

**BMI COMPLEX**  
**CAMU ACID VAPOR AIR MONITORING SUMMARY**  
**REPORT**

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## TABLE OF CONTENTS

<b>1.0</b>	<b>INTRODUCTION .....</b>	<b>1</b>
2.0	SITE SELECTION AND LOCATIONS.....	2
2.1	RATIONALE FOR CHEMICAL PARAMETERS .....	2
2.2	SAMPLING EQUIPMENT CALIBRATION AND OPERATION .....	2
2.3	SAMPLE NOMENCLATURE .....	3
2.4	SAMPLE PARAMETERS.....	3
2.5	METEOROLOGICAL CONDITIONS DURING SAMPLE EVENTS .....	5
<b>3.0</b>	<b>ANALYTICAL RESULTS.....</b>	<b>6</b>
3.1	INORGANIC ACID COMPOUND RESULTS .....	6
<b>4.0</b>	<b>REFERENCES.....</b>	<b>9</b>

## TABLES

TABLE 1	SAMPLE COLLECTION AND ANALYSIS SPECIFICATIONS FOR CAMU INORGANIC ACID AIR SAMPLING DECEMBER 17 – 18, 2008 HENDERSON, NEVADA
TABLE 2	METEOROLOGICAL DATA RECORD DURING CAMU INORGANIC ACID AIR SAMPLING DECEMBER 17 – 18, 2008 HENDERSON, NEVADA
TABLE 3	SUMMARY OF DETECTED COMPOUNDS AND SCREENING CRITERIA CAMU INORGANIC ACID AIR SAMPLING DECEMBER 17 – 18, 2008 HENDERSON, NEVADA

## APPENDICES

A	FIELD DOCUMENTATION FORMS
B	LABORATORY ANALYTICAL REPORT
C	ELECTRONIC COPY OF REPORT AND APPENDICES

## 1.0 INTRODUCTION

In response to a request from the Nevada Division of Environmental Protection (NDEP) Basic Remediation Company (BRC) retained Tetra Tech EM Inc. (Tetra Tech) to conduct ambient air sampling for inorganic acids (acids) at the Corrective Action Management Unit (CAMU) Area located in Henderson, Nevada.

Based on guidance and input from NDEP and BRC, Tetra Tech set up two temporary air-monitoring stations along the southwestern portion of the CAMU Area to collect ambient air samples from December 17, 2008 – December 18, 2008. Air monitoring equipment was set up at each of the stations to collect ambient air samples over an approximate 3-hour (hr) period. Air monitoring sampling equipment consisted of the following:

- One battery operated SKC Model 224-PCXR8 (SKC) low-volume sample pump at each station designed to collect a time-weighted average (TWA) 3-hr sample for analysis of inorganic acids (acids) contained in the National Institute for Occupational Safety and Health (NIOSH) analytical method 7903.
- One SKC Model 226-10-03 (SKC) silica gel sorbent tube at each station outfitted with a low-volume sample pump designed to collect a TWA 3-hr sample for analysis of inorganic acids (Acids) contained in NIOSH analytical method 7903.

This report summarizes the rationale to initiate sampling, sample collection procedures, analyses methodology, and analytical data collected between December 17, 2008 and December 18, 2008 along the southwestern portion of CAMU site. Sampling locations, summary of activities, and meteorological data are presented in Section 2.0. The analytical data results are presented in Section 3.0. Field documentation forms are provided in Appendix A; laboratory analytical and data validation reports are provided in Appendix B. An electronic copy of this report and appendices are provided in Appendix C

## **2.0 SITE SELECTION AND LOCATIONS**

Tetra Tech personnel selected three air sample locations at the CAMU site based on input from NDEP and field personnel observations. Samples were collected at sites CAMU-A1 and CAMU-A2 on December 17, 2008 and were selected based on NDEP input where the intensity of the odors seemed to be the strongest. Additional samples were collected at sites CAMU-A1 and CAMU-A3 on December 18, 2008. A short description of the sample sites is provided below:

- Site CAMU-A1: Adjacent to southern property boundary
- Site CAMU-A2: Inside the southeast corner of CAMU Phase II Pit
- Site CAMU-A3: On elevated berm east of CAMU Phase II Pit

SKC silica gel sorbent tubes samplers were established at these locations and samples were collected using methods described in the following sections.

### **2.1 RATIONALE FOR CHEMICAL PARAMETERS**

Sample and analytical parameters were selected based on nature of the odor, known sources of chemicals, and rapidly deployable portable sampling equipment and corresponding analytical methods. Based on the information about the chemical odors, NDEP and Tetra Tech determined that NIOSH Analytical Method 7903 would support the sampling protocols and chemical parameters for this sampling effort. The field sampling equipment associated with these NIOSH methods were readily available and deployable.

### **2.2 SAMPLING EQUIPMENT CALIBRATION AND OPERATION**

Tetra Tech assembled and calibrated the SKC air samplers and SKC silica gel sorbent glass tubes prior to sample collection. All samplers were calibrated using National Institute of Standards and Testing (NIST) or other authoritative reference certified equipment. To ensure proper sample collection, SKC sample pumps were ran at approximately 0.4 liters per minute.

The initial calibrations on the SKC samplers only required minor adjustments to set correct flow rates, but no major adjustments or equipment failures were observed. All equipment was checked again before sample collection began to ensure the correct flow rate(s) and timer operation.

All SKC 226-10-03 silica gel sorbent tube samplers were powered by portable battery operated SKC Model 224-PCXR8 (SKC) low-volume sample pumps for each sample event. Monitoring at each sample event was performed continuously for a duration of approximately 3-hours. At the beginning of each sample event, Tetra Tech transported the sample pumps and air sampling equipment to each sample station. Samplers were set up and programmed at each station prior to sampling. Samplers were manually started and stopped and subsequently removed after the completion of each sample event. All sample parameters were documented on CAMU field documentation forms before and after sample event.

### 2.3 SAMPLE NOMENCLATURE

All samples collected at each of the two CAMU air sample locations were given a sample ID according to the sample location and sample date as follows:

- CAMU-A1-121708 (where A1 denotes site #1 for acid sampling and 121708 denotes that sample was collected on December 17, 2008)

### 2.4 SAMPLE PARAMETERS

Air samples were collected continuously for approximately three hours at the established monitoring stations for the analysis of acids. The sampling and analysis procedures are summarized below. Upon completion of both sample events, the samples and associated information was recorded on chain-of-custody (COC) sheets and submitted to DataChem Laboratories, Inc (DataChem) for analysis. The COC included the sample identification number, sample location, sample date, sample volume, and the required analysis.

At each sampling location, SKC 226-10-03 silica gel sorbent tube samplers were used to collect acid samples for the analysis of Hydrofluoric acid (HF), Hydrochloric acid (HCL), Hydrobromic acid (HBr), Nitric acid (HNO<sub>3</sub>), Phosphoric acid (H<sub>3</sub>PO<sub>4</sub>), and Sulfuric acid (H<sub>2</sub>SO<sub>4</sub>) using NIOSH Method 7903. The low-volume samplers draw approximately 0.4 liter per minute (l/min) of ambient air into an 11 centimeter (cm) by 7 millimeter (mm) glass sorbent cartridge tube containing a 400 milligram (mg) front section and 200 mg backup section of washed silica gel, flame-sealed ends with plastic caps. Acids are extracted from the sorbent cartridge through desorption of sodium bicarbonate and sodium carbonate and determined by Ion chromatography (IC).

All acid samples were submitted with COC form(s) to DataChem for analysis. A summary of sample collection and sample handling procedures is provided in Table 1.

**TABLE 1**

**SAMPLE COLLECTION AND ANALYSIS SPECIFICATIONS FOR CAMU INORGANIC ACID  
AIR SAMPLING DECEMBER 17 – 18, 2008  
HENDERSON, NEVADA**

<b>Analytical Parameter</b>	<b>Equipment Manufacturer/ Model</b>	<b>Sample Media</b>	<b>Sample Frequency/ Sample Events</b>	<b>Sample Handling Temperature/ hold time</b>	<b>Laboratory/ Analytical Method</b>
Hydrofluoric acid	SKC - Model 224-PCXR8 Low Volume Sample Pump	SKC 226-10-03 Silica gel sorbent glass tube	3-hr cont. samples at 2 locations/2 events	Room Temperature/within 3 weeks of collection	DataChem Laboratories Inc./NIOSH 7309
Hydrochloric acid	SKC - Model 224-PCXR8 Low Volume Sample Pump	SKC 226-10-03 Silica gel sorbent glass tube	3-hr cont. samples at 2 locations/2 events	Room Temperature/within 3 weeks of collection	DataChem Laboratories Inc./NIOSH 7309
Hydrobromic acid	SKC - Model 224-PCXR8 Low Volume Sample Pump	SKC 226-10-03 Silica gel sorbent glass tube	3-hr cont. samples at 2 locations/2 events	Room Temperature/within 3 weeks of collection	DataChem Laboratories Inc./NIOSH 7309
Nitric acid	SKC - Model 224-PCXR8 Low Volume Sample Pump	SKC 226-10-03 Silica gel sorbent glass tube	3-hr cont. samples at 2 locations/2 events	Room Temperature/within 3 weeks of collection	DataChem Laboratories Inc./NIOSH 7309
Phosphoric acid	SKC - Model 224-PCXR8 Low Volume Sample Pump	SKC 226-10-03 Silica gel sorbent glass tube	3-hr cont. samples at 2 locations/2 events	Room Temperature/within 3 weeks of collection	DataChem Laboratories Inc./NIOSH 7309
Sulfuric acid	SKC - Model 224-PCXR8 Low Volume Sample Pump	SKC 226-10-03 Silica gel sorbent glass tube	3-hr cont. samples at 2 locations/2 events	Room Temperature/within 3 weeks of collection	DataChem Laboratories Inc./NIOSH 7309

Notes:

cont. continuous  
hr hour

## 2.5 METEOROLOGICAL CONDITIONS DURING SAMPLE EVENTS

The meteorological parameters recorded during the CAMU sampling may provide insight to the site conditions during sample collection. The general weather conditions during the two sampling events were recorded on the field documentation forms. The weather on December 17, 2008 was recorded as snow and rain with a temperature of about 35 degrees Fahrenheit and light winds. The weather on December 18, 2008 was recorded as sunny with a temperature of about 40 degrees Fahrenheit with light winds.

On August 6, 2008 Tetra Tech installed and currently operates a meteorological station at the entrance to the Eastside area. Meteorological data was recorded for duration of the two sample events and the prevailing wind direction was generally from the southwest and southeast. A summary of meteorological data during the sample events is present in Table 2.

**TABLE 2**

**METEOROLOGICAL DATA RECORD DURING CAMU INORGANIC ACID AIR SAMPLING  
DECEMBER 17 – 18, 2008  
HENDERSON, NEVADA**

<b>Date/Time</b>	<b>Average Wind Speed (meters per second)</b>	<b>Average Wind Direction-Blowing from (degrees)</b>	<b>Average Temperature (degrees Celsius)</b>	<b>Average Humidity (percent)</b>
December 17, 2008 12:00PM – 3:00PM	1.6	201.2	2.9	73.7
December 18, 2008 12:00PM – 3:00PM	1.8	158.3	7.1	62.2

### 3.0 ANALYTICAL RESULTS

All sample data was compared to the National Institute for Occupational Safety and Health (NIOSH) Relative Exposure Limits (RELs) and Occupational Safety and Health Administration (OSHA) Permissible Exposure Limits (PELs) workplace exposure criteria (September 2005) to determine if ambient concentrations exceeded the REL or PEL criteria. None of the chemicals detected during sampling exceeded either criterion.

A summary of analytical results for each subset of chemical compounds is provided below.

#### 3.1 INORGANIC ACID COMPOUND RESULTS

HCL, HNO<sub>3</sub>, and H<sub>2</sub>SO<sub>4</sub> were detected in sample results at very low concentrations. HF, HBr, and H<sub>3</sub>PO<sub>4</sub>, were not detected in any samples. A summary of detected compounds is provided below:

- HCL concentrations of 0.0098 parts per million (ppm) and 0.0091 ppm were detected in CAMU-A1-121708 and CAMU-A2-121708 samples collected on December 17, 2008
- A HNO<sub>3</sub> concentration of 0.0040 ppm was detected in the CAMU-A2-121708 sample collected on December 17, 2008; However, HNO<sub>3</sub> was not detected in the CAMU-A1-121708 sample collected on December 17, 2008.
- A H<sub>2</sub>SO<sub>4</sub> concentration of 0.032 ppm was detected in the CAMU-A1-121708 sample collected on December 17, 2008; However, H<sub>2</sub>SO<sub>4</sub> was not detected in the CAMU-A2-121708 sample collected on December 17, 2008.
- A HNO<sub>3</sub> concentration of 0.0038 ppm was detected in the CAMU-A3-121808 sample collected on December 18, 2008; However, HNO<sub>3</sub> was not detected in the CAMU-A1-121808 sample collected on December 18, 2008.

All detected acid concentrations were well below the REL or PEL screening criteria. A complete summary of all results are presented in Appendix B and a summary of detected compounds and screening criteria is presented in Table 3.



**TABLE 3**  
**SUMMARY OF DETECTED COMPOUNDS AND SCREENING CRITERIA**  
**CAMU INORGANIC ACID AIR SAMPLING DECEMBER 17 – 18, 2008**  
**HENDERSON, NEVADA**

Chemical Compound	Collection and Analytical Method	Maximum Concentration	Lower of NIOSH REL <sub>1</sub> or OSHA PEL <sub>2</sub>	REL or PEL Exceeded (Yes/No)
Hydrofluoric acid	SKC 226-10-03 silica gel sorbent tube/ NIOSH 7903	Below reporting limit (RL) of 0.53 µg/sample	TWA 3 ppm (2.5 mg/m <sup>3</sup> )	No
Hydrochloric acid	SKC 226-10-03 silica gel sorbent tube/ NIOSH 7903	0.0098 ppm (0.015 mg/m <sup>3</sup> )	C 5 ppm (7 mg/m <sup>3</sup> )	No
Hydrobromic acid	SKC 226-10-03 silica gel sorbent tube/ NIOSH 7903	Below RL of 0.51 µg/sample	TWA/Ceiling 3 ppm (10 mg/m <sup>3</sup> )	No
Nitric acid	SKC 226-10-03 silica gel sorbent tube/ NIOSH 7903	0.0040 ppm (0.010 mg/m <sup>3</sup> )	TWA 2 ppm (5mg/m <sup>3</sup> )	No
Phosphoric acid	SKC 226-10-03 silica gel sorbent tube/ NIOSH 7903	Below RL of 0.51 µg/sample	TWA 1 mg/m <sup>3</sup>	No
Sulfuric acid	SKC 226-10-03 silica gel sorbent tube/ NIOSH 7903	0.032 ppm (0.13 mg/m <sup>3</sup> )	TWA 1 mg/m <sup>3</sup>	No

Notes:

PEL Permissible Exposure Limit  
 STEL Short Term Exposure Limit  
 NIOSH National Institute for Occupational Safety and Health  
 OSHA Occupational Safety and Health Administration  
 REL Relative Exposure Limit  
 µg micrograms  
 mg milligrams

**TABLE 3 (cont.)**

m<sup>3</sup>            cubic meter  
ppm           parts per million  
TWA           Time Weighted Average

<sup>1</sup>            National Institute for Occupational Safety and Health (NIOSH) relative exposure limits (RELs) are from the Department of Health and Human Services (DHHS) NIOSH Publication No. 2005-149 (September 2005).

<sup>2</sup>            Occupational Safety and Health Administration (OSHA) permissible exposure limits (PELs) are from Tables z-1 and z 2 of 29 CFR 1910.1000. The values given are 8-hour time weighed averages (TWAs) in ppm and/or mg/m<sup>3</sup>. A (C) designation denotes a ceiling limit value.

#### 4.0 REFERENCES

National Institute for Occupational Safety and Health (NIOSH). Method No. 7903 Acids, Inorganic. NIOSH Manual of Analytical Methods (NMAM®), 4th ed. DHHS (NIOSH) Publication 94-113 (August, 1994), 1st Supplement Publication 96-135, 2nd Supplement Publication 98-119, 3rd Supplement 2003-154.

Occupational Safety and Health Administration (OSHA) permissible exposure limits, Tables Z-1 and Z-2 of 29 CFR 1910.1000. Accessed January 5, 2008 at <http://www.osha.gov>

**APPENDIX A**

**FIELD DOCUMENTATION FORMS**

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**APPENDIX B**

**LABORATORY ANALYTICAL REPORT**

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## **APPENDIX C**

### **ELECTRONIC COPY OF REPORT AND APPENDICES**