: Lead (EPA 6010C)
ATS Project: NSK-AKS #H001-NSK
Report Date: 9/27/16

Results of QA Samples run concurrently with project samples

REPLICATE ANALYSIS

Sample	Replicate #1	Replicate #2	Mean	Relative Range (percent)
#Z999-001				
HO - Lind 9/20/16 Laboratory Duplicate	<0.05 mg/L	<0.05 mg/L	<0.05 mg/L	nc

SPIKES and/or QC CHECK SAMPLES

Sample/Analyte	Known Concentration	Spike Concentration	Analyzed Concentration	Recovery (percent)
#H001-NSK, #Z999-001, #Z999-NOT				
Initial Calibration Verification Standard	<0.05 mg/L	2.0 mg/L	1.8 mg/L	92.4
Interference Check Standard	<0.05 mg/L	1.0 mg/L	1.0 mg/L	100.1
Calibration Verification Standard	<0.05 mg/L	2.0 mg/L	1.8 mg/L	91.8
Calibration Verification Standard	<0.05 mg/L	2.0 mg/L	1.8 mg/L	89.7*
#Z999-001				
HO - Kauf 9/19/16 Matrix Spike	<0.05 mg/L	2.0 mg/L	2.0 mg/L	100.3
#H001-NSK, #Z999-001, #Z999-NOT				
Calibration Verification Standard	<0.05 mg/L	2.0 mg/L	2.0 mg/L	100.0

BLANK ANALYSIS

Sample	Analyzed Concentration	QC Decision
#H001-NSK, #Z999-001, #Z999-NOT		
Continuing Calibration Blank	<0.05 mg/L	Acceptable
Continuing Calibration Blank	<0.05 mg/L	Acceptable
Continuing Calibration Blank	<0.05 mg/L	Acceptable

Comments:

Calculations performed prior to rounding.
nc - Indicates not calculable.
* Outside standard control limits.

Control Limits:

Initial Calibration Verification Recoveries (90 - 110 %)
Calibration Verification Recoveries (90 - 110 %)
Interference Check Recoveries (80 - 120 %)
Spike Recoveries (75 - 125 %)
Relative Range < or = 20%

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Quality Assurance / Quality Control
Digestion Batch Summary

QC Batch Number: 0922162-N
Parameter: Mercury (EPA 7470A)
ATS Project: NSK-AKS #H001-NSK
Report Date: 9/27/16

Results of QA Samples run concurrently with project samples

REPLICATE ANALYSIS

Sample	Replicate #1	Replicate #2	Mean	Relative Range (percent)
#H001-NSK L1 Sludge 8/9/16 Laboratory Duplicate	<0.0005	<0.0005	<0.0005	nc

SPIKES and/or QC CHECK SAMPLES

Sample/Analyte	Known Concentration	Spike Concentration	Analyzed Concentration	Recovery (percent)
#H001-NSK Laboratory Control Sample 9/22/16	<0.0005 mg/L	0.0050 mg/L	0.0048 mg/L	96.2
#H001-NSK Grind Sludge 8/2/16 Matrix Spike	<0.0005 mg/L	0.0050 mg/L	0.0050 mg/L	99.8

BLANK ANALYSIS

Sample	Analyzed Concentration	QC Decision
#H001-NSK Laboratory Reagent Blank 9/22/16	<0.0005 mg/L	Acceptable

Comments:
Calculations performed prior to rounding.
nc - Indicates not calculable.

Control Limits:
Spike Recoveries (80 - 120 %)
Laboratory Control Sample Recoveries (85 - 115 %)
Relative Range < or = 10%

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Quality Assurance / Quality Control
CVAAS Summary

QC Batch Number: 0922162-N
Parameter: Mercury (EPA 7470A)
ATS Project: NSK-AKS #H001-NSK
Report Date: 9/27/16

Results of QA Samples run concurrently with project samples

REPLICATE ANALYSIS

Sample	Replicate #1	Replicate #2	Mean	Relative Range (percent)

SPIKES and/or QC CHECK SAMPLES

Sample/Analyte	Known Concentration	Spike Concentration	Analyzed Concentration	Recovery (percent)
#H001-NSK				
Initial Cal bration Verification Standard	<0.0005 mg/L	0.0040 mg/L	0.0037 mg/L	91.8
Cal bration Verification Standard	<0.0005 mg/L	0.0020 mg/L	0.0020 mg/L	99.0

BLANK ANALYSIS

Sample	Analyzed Concentration	QC Decision
#H001-NSK		
Continuing Calibration Blank	<0.0005 mg/L	Acceptable

Comments:
Calculations performed prior to rounding.

Control Limits:
Initial Calibration Verification Recoveries (90 - 110 %)
Calibration Verification Recoveries (90 - 110 %)

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Quality Assurance / Quality Control Digestion Batch Summary

QC Batch Number: 0923161-N
Parameter: Nickel (EPA 3010A)
ATS Project: NSK-AKS #H001-NSK
Report Date: 9/27/16

Results of QA Samples run concurrently with project samples

REPLICATE ANALYSIS

Sample	Replicate #1	Replicate #2	Mean	Relative Range (percent)
#H001-NSK L1 Sludge 8/9/16 Laboratory Duplicate	0.025 mg/L	0.020 mg/L	0.022 mg/L	22.2*

SPIKES and/or QC CHECK SAMPLES

Sample/Analyte	Known Concentration	Spike Concentration	Analyzed Concentration	Recovery (percent)
#H001-NSK Laboratory Control Sample 9/23/16	<0.005 mg/L	0.20 mg/L	0.21 mg/L	107.2
#H001-NSK Grind Sludge 8/2/16 Matrix Spike	0.088 mg/L	0.20 mg/L	0.29 mg/L	99.8

BLANK ANALYSIS

Sample	Analyzed Concentration	QC Decision
#H001-NSK Laboratory Reagent Blank 9/23/16	<0.005 mg/L	Acceptable

Comments:
Calculations performed prior to rounding.
*Outside standard control limits.

Control Limits:
Spike Recoveries (75 - 125 %)
Laboratory Control Sample Recoveries (85 - 115 %)
Relative Range < or = 20%

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Quality Assurance / Quality Control
ICP/AES Summary

QC Batch Number: 0923161-N
Parameter: Nickel (EPA 6010C)
ATS Project: NSK-AKS #H001-NSK
Report Date: 9/27/16

Results of QA Samples run concurrently with project samples

REPLICATE ANALYSIS

Sample	Replicate #1	Replicate #2	Mean	Relative Range (percent)
#Z999-001				
HO - Lind 9/20/16 Laboratory Duplicate	<0.005 mg/L	<0.005 mg/L	<0.005 mg/L	nc

SPIKES and/or QC CHECK SAMPLES

Sample/Analyte	Known Concentration	Spike Concentration	Analyzed Concentration	Recovery (percent)
#H001-NSK, #Z999-001, #Z999-NOT				
Initial Cal bration Verification Standard	<0.005 mg/L	2.0 mg/L	1.9 mg/L	95.1
Interference Check Standard	<0.005 mg/L	1.0 mg/L	1.0 mg/L	100.4
Cal bration Verification Standard	<0.005 mg/L	2.0 mg/L	1.9 mg/L	94.9
Cal bration Verification Standard	<0.005 mg/L	2.0 mg/L	1.8 mg/L	90.7
#Z999-001				
HO - Kauf 9/19/16 Matrix Spike	<0.005 mg/L	2.0 mg/L	2.1 mg/L	107.0
#H001-NSK, #Z999-001, #Z999-NOT				
Cal bration Verification Standard	<0.005 mg/L	2.0 mg/L	2.1 mg/L	103.5

BLANK ANALYSIS

Sample	Analyzed Concentration	QC Decision
#H001-NSK, #Z999-001, #Z999-NOT		
Continuing Calibration Blank	<0.005 mg/L	Acceptable
Continuing Calibration Blank	<0.005 mg/L	Acceptable
Continuing Calibration Blank	<0.005 mg/L	Acceptable

Comments:

Calculations performed prior to rounding.
nc - Indicates not calculable.

Control Limits:

Initial Calibration Verification Recoveries (90 - 110 %)
Calibration Verification Recoveries (90 - 110 %)
Interference Check Recoveries (80 - 120 %)
Spike Recoveries (75 - 125 %)
Relative Range < or = 20%

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Quality Assurance / Quality Control
Digestion Batch Summary

QC Batch Number: 0923161-N
Parameter: Selenium (EPA 3010A)
ATS Project: NSK-AKS #H001-NSK
Report Date: 9/27/16

Results of QA Samples run concurrently with project samples

REPLICATE ANALYSIS

Sample	Replicate #1	Replicate #2	Mean	Relative Range (percent)
#H001-NSK L1 Sludge 8/9/16 Laboratory Duplicate	<0.01 mg/L	<0.01 mg/L	<0.01 mg/L	nc

SPIKES and/or QC CHECK SAMPLES

Sample/Analyte	Known Concentration	Spike Concentration	Analyzed Concentration	Recovery (percent)
#H001-NSK Laboratory Control Sample 9/23/16	<0.01 mg/L	0.20 mg/L	0.22 mg/L	107.8
#H001-NSK Grind Sludge 8/2/16 Matrix Spike	<0.01 mg/L	0.20 mg/L	0.23 mg/L	116.6

BLANK ANALYSIS

Sample	Analyzed Concentration	QC Decision
#H001-NSK Laboratory Reagent Blank 9/23/16	<0.01 mg/L	Acceptable

Comments:
Calculations performed prior to rounding.
nc - Indicates not calculable.

Control Limits:
Spike Recoveries (75 - 125 %)
Laboratory Control Sample Recoveries (85 - 115 %)
Relative Range < or = 20%

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Quality Assurance / Quality Control
ICP/AES Summary

QC Batch Number: 0923161-N
Parameter: Selenium (EPA 6010C)
ATS Project: NSK-AKS #H001-NSK
Report Date: 9/27/16

Results of QA Samples run concurrently with project samples

REPLICATE ANALYSIS

Sample	Replicate #1	Replicate #2	Mean	Relative Range (percent)
#Z999-001				
HO - Lind 9/20/16 Laboratory Duplicate	<0.01 mg/L	<0.01 mg/L	<0.01 mg/L	nc

SPIKES and/or QC CHECK SAMPLES

Sample/Analyte	Known Concentration	Spike Concentration	Analyzed Concentration	Recovery (percent)
#H001-NSK, #Z999-001, #Z999-NOT				
Initial Cal bration Verification Standard	<0.01 mg/L	10 mg/L	9.4 mg/L	93.8
Interference Check Standard	<0.01 mg/L	1.0 mg/L	1.1 mg/L	108.7
Cal bration Verification Standard	<0.01 mg/L	10 mg/L	9.4 mg/L	93.9
Cal bration Verification Standard	<0.01 mg/L	10 mg/L	9.2 mg/L	92.1
#Z999-001				
HO - Kauf 9/19/16 Matrix Spike	<0.01 mg/L	10 mg/L	11 mg/L	109.5
#H001-NSK, #Z999-001, #Z999-NOT				
Cal bration Verification Standard	<0.01 mg/L	10 mg/L	10 mg/L	101.5

BLANK ANALYSIS

Sample	Analyzed Concentration	QC Decision
#H001-NSK, #Z999-001, #Z999-NOT		
Continuing Calibration Blank	<0.01 mg/L	Acceptable
Continuing Calibration Blank	<0.01 mg/L	Acceptable
Continuing Calibration Blank	<0.01 mg/L	Acceptable

Comments:

Calculations performed prior to rounding.
nc - Indicates not calculable.

Control Limits:

Initial Calibration Verification Recoveries (90 - 110 %)
Calibration Verification Recoveries (90 - 110 %)
Interference Check Recoveries (80 - 120 %)
Spike Recoveries (75 - 125 %)
Relative Range < or = 20%

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Quality Assurance / Quality Control
Digestion Batch Summary

QC Batch Number: 0923161-N
Parameter: Zinc (EPA 3010A)
ATS Project: NSK-AKS #H001-NSK
Report Date: 9/27/16

Results of QA Samples run concurrently with project samples

REPLICATE ANALYSIS

Sample	Replicate #1	Replicate #2	Mean	Relative Range (percent)
#H001-NSK L1 Sludge 8/9/16 Laboratory Duplicate	<0.05 mg/L	<0.05 mg/L	<0.05 mg/L	nc

SPIKES and/or QC CHECK SAMPLES

Sample/Analyte	Known Concentration	Spike Concentration	Analyzed Concentration	Recovery (percent)
#H001-NSK Laboratory Control Sample 9/23/16	<0.05 mg/L	0.20 mg/L	0.22 mg/L	109.1
#H001-NSK Grind Sludge 8/2/16 Matrix Spike	0.06 mg/L	0.20 mg/L	0.27 mg/L	106.4

BLANK ANALYSIS

Sample	Analyzed Concentration	QC Decision
#H001-NSK Laboratory Reagent Blank 9/23/16	<0.05 mg/L	Acceptable

Comments:
Calculations performed prior to rounding.
nc - Indicates not calculable.

Control Limits:
Spike Recoveries (75 - 125 %)
Laboratory Control Sample Recoveries (85 - 115 %)
Relative Range < or = 20%

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Quality Assurance / Quality Control
ICP/AES Summary

QC Batch Number: 0923161-N
Parameter: Zinc (EPA 6010C)
ATS Project: NSK-AKS #H001-NSK
Report Date: 9/27/16

Results of QA Samples run concurrently with project samples

REPLICATE ANALYSIS

Sample	Replicate #1	Replicate #2	Mean	Relative Range (percent)
#Z999-001				
HO - Lind 9/20/16 Laboratory Duplicate	<0.05 mg/L	<0.05 mg/L	<0.05 mg/L	nc

SPIKES and/or QC CHECK SAMPLES

Sample/Analyte	Known Concentration	Spike Concentration	Analyzed Concentration	Recovery (percent)
#H001-NSK, #Z999-001, #Z999-NOT				
Initial Cal bration Verification Standard	<0.05 mg/L	2.0 mg/L	1.8 mg/L	92.0
Interference Check Standard	<0.05 mg/L	1.0 mg/L	1.1 mg/L	106.9
Cal bration Verification Standard	<0.05 mg/L	2.0 mg/L	1.8 mg/L	91.8
Cal bration Verification Standard	<0.05 mg/L	2.0 mg/L	1.8 mg/L	87.7*
#Z999-001				
HO - Kauf 9/19/16 Matrix Spike	<0.05 mg/L	2.0 mg/L	1.8 mg/L	90.9
#H001-NSK, #Z999-001, #Z999-NOT				
Cal bration Verification Standard	<0.05 mg/L	2.0 mg/L	2.0 mg/L	101.4

BLANK ANALYSIS

Sample	Analyzed Concentration	QC Decision
#H001-NSK, #Z999-001, #Z999-NOT		
Continuing Calibration Blank	<0.05 mg/L	Acceptable
Continuing Calibration Blank	<0.05 mg/L	Acceptable
Continuing Calibration Blank	<0.05 mg/L	Acceptable

Comments:

Calculations performed prior to rounding.
nc - Indicates not calculable.
* Outside standard control limits.

Control Limits:

Initial Calibration Verification Recoveries (90 - 110 %)
Calibration Verification Recoveries (90 - 110 %)
Interference Check Recoveries (80 - 120 %)
Spike Recoveries (75 - 125 %)
Relative Range < or = 20%

290 South Wagner Road
Ann Arbor, Michigan 48103
Tel. 734/995-0995 Fax. 734/995-3731
Michigan Laboratory ID: 9604
Wisconsin Laboratory ID: 998321720

Quality Assurance / Quality Control
Extraction Batch Summary

QC Batch Number: 0923162-N
Parameter: Oil Content (EPA 9071B)
ATS Project: NSK-AKS #H001-NSK
Report Date: 9/27/16

Results of QA Samples run concurrently with project samples

REPLICATE ANALYSIS

Sample	Replicate #1	Replicate #2	Mean	Relative Range (percent)
#H001-NSK				
Grind Sludge 8/2/16	110,000 mg/kg	130,000 mg/kg	120,000 mg/kg	12.1
Grind Sludge 8/9/16	110,000 mg/kg	120,000 mg/kg	120,000 mg/kg	9.0
L1 Sludge 8/2/16	170,000 mg/kg	180,000 mg/kg	170,000 mg/kg	5.1
L1 Sludge 8/9/16	180,000 mg/kg	190,000 mg/kg	190,000 mg/kg	2.9

SPIKES and/or QC CHECK SAMPLES

Sample/Analyte	Known Concentration	Spike Concentration	Analyzed Concentration	Recovery (percent)

BLANK ANALYSIS

Sample	Analyzed Concentration	QC Decision
#H001-NSK		
Extraction Blank 9/23/16	<500 mg/kg	Acceptable

Comments:
Calculations performed prior to rounding.

Control Limits:
Relative Range < or = 20%

290 South Wagner Road
Ann Arbor, Michigan 48103
Tel. 734/995-0995 Fax.
734/995-3731
Michigan Laboratory ID: 9604
Wisconsin Laboratory ID:

CHAIN OF CUSTODY RECORD

PROJECT ID / NUMBER	LABORATORY INFORMATION
17001-NSK	Ann Arbor Technical Services, Inc.

SAMPLE CUSTODIAN (Print & Signature): Terry Kinman

SHIPPING INFORMATION: SHIPPER (Check one) / TRACKING NUMBER(S) (If applicable)

Date	8/15/16	Fed Ex		UPS	X	DHL		Courier		Tracking Number	
Date		Fed Ex		UPS		DHL		Courier		Tracking Number	
Date		Fed Ex		UPS		DHL		Courier		Tracking Number	
Date		Fed Ex		UPS		DHL		Courier		Tracking Number	

RELINQUISHED BY (Print & Signature)	DATE / TIME	RECEIVED BY (Print & Signature)	DATE / TIME
Terry Kinman	8/11/16 12:00	Mark Ahlborg via UPS	8/15/16 12:30pm MTD
RELINQUISHED BY (Print & Signature)	DATE / TIME	RECEIVED BY (Print & Signature)	DATE / TIME

RELINQUISHED BY (Print & Signature)	DATE / TIME	RECEIVED BY (Print & Signature)	DATE / TIME
RELINQUISHED BY (Print & Signature)	DATE / TIME	RECEIVED BY (Print & Signature)	DATE / TIME

COMMENTS (Preservation, etc.)

LINE NO.	BAR CODE	DATE	TIME	COMP.	GRAB	SAMPLE IDENTIFICATION	NO. OF CONTAINERS	PRIORITY NUMBER	ANALYSIS	MATRIX Indicate Soil/Water/Air Sediment/Sludge Extract
1.	Grind Sample	8/2/2016	12:00pm			Sludge	1			Sludge
2.	L1 Sample	8/2/2016	12:00pm			Sludge	1			
3.	Grind Sample	8/9/2016	12:00pm			Sludge	1			MTD
4.	L1 Sample	8/9/2016	12:00pm			Sludge	1			
5.										
6.										
7.										
8.										
9.										
10.										
11.										
12.										
13.										
14.										
15.										
16.										
17.										
18.										
19.										
20.										

Appendix 7

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Historic TCLP Chromium Exceedances Table

Historic TCLP Chromium Exceedances Table

Lab Identification	Sample ID	Date Collected	Date Received	Total or TCLP	Chromium Results 6010/6020A Result via 3010/3005A	Unit	Reporting Limit	Lab	SDG #	Comments / Other
Heritage/Pace Laboratories	2	12/12/13	12/13/13	TCLP Cr	7.5	mg/L	0.05	Pace	67065	
Heritage/Pace Laboratories	3	12/12/13	12/13/13	TCLP Cr	5.0	mg/L	0.05	Pace	67065	
Heritage/Pace Laboratories	5	12/12/13	12/13/13	TCLP Cr	8.1	mg/L	0.05	Pace	67065	
Fibertec Environmental Services	L1 Sludge	7/17/14	7/24/14	TCLP Cr	5.0	mg/L	1	Fibertec	63378	
Fibertec Environmental Services	L1 Sludge	9/17/14	9/22/14	TCLP Cr	7.7	mg/L	1	Fibertec	64297	