DRA-34. HUMIDITY CELL MINERALOGY AND CHARACTERIZATION

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(reviewed by Ed Trujillo)

1. STATEMENT OF THE PROBLEM

What are the mineralogy and chemistry of the samples used for the humidity (weathering) cell experiments and how did the mineralogy and chemistry change after the experiments were completed? The purpose of this DRA is to characterize the three sets of humidity cell samples (Robertson GeoConsultants, Golder Associates, and University of Utah, UU) in terms of total mineral content, clay mineralogy, degree of alteration, whole rock major and trace element chemistry, paste pH, and paste conductivity of samples before placement in the humidity cell tests and after the humidity cell tests for the UU samples. A total of 22 samples were examined.

2. PREVIOUS WORK

Humidity or weathering cell experiments are kinetic or accelerated weathering tests, which attempt to mimic natural oxidation reactions. The samples are subjected to dissolution and the results can be used to estimate the potential quality of drainage from the material and to estimate the rates of mineral oxidation and dissolution (White and Lapakko, 2000; Lapakko, 2002) and the experimental procedures are standardized by the ASTM (2000, 2007). These tests examine the impact of different variables (i.e. parameters) on the potential to generate acid from various materials. Variables include temperature, particle size, bacteria, airflow, leachant volume, air humidity, effluent volume, temperature, and percentage of water removed from the leached sample (Pool and Balderrama, 1994). These tests generally accelerate the weathering conditions faster and beyond that observed in the field and are subject to interpretation. The effects of weathering in the humidity cell tests can be observed more quickly in these tests than in the field. Detailed mineralogical analysis and description of the leached solids are important for understanding the effects of the test conditions on weathering of the materials.

3. TECHNICAL APPROACH

Sample collection

Four different types of samples were collected in order to select samples for the humidity cell experiments:

- Samples of the rock-pile material (5 ft channel or selected layers)
- Samples of colluvium, weathered bedrock, alteration scar, and debris flows
- Samples collected from test pits throughout the rock piles
- Outcrop samples of unweathered (or least weathered) igneous rocks representative of the mined rock (overburden).

The collected samples from the rock piles consisted of a heterogeneous mixture of rock fragments ranging in size from boulders (0.5 m) to <1 mm in diameter within a fine-grained soil matrix. Most rock fragments exhibit hydrothermal alteration before mining occurred and could have undergone oxidization and weathering since emplacement in the rock pile.

Sample selection

Approximately 70 samples were collected and analyzed for major and trace element geochemistry, especially S and SO_4, or total S, in order to have a complete suite of samples to select for the humidity cells experiments. Many of these samples also were used for other purposes in the project. The final selection of samples (Fig. 1) was based upon:

- A range of pyrite and total S distribution
- A range of rock types, alteration assemblages, and types of samples (outcrop, rock pile)
- A range of weathering intensities (weathered, unweathered, alteration scar)
- Sufficient sample size for humidity cells and characterization (generally one or more 5-gallon buckets).

Three sets of samples were used in the humidity cell tests and are characterized in this report; Robertson GeoConsultants Inc. (RGC), Golder Associates (Golder), and University of Utah (UU) samples (Fig. 1). In phase 1, the existing humidity cell data for six cells contained in Robertson GeoConsultants Inc. (2003) was used to calibrate the geochemical model. One of the problems in using these data to calibrate the geochemical model is that an extensive mineralogical analysis of the various rock types used for the humidity cells was not done. This problem makes model calibration difficult because a quantitative analysis of the actual rock particles used in the testing for our model is needed and none of the original sample material remained for mineralogical testing. However, the NMIMT team was able to analyze samples that are very close to those used in the Robertson study and the results are presented in this DRA and in McLemore et al. (2008). Two samples were chosen from test plots in the rock-pile material for the Golder humidity cell tests and these samples were also characterized in this report.

Samples for the UU humidity cell tests were selected based on differences in lithology and total sulfur content. The humidity cell experiments will be used to model the pH, temperature, and availabilities of oxygen and water at various locations within the pile. This model will allow prediction of mineral dissolution rates at specific locations within the rock pile given the spatial variation of composition within the pile. Therefore, the compositional variables and the effects of pH and temperature are of primary importance for the humidity cell testing. Key rock characteristics are the pyrite and Ca/Mg carbonate mineral surface area exposure and the extent of oxide coatings on the pyrite. Two lithologies were tested; a fresh and a weathered example of each lithology were tested, with weathering determined based on visual observation. Four fresh rhyolite and four fresh andesite samples and three weathered rhyolite and three weathered andesite samples, each with varying amounts of pyrite were selected. Choosing samples with varying pyrite concentration proved difficult because only total sulfur was measured initially and, in general, the amount of pyrite in the Goathill North samples is generally low. A sample of crushed quartz with the same particle size distribution as the other samples was used as a control in the humidity cells experiments.

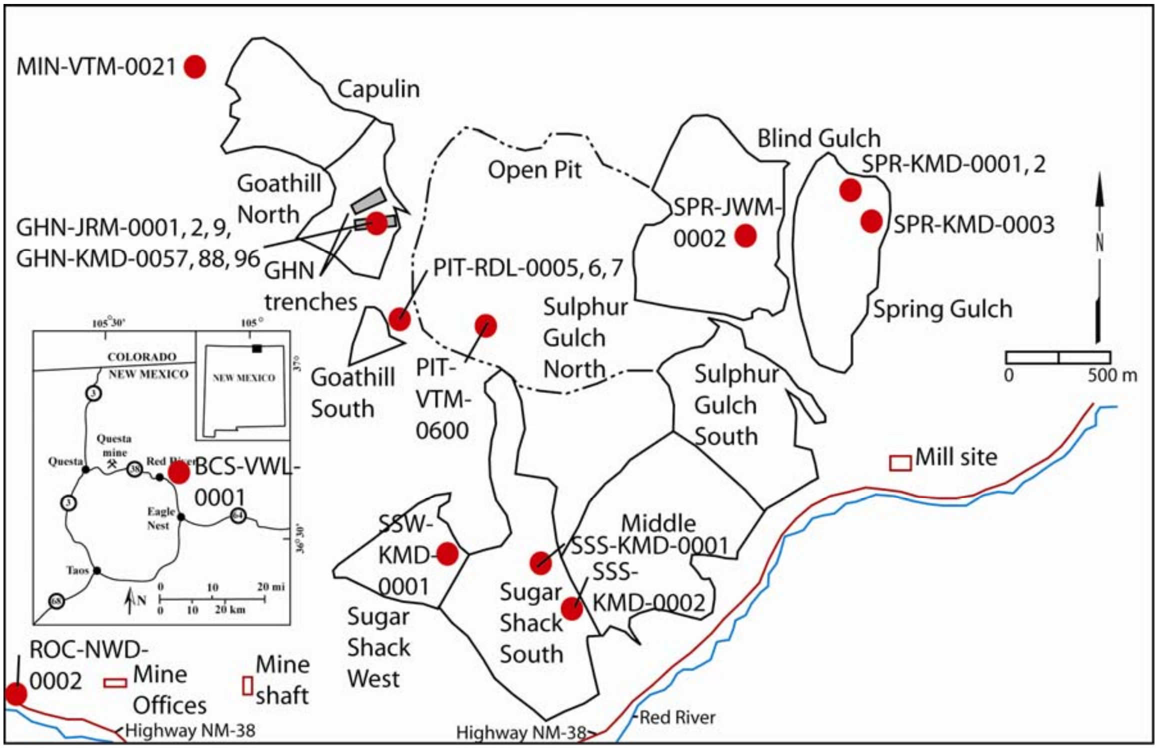


FIGURE 1. Location of humidity cell samples.

Sample preparation and analytical procedures

Laboratory analyses are summarized in Figure 2. Samples were petrographically analyzed using a binocular microscope. Analytical procedures are described in the project SOPs and McLemore et al. (2008); a more detailed discussion of the procedure is discussed in SOP 24. Sample textures were examined using electron microprobe techniques. For each analysis of the selected UU humidity cell samples, the original sample that went into the humidity cells (sample designation -92) and the top and bottom samples collected from the humidity cell after the tests were completed (sample designations -33 through -48) were analyzed together for comparison purposes. Descriptions are in McLemore et al. (2008) and summarized in this DRA.

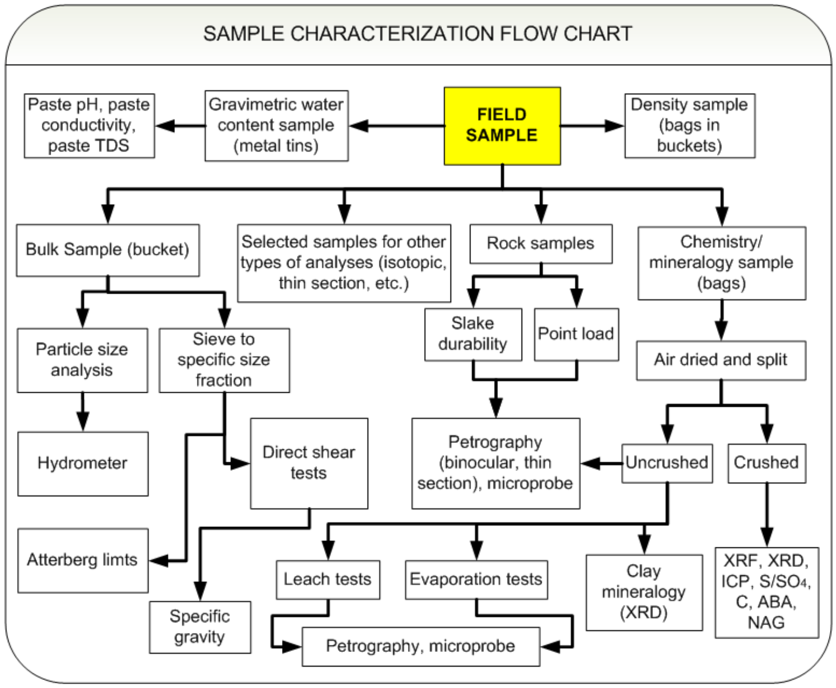


FIGURE 2. Flow chart showing analyses of selected samples. Not all analyses are performed on every sample. Bucket (5 gallons), metal tin, and bags (quart to gallon) refers to size of sample collected. XRF–X-ray fluorescence analyses, XRD–X-ray diffraction analysis, ICP–Induced-coupled plasma spectrographic analysis, NAG–net acid producing tests, ABA–acid base accounting tests. Specific details describing the sample preparation are in the project SOPs and summarized in DRA-0.

Mineralogical analysis

Mineralogical data is obtained from several different techniques (DRA-0, 5), including:

- Petrographic analysis of a bulk grab sub-sample using a binocular microscope
- Petrographic analysis of thin sections of the rock fragments using a petrographic microscope (including both transmitted- and reflected-light microscopy)
- Electron microprobe analysis of both fine-grained soil matrix and rock fragments
- Clay mineral determination of a bulk sample split using clay separation techniques and X-ray diffraction analysis (Moore and Reynolds, 1989; Hall, 2004)
- Rietveld analysis of heavy mineral separates (Oerter et al., 2007)
- Other methods of determining mineralogy (spectral analysis, X-ray diffraction, fizz test).

Quantitative mineralogy (observed mineralogy) was calculated using the modified ModAn bulk mineralogy method (McLemore et al., 2009). Geochemical data used in this model were collected with X-ray fluorescence (major elements), infrared detection of vaporized sample (total carbon and total sulfur), and gravimetric analysis (sulfate). The data were input into ModAn, a program developed for estimating mineral abundances using geochemical data (Paktunc, 1998, 2001). Since ModAn is unable to model sulfate minerals, gypsum, jarosite and carbonates were calculated using the total carbon and sulfate geochemical data. The revised oxide composition of each sample was then imported into ModAn for mineralogical modeling. The user must consider the lithology of the sample, alteration type and clay mineralogy data when assessing the results. Paktunc (1998, 2001) discusses the program at length.

4. CONCEPTUAL MODEL

Petrographic characterization of the sample performed prior to the humidity cell tests provides baseline mineralogy necessary for the predictive model. After the humidity cells tests are completed, characterization of the new, weathered samples will determine the change in mineralogy and chemistry. Only samples from the UU cells were available for characterization after the humidity cell tests were completed.

5. STATUS OF COMPONENT INVESTIGATION

Table 1 is a summary of the location and descriptions of humidity cell samples. Chemical and mineralogical analyses are in Appendix 1 and McLemore et al. (2008).

TABLE 1. Location and descriptions of samples used in the humidity cells tests. Three sets of samples of the humidity cell tests were by University of Utah (UU) samples (first 15 samples), Robertson Geoconsultants, Inc. (RGC) (last 8 samples), and splits of the Golder humidity cells samples (middle 2 samples). Detailed descriptions and chemical and mineralogical data of humidity cell samples are in McLemore et al. (2008, appendix 1). The two Golder samples SPR-OTH-0001 were composite samples from test plots from Spring Gulch rock pile and the exact locations are unknown.

Sample	unit	UTM easting (m)	UTM northing (m)	Elevation (ft)	Depth (ft)	Actual hole identification number	Correlates with sample identification number
UU samples							
BCS-VWL-0004	scar	466549	4065237	10340	0		
GHN-JRM-0001	Unit J	453642.2	4062137	9602			
GHN-JRM-0002	Unit N	453642.4	4062137	9601			
GHN-JRM-0009	Unit J	453634.2	406123	9585.8			
GHN-KMD-0057	Unit O	453695.8	4062140	9694			
GHN-KMD-0088	Unit O	453657.4	4062127	9635.4			
GHN-KMD-0096	Unit J	453658.4	4062119	9640.3			
MIN-VTM-0021	andesite	453817	4062418	9968	0		
PIT-RDL-0005	rhyolite	453822	4061505	9912	0		
PIT-RDL-0006	rhyolite	453822	4061588	9916	0		
PIT-RDL-0007	rhyolite	453822	4061588	9916	0		
PIT-VTM-0600	andesite	454215	4061522	9476	0		
ROC-NWD-0002	rhyolite	451697	4060400	8023.5	0		
SPR-JWM-0002	andesite	455254	4062384	9319	0		
RGC humidity cells							
SPR-KMD-0001		455795	4062171	9043.4	5-10	MMW-40A	WRD 1 (5-10 ft), cell 1
SPR-KMD-0002		455795	4062171	8998.4	50-55	MMW-40A	WRD 1 (50-55ft), cell 2
SPR-KMD-0003		455838	4062293	9017.7	45-50	WRD-20	WRD 2 (55-60ft), cell 3
SSS-KMD-0001		454181	4060503	9263	0-5	WRD-5	WRD 5 (5-10ft),

Sample	unit	UTM easting (m)	UTM northing (m)	Elevation (ft)	Depth (ft)	Actual hole identification number	Correlates with sample identification number
							cell 5
SSS-KMD-0002		45424.8	4060204	8692.3	25-30	WRD-3	WRD 3 (20-25ft), cell 4
SSW-KMD-0001		453872.1	4060686	9372.5	34-39	SI-1	WRD 6 (30-35 ft), cell 6
Golder humidity cells							
SPR-OTH-0001		unknown	unknown	unknown	surface		
SPR-OTH-0002		unknown	unknown	unknown	surface		

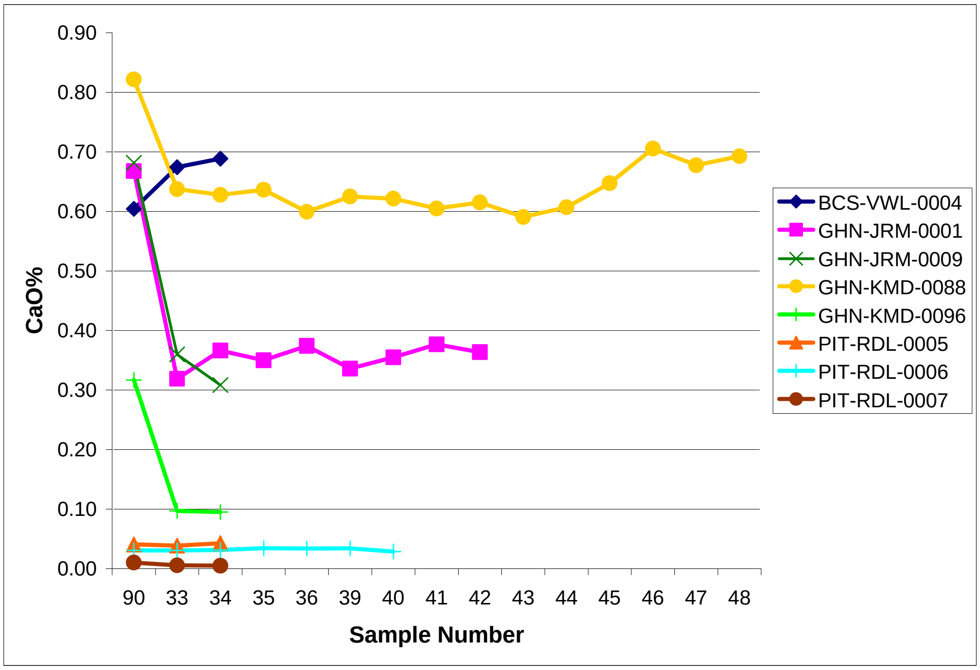
Sample	rhyolite (Amaila Tuff) %	andesite %	intrusive %	QSP %	propylitic %	argillic %	SWI	QMWI
UU samples								
BCS-VWL-0004		100		55	5		4	4
GHN-JRM-0001		100		90	2		4	4
GHN-JRM-0002		98	2	70	7		2	6
GHN-JRM-0009		99		80	7	1	4	1
GHN-KMD-0057		100		15	40		2	0
GHN-KMD-0088	100			60	10		2	1
GHN-KMD-0096	100	0		70			4	6
MIN-VTM-0021		100		70			3	0
PIT-RDL-0005	98		2	65			3	6
PIT-RDL-0006	100			65			4	0
PIT-RDL-0007	100						4	1
PIT-VTM-0600		100			10		2	4
ROC-NWD-0002	100			20	5		1	1
SPR-JWM-0002		100		20	5		2	4
RGC humidity cells								
SPR-KMD-0001	50	50		50	2		2	4
SPR-KMD-0002	10	90		15	2		2	1
SPR-KMD-0003	0	40	60	65		3	2	1
SSS-KMD-0001	30	50	20	40	5		2	4
SSS-KMD-0002	0	90	10	35			2	4
SSW-KMD-0001	10	90		15	2		2	1
Golder humidity cells								
SPR-OTH-0001		50	50	55	7	3	2	4
SPR-OTH-0002	5	55	40	55	6	3	2	1

6. RELIABILITY ANALYSIS

The chemical analyses are accurate to within ±5% as determined by duplicate and triplicate analyses and comparison to known internal standards. The mineralogical analyses are estimated to be accurate to within ±10% of the reported value and compare well with other mineralogical techniques (McLemore et al., 2009; DRA 5). See McLemore and Frey (2008) for more details on the quality control and quality assurance, precision and accuracy data. The quantitative mineralogy method obtained by the modified ModAn method is a reliable method that is consistent with the petrographic observations, electron microprobe analysis, clay mineral analysis, and the whole-rock chemistry of the samples. Because it does quantify specific clay and sulfate minerals, both of which are important for understanding the rock and mineral weathering of the Questa materials, bulk mineralogy obtained by this method provides a more reliable mineral composition. In additional, the method reduces the bias associated with petrographic analysis by different petrographers (McLemore et al., 2009; DRA 5).

7. CONCLUSION OF THE COMPONENT

Humidity or weathering cell experiments are kinetic or accelerated weathering tests, which attempt to mimic natural oxidation reactions. The samples are subjected to dissolution and the results can be used to estimate the potential quality of drainage from the material and to estimate rates of mineral oxidation and dissolution. Detailed mineralogical analysis and description of the original material and the leached solids are important in understanding the effects of test conditions on weathering of the materials. The results of chemical and mineralogical analyses of three sets of humidity cell samples (University of Utah, Golder, Roberston GeoConsultants, Inc.) are provided in Appendix 1. The majority of samples (not all) showed a decrease in CaO, SO_4, Cu, Zn, gypsum, and jarosite (if present in the original sample) after the humidity cell experiments as compared to the original sample (Figs. 3, 4; McLemore et al., 2008). Some samples show a decrease in total FeO and Fe oxide minerals after the humidity cell experiments as compared to the original sample (Fig. 4, McLemore et al., 2008). Electron microprobe analyses, including backscattered electron (BSE) imaging and quantitative analysis, indicate the changes to the samples in the humidity cells are subtle. Quantitative analysis shows little chemical difference between phases in the weathering cell or original samples. One exception is that some clay-rich areas of the samples appear to have slightly more Cl and S in samples that have not been in the weathering cells. The reason for this is difficult to quantify, but may be related to the presence of soluble salts associated with the clay minerals. Qualitative observation of BSE images for weathering cell versus original samples indicates that there may be small differences in the amount of Fe oxide associated with clay minerals between a few of the sample sets. In several cases, there appears to be slightly more Fe oxide intergrown with clay minerals in the samples that have been in the weathering cells. In contrast, sample PIT-RDL-0006, a very jarosite- and Fe-oxide-rich sample, appears to contain slightly less of these phases in the weathering cell samples. Other observations include that carbonate fragments appear more pitted and dissolved looking with eroded embayed edges in weathering cell samples, and one sample contained a feldspar crystal that appeared etched.



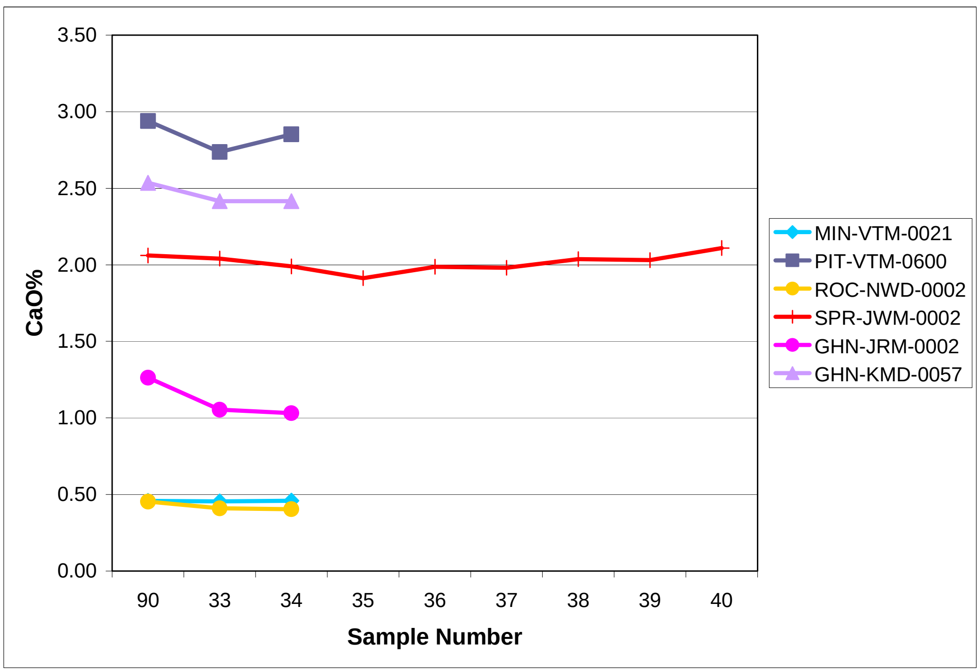
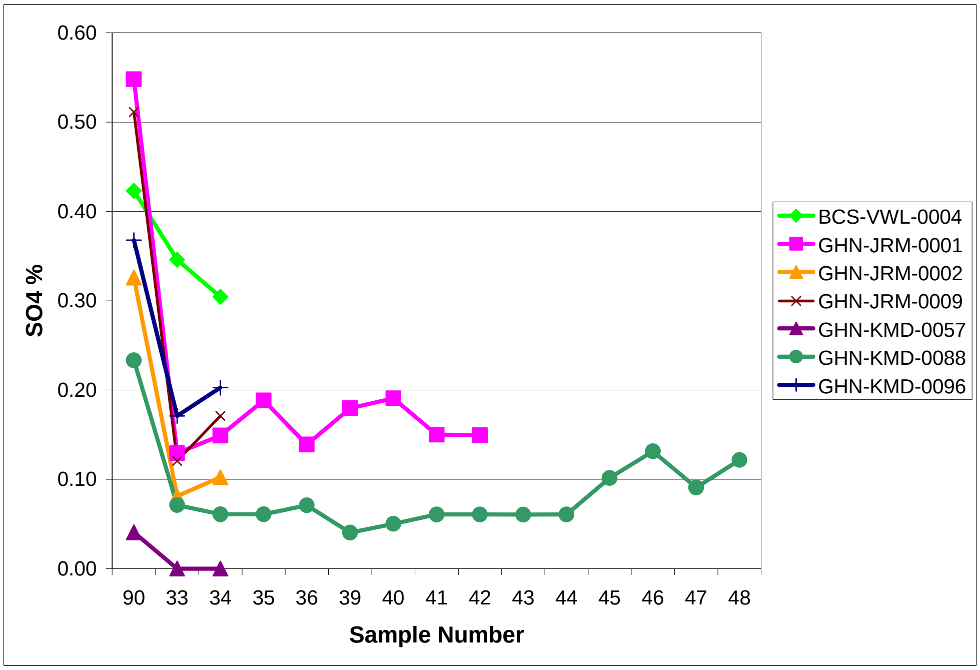
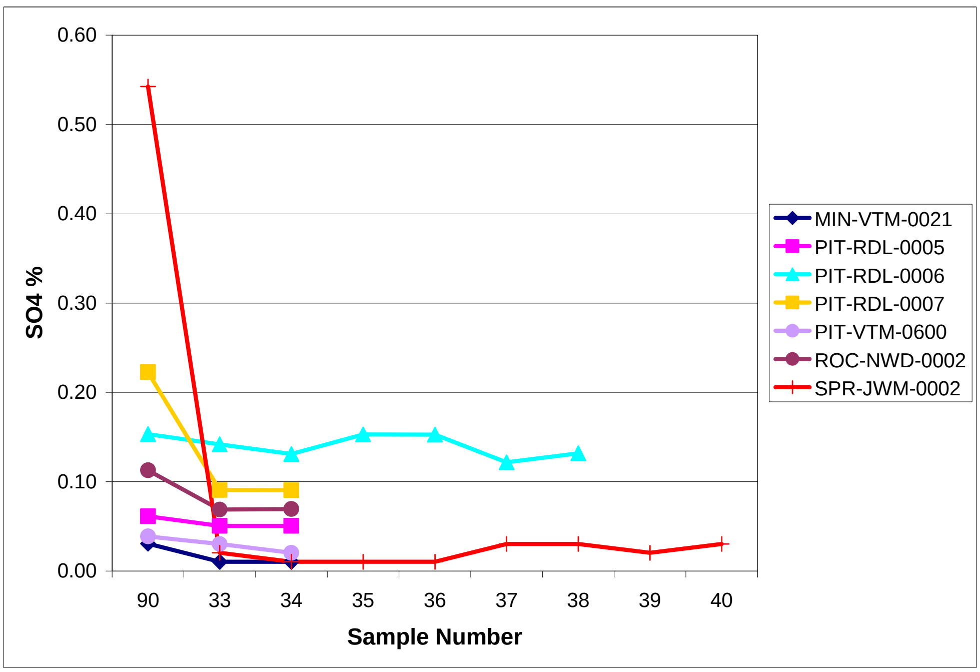


FIGURE 3. Variations of CaO, SO_4, Cu, and Zn by sample number. Sample number 90 is the original sample and samples 33-48 are the samples after the humidity cells experiments were completed. Actual chemical analyses are in McLemore et al. (2008).





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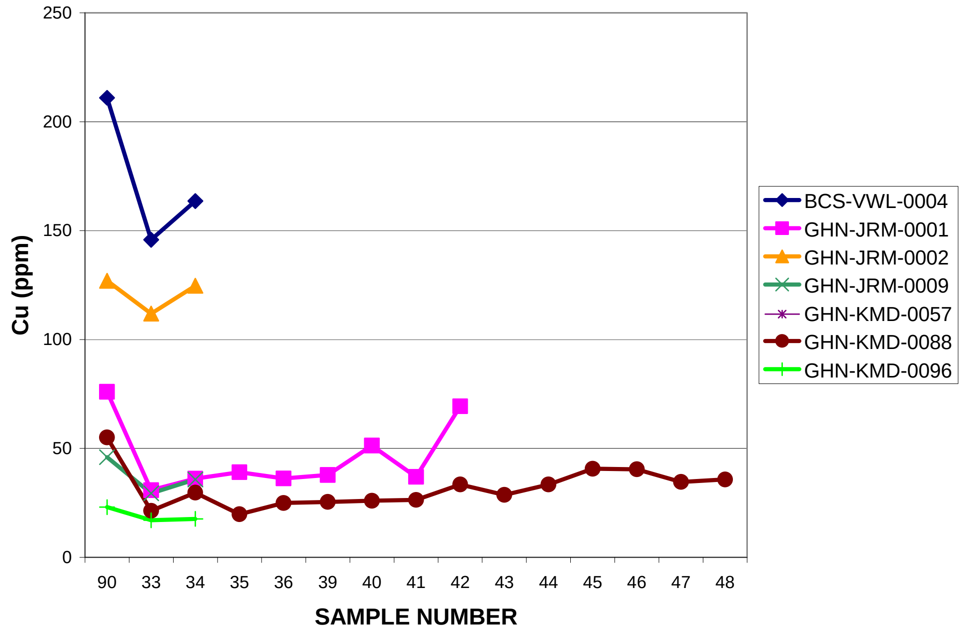

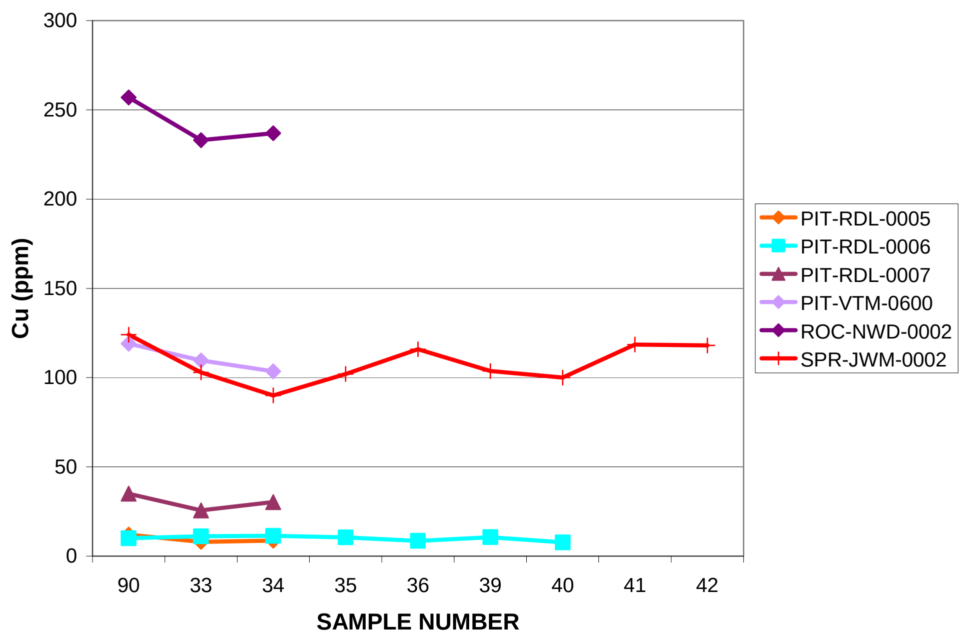

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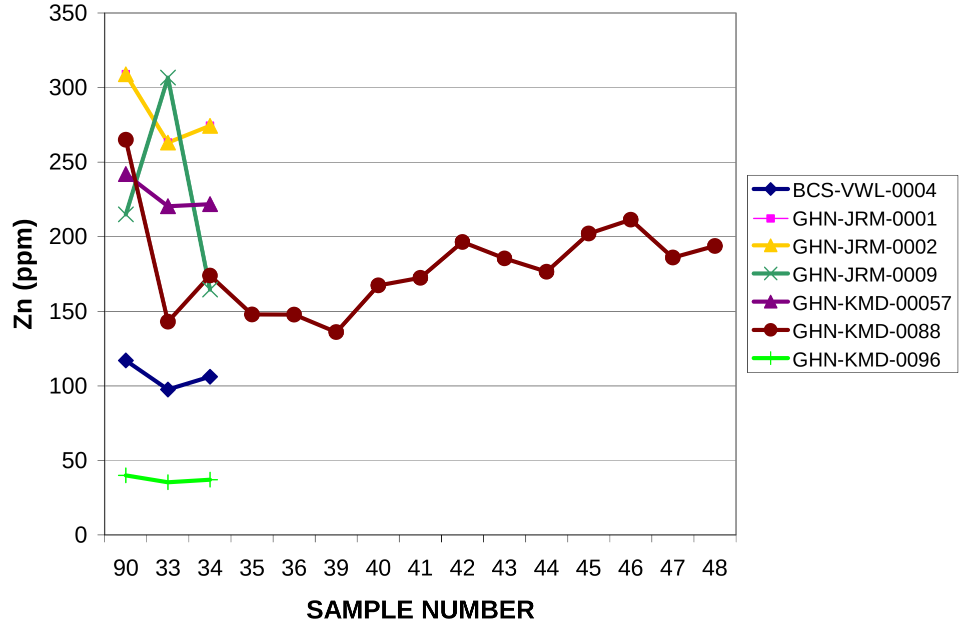

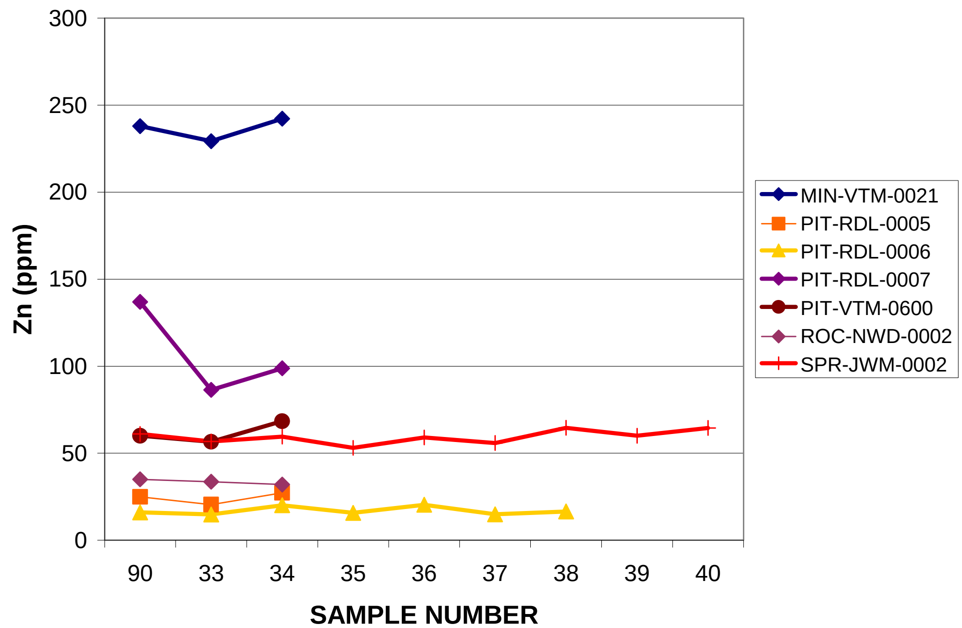

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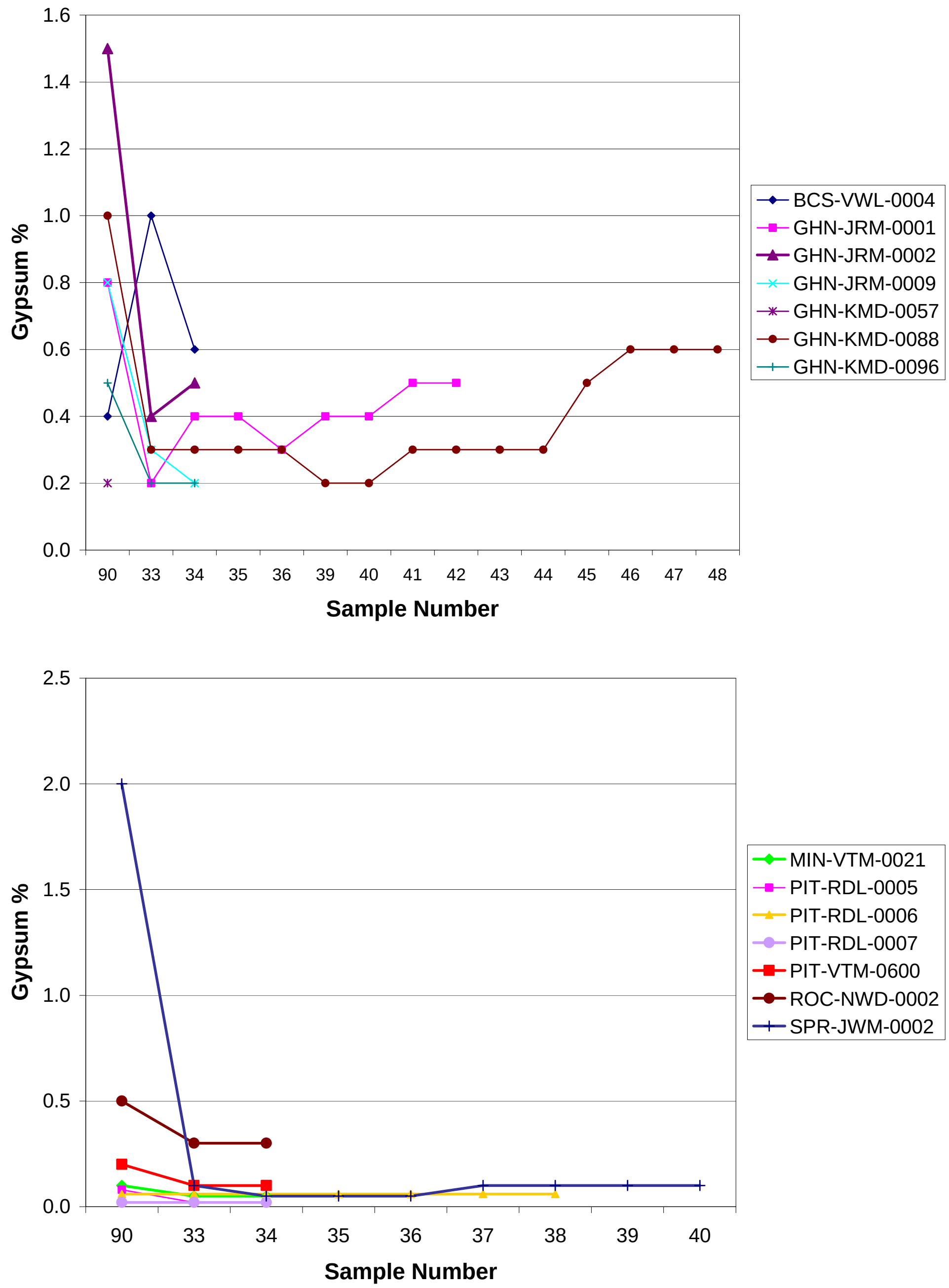
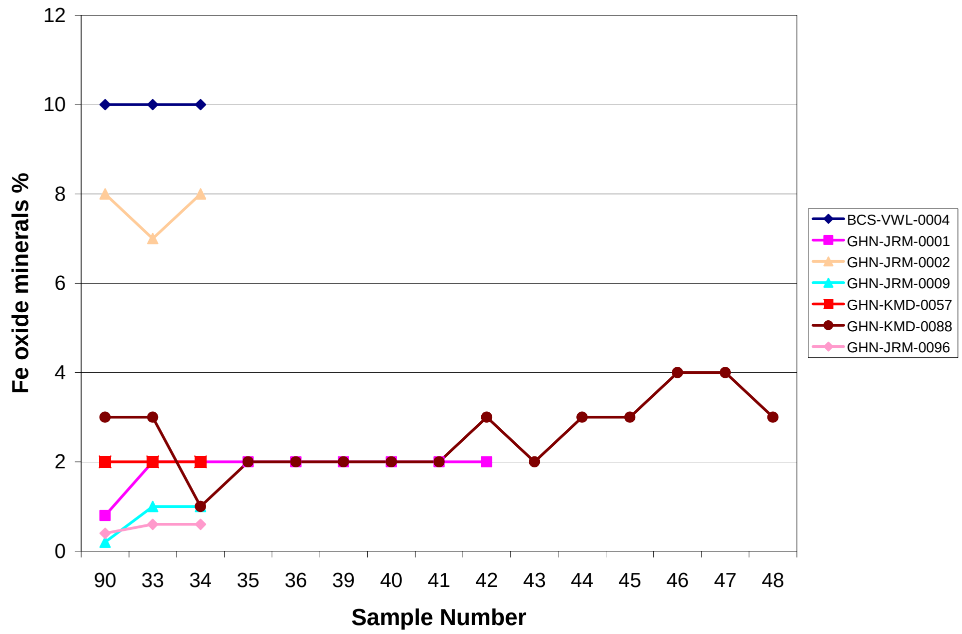
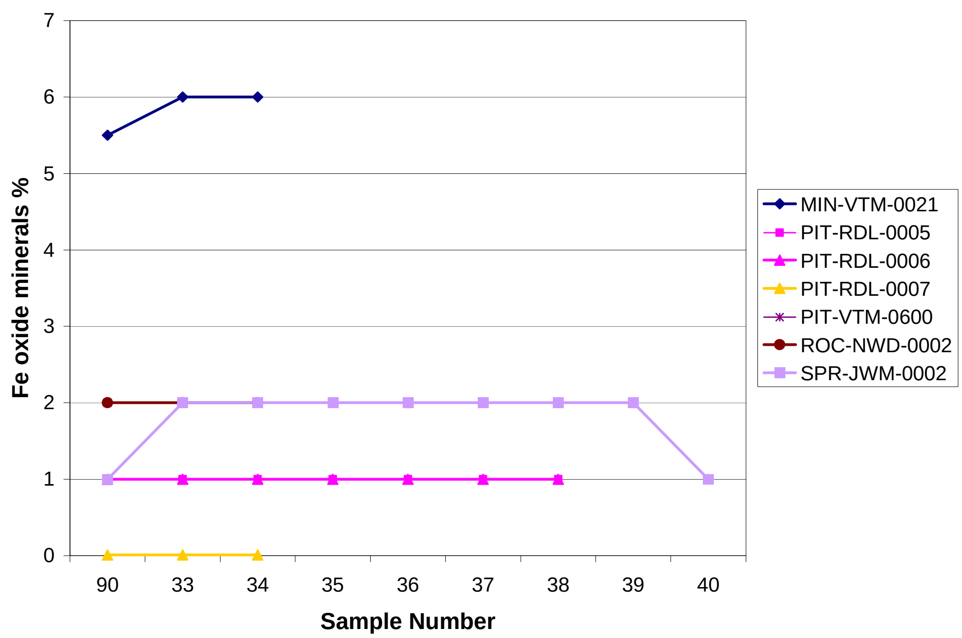


FIGURE 4. Variations of gypsum, Fe oxides, and FeOT by sample number. Sample number 90 is the original sample and samples 33-48 are the samples after the humidity cells experiments were completed. Actual mineral analyses are in McLemore et al. (2008).





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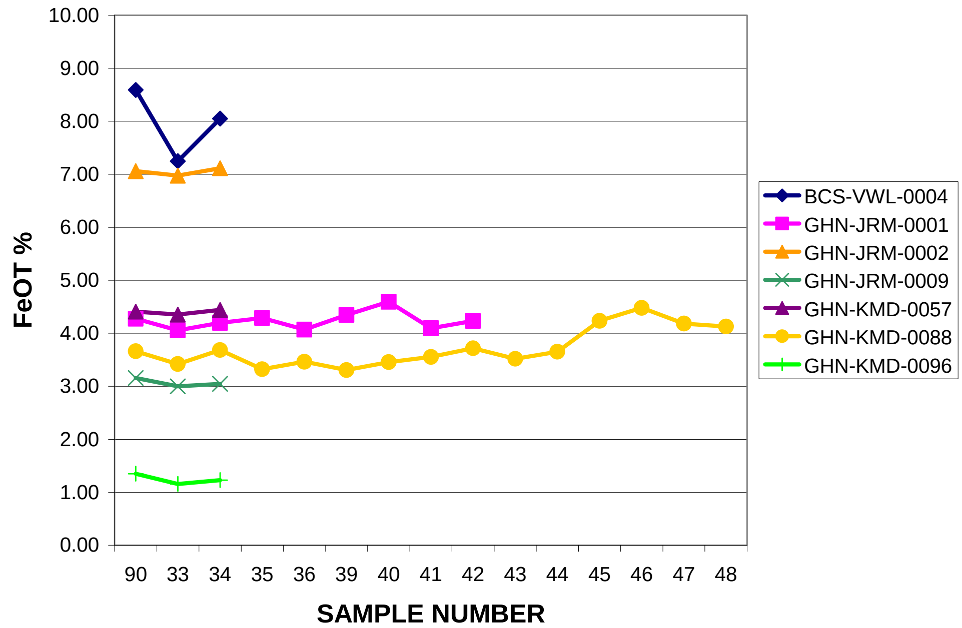

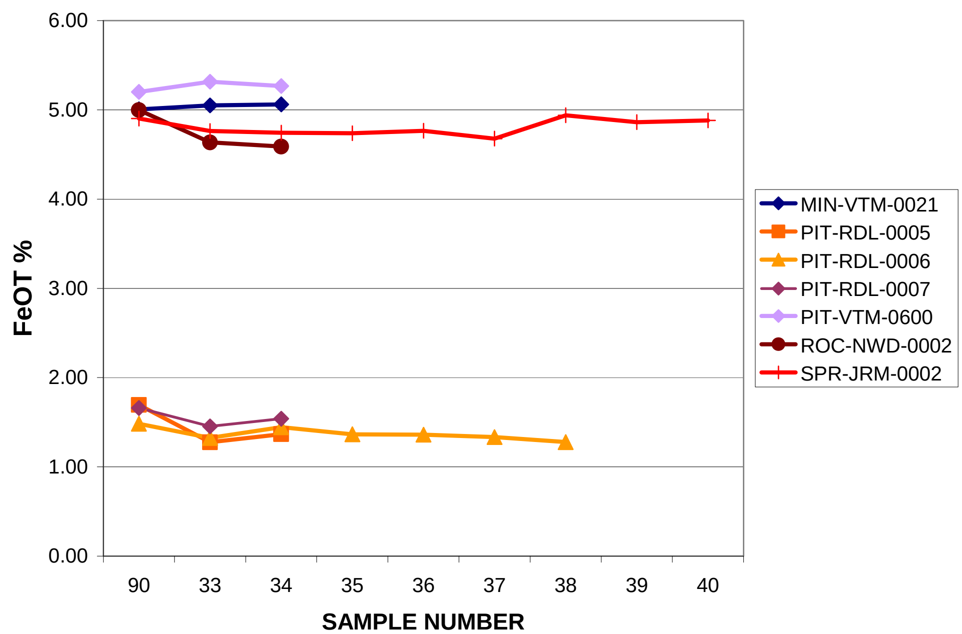

FIGURE 4 continued. Variations of gypsum, Fe oxides, and FeOT by sample number. Sample number 90 is the original sample and samples 33-48 are the samples after the humidity cells experiments were completed. Actual mineral analyses are in McLemore et al. (2008).

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9. **TECHNICAL APPENDICES**

McLemore, V.T., Heizler, L., Dunbar, N., Phillips, E., Donahue, K., Sweeney, D., Dickens, A., and Ennin, F., 2008, Petrographic Analysis of Humidity Cell Samples: unpublished report to Chevron, Task B1.5.2

APPENDIX 1. CHARACTERIZATION OF HUMIDITY CELLS SAMPLES

TABLE 1-1. Paste tests and ABA results for the humidity cells samples.

Sample	paste pH	paste conductivity	paste TDS	NAG pH	NAG value	AP	NP	net NP	NPAP
UU humidity cells									
BCS-VWL-0004	4.29	0.63	0.32						
GHN-JRM-0001	2.14	6.31	3.16	2.87	28.03	26.42	0	-26.42	0
GHN-JRM-0002	2.15	5.46	2.73	3.8	12.78	3.27	4.3	1.03	1.31
GHN-JRM-0009	3.97	5.45	2.73			19.13	0	-19.13	0
GHN-KMD-0057	7.96	0.18	0.09	7.94	0	3.78	25.15	21.37	6.65
GHN-KMD-0088	2.63	6.09	3.05	8.99	0	10.99		-10.99	0
GHN-KMD-0096	2.56	3.04	1.52			7		-7	0
MIN-VTM-0021	5.62	0.04	0.02			0.94	5.43	4.5	-4.5
PIT-RDL-0005	4.6	0.15	8						
PIT-RDL-0006	4.6	0.04	0.02						
PIT-RDL-0007	2.29	4.02	2.01						
PIT-VTM-0600	7.16	0.16	0.08						
ROC-NWD-0002	4.4	10.89	5.45						
SPR-JWM-0002	6.26	0.3	0.15	4.2	5.17	17.5	13.83	-3.67	3.67
RGC humidity cells									
SPR-KMD-0001	7.01	1.41	0.71	8.74	0	2.39	84581	82.19	35.39
SPR-KMD-0002	7.38	1.73	0.87	9.17	0	8.59	51.116	42.53	5.95
SPR-KMD-0003	7.09	1.35	0.68	9.17	0	4.32	42.957	38.64	9.94
SSS-KMD-0001	6.14	2.42	1.21	8.89	0	6.3	19.034	12.73	3.021
SSS-KMD-0002	6.99			9.09	0	13.9	134.15	120.25	9.6512
SSW-KMD-0001	7	1.43	0.72	8.98	0	8.28	37.523	29.24	4.5318
Golder humidity cells									
SPR-OTH-0001	6.37	1.64	0.82						
SPR-OTH-0002	6.71	2.8	1.74						

TABLE 1-2. Plasticity and grain size data for humidity cells samples.

Sample	LL	PL	PI	Gravel	Sand	Silt	Clay	Fines	D10	D30	D60
UU humidity cells											
GHN-JRM-0001	37.35	19.64	17.71								
GHN-KMD-0057	32.75	18.06	14.69	59.56	31.69	5.31	3.44	8.75	0.115	2.55	11.6
GHN-KMD-0088	40.96	20.67	20.3	37.19	48.41	14.4	0.01	14.41	0.041	0.52	4.1
GHN-KMD-0096	33.91	18.72	15.18	50.13	39.17	6.74	3.97	10.71	0.054	1.6	6
MIN-VTM-0021											
PIT-RDL-0005	24	17.21	6.79	32.01	58.35	3.95	5.69	9.64	0.077	0.74	3.8
PIT-RDL-0007				38.54	48.01	7.45	6	13.45	0.035	0.81	4.5

TABLE 1-3. Chemical analyses of humidity cells samples. Major elements (oxides) in percent and trace elements in parts per million (ppm). Major elements are normalized to sum to 100%.

	Sample	SiO_2	TiO_2	Al_2O_23	FeOT	MnO	MgO	CaO	Na_2O	K_2O
	UU samples									
whole rock	BCS-VWL-0004	65.00	0.53	15.13	3.55	0.07	1.42	1.55	3.51	3.60
fines	BCS-VWL-0004-92	54.86	0.64	15.02	7.66	0.04	1.59	0.54	1.03	2.68
coarse fraction	BCS-VWL-0004-90	57.54	0.42	14.11	8.59	0.04	1.13	0.60	1.42	3.08
top	BCS-VWL-0004-33	61.51	0.43	14.18	7.25	0.04	1.07	0.67	1.76	3.38
bottom	BCS-VWL-0004-34	59.49	0.43	14.38	8.05	0.04	1.15	0.69	1.71	3.32
whole rock	GHN-JRM-0001	61.09	0.53	13.53	4.72	0.08	1.27	0.97	1.85	3.88
fines	GHN-JRM-0001-92	48.74	0.57	14.07	7.53	0.13	1.53	2.61	1.04	3.54
coarse fraction	GHN-JRM-0001-90	66.16	0.50	13.18	4.27	0.12	1.29	0.67	1.60	3.92
top	GHN-JRM-0001-33	68.85	0.49	13.27	4.06	0.09	1.18	0.32	1.68	4.03
bottom	GHN-JRM-0001-34	68.16	0.50	13.51	4.20	0.09	1.21	0.37	1.68	4.08
top	GHN-JRM-0001-35	68.14	0.51	13.33	4.29	0.09	1.22	0.35	1.71	4.01
bottom	GHN-JRM-0001-36	68.66	0.50	13.38	4.07	0.09	1.21	0.37	1.68	4.09
top	GHN-JRM-0001-37	68.19	0.49	13.19	4.35	0.08	1.19	0.34	1.62	3.99
bottom	GHN-JRM-0001-38	67.68	0.50	13.22	4.59	0.09	1.20	0.35	1.64	3.97
top	GHN-JRM-0001-39	68.38	0.50	13.37	4.10	0.10	1.26	0.38	1.71	4.01
bottom	GHN-JRM-0001-40	68.21	0.50	13.34	4.23	0.10	1.23	0.36	1.68	4.01
whole rock	GHN-JRM-0002	61.33	0.84	14.43	6.93	0.36	2.58	1.73	2.83	3.35
fines	GHN-JRM-0002-92	46.79	0.79	14.27	12.44	0.48	2.32	3.00	1.33	2.35
coarse fraction	GHN-JRM-0002-90	62.30	0.82	14.01	7.06	0.45	2.34	1.26	2.73	3.60
top	GHN-JRM-0002-33	63.41	0.83	14.11	6.97	0.41	2.33	1.05	2.82	3.68
bottom	GHN-JRM-0002-34	63.00	0.83	14.14	7.11	0.45	2.31	1.03	2.76	3.65
whole rock	GHN-JRM-0009	70.99	0.37	11.98	3.45	0.18	1.23	0.93	0.62	2.71
fines	GHN-JRM-0009-92	53.30	0.50	14.42	6.94	0.09	1.23	1.80	0.66	4.07
coarse fraction	GHN-JRM-0009-90	70.04	0.40	12.78	3.16	0.10	1.08	0.68	0.99	3.92
top	GHN-JRM-0009-33	72.23	0.39	12.66	3.00	0.10	1.12	0.36	1.08	3.94
bottom	GHN-JRM-0009-34	71.82	0.40	12.95	3.05	0.09	1.06	0.31	1.01	4.02
whole rock	GHN-KMD-0057	63.22	0.72	15.12	4.76	0.35	2.64	2.58	3.08	3.55
fines	GHN-KMD-0057-92	55.28	0.87	16.33	7.19	0.73	3.44	3.73	2.25	2.47
coarse fraction	GHN-KMD-0057-90	64.76	0.70	14.59	4.41	0.26	2.62	2.54	3.06	3.83
top	GHN-KMD-0057-33	65.10	0.68	14.66	4.35	0.24	2.53	2.42	3.17	3.84
bottom	GHN-KMD-0057-34	65.02	0.69	14.63	4.44	0.25	2.53	2.42	3.09	3.89
whole rock	GHN-KMD-0088	65.19	0.50	14.38	3.86	0.16	1.53	1.14	2.96	3.85
fines	GHN-KMD-0088-92	53.38	0.54	15.61	6.69	0.24	2.14	2.14	2.60	1.66

	Sample	SiO_2	TiO_2	Al_2O_23	FeOT	MnO	MgO	CaO	Na_2O	K_2O
coarse fraction	GHN-KMD-0088-90	67.03	0.48	14.43	3.66	0.16	1.64	0.82	3.04	4.05
top	GHN-KMD-0088-33	68.31	0.49	14.47	3.42	0.14	1.61	0.64	3.22	4.10
bottom	GHN-KMD-0088-34	67.91	0.48	14.43	3.69	0.15	1.66	0.63	3.05	4.03
top	GHN-KMD-0088-35	68.48	0.48	14.34	3.32	0.13	1.56	0.64	3.33	4.14
bottom	GHN-KMD-0088-36	68.38	0.48	14.34	3.46	0.14	1.60	0.60	3.19	4.09
top	GHN-KMD-0088-39	68.34	0.48	14.35	3.31	0.13	1.54	0.62	3.33	4.14
bottom	GHN-KMD-0088-40	68.06	0.49	14.54	3.46	0.14	1.59	0.62	3.31	4.08
top	GHN-KMD-0088-41	68.28	0.47	14.37	3.55	0.14	1.59	0.60	3.10	4.08
bottom	GHN-KMD-0088-42	67.68	0.49	14.57	3.72	0.16	1.67	0.62	3.05	4.06
top	GHN-KMD-0088-43	68.09	0.48	14.40	3.52	0.14	1.61	0.59	3.11	4.11
bottom	GHN-KMD-0088-44	67.80	0.49	14.56	3.65	0.14	1.62	0.61	3.06	4.11
top	GHN-KMD-0088-45	66.44	0.50	14.79	4.24	0.15	1.68	0.65	2.93	3.98
bottom	GHN-KMD-0088-46	66.14	0.50	14.87	4.48	0.15	1.72	0.71	2.89	3.90
top	GHN-KMD-0088-47	66.76	0.50	14.75	4.18	0.15	1.68	0.68	2.95	3.93
bottom	GHN-KMD-0088-48	66.80	0.50	14.69	4.13	0.15	1.66	0.69	2.93	3.96
whole rock	GHN-KMD-0096	73.05	0.23	12.03	2.12	0.04	0.64	0.67	0.78	4.62
fines	GHN-KMD-0096-92	54.82	0.32	14.70	6.36	0.05	0.82	2.13	0.48	4.08
coarse fraction	GHN-KMD-0096-90	77.34	0.16	11.32	1.35	0.03	0.44	0.32	0.58	4.70
top	GHN-KMD-0096-33	78.62	0.17	11.25	1.16	0.03	0.42	0.10	0.59	4.77
bottom	GHN-KMD-0096-34	78.37	0.16	11.30	1.23	0.03	0.41	0.09	0.62	4.79
whole rock	MIN-VTM-0021	64.25	0.64	16.87	5.54	0.07	1.72	0.42	0.15	4.10
fines	MIN-VTM-0021-92	55.92	0.66	19.61	7.08	0.08	1.78	0.52	0.39	4.10
coarse fraction	MIN-VTM-0021-90	65.55	0.64	16.36	5.01	0.07	1.71	0.46	0.19	4.12
top	MIN-VTM-0021-33	65.56	0.65	16.31	5.05	0.06	1.69	0.45	0.23	4.12
bottom	MIN-VTM-0021-34	65.23	0.65	16.44	5.06	0.07	1.71	0.46	0.24	4.11
whole rock	PIT-RDL-0005	76.84	0.16	11.55	2.05	0.02	0.33	0.08	0.21	5.32
fines	PIT-RDL-0005-92	65.58	0.28	15.03	4.83	0.03	0.66	0.14	0.23	4.81
coarse fraction	PIT-RDL-0005-90	78.39	0.14	11.05	1.69	0.02	0.33	0.04	0.23	5.46
top	PIT-RDL-0005-33	79.16	0.13	11.00	1.28	0.02	0.30	0.04	0.30	5.57
bottom	PIT-RDL-0005-34	78.82	0.13	11.05	1.37	0.02	0.30	0.04	0.30	5.60
whole rock	PIT-RDL-0006	77.32	0.15	11.69	1.39	0.02	0.39	0.07	0.23	5.64
fines	PIT-RDL-0006-92	68.93	0.24	14.45	3.23	0.02	0.64	0.09	0.16	4.89
coarse fraction	PIT-RDL-0006-90	78.19	0.13	11.17	1.48	0.02	0.37	0.03	0.21	5.60

	Sample	SiO_2	TiO_2	Al_2O_23	FeOT	MnO	MgO	CaO	Na_2O	K_2O
top	PIT-RDL-0006-33	78.56	0.13	11.05	1.32	0.01	0.35	0.03	0.28	5.73
bottom	PIT-RDL-0006-34	78.34	0.13	11.10	1.44	0.01	0.36	0.03	0.26	5.68
top	PIT-RDL-0006-37	78.57	0.13	11.03	1.36	0.01	0.36	0.03	0.24	5.62
bottom	PIT-RDL-0006-38	78.51	0.13	11.07	1.36	0.02	0.36	0.03	0.23	5.63
top	PIT-RDL-0006-39	78.58	0.13	11.11	1.33	0.01	0.34	0.03	0.29	5.74
bottom	PIT-RDL-0006-40	78.71	0.13	11.05	1.28	0.01	0.33	0.03	0.27	5.73
whole rock	PIT-RDL-0007	75.16	0.14	11.41	2.31	0.03	0.48	0.04	0.11	4.60
fines	PIT-RDL-0007-92	67.63	0.16	13.24	3.58	0.03	0.60	0.01	0.10	4.50
coarse fraction	PIT-RDL-0007-90	77.89	0.14	10.94	1.66	0.03	0.38	0.01	0.13	4.87
top	PIT-RDL-0007-33	78.76	0.14	10.86	1.45	0.03	0.39	0.01	0.15	4.89
bottom	PIT-RDL-0007-34	78.53	0.14	10.96	1.54	0.03	0.40	0.00	0.14	4.89
whole rock	PIT-VTM-0600	64.65	0.62	14.78	4.91	0.10	2.09	2.53	3.08	3.23
fines	PIT-VTM-0600-92	56.70	0.61	16.86	6.29	0.18	2.87	2.81	0.15	3.03
coarse fraction	PIT-VTM-0600-90	60.08	0.61	14.11	5.20	0.11	2.39	2.94	2.45	3.38
top	PIT-VTM-0600-33	63.32	0.66	14.89	5.32	0.10	2.46	2.74	2.75	3.55
bottom	PIT-VTM-0600-34	63.16	0.65	14.80	5.27	0.11	2.44	2.85	2.64	3.55
whole rock	ROC-NWD-0002	58.44	0.79	16.20	5.64	0.06	1.67	0.50	4.74	3.40
fines	ROC-NWD-0002-92	50.91	0.85	14.82	8.63	0.07	1.68	0.58	3.91	3.42
coarse fraction	ROC-NWD-0002-90	63.70	0.81	16.79	5.00	0.06	1.53	0.45	4.51	4.15
top	ROC-NWD-0002-33	62.43	0.78	16.09	4.63	0.06	1.44	0.41	4.32	4.04
bottom	ROC-NWD-0002-34	62.26	0.77	16.20	4.59	0.06	1.44	0.40	4.41	4.06
whole rock	SPR-JWM-0002	62.40	0.70	14.35	5.67	0.11	3.58	1.83	4.16	2.55
fines	SPR-JWM-0002-92	57.55	0.77	14.83	7.01	0.37	3.87	2.75	2.75	2.40
coarse fraction	SPR-JWM-0002-90	62.13	0.71	14.06	4.90	0.15	3.36	2.06	3.99	2.44
top	SPR-JWM-0002-33	64.63	0.75	14.58	4.76	0.13	3.44	2.04	4.28	2.54
bottom	SPR-JWM-0002-34	64.59	0.76	14.63	4.74	0.14	3.47	1.99	4.26	2.63
top	SPR-JWM-0002-35	64.73	0.74	14.58	4.74	0.13	3.48	1.91	4.39	2.55
bottom	SPR-JWM-0002-36	64.55	0.74	14.59	4.77	0.14	3.49	1.99	4.25	2.56
top	SPR-JWM-0002-37	64.81	0.73	14.56	4.68	0.12	3.45	1.98	4.32	2.47
bottom	SPR-JWM-0002-38	64.16	0.73	14.56	4.94	0.15	3.47	2.04	4.20	2.52
top	SPR-JWM-0002-39	64.28	0.74	14.61	4.86	0.14	3.49	2.03	4.27	2.53
bottom	SPR-JWM-0002-40	64.26	0.73	14.52	4.88	0.15	3.40	2.11	4.17	2.53
	RGC samples									
	SPR-KMD-0001	65.09	0.67	14.58	3.46	0.05	2.53	2.20	2.09	4.84
	SPR-KMD-0002	63.28	0.70	14.13	4.21	0.09	3.39	3.65	2.63	3.55
	SPR-KMD-0003	71.02	0.45	13.88	1.88	0.09	0.94	1.92	2.66	5.18
	SSS-KMD-0001	63.93	0.59	14.52	4.42	0.07	1.94	2.29	2.79	3.67
	SSS-KMD-0002	62.42	0.66	13.67	5.03	0.19	2.74	4.38	2.91	3.73

	Sample	SiO_2	TiO_2	Al_2O_23	FeOT	MnO	MgO	CaO	Na_2O	K_2O
	SSW-KMD-0001	61.76	0.67	15.06	5.94	0.09	2.56	2.46	2.60	3.85
	Golder samples									
	SPR-OTH-0001	64.32	0.58	13.89	3.65	0.12	2.19	2.80	2.52	4.49
	SPR-OTH-0002	65.90	0.59	14.11	2.20	0.12	2.15	2.65	2.48	4.42

	Sample	P_2O_5	S	SO_4	C	LOI	Ba	Rb	Sr	Pb
	UU samples									
whole rock	BCS-VWL-0004	0.25	0.38	0.08	0.36	4.57	1357	94	663	73
fines	BCS-VWL-0004-92	0.58	0.01	0.54	2.09	12.72	672	117	218	75
coarse fraction	BCS-VWL-0004-90	0.80	0.03	0.42	1.58	10.22	849	104	304	83
top	BCS-VWL-0004-33	0.68	0.00	0.35	0.96	7.71	920	105	353	88
bottom	BCS-VWL-0004-34	0.73	0.10	0.30	1.12	8.49	937	106	351	88
whole rock	GHN-JRM-0001	0.19	1.99	1.11	0.07	8.73	832	134	136	153
fines	GHN-JRM-0001-92	0.38	1.73	2.98	0.05	15.10	631	126	152	375
coarse fraction	GHN-JRM-0001-90	0.22	1.80	0.55	0.06	5.66	902	131	155	68
top	GHN-JRM-0001-33	0.21	1.74	0.13	0.04	3.92	923	133	148	53
bottom	GHN-JRM-0001-34	0.23	1.67	0.15	0.04	4.12	920	135	159	74
top	GHN-JRM-0001-35	0.23	1.68	0.19	0.04	4.22	953	130	161	78
bottom	GHN-JRM-0001-36	0.22	1.66	0.14	0.04	3.91	972	134	181	60
top	GHN-JRM-0001-37	0.22	1.87	0.18	0.04	4.25	922	132	148	75
bottom	GHN-JRM-0001-38	0.23	1.90	0.19	0.03	4.41	950	129	152	77
top	GHN-JRM-0001-39	0.22	1.79	0.15	0.03	4.01	941	130	154	60
bottom	GHN-JRM-0001-40	0.22	1.78	0.15	0.03	4.15	921	131	154	68
whole rock	GHN-JRM-0002	0.40	0.14	0.34	0.06	4.68	1223	93	512	131
fines	GHN-JRM-0002-92	0.59	0.03	2.04	0.05	13.52	832	78	331	525
coarse fraction	GHN-JRM-0002-90	0.36	0.00	0.33	0.04	4.72	1388	93	443	153
top	GHN-JRM-0002-33	0.36	0.03	0.08	0.03	3.89	1396	92	448	129
bottom	GHN-JRM-0002-34	0.37	0.03	0.10	0.04	4.17	1379	92	439	159
whole rock	GHN-JRM-0009	0.18	1.30	0.55	0.07	5.43	506	95	66	132
fines	GHN-JRM-0009-92	0.19	0.88	2.74	0.06	13.11	658	146	100	354
coarse fraction	GHN-JRM-0009-90	0.13	1.31	0.51	0.07	4.83	875	131	96	104
top	GHN-JRM-0009-33	0.13	1.24	0.12	0.06	3.58	879	126	102	110
bottom	GHN-JRM-0009-34	0.13	1.11	0.17	0.06	3.83	901	132	94	104
whole rock	GHN-KMD-0057	0.33	0.09	0.01	0.13	3.41	1243	101	613	141
fines	GHN-KMD-0057-92	0.39	0.24	0.25	0.12	6.73	801	82	530	640
coarse fraction	GHN-KMD-0057-90	0.32	0.00	0.04	0.15	2.73	1340	100	627	89
top	GHN-KMD-0057-33	0.31	0.04	0.00	0.09	2.57	1324	100	640	68
bottom	GHN-KMD-0057-34	0.31	0.04	0.00	0.08	2.62	1336	103	628	75

	Sample	P_2O_5	S	SO_4	C	LOI	Ba	Rb	Sr	Pb
whole rock	GHN-KMD-0088	0.21	0.56	0.42	0.04	5.21	1216	102	374	60
fines	GHN-KMD-0088-92	0.28	0.23	1.98	0.05	12.45	755	92	239	243
coarse fraction	GHN-KMD-0088-90	0.21	0.69	0.23	0.05	3.50	1216	107	382	60
top	GHN-KMD-0088-33	0.21	0.57	0.07	0.03	2.72	1219	105	393	44
bottom	GHN-KMD-0088-34	0.21	0.71	0.06	0.03	2.97	1208	106	374	85
top	GHN-KMD-0088-35	0.20	0.68	0.06	0.03	2.61	1222	105	405	39
bottom	GHN-KMD-0088-36	0.20	0.62	0.07	0.03	2.80	1199	105	385	51
top	GHN-KMD-0088-39	0.20	0.86	0.04	0.04	2.61	1230	105	406	42
bottom	GHN-KMD-0088-40	0.21	0.77	0.05	0.03	2.67	1237	104	404	47
top	GHN-KMD-0088-41	0.20	0.70	0.06	0.02	2.82	1192	106	379	44
bottom	GHN-KMD-0088-42	0.21	0.68	0.06	0.03	3.03	1217	107	375	65
top	GHN-KMD-0088-43	0.21	0.69	0.06	0.03	2.96	1207	108	379	54
bottom	GHN-KMD-0088-44	0.21	0.66	0.06	0.03	3.00	1225	107	378	54
top	GHN-KMD-0088-45	0.22	0.73	0.10	0.03	3.58	1138	106	361	87
bottom	GHN-KMD-0088-46	0.22	0.65	0.13	0.03	3.62	1131	106	357	95
top	GHN-KMD-0088-47	0.22	0.71	0.09	0.03	3.38	1173	106	369	80
bottom	GHN-KMD-0088-48	0.22	0.69	0.12	0.05	3.42	1166	106	362	83
whole rock	GHN-KMD-0096	0.05	0.16	0.67	0.06	4.89	274	146	89	121
fines	GHN-KMD-0096-92	0.09	0.01	2.91	0.06	13.18	249	150	105	519
coarse fraction	GHN-KMD-0096-90	0.03	0.06	0.37	0.02	3.28	229	144	59	72
top	GHN-KMD-0096-33	0.03	0.07	0.17	0.03	2.60	236	145	56	78
bottom	GHN-KMD-0096-34	0.03	0.06	0.20	0.04	2.66	227	146	56	73
whole rock	MIN-VTM-0021	0.29	0.03	0.02	0.20	5.70	948	112	65	96
fines	MIN-VTM-0021-92	0.44	0.03	0.10	0.48	8.80	2096	118	129	130
coarse fraction	MIN-VTM-0021-90	0.29	0.00	0.03	0.14	5.43	1027	109	67	82
top	MIN-VTM-0021-33	0.29	0.01	0.01	0.13	5.43	922	108	68	76
bottom	MIN-VTM-0021-34	0.30	0.01	0.01	0.16	5.55	911	107	68	77
whole rock	PIT-RDL-0005	0.04	0.01	0.20	0.14	3.03	197	172	59	96
fines	PIT-RDL-0005-92	0.09	0.00	0.69	0.25	7.38	273	169	81	338
coarse fraction	PIT-RDL-0005-90	0.03	0.00	0.15	0.06	2.41	200	167	52	78
top	PIT-RDL-0005-33	0.02	0.01	0.09	0.05	2.03	191	169	51	50
bottom	PIT-RDL-0005-34	0.03	0.00	0.11	0.05	2.18	194	170	51	55
whole rock	PIT-RDL-0006	0.03	0.01	0.18	0.06	2.80	211	174	53	74
fines	PIT-RDL-0006-92	0.06	0.03	0.57	0.08	6.62	226	162	49	236
coarse fraction	PIT-RDL-0006-90	0.03	0.00	0.15	0.03	2.58	218	167	51	69
top	PIT-RDL-0006-33	0.03	0.00	0.14	0.04	2.33	215	168	52	45
bottom	PIT-RDL-0006-34	0.03	0.01	0.13	0.04	2.43	211	169	51	56
top	PIT-RDL-0006-37	0.03	0.00	0.15	0.03	2.41	208	166	51	63
bottom	PIT-RDL-0006-38	0.03	0.00	0.15	0.04	2.44	214	166	52	59

	Sample	P_2O_5	S	SO_4	C	LOI	Ba	Rb	Sr	Pb
top	PIT-RDL-0006-39	0.03	0.01	0.12	0.05	2.21	208	169	51	46
bottom	PIT-RDL-0006-40	0.03	0.02	0.13	0.03	2.25	215	169	51	52
whole rock	PIT-RDL-0007	0.03	1.07	0.43	0.04	4.14	169	162	14	385
fines	PIT-RDL-0007-92	0.03	1.21	1.01	0.03	7.87	164	164	15	590
coarse fraction	PIT-RDL-0007-90	0.02	0.81	0.22	0.04	2.85	199	163	17	91
top	PIT-RDL-0007-33	0.03	0.77	0.09	0.05	2.40	181	162	16	103
bottom	PIT-RDL-0007-34	0.03	0.74	0.09	0.04	2.46	190	163	16	106
whole rock	PIT-VTM-0600	0.26	0.41	0.00	0.19	3.16	1180	119	650	21
fines	PIT-VTM-0600-92	0.26	1.27	0.06	0.27	8.65	885	112	426	116
coarse fraction	PIT-VTM-0600-90	0.27	0.92	0.04	0.25	7.25	1235	117	565	30
top	PIT-VTM-0600-33	0.29	0.78	0.03	0.18	2.95	1253	116	583	24
bottom	PIT-VTM-0600-34	0.28	0.87	0.02	0.21	3.13	1231	116	568	23
whole rock	ROC-NWD-0002	0.38	3.38	0.17	0.05	4.58	939	125	268	9
fines	ROC-NWD-0002-92	0.46	6.45	0.32	0.05	7.86	1007	115	263	65
coarse fraction	ROC-NWD-0002-90	0.36	2.49	0.11	0.03	0.00	1268	131	304	12
top	ROC-NWD-0002-33	0.34	2.08	0.07	0.03	3.29	1299	131	302	9
bottom	ROC-NWD-0002-34	0.35	2.11	0.07	0.03	3.25	1303	130	307	9
whole rock	SPR-JWM-0002	0.30	1.10	0.04	0.13	3.08	782	92	553	8
fines	SPR-JWM-0002-92	0.33	0.50	0.13	0.35	6.38	900	83	701	51
coarse fraction	SPR-JWM-0002-90	0.29	1.79	0.54	0.06	3.51	955	77	620	10
top	SPR-JWM-0002-33	0.31	0.33	0.02	0.10	2.10	935	77	573	8
bottom	SPR-JWM-0002-34	0.31	0.30	0.01	0.08	2.09	981	79	574	8
top	SPR-JWM-0002-35	0.31	0.33	0.01	0.08	2.02	946	75	590	8
bottom	SPR-JWM-0002-36	0.31	0.32	0.01	0.09	2.21	949	78	580	8
top	SPR-JWM-0002-37	0.30	0.27	0.03	0.08	2.21	930	76	619	8
bottom	SPR-JWM-0002-38	0.30	0.31	0.03	0.11	2.48	931	78	616	10
top	SPR-JWM-0002-39	0.31	0.31	0.02	0.09	2.33	947	76	604	8
bottom	SPR-JWM-0002-40	0.30	0.30	0.03	0.12	2.49	953	78	621	9
	RGC samples									
	SPR-KMD-0001	0.19	1.13	0.06	0.61	2.50	861	158	410	24
	SPR-KMD-0002	0.24	0.75	0.05	0.52	2.80	846	135	572	12
	SPR-KMD-0003	0.09	0.46	0.03	0.28	1.13	744	157	418	119
	SSS-KMD-0001	0.17	1.09	0.43	0.26	3.84	1155	123	492	60
	SSS-KMD-0002	0.22	0.79	0.58	0.33	2.35	977	142	477	92
	SSW-KMD-0001	0.21	0.79	0.79	0.10	3.12	1148	147	466	49
	Golder samples									
	SPR-OTH-0001	0.26	0.79	0.08	0.44	3.87	832	146	420	24
	SPR-OTH-0002	0.25	0.93	0.09	0.35	3.76	813	147	553	48

	Sample	Th	U	Zr	Nb	Y	Sc	V	Ni	Cu	Zn
	UU samples										
whole rock	BCS-VWL-0004	9	4	145	9	13	9	75	20	65	92
fines	BCS-VWL-0004-92	13	6	225	14	20	11	101	24	232	157
coarse fraction	BCS-VWL-0004-90	13	6	115	8	15	8	89	13	211	117
top	BCS-VWL-0004-33	11	4	119	9	13	8	82	13	146	98
bottom	BCS-VWL-0004-34	11	4	127	9	13	8	88	14	164	106
whole rock	GHN-JRM-0001	11	5	163	16	25	9	74	30	172	92
fines	GHN-JRM-0001-92	21	4	177	15	28	10	87	26	130	233
coarse fraction	GHN-JRM-0001-90		4	171	14	24	7	71	20	76	160
top	GHN-JRM-0001-33	9	4	174	15	23	7	74	17	31	92
bottom	GHN-JRM-0001-34	9	4	172	14	22	8	75	16	36	129
top	GHN-JRM-0001-35	10	3	172	15	23	8	76	18	39	125
bottom	GHN-JRM-0001-36	10	3	181	15	23	6	72	18	36	112
top	GHN-JRM-0001-37	10	3	170	14	23	8	72	18	38	119
bottom	GHN-JRM-0001-38	10	3	177	14	22	7	75	19	51	123
top	GHN-JRM-0001-39	9	2	169	14	23	8	73	18	37	112
bottom	GHN-JRM-0001-40	9	2	173	14	23	8	78	19	69	114
whole rock	GHN-JRM-0002	7	1	173	12	19	11	106	49	88	295
fines	GHN-JRM-0002-92	7	2	147	11	25	14	132	40	222	500
coarse fraction	GHN-JRM-0002-90	5	3	171	11	15	9	100	42	127	309
top	GHN-JRM-0002-33	5	2	174	11	14	8	100	42	112	263
bottom	GHN-JRM-0002-34	6	3	169	12	13	9	101	44	125	274
whole rock	GHN-JRM-0009	11	6	208	18	43	7	53	28	99	252
fines	GHN-JRM-0009-92	12	6	214	20	34	8	76	20	73	173
coarse fraction	GHN-JRM-0009-90	10	3	204	20	35	6	51	13	46	215
top	GHN-JRM-0009-33	11	4	205	21	33	6	51	15	29	307
bottom	GHN-JRM-0009-34	11	4	202	20	34	6	52	13	36	165
whole rock	GHN-KMD-0057	9	3	182	13	19	10	89	52	63	319
fines	GHN-KMD-0057-92	10	3	207	14	34	14	126	75	160	723
coarse fraction	GHN-KMD-0057-90	6	2	170	12	14	10	81	40	46	242
top	GHN-KMD-0057-33	6	3	174	11	15	9	81	41	39	221
bottom	GHN-KMD-0057-34	6	3	174	11	15	10	81	40	40	222
whole rock	GHN-KMD-0088	7	4	176	13	26	6	60	31	40	221
fines	GHN-KMD-0088-92	10	3	180	14	46	10	78	32	92	517
coarse fraction	GHN-KMD-0088-90	10	5	175	13	25	7	62	21	55	265
top	GHN-KMD-0088-33	9	3	174	13	19	7	64	22	21	143
bottom	GHN-KMD-0088-34	9	3	177	13	19	7	63	20	30	174
top	GHN-KMD-0088-35	9	3	177	13	19	6	59	19	20	148

	Sample	Th	U	Zr	Nb	Y	Sc	V	Ni	Cu	Zn
bottom	GHN-KMD-0088-36	9	4	175	13	19	6	60	18	25	148
top	GHN-KMD-0088-39	11	4	180	13	21	5	58	20	25	136
bottom	GHN-KMD-0088-40	9	5	178	13	21	6	62	20	26	167
top	GHN-KMD-0088-41	10	4	175	13	21	6	60	20	26	172
bottom	GHN-KMD-0088-42	8	4	174	13	21	6	65	21	33	196
top	GHN-KMD-0088-43	9	4	174	13	22	6	62	20	29	185
bottom	GHN-KMD-0088-44	10	4	177	13	22	6	64	20	33	177
top	GHN-KMD-0088-45	9	3	185	14	23	7	67	20	41	202
bottom	GHN-KMD-0088-46	9	4	178	14	23	8	65	21	40	211
top	GHN-KMD-0088-47	9	5	183	13	23	7	65	22	35	186
bottom	GHN-KMD-0088-48	9	5	181	13	22	7	66	20	36	194
whole rock	GHN-KMD-0096	10	5	266	31	51	2	22	11	30	53
fines	GHN-KMD-0096-92	12	5	258	44	68	3	29	6	94	104
coarse fraction	GHN-KMD-0096-90	12	4	267	30	55	2	13	0	23	40
top	GHN-KMD-0096-33	13	4	273	29	53	2	14	0	17	35
bottom	GHN-KMD-0096-34	12	5	273	31	53	1	14	0	18	37
whole rock	MIN-VTM-0021	6	3	163	8	18	11	88	62	29	257
fines	MIN-VTM-0021-92	10	3	172	9	32	13	95	79	53	304
coarse fraction	MIN-VTM-0021-90	6	3	158	8	19	9	86	52	30	238
top	MIN-VTM-0021-33	6	2	163	8	20	9	85	54	29	229
bottom	MIN-VTM-0021-34	7	3	163	8	20	10	86	55	32	242
whole rock	PIT-RDL-0005	10	5	291	35	50	1	11	8	15	30
fines	PIT-RDL-0005-92	21	5	305	54	86	3	19	3	38	55
coarse fraction	PIT-RDL-0005-90	12	5	290	32	58	1	10	0	12	25
top	PIT-RDL-0005-33	13	5	294	34	57	1	8	0	8	21
bottom	PIT-RDL-0005-34	13	6	292	34	57	2	7	0	9	27
whole rock	PIT-RDL-0006	11	5	303	35	58	2	6	7	9	16
fines	PIT-RDL-0006-92	21	6	305	51	96	2	10	2	23	28
coarse fraction	PIT-RDL-0006-90	14	5	289	31	59	1	7	0	10	16
top	PIT-RDL-0006-33	13	5	289	32	59	1	7	14	11	15
bottom	PIT-RDL-0006-34	14	5	293	32	60	1	7	0	11	20
top	PIT-RDL-0006-37	14	5	285	30	57	1	7	0	11	16
bottom	PIT-RDL-0006-38	12	5	287	31	58	1	7	0	9	20
top	PIT-RDL-0006-39	12	5	295	32	59	1	7	0	11	15
bottom	PIT-RDL-0006-40	13	5	293	32	58	2	9	0	8	17
whole rock	PIT-RDL-0007	14	5	294	34	64	0	7	10	68	301
fines	PIT-RDL-0007-92	18	6	322	39	76	1	9	5	77	332
coarse fraction	PIT-RDL-0007-90	15	6	291	34	71	1	7	0	35	137

	Sample	Th	U	Zr	Nb	Y	Sc	V	Ni	Cu	Zn
top	PIT-RDL-0007-33	16	6	290	34	71	1	8	0	26	86
bottom	PIT-RDL-0007-34	15	6	290	34	72	0	7	0	30	99
whole rock	PIT-VTM-0600	9	3	145	9	13	11	92	42	164	49
fines	PIT-VTM-0600-92	9	4	152	10	18	11	94	42	217	113
coarse fraction	PIT-VTM-0600-90	7	3	149	9	16	10	102	36	119	60
top	PIT-VTM-0600-33	7	4	149	10	16	11	104	39	110	57
bottom	PIT-VTM-0600-34	7	3	151	10	15	10	101	39	104	68
whole rock	ROC-NWD-0002	7	3	175	10	14	13	109	71	449	39
fines	ROC-NWD-0002-92	9	5	160	11	19	14	122	12	168	70
coarse fraction	ROC-NWD-0002-90	7	4	177	10	14	12	111	46	257	35
top	ROC-NWD-0002-33	8	3	177	9	15	11	113	45	233	34
bottom	ROC-NWD-0002-34	6	3	175	9	14	12	107	43	237	32
whole rock	SPR-JWM-0002	6	2	169	10	17	13	98	80	165	44
fines	SPR-JWM-0002-92	8	3	164	11	26	13	114	114	283	115
coarse fraction	SPR-JWM-0002-90	6	3	170	11	20	12	99	63	124	61
top	SPR-JWM-0002-33	7	3	169	10	19	12	96	60	103	57
bottom	SPR-JWM-0002-34	5	2	171	11	19	12	97	62	90	60
top	SPR-JWM-0002-35	5	3	172	11	18	13	97	58	102	53
bottom	SPR-JWM-0002-36	5	4	167	10	19	11	98	61	116	59
top	SPR-JWM-0002-37	6	4	170	10	19	12	96	60	104	56
bottom	SPR-JWM-0002-38	6	3	169	11	19	13	95	64	100	65
top	SPR-JWM-0002-39	5	2	169	10	18	14	99	62	119	60
bottom	SPR-JWM-0002-40	4	4	168	10	19	12	98	63	118	65
	RGC samples										
	SPR-KMD-0001	8	2	194	18	22		122	6	178	32
	SPR-KMD-0002	7	1	178	11	26		140	43	201	34
	SPR-KMD-0003	12	2	129	27	15		62	0	131	121
	SSS-KMD-0001	8	2	148	15	17		101	20	96	71
	SSS-KMD-0002	10	2	171	14	21		116	21	119	291
	SSW-KMD-0001	11	3	165	12	19		122	40	204	161
	Golder samples										
	SPR-OTH-0001	11	5	164	16	19	10	82	41	179	52
	SPR-OTH-0002	13	4	173	17	20	9	78	41	182	72

	Sample	Ga	Cr	F	La	Ce	Nd
	UU samples						
whole rock	BCS-VWL-0004	19	39	917	35	59	28
fines	BCS-VWL-0004-92	21	57		44	88	36
coarse fraction	BCS-VWL-0004-90	19	46	1521	49	88	13
top	BCS-VWL-0004-33	17	39	1371	44	79	33

	Sample	Ga	Cr	F	La	Ce	Nd
bottom	BCS-VWL-0004-34	19	45	2239	43	76	32
whole rock	GHN-JRM-0001	21	57	1646	49	96	40
fines	GHN-JRM-0001-92	20	66		81	149	55
coarse fraction	GHN-JRM-0001-90	19	50	1604	38	72	31
top	GHN-JRM-0001-33	18	49	1608	35	68	30
bottom	GHN-JRM-0001-34	19	50	1715	35	67	27
top	GHN-JRM-0001-35	18	50	1629	37	72	29
bottom	GHN-JRM-0001-36	19	50	1800	38	66	29
top	GHN-JRM-0001-37	18	48	1698	38	73	31
bottom	GHN-JRM-0001-38	17	48	1559	38	76	29
top	GHN-JRM-0001-39	18	52	1611	35	64	27
bottom	GHN-JRM-0001-40	18	51	1625	37	70	27
whole rock	GHN-JRM-0002	21	87	1047	45	102	46
fines	GHN-JRM-0002-92	21	101		110	224	84
coarse fraction	GHN-JRM-0002-90	18	80	1024	38	85	35
top	GHN-JRM-0002-33	17	81	932	35	78	32
bottom	GHN-JRM-0002-34	18	79	1014	37	85	33
whole rock	GHN-JRM-0009	17	48	1016	42	93	47
fines	GHN-JRM-0009-92	23	57		78	132	53
coarse fraction	GHN-JRM-0009-90	20	40	1262	49	94	39
top	GHN-JRM-0009-33	19	38	1326	44	88	37
bottom	GHN-JRM-0009-34	20	40	1471	48	96	40
whole rock	GHN-KMD-0057	21	73	910	43	87	39
fines	GHN-KMD-0057-92	25	106		84	161	67
coarse fraction	GHN-KMD-0057-90	19	74	918	35	71	34
top	GHN-KMD-0057-33	18	69	814	36	69	31
bottom	GHN-KMD-0057-34	17	69	826	39	70	31
whole rock	GHN-KMD-0088	20	47	1015	41	102	54
fines	GHN-KMD-0088-92	21	69		95	228	116
coarse fraction	GHN-KMD-0088-90	17	45	986	34	92	44
top	GHN-KMD-0088-33	18	41	865	25	56	27
bottom	GHN-KMD-0088-34	18	44	987	31	66	30
top	GHN-KMD-0088-35	16	39	882	26	60	28
bottom	GHN-KMD-0088-36	18	41	921	24	59	28
top	GHN-KMD-0088-39	17	40	842	33	75	36
bottom	GHN-KMD-0088-40	17	41	922	43	91	44
top	GHN-KMD-0088-41	17	42	949	30	73	35
bottom	GHN-KMD-0088-42	20	45	1054	35	76	38

	Sample	Ga	Cr	F	La	Ce	Nd
top	GHN-KMD-0088-43	18	43	992	32	78	36
bottom	GHN-KMD-0088-44	17	45	1008	39	87	42
top	GHN-KMD-0088-45	19	48	1097	40	90	42
bottom	GHN-KMD-0088-46	19	51	1121	39	96	45
top	GHN-KMD-0088-47	18	48	1066	39	89	43
bottom	GHN-KMD-0088-48	18	46	1071	39	89	42
whole rock	GHN-KMD-0096	24	16	1069	56	113	13
fines	GHN-KMD-0096-92	30	23		143	262	107
coarse fraction	GHN-KMD-0096-90	22	10	813	44	92	40
top	GHN-KMD-0096-33	21	10	835	42	87	39
bottom	GHN-KMD-0096-34	23	9	872	43	82	37
whole rock	MIN-VTM-0021	20	78	1330	26	57	28
fines	MIN-VTM-0021-92	21	77		48	88	45
coarse fraction	MIN-VTM-0021-90	19	77	906	31	54	27
top	MIN-VTM-0021-33	19	75	1302	28	56	28
bottom	MIN-VTM-0021-34	18	76	1256	27	55	29
whole rock	PIT-RDL-0005	27	7	793	34	67	26
fines	PIT-RDL-0005-92	33	19		98	168	63
coarse fraction	PIT-RDL-0005-90	24	7	776	36	73	30
top	PIT-RDL-0005-33	22	4	762	32	69	29
bottom	PIT-RDL-0005-34	23	5	771	33	65	28
whole rock	PIT-RDL-0006	27	8	1036	58	117	52
fines	PIT-RDL-0006-92	33	15		104	210	91
coarse fraction	PIT-RDL-0006-90	24	6	1188	50	102	45
top	PIT-RDL-0006-33	22	4	895	49	103	43
bottom	PIT-RDL-0006-34	24	6	949	50	103	46
top	PIT-RDL-0006-37	22	6	948	51	98	42
bottom	PIT-RDL-0006-38	23	6	944	48	101	45
top	PIT-RDL-0006-39	24	5	888	50	103	44
bottom	PIT-RDL-0006-40	22	5	913	48	98	43
whole rock	PIT-RDL-0007	26	7	1201	59	127	56
fines	PIT-RDL-0007-92	27	10		65	124	50
coarse fraction	PIT-RDL-0007-90	23	6	1020	70	132	56
top	PIT-RDL-0007-33	21	5	1067	65	130	53
bottom	PIT-RDL-0007-34	22	5	1118	68	134	56
whole rock	PIT-VTM-0600	19	72	771	34	63	27
fines	PIT-VTM-0600-92	21	71		41	72	30

	Sample	Ga	Cr	F	La	Ce	Nd
coarse fraction	PIT-VTM-0600-90	19	71	1070	38	73	32
top	PIT-VTM-0600-33	18	75	1108	38	67	32
bottom	PIT-VTM-0600-34	17	72	1094	38	73	32
whole rock	ROC-NWD-0002	24	82	1172	32	68	34
fines	ROC-NWD-0002-92	21	101		59	122	58
coarse fraction	ROC-NWD-0002-90	21	75	1024	33	63	31
top	ROC-NWD-0002-33	20	73	1008	31	64	30
bottom	ROC-NWD-0002-34	20	73	995	34	67	28
whole rock	SPR-JWM-0002	21	101	2415	41	79	33
fines	SPR-JWM-0002-92	21	122		55	116	48
coarse fraction	SPR-JWM-0002-90	18	101	2507	37	75	34
top	SPR-JWM-0002-33	18	100	2249	39	72	34
bottom	SPR-JWM-0002-34	19	101	2412	37	73	33
top	SPR-JWM-0002-35	18	101	2305	38	71	34
bottom	SPR-JWM-0002-36	18	98	2454	37	68	31
top	SPR-JWM-0002-37	18	100	2451	38	74	33
bottom	SPR-JWM-0002-38	17	102	2703	38	74	35
top	SPR-JWM-0002-39	19	101	2543	36	70	32
bottom	SPR-JWM-0002-40	18	97	3075	35	74	33
	RGC samples						
	SPR-KMD-0001	16	75	2546	42	81	35
	SPR-KMD-0002	16	131	3646	39	81	10
	SPR-KMD-0003	19	61	3523	47	81	8
	SSS-KMD-0001	19	83	1077	33	65	28
	SSS-KMD-0002	27	127	7814	41	79	35
	SSW-KMD-0001	23		1365	34	68	30
	Golder samples						
	SPR-OTH-0001	18	74		47	80	31
	SPR-OTH-0002	18	182	3838	51	86	32

TABLE 1-4. Mineralogy of humidity cells samples in percent.

	Sample	quartz	K-spar/ orthoclase	plagioclase	biotite	illite/ sericite (muscovite)	chlorite	smectite	kaolinte
	UU samples (NMT)								
NMT--whole	BCS-VWL-0004	27	21	24	0.01	14	3	2	2
NMT--fines	BCS-VWL-0004-92	29	1	9	0.01	40	4	2	2
NMT--coarse	BCS-VWL-0004-90	32	5	12	0.01	33	2	1	1
top	BCS-VWL-0004-33	32	11	12		27	2	1	1
bottom	BCS-VWL-0004-34	31	11	12		29	2	1	1
NMT--whole rock	GHN-JRM-0001	35	8	16	0.01	25	4	2	0.9
NMT--fines	GHN-JRM-0001-92	25	8	8		36	4	2	1
NMT--coarse	GHN-JRM-0001-90	38	15	10	0.01	23	4	1	1

	Sample	quartz	K-spar/ orthoclase	plagioclase	biotite	illite/ sericite (muscovite)	chlorite	smectite	kaolinte
top	GHN-JRM-0001-33	38	22	9		20	3	1	1
bottom	GHN-JRM-0001-34	37	22	9		20	3	1	1
top	GHN-JRM-0001-35	38	21	9		20	3	1	1
bottom	GHN-JRM-0001-36	38	22	9		20	3	1	1
top	GHN-JRM-0001-37	38	21	9		20	3	1	1
bottom	GHN-JRM-0001-38	38	21	9		20	3	1	1
top	GHN-JRM-0001-39	37	22	9		20	3	1	1
bottom	GHN-JRM-0001-40	37	22	9		20	3	1	1
NMT--whole rock	GHN-JRM-0002	26	18	19		16	6	4	
NMT--fines	GHN-JRM-0002-92	18	6	10		24	5	3	2
NMT--coarse	GHN-JRM-0002-90	28	21	18		14	6	1	1
top	GHN-JRM-0002-33	28	22	18		14	6	1	1
bottom	GHN-JRM-0002-34	28	22	18		14	5	1	1
NMT--whole rock	GHN-JRM-0009	50	2	5		31	3	1	1
NMT--fines	GHN-JRM-0009-92	30	0.1	11		37	4	3	2
NMT--coarse	GHN-JRM-0009-90	44	14	5		26	3	1	1
top	GHN-JRM-0009-33	44	20	4		22	3	1	1
bottom	GHN-JRM-0009-34	44	19	4		24	3	1	1
NMT--whole rock	GHN-KMD-0057	26	17	25		11	7	2	1
NMT--fines	GHN-KMD-0057-92	22	6	19		24	9	1	1
NMT--coarse	GHN-KMD-0057-90	26	27	18		7	8	1	1
top	GHN-KMD-0057-33	26	27	19		7	7	1	1
bottom	GHN-KMD-0057-34	26	27	19		7	7	1	1
NMT--whole rock	GHN-KMD-0088	29	22	19		15	4	2	2
NMT--fines	GHN-KMD-0088-92	23		26		22	6	1	1
NMT--coarse	GHN-KMD-0088-90	30	26	19		13	4	1	1
after-top	GHN-KMD-0088-33	30	27	20		11	4	1	1
bottom	GHN-KMD-0088-34	31	27	19		12	4	1	1
top	GHN-KMD-0088-35	30	28	21		10	4	1	1
bottom	GHN-KMD-0088-36	31	27	20		11	4	1	1
top	GHN-KMD-0088-39	30	28	21		10	4	1	1
bottom	GHN-KMD-0088-40	30	27	21		11	4	1	1
top	GHN-KMD-0088-41	31	27	19		12	4	1	1
bottom	GHN-KMD-0088-42	30	26	19		13	4	1	1
top	GHN-KMD-0088-43	31	27	19		11	4	1	1
bottom	GHN-KMD-0088-44	30	26	19		13	4	1	1
top	GHN-KMD-0088-45	30	24	19		15	4	1	1
bottom	GHN-KMD-0088-46	29	23	19		16	4	1	1
top	GHN-KMD-0088-47	29	23	19		16	4	1	1
bottom	GHN-KMD-0088-48	30	24	19		15	4	1	1
NMT--whole rock	GHN-KMD-0096	46	19	2	0.01	23	2	1	2
NMT--fines	GHN-KMD-0096-92	35	1	5		11	1	2	33
NMT--coarse	GHN-KMD-0096-90	51	24	0.01	0.01	19	1	1	1
top	GHN-KMD-0096-33	51	27	0.01		17	1	1	1

	Sample	quartz	K-spar/ orthoclase	plagioclase	biotite	illite/ sericite (muscovite)	chlorite	smectite	kaolinte
bottom	GHN-KMD-0096-34	51	27	0.01		17	1	1	1
NMT--whole rock	MIN-VTM-0021	32	11			41	4	2	2
NMT--fines	MIN-VTM-0021-92	21	7	1		52	2	1	3
NMT--coarse	MIN-VTM-0021-90	34	13			40	4	1	1
top	MIN-VTM-0021-33	34	13			40	4	1	1
bottom	MIN-VTM-0021-34	34	13			40	4	1	1
NMT--whole rock	PIT-RDL-0005	45	29	1		16	1	2	3
NMT--fines	PIT-RDL-0005-92	38	10	1		39	2	1	1
NMT--coarse	PIT-RDL-0005-90	48	33	1		13	1	1	1
top	PIT-RDL-0005-33	49	35	0.1		11	1	1	1
bottom	PIT-RDL-0005-34	48	35	0.1		12	1	1	1
NMT--whole rock	PIT-RDL-0006	48	24	1		19	1	3	1
NMT--fines	PIT-RDL-0006-92	43	10	1		37	2	1	1
NMT--coarse	PIT-RDL-0006-90	48	34	1		13	1	1	1
top	PIT-RDL-0006-33	48	36			11	1	1	1
bottom	PIT-RDL-0006-34	48	36			12	1	1	1
top	PIT-RDL-0006-37	48	35			12	1	1	1
bottom	PIT-RDL-0006-38	48	35			12	1	1	1
top	PIT-RDL-0006-39	48	36			11	1	1	1
bottom	PIT-RDL-0006-40	48	36			11	1	1	1
NMT--whole rock	PIT-RDL-0007	52	17	0.2		24	1	1	
NMT--fines	PIT-RDL-0007-92	47	3	1		39	1	1	1
NMT--coarse	PIT-RDL-0007-90	54	19	0.3		21	1	1	1
top	PIT-RDL-0007-33	52	27	0.01		16	1	1	1
bottom	PIT-RDL-0007-34	51	29	0.01		15	1	1	1
NMT--whole rock	PIT-VTM-0600	28	19	21		11	5	3	1
NMT--fines	PIT-VTM-0600-92	28	1	1		46	7	4	2
NMT--coarse	PIT-VTM-0600-90	26	21	15		13	6	3	1
top	PIT-VTM-0600-33	27	22	17		12	6	1	1
bottom	PIT-VTM-0600-34	27	22	16		12	6	1	1
NMT--whole rock	ROC-NWD-0002	16	22	36		10	5	1	1
NMT--fines	ROC-NWD-0002-92	14	19	31		13	5	2	2
NMT--coarse	ROC-NWD-0002-90	19	27	30		10	4	1	1
top	ROC-NWD-0002-33	20	28	30		9	4	1	1
bottom	ROC-NWD-0002-34	19	28	31		9	4	1	1
NMT--whole rock	SPR-JWM-0002	25	17	30	0.01	5	9	3	1
NMT--fines	SPR-JWM-0002-92	29	6	9		27	11	3	
NMT--coarse	SPR-JWM-0002-90	27	15	30	0.01	9	9	1	1
top	SPR-JWM-0002-33	26	17	31		4	9	1	1
bottom	SPR-JWM-0002-34	26	18	31		4	9	1	1
top	SPR-JWM-0002-35	26	18	32		3	9	1	1

	Sample	quartz	K-spar/ orthoclase	plagioclase	biotite	illite/ sericite (muscovite)	chlorite	smectite	kaolinte
bottom	SPR-JWM-0002-36	26	18	31		4	9	1	1
top	SPR-JWM-0002-37	27	17	31		4	9	1	1
bottom	SPR-JWM-0002-38	26	17	31		5	9	1	1
top	SPR-JWM-0002-39	26	17	31		4	9	1	1
bottom	SPR-JWM-0002-40	26	18	30		4	9	1	1
	RGC humidity cells								
NMT--whole rock	SPR-KMD-0001	26	33	9	0.01	10	5	7	1
NMT--whole rock	SPR-KMD-0002	28	23	16		10	9	1	1
NMT--whole rock	SPR-KMD-0003	31	36	12	0.01	7	2	1	4
NMT--whole rock	SSS-KMD-0001	28	21	18	0.01	15	5	2	1
NMT--whole rock	SSS-KMD-0002	26	26	17		6	7	1	1
NMT--whole rock	SSW-KMD-0001	25	21	16		18	6	2	1
	Golder humidity cells								
NMT--whole rock	SPR-OTH-0001	27	31	13	1	10	6	1	1
NMT--whole rock	SPR-OTH-0002	30	29	13	0.01	12	5	2	1

	Sample	epidote	magnetite	Fe oxides	rutile	apatite	pyrite	calcite	gypsum
	UU samples (NMT)								
NMT--whole	BCS-VWL-0004	0.01		3	0.4	0.5	0.7	2	0.40
NMT--fines	BCS-VWL-0004-92	0.1		10	0.3	0.8	0.01	0.8	0.01
NMT--coarse	BCS-VWL-0004-90	0.01		10	0.01	1	0.1	0.2	0.4
top	BCS-VWL-0004-33	0.01		10	0.01	0.6	0.01	2	1
bottom	BCS-VWL-0004-34			10	0.1	1	0.2	0.1	0.6
NMT--whole rock	GHN-JRM-0001	0.01		0.2	0.5	0.4	3	0.5	1
NMT--fines	GHN-JRM-0001-92	0.1		6	0.4	0.9	3	0.4	3
NMT--coarse	GHN-JRM-0001-90	0.1		1	0.5	0.3	3	0.4	0.8
top	GHN-JRM-0001-33			2	0.4	0.2	3	0.2	0.2
bottom	GHN-JRM-0001-34			2	0.5	0.4	3	0.2	0.4
top	GHN-JRM-0001-35			2	0.5	0.3	3	0.2	0.4
bottom	GHN-JRM-0001-36			2	0.5	0.3	3	0.2	0.3
top	GHN-JRM-0001-37			2	0.4	0.3	3	0.2	0.4
bottom	GHN-JRM-0001-38			2	0.4	0.4	3	0.1	0.4
top	GHN-JRM-0001-39			2	0.5	0.3	3	0.1	0.5
bottom	GHN-JRM-0001-40			2	0.5	0.3	3	0.1	0.5
NMT--whole rock	GHN-JRM-0002	0.3	0.01	7	0.5	0.9	0.3	0.6	1.20
NMT--fines	GHN-JRM-0002-92	9		12	0.2	1.0	0.1	0.5	4
NMT--coarse	GHN-JRM-0002-90	0	0.01	8	0.5	0.7	0.01	0.3	1.5
top	GHN-JRM-0002-33	0.4		7	0.5	0.9	0.1	0.6	0.4
bottom	GHN-JRM-0002-34	0.3		8	0.5	0.9	0.1	0.5	0.5
NMT--whole rock	GHN-JRM-0009	0.01		1	0.4	0.5	2	0.7	1.1
NMT--fines	GHN-JRM-0009-92			0.1	0.5	0.2	1	0.3	2

	Sample	epidote	magnetite	Fe oxides	rutile	apatite	pyrite	calcite	gypsum
NMT--coarse	GHN-JRM-0009-90	0.01		0.2	0.4	0.2	2	0.5	0.8
top	GHN-JRM-0009-33	0.01		1	0.4	0.2	2	0.4	0.3
bottom	GHN-JRM-0009-34	0.01		1	0.4	0.2	2	0.4	0.2
NMT--whole rock	GHN-KMD-0057	7	0.01	2	0.6	0.8	0.2	1	0.05
NMT--fines	GHN-KMD-0057-92	10		4	0.7	1	0.4	1	1
NMT--coarse	GHN-KMD-0057-90	8		2	0.6	0.8		0.5	0.2
top	GHN-KMD-0057-33	8		2	0.6	0.8	0.1	0.8	
bottom	GHN-KMD-0057-34	8		2	0.6	0.8	0.1	0.7	
NMT--whole rock	GHN-KMD-0088	0.01		3	0.4	0.5	0.9	0.2	1.1
NMT--fines	GHN-KMD-0088-92	11		0.20	0.6	0.2	0.3	0.1	3
NMT--coarse	GHN-KMD-0088-90	0		3	0.4	0.3	1	0.3	1
after-top	GHN-KMD-0088-33	0.20		3	0.4	0.5	1	0.3	0.3
bottom	GHN-KMD-0088-34	1		1	0.4	0.5	1	0.3	0.3
top	GHN-KMD-0088-35	0.3		2	0.4	0.5	1	0.3	0.3
bottom	GHN-KMD-0088-36	0.0		2	0.4	0.5	1	0.3	0.3
top	GHN-KMD-0088-39	0.3		2	0.4	0.5	2	0.4	0.2
bottom	GHN-KMD-0088-40	0.3		2	0.4	0.5	1	0.3	0.2
top	GHN-KMD-0088-41	0.01		2	0.4	0.5	1	0.4	0.3
bottom	GHN-KMD-0088-42	0.1		3	0.4	0.5	1	0.3	0.3
top	GHN-KMD-0088-43	1		2	0.4	0.5	1	0.3	0.3
bottom	GHN-KMD-0088-44	0.1		3	0.4	0.5	1	0.3	0.3
top	GHN-KMD-0088-45	0.01		3	0.4	0.5	1	0.2	0.5
bottom	GHN-KMD-0088-46	0.01		4	0.3	0.5	1	0.2	0.6
top	GHN-KMD-0088-47	0.01		4	0.3	0.5	1	0.2	0.6
bottom	GHN-KMD-0088-48	0.01		3	0.4	0.4	1	0.4	0.6
NMT--whole rock	GHN-KMD-0096	0.01		0.4	0.2	0.1	0.3	0.5	
NMT--fines	GHN-KMD-0096-92	0.01		0.01	0.3	0.1		0.2	3
NMT--coarse	GHN-KMD-0096-90	0.01		0.4	0.2	0.01	0.1	0.2	0.5
top	GHN-KMD-0096-33			1	0.1		0.1	0.2	0.2
bottom	GHN-KMD-0096-34			1	0.1		0.1	0.2	0.2
NMT--whole rock	MIN-VTM-0021	0.01		6	0.4	0.2	0.1	1	0.1
NMT--fines	MIN-VTM-0021-92	0.10		9	0.3	0.01	0.1	3	0.5
NMT--coarse	MIN-VTM-0021-90	0.01		6	0.4	0.3		0.9	0.1
top	MIN-VTM-0021-33	0.01		6	0.4	0.3	0.01	0.9	0.05
bottom	MIN-VTM-0021-34	0.01		6	0.4	0.3	0.01	1	0.05
NMT--whole rock	PIT-RDL-0005	0.01		2	0.1	0.01	0.01	0.7	0.10
NMT--fines	PIT-RDL-0005-92	0.01		4	0.1	1		0.01	0.3
NMT--coarse	PIT-RDL-0005-90			1	0.1	0.01	0.01	0.3	0.08
top	PIT-RDL-0005-33			1	0.1	0.01	0.01	0.3	0.02
bottom	PIT-RDL-0005-34			1	0.1	0.01	0.01	0.3	0.02
NMT--whole rock	PIT-RDL-0006	0.01		1	0.1		0.01	0.3	0.10
NMT--fines	PIT-RDL-0006-92			2	0.2		0.1	0.5	0.2
NMT--coarse	PIT-RDL-0006-90	0.01		1	0.1	0.01	0.01	0.2	0.06
top	PIT-RDL-0006-33			1	0.1			0.2	0.06

	Sample	epidote	magnetite	Fe oxides	rutile	apatite	pyrite	calcite	gypsum
bottom	PIT-RDL-0006-34			1	0.1			0.2	0.06
top	PIT-RDL-0006-37			1	0.1			0.2	0.06
bottom	PIT-RDL-0006-38			1	0.1			0.2	0.06
top	PIT-RDL-0006-39			1	0.1			0.1	0.06
bottom	PIT-RDL-0006-40			1	0.1			0.2	0.06
NMT--whole rock	PIT-RDL-0007	0.01	0.01	1	0.1	0.01	2	0.2	0.08
NMT--fines	PIT-RDL-0007-92			0.01	0.2		2	0.1	0.02
NMT--coarse	PIT-RDL-0007-90			0.01	0.1	0.01	1	0.2	0.02
top	PIT-RDL-0007-33			0.01	0.1		1	0.2	0.02
bottom	PIT-RDL-0007-34			0.01	0.1		1	0.2	0.02
NMT--whole rock	PIT-VTM-0600	7	0	1	1	1	1	2	0
NMT--fines	PIT-VTM-0600-92	0.01	0.01	4	0.4	2	2	3	0.3
NMT--coarse	PIT-VTM-0600-90	8		2	0.6	0.7	2	2	0.2
top	PIT-VTM-0600-33	8		2	0.6	0.7	1	2	0.1
bottom	PIT-VTM-0600-34	8		2	0.6	0.7	2	2	0.1
NMT--whole rock	ROC-NWD-0002			1	0.7	0.5	6	0.01	0.6
NMT--fines	ROC-NWD-0002-92				1	1	10	0.2	0.3
NMT--coarse	ROC-NWD-0002-90			2	0.7	0.5	4	0.1	0.5
top	ROC-NWD-0002-33			2	0.7	0.7	4	0.1	0.3
bottom	ROC-NWD-0002-34			2	0.7	0.5	3.6	0.01	0.3
NMT--whole rock	SPR-JWM-0002	4		2	0.6	0.7	2	1	0.2
NMT--fines	SPR-JWM-0002-92	7		4	0.7	0.8	0.8	1	0.6
NMT--coarse	SPR-JWM-0002-90	0.2		1	0.6	0.7	3	0.5	2
top	SPR-JWM-0002-33	5		2	0.7	0.8	1	0.7	0.1
bottom	SPR-JWM-0002-34	6		2	0.7	0.7	0.5	0.7	0.05
top	SPR-JWM-0002-35	5		2	0.7	0.7	0.6	0.7	0.05
bottom	SPR-JWM-0002-36	6		2	0.7	0.7	0.6	0.8	0.05
top	SPR-JWM-0002-37	5		2	0.7	0.7	0.5	0.6	0.1
bottom	SPR-JWM-0002-38	5		2	0.7	0.7	0.6	0.9	0.1
top	SPR-JWM-0002-39	6		2	0.7	0.7	0.6	0.8	0.1
bottom	SPR-JWM-0002-40	6		1	0.7	0.7	0.8	0.8	0.1
	RGC humidity cells								
NMT--whole rock	SPR-KMD-0001	0.01		1	0.7	0.01	2	5	0.26
NMT--whole rock	SPR-KMD-0002	6		0.01	0.7	0.7	1	4	0.20
NMT--whole rock	SPR-KMD-0003	3	0.01	0.01	0.5	0.3	0.8	2.2	0.14
NMT--whole rock	SSS-KMD-0001	1		2	0.5	0.4	2	2	2.00
NMT--whole rock	SSS-KMD-0002	7	0.01	1	0.6	0.6	1	3	2.30
NMT--whole rock	SSW-KMD-0001			5	0.5	0.4	1	0.7	3.40
	Golder humidity cells								
NMT--whole rock	SPR-OTH-0001	3	0.01	1	0.6	0.7	1	4	0.40
NMT--whole rock	SPR-OTH-0002	2	0.01	0.01	0.6	2	2	1	0.44

	Sample	zircon	sphalerite	molybdenite	fluorite	jarosite	copiapite	chalcopyrite	organic C
	UU samples (NMT)								
NMT--whole	BCS-VWL-0004	0.03				0.01			0.5
NMT--fines	BCS-VWL-0004-92	0.04				1			0.5
NMT--coarse	BCS-VWL-0004-90	0.03				2			0.5
top	BCS-VWL-0004-33	0.03				1			0.5
bottom	BCS-VWL-0004-34	0.03				0.9			0.9
NMT--whole rock	GHN-JRM-0001	0.03				3			
NMT--fines	GHN-JRM-0001-92	0.03				2			
NMT--coarse	GHN-JRM-0001-90	0.03			0.003	2			
top	GHN-JRM-0001-33	0.03			0.003	0.5			
bottom	GHN-JRM-0001-34	0.03				0.3			
top	GHN-JRM-0001-35	0.03				0.6			
bottom	GHN-JRM-0001-36	0.03			0.001	0.4			
top	GHN-JRM-0001-37	0.03				0.5			
bottom	GHN-JRM-0001-38	0.03				0.5			
top	GHN-JRM-0001-39	0.03				0.2			
bottom	GHN-JRM-0001-40	0.03				0.2			
NMT--whole rock	GHN-JRM-0002	0.03				0.01			
NMT--fines	GHN-JRM-0002-92	0.03				5			
NMT--coarse	GHN-JRM-0002-90	0.03				0.01			
top	GHN-JRM-0002-33	0.03				0.01			
bottom	GHN-JRM-0002-34	0.03				0.01			
NMT--whole rock	GHN-JRM-0009	0.04				1.9			
NMT--fines	GHN-JRM-0009-92	0.02				9			
NMT--coarse	GHN-JRM-0009-90	0.04				1.7			
top	GHN-JRM-0009-33	0.04				0.3			
bottom	GHN-JRM-0009-34	0.04				0.7			
NMT--whole rock	GHN-KMD-0057	0.03							
NMT--fines	GHN-KMD-0057-92	0.04							
NMT--coarse	GHN-KMD-0057-90	0.03							
top	GHN-KMD-0057-33	0.03							
bottom	GHN-KMD-0057-34	0.03							
NMT--whole rock	GHN-KMD-0088	0.03				0.4			
NMT--fines	GHN-KMD-0088-92	0.03				5			
NMT--coarse	GHN-KMD-0088-90	0.03						0.01	
after-top	GHN-KMD-0088-33	0.03							
bottom	GHN-KMD-0088-34	0.03							
top	GHN-KMD-0088-35	0.03							
bottom	GHN-KMD-0088-36	0.03							
top	GHN-KMD-0088-39	0.03							
bottom	GHN-KMD-0088-40	0.03							
top	GHN-KMD-0088-41	0.03							
bottom	GHN-KMD-0088-42	0.03							
top	GHN-KMD-0088-43	0.03							

	Sample	zircon	sphalerite	molybdenite	fluorite	jarosite	copiapite	chalcopyrite	organic C
bottom	GHN-KMD-0088-44	0.03							
top	GHN-KMD-0088-45	0.03							
bottom	GHN-KMD-0088-46	0.03							
top	GHN-KMD-0088-47	0.03							
bottom	GHN-KMD-0088-48	0.03							
NMT--whole rock	GHN-KMD-0096	0.06				2.5			
NMT--fines	GHN-KMD-0096-92	0.04				9			
NMT--coarse	GHN-KMD-0096-90	0.06				1.4			
top	GHN-KMD-0096-33	0.06				0.7			
bottom	GHN-KMD-0096-34	0.06				0.9			
NMT--whole rock	MIN-VTM-0021	0.03				0.1			
NMT--fines	MIN-VTM-0021-92	0.03				0.01			
NMT--coarse	MIN-VTM-0021-90	0.03				0.1			
top	MIN-VTM-0021-33	0.03				0.01			
bottom	MIN-VTM-0021-34	0.03				0.01			
NMT--whole rock	PIT-RDL-0005	0.04				1			
NMT--fines	PIT-RDL-0005-92	0.06				3			
NMT--coarse	PIT-RDL-0005-90	0.06				0.7			
top	PIT-RDL-0005-33	0.06				0.5			
bottom	PIT-RDL-0005-34	0.06				0.6			
NMT--whole rock	PIT-RDL-0006	0.06				1			
NMT--fines	PIT-RDL-0006-92	0.06				2			
NMT--coarse	PIT-RDL-0006-90	0.06				0.7			
top	PIT-RDL-0006-33	0.06				0.7			
bottom	PIT-RDL-0006-34	0.06				0.6			
top	PIT-RDL-0006-37	0.06				0.7			
bottom	PIT-RDL-0006-38	0.06				0.7			
top	PIT-RDL-0006-39	0.06				0.6			
bottom	PIT-RDL-0006-40	0.06				0.6			
NMT--whole rock	PIT-RDL-0007	0.06				0.9			
NMT--fines	PIT-RDL-0007-92	0.06				5			
NMT--coarse	PIT-RDL-0007-90	0.06				1			
top	PIT-RDL-0007-33	0.06				0.9			
bottom	PIT-RDL-0007-34	0.06				0.5			
NMT--whole rock	PIT-VTM-0600	0		0.01				0.01	
NMT--fines	PIT-VTM-0600-92	0.03							
NMT--coarse	PIT-VTM-0600-90	0.03						0.01	
top	PIT-VTM-0600-33	0.03				0.01			
bottom	PIT-VTM-0600-34	0.03							
NMT--whole rock	ROC-NWD-0002	0.03				0.2		0.01	
NMT--fines	ROC-NWD-0002-92					1			
NMT--coarse	ROC-NWD-0002-90	0.03				0.01		0.01	

	Sample	zircon	sphalerite	molybdenite	fluorite	jarosite	copiapite	chalcopyrite	organic C
top	ROC-NWD-0002-33	0.03				0.01			
bottom	ROC-NWD-0002-34	0.03				0.01			
NMT--whole rock	SPR-JWM-0002	0.03			0.01	0.01		0.01	
NMT--fines	SPR-JWM-0002-92	0.03			0.01				
NMT--coarse	SPR-JWM-0002-90	0.03		0.01			0.01		
top	SPR-JWM-0002-33	0.03							
bottom	SPR-JWM-0002-34	0.03				0.01			
top	SPR-JWM-0002-35	0.03							
bottom	SPR-JWM-0002-36	0.03							
top	SPR-JWM-0002-37	0.03							
bottom	SPR-JWM-0002-38	0.03							
top	SPR-JWM-0002-39	0.03							
bottom	SPR-JWM-0002-40	0.03							
	RGC humidity cells								
NMT--whole rock	SPR-KMD-0001	0.04		0.01	0.03	0.01			
NMT--whole rock	SPR-KMD-0002	0.03		0.01	0.05				
NMT--whole rock	SPR-KMD-0003	0.03			0.05				
NMT--whole rock	SSS-KMD-0001	0.03							
NMT--whole rock	SSS-KMD-0002	0.03	0.01		0.14				
NMT--whole rock	SSW-KMD-0001	0.03							
	Golder humidity cells								
NMT--whole rock	SPR-OTH-0001	0.03			0.01			0.01	
NMT--whole rock	SPR-OTH-0002	0.03		0.01	0.01			0.01	