Summary results of short-wave infrared spectroscopy of the gold bearing drill cores from Centennial, Propalof, Red Cove, and of auger samples from the Orange grid; all of Popof Island of Southwest Alaska.

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Summary Results of Short-wave Infrared Spectroscopy, Popof Island, Alaska

Analysis of Drill Core: Centennial, Propalof, Red Cove
Analysis of Auger Samples: Orange Grid

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Background

Samples from several project areas on Popof Island, Alaska were analyzed on June 14, 2005. The samples are part of a collection stored at the Alaskan Geological Materials Repository in Eagle River, Alaska. Anne Thompson of PetraScience Consultants Inc., Vancouver, B.C., carried out the analyses on site at the warehouse. Sketch maps were available of the areas, but no site visit was made and the project geologist was not available for discussions regarding the samples. The analyses were carried out with a PIMA-SP spectrometer. Results were previously reported in excel spreadsheets via email. This report summarizes the basic variations observed. Also included is a brief description of the technique.

Summary

The analysis successfully helped to identify a variety of alteration minerals including the following: smectite (including montmorillonite, and likely beidellite), illite, chlorite, dickite, kaolinite, illite, kaolinite, prehnite, pyrophyllite, alunite (rare) and carbonate. In particular, the following observations were made for each of the areas:

Centennial

The alteration mineralogy observed in the Centenniel drill core is characterized by the presence of chlorite, illite, epidote and calcite. Prehnite was also observed in a couple of samples. Gypsum is common, likely as the result of weathering of fine pyrite in the core during storage. Where present the illite appears to vary in composition from phengitic to more potassic compositions as defined by a wavelength shift in the Al-OH position at approximately 2200nm. The majority of the illite is characterized by a wavelength position of ~2212-2216nm (phengitic). A few samples, however, have much lower values, e.g. ~2198nm. The lower wavelengths, in some deposits, may be associated with mineralization.

Propalof

Only a handful of samples were analyzed from the Propalof core. One drill hole (03) was available at the warehouse, and visual inspection of the core suggested much of it consisted of relatively fresh rock. Small zones of veining in the core contained quartz and carbonate (calcite and dolomite). Minor montmorillonite and kaolinite were also observed.

Red Cove

The alteration at Red Cove contains zones of advanced argillic minerals including pyrophyllite and alunite. Broadly the alteration includes zones of alunite, pyrophyllite-dickite, kaolinite, outwards to illite, and montmorillonite or beidellite – chlorite. Beidellite is an Al-rich smectite-group mineral.

Orange Grid

Montmorillonite, illite, kaolinite, dickite, chlorite, and likely carbonate are common in the auger samples from the Orange Grid. Dickite appears to group in an area within the grid, and may be of interest if it correlates with variations in the geochemistry. In general, the chip samples are more difficult to analyze, particularly as the majority of samples appeared inhomogenous, with both possible altered chips and fresh rock mixed together. The smaller the amount of clay present, the more reduced the signal will be, causing a flat and unresponsive pattern. Many of the samples shown as "?Silica" may be a reflection of a dominant amount of fresh rock in the sample. These samples essentially showed up as flat lines on the spectrometer.

Reflectance Spectroscopy

Short-wave infrared spectroscopy detects the energy generated by vibrations within molecular bonds. These bonds have bending and stretching modes within the 1300 to 2500nm region of the electromagnetic spectrum. The observed absorption features represent the first and second overtones and combination tones of fundamental modes that occur in the mid-infrared region. The positions of the features in the spectrum and their characteristic shapes are a function of the molecular bonds present in the mineral. A typical spectrum consists of several characteristic features including the hull (background), wavelength position, feature depth and width. Variations in chemical composition may be detected as the wavelength positions of features shift consistently with elemental substitution. The SWIR range is particularly responsive to a variety of molecules and radicals typical of alteration minerals, including OH, H_2O, NH_4, CO_3, and cation-OH bonds such as Al-OH, Mg-OH and Fe-OH.

Mineral identification is based on feature positions, intensity and shape of absorption troughs and the overall shape of the entire spectrum. The short-wave infrared wavelength region is not suitable for most anhydrous silicates, however some important features may be visible for individual minerals in the VNIR, where variations in iron and chromium are observed. In order to accurately identify minerals, high quality reference data sets are required (e.g. Hauff, 1993). These references constitute empirical records of a mineral's characteristic spectra. Visual observation of a group of spectra for a given mineral will quickly show variations based on numerous factors, including mineral chemistry, temperature, mode of formation and other subtle changes.

The positions of the features in the spectrum and their characteristic shapes are a function of the molecular bonds present in the mineral. Variations in chemical composition may be detected as the wavelength positions of features shift consistently with elemental substitution. SWIR spectroscopy is partly sensitive to crystallinity variations, but may not detect primary changes in the lattice structure. A typical spectrum consists of several absorption features. Figure 1 below illustrates the various aspects of an absorption feature, including wavelength position, depth and width (full height, half width maximum). The outline of the hull or continuum is also shown.

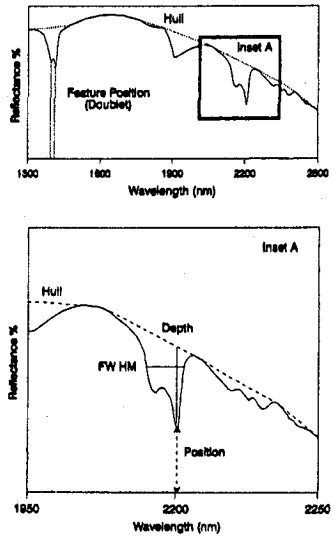

Figure 1. Elements of a reflectance spectrum, including hull, wavelength position and depth.

Each sample is typically analyzed twice and every analysis uses gold reflectance calibration. Wavelength calibration was carried out approximately every 5°C change in temperature. Mineral identification was verified using references from the Spectral Library, SPECMIN™ and compared using overlays in FeatureSearch 1.6 (SIMIS Solutions). Representative plots in this report were made using SpecWin. Examples of the minerals identified in the samples are shown in Figure 2.

Typically, in order to achieve high quality results, spectral variations at the deposit-scale must be observed and recorded by the user. Identification of complex mixtures requires geological context, user experience and establishment of reference samples with supporting mineralogical information from other analytical techniques.

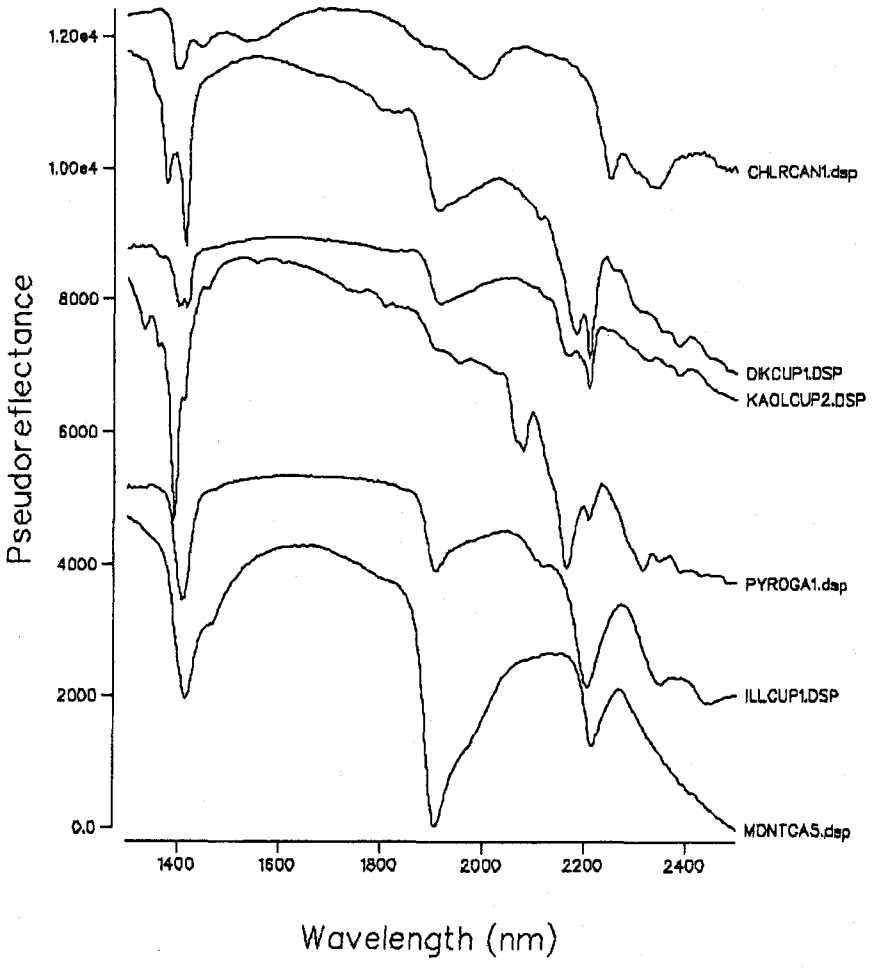

Figure 2. The spectra shown above are references (top to bottom): chlorite, dickite, kaolinite, pyrophyllite, illite, and montmorillonite.

References

Hauff, P.L., 1993, SPECMIN™ Mineral Identification System and Spectral Library, v. 1 & 2.: Arvada, Colorado.

Thompson, A.J.B., Hauff, P.L., and Robitaille, A.J., 1999, Alteration mapping in exploration: Application of short-wave infrared spectroscopy: Society of Economic Geologists' Newsletter, v.39, 13 pp.

Thompson, A.J.B. and Thompson, J.F.H., 1996, Atlas of Alteration: A Field and Petrographic Guide to Hydrothermal Alteration Minerals: Geological Association of Canada, Mineral Deposits Division, 119p.

Drill Hole	Depth FT	File Name	Mineral 1	Mineral 2	Mineral3		Description
CEN 01	21	AES_CEN00001	Prehnite	Montmorillonite			green, hematitic red
		AES_CEN00002	Prehnite	Montmorillonite			0.17oz. Au, green, hematitic red , white fracture fill, no response ma
	70	AES_CEN00003	Chlorite	?Calcite			pale green white fracture fill,
		AES_CEN00004	Chlorite	?Calcite			pale green white fracture fill,
	95	AES_CEN00005	u/r				pale green , hard, minor white in vugs
		AES_CEN00006	u/r				pale green , hard, minor white in vugs
	119	AES_CEN00007	Calcite	?Chlorite			pale green , hard, centred on white veinlet
		AES_CEN00008	u/r				pale green , hard, groundmass
	150	AES_CEN00009	Chlorite (Mg)				pale, pale green , groundmass, diss sulfides
		AES_CEN00010	Chlorite (Mg)				pale, pale green , groundmass, diss sulfides
	169	AES_CEN00011	Epidote				pale, pale green , groundmass, diss sulfides
		AES_CEN00012	Epidote				pale, pale green , groundmass, diss sulfides
	179.5	AES_CEN00013	Prehnite	Montmorillonite			white to pale green groundmass of breccia, clasts red/grey
		AES_CEN00014	Prehnite	Montmorillonite			white to pale green groundmass of breccia, clasts red/grey
	252	AES_CEN00015	u/r				white to pale green groundmass, homogeneous, fine-grained
		AES_CEN00016	Gypsum (minor)				white to pale green groundmass, homogeneous, fine-grained
	258.5	AES_CEN00017	Chlorite				white to pale green groundmass, green spots, fine-grained
		AES_CEN00018	Chlorite	Epidote			white to pale green groundmass, green spots, fine-grained
	350	AES_CEN00019	Quartz				white to pale green fracture surface, hard
		AES_CEN00020	Gypsum				white to pale green hard, homogeneous
	358	AES_CEN00021	?tr Chlorite				white veinlet in hard, grey, red spots
		AES_CEN00022	?tr Chlorite				hard, grey, red spots
	442	AES_CEN00023	Chlorite	Montmorillonite			pale green, white splotches
		AES_CEN00024	Chlorite	Montmorillonite			pale green, white splotches mostly white
	499	AES_CEN00025	u/r				pale green, hard, fine-grained
		AES_CEN00026	Calcite				pale green, hard, fine-grained fracture surface
CEN 03	41	AES_CEN00027	u/r				fine pink and green alteration, dominantly pink
		AES_CEN00028	u/r				fine pink and green alteration, white vug-quartz?
	58	AES_CEN00029	Illite	?Quartz		2204	white to yellow-brown weathered
		AES_CEN00030	Montmorillonite	Kaolinte		2210	white to yellow-brown weathered
	101	AES_CEN00031	Illite	Kaolinte	?Chlorite	2210	green, white with hematite
		AES_CEN00032	Illite	Chlorite	?Carbonate	2212	green, white with hematite broken surface
	133.5	AES_CEN00033	Chlorite	?Calcite			green, minor white clear crystals, broken surface
		AES_CEN00034	Chlorite	?tr Calcite			green, broken surface
	155.5	AES_CEN00035	Illite	Gypsum		2214	pale tan, to green, irregular stringers, unweath version 58
		AES_CEN00036	Calcite	Tr. Gypsum			, white patches irregular stringers, unweath version 58
		AES_CEN00037	Illite	Gypsum		2212	, white patches irregular stringers, scraped groundmass

Drill Hole	Depth FT	File Name	Mineral 1	Mineral 2	Mineral3		Description
	262	AES_CEN00038	?Gypsum				white, green, homogeneous
		AES_CEN00039	?Gypsum				white, green, homogeneous
	357	AES_CEN00040	u/r				green, homogeneous hard
		AES_CEN00041	u/r				green, homogeneous hard
CEN 07	43	AES_CEN00042	u/r				green, grey homogeneous hard
		AES_CEN00043	Prehnite				green, grey homogeneous hard outside surface
	66	AES_CEN00044	u/r				green, grey homogeneous hard broken surface
		AES_CEN00045	u/r				green, grey homogeneous outside surface
	109	AES_CEN00046	?Epidote/clinozoisite				green, grey homogeneous fresh broken sulfides
		AES_CEN00047	?Epidote/clinozoisite				green, grey homogeneous fresh broken sulfides
	129	AES_CEN00048	Chlorite -Mg				pale green, grey homogeneous broken surface
		AES_CEN00049	Chlorite -Mg				pale green, grey homogeneous flat surface
	194	AES_CEN00050	Chlorite - Mg				pale green, grey homogeneous flat surface
		AES_CEN00051	Chlorite - Mg				pale green, grey homogeneous flat surface
	354	AES_CEN00052	?Chlorite				white, grey green, sulfides irregular
		AES_CEN00053	?Chlorite				white, grey green, sulfides irregular no fizz
	485	AES_CEN00054	Illite	?tr Gypsum		2214	white, soft, grey extremely altered
		AES_CEN00055	Illite	Gypsum		2208	white, soft, grey extremely altered sawn surface
	489	AES_CEN00056	Chlorite				white,hard, sulfides, grey broken surface
		AES_CEN00057	Chlorite	tr Gypsum			white,hard, sulfides, greysawn surface
	512	AES_CEN00058	Chlorite - Fe-Mg				white,grey green clasts, sulfides, dominantly green clast
		AES_CEN00059	Chlorite - Fe				white,grey green clasts, sulfides, fresh green clast
	589.5	AES_CEN00060	Chlorite - Mg				fine grained green
		AES_CEN00061	Chlorite - Mg				fine grained green
CEN 11	26	AES_CEN00062	u/r				fine grained green-pink (?K-spr)
		AES_CEN00063	Montmorillonite				fine grained green-pink (?K-spr)
	93	AES_CEN00064	?Quartz				fine grained green-pink , white veinlet fizzes
		AES_CEN00065	Quartz				fine grained green-pink , white tan area
	131	AES_CEN00066	Quartz				fine grained green-white, homogeneous, sandy
		AES_CEN00067	Gypsum	?Quartz			fine grained green-white, homogeneous, sandy
	274	AES_CEN00068	Montmorillonite	Chlorite	Quartz?		fine grained green-white, homogeneous, soft, sulfides
		AES_CEN00069	Quartz	tr Gypsum			fine grained green-white, homogeneous, soft, sulfides
	427	AES_CEN00070	Illite	?Gypsum		2196	fine grained, black
		AES_CEN00071	Illite	?Gypsum		2196	fine grained, black
	508	AES_CEN00072	Illite			2212	end of hole, white, soft, green clasts

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Drill Hole	Depth FT	File Name	Mineral 1	Mineral 2	Mineral3		Description
CEN 14	39.5	AES_CEN00073	?Calcite	u/r			grey green fine-grained sandy
		AES_CEN00074	?Calcite	?Chlorite	?Illite		grey green fine-grained sandy sawn surface
	89	AES_CEN00075	Chlorite	Calcite	Montmorillonite		grey green fine-grained sandy broken surface, fine cc veinlet
		AES_CEN00076	Chlorite	Calcite	Montmorillonite		grey green fine-grained sandy broken surface, fine cc veinlet
	121.5	AES_CEN00077	Montmorillonite	Chlorite			clast in sandy matrix,white green no fizz
		AES_CEN00078	Gypsum				clast in sandy matrix,dominantly matrix material
	149	AES_CEN00079	Calcite	Montmorillonite	?Chlorite		grey green fine-grained
		AES_CEN00080	Calcite	tr Montmorillonite	?Chlorite		grey green fine-grained sawn surface
	207	AES_CEN00081	?Chlorite				grey green fine-grained sawn surface, volcanoclastic?
		AES_CEN00082	Chlorite	?Montmorillonite	Calcite		grey green fine-grained fresh surface, fragments, gentle fizz
	282	AES_CEN00083	Chlorite				white, grey-grn soft with sulfides fragmental
		AES_CEN00084	Chlorite				white, grey-grn soft with sulfides fragmental fresh surface
	378	AES_CEN00085	u/r				grey green, fragmental fine fractures
		AES_CEN00086	Montmorillonite	Chlorite		2210	grey green, fragmental sawn surface
	483.5	AES_CEN00087	Illite	Chlorite		2216	white grey, extremely soft minor sulfides?
		AES_CEN00088	Gypsum	Chlorite	Illite	2214	white grey, extremely soft minor sulfides? strong fizz in brown stain
		AES_CEN00089	Illite	Chlorite	Gypsum	2216	white grey, extremely soft minor sulfides? strong fizz in brown stain
	499	AES_CEN00090	u/r				black, fine-grained
		AES_CEN00091	u/r				black, fine-grained fresh
	555.5	AES_CEN00092	Chlorite - Fe				pale green sand, end of hole
		AES_CEN00093	Chlorite - Fe				pale green sand, end of hole no fizz
CEN 41	17	AES_CEN00094	Illite	?Gypsum		2210	white, yellow, weathered
		AES_CEN00095	Illite			2210	white, yellow, weathered
	24	AES_CEN00096	Illite			2210	white, grey clasts, moderately soft
		AES_CEN00097	Illite			2210	white, grey clasts, moderately soft
	41	AES_CEN00098	Illite	Gypsum	?Quartz	2214	white, grey clasts, grey matrix, 0.066 Au opt, soft
		AES_CEN00099	Illite			2216	white, grey clasts, grey matrix, 0.066 Au opt, fracture white surface
	48	AES_CEN00100	Illite	Chlorite		2216	clasts, fragmental white, grey
		AES_CEN00101	Illite	Chlorite		2214	clasts, fragmental white, grey
	73	AES_CEN00102	Chlorite	Illite		2216	green, white, bleached
		AES_CEN00103	Chlorite	Illite		2216	green, white, bleached
	78	AES_CEN00104	Illite	Gypsum	?Carbonate	2212	green, white, bleached, brown stain with fizz
		AES_CEN00105	Illite	Gypsum	?Carbonate	2216	green, white, bleached, brown stain with fizz
	111	AES_CEN00106	Montmorillonite	Chlorite		2212	?fragmental, pale green, white,
		AES_CEN00107	Montmorillonite	Chlorite		2208	?fragmental, pale green, white,
	131	AES_CEN00108	Illite			2214	adjacent min zone, pale white, grey, sandy bleached fragmental
		AES_CEN00109	Illite	Chlorite		2210	adjacent min zone, pale white, grey, sandy bleached fragmental

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Drill Hole	Depth FT	File Name	Mineral 1	Mineral 2	Mineral3		Description
	147	AES_CEN00110	Illite	Chlorite		2214	adjacent min zone, pale white, soft grey, bleached fragmental
		AES_CEN00111	Chlorite	Illite		2214	adjacent min zone, pale white, soft grey, bleached fragmental
	167	AES_CEN00112	Montmorillonite	?Chlorite		2208	white, green, hard
		AES_CEN00113	Montmorillonite	?Chlorite		2202	white, green, hard
	200	AES_CEN00114	?Quartz	tr. ?Montmorillon			green grey, homogeneous, hard
		AES_CEN00115	?Quartz	tr. ?Montmorillon			green grey, homogeneous, hard
	248	AES_CEN00116	Chlorite	Gypsum			green grey, homogeneous, hard, sandy
		AES_CEN00117	Chlorite	Gypsum			green grey, homogeneous, hard, sandy fresh surface no fizz
CEN 57	10	AES_CEN00118	Chlorite - Fe	?Kaolinite			tan, yellow-green moderately soft
		AES_CEN00119	Chlorite - Fe	?Kaolinite			tan, yellow-green moderately soft minor fizz
	18	AES_CEN00120	Chlorite - Fe				tan, yellow-green moderately soft
		AES_CEN00121	Chlorite				tan, yellow-green moderately soft
	24	AES_CEN00122	Quartz	?tr Chlorite			tan, yellow-green moderately soft , irregular green zone
		AES_CEN00123	Quartz				tan, yellow-green moderately soft , irregular tan zone
	35	AES_CEN00124	Illite			2204	white, virtually pure clay zone
		AES_CEN00125	Gypsum	Illite		2212	grey zone with ?sulfides 10cm away
	45	AES_CEN00126	Chlorite	Montmorillonite			grey-green homogeneous
		AES_CEN00127	Chlorite	Montmorillonite		2212	grey-green homogeneous sawn surface, filed
	58	AES_CEN00128	Gypsum	?Chlorite			grey-green fragmental, broken end
		AES_CEN00129	Chlorite				grey-green fragmental, filed flat surface
	86	AES_CEN00130	Chlorite				grey-green fragmental, filed flat surface
		AES_CEN00131	Chlorite				grey-green fragmental, filed broken surface
	115	AES_CEN00132	Chlorite	Montmorillonite		2208	grey-green fragmental, broken surface
		AES_CEN00133	Chlorite	Montmorillonite		2209	grey-green fragmental, filed sawn surface
	136.5	AES_CEN00134	Chlorite	?Epidote			grey-green fragmental, filed sawn surface
		AES_CEN00135	Chlorite	?Epidote	?Montmorillonite		grey-green fragmental, broken surface
	156	AES_CEN00136	u/r				grey-green, grey cores, hard, green matrix
		AES_CEN00137	?tr Chlorite				grey-green, grey cores, hard, green matrix, minor fizz
	162	AES_CEN00138	u/r				grey-green, sandy, homogeneous
		AES_CEN00139	u/r				grey-green, sandy, homogeneous
	168.5	AES_CEN00140	?Montmorillonite	?Chlorite			grey-green, homogeneous hard
		AES_CEN00141	Prehnite	?Gypsum			grey-green, fracture surface
		AES_CEN00142	Prehnite				grey-green, fracture surface
	196	AES_CEN00143	u/r				grey-green, sandy, fragmental
		AES_CEN00144	u/r				grey-green, sandy, fragmenta sawn surface
	229	AES_CEN00145	u/r				grey-green, broken surface, hard
		AES_CEN00146	u/r				grey-green, sawn surface

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Drill Hole	Depth FT	File Name	Mineral 1	Mineral 2	Mineral3		Description
	259	AES_CEN00147	u/r				grey-green, end of core
		AES_CEN00148	u/r				grey-green, filed, flat
	287.5	AES_CEN00149	?Calcite				grey-green,fracture surface with ?cc
		AES_CEN00150	?Chlorite	Montmorillonite			grey-green, filed surface
CEN 58	17	AES_CEN00151	Chlorite - Mg				grey green sandy
		AES_CEN00152	u/r				grey green sandy, filed
	38.5	AES_CEN00153	?Chlorite	?Montmorillonite			grey green-yellow sandy
		AES_CEN00154	?Chlorite	?Montmorillonite			grey green-yellow sandy
	71.5	AES_CEN00155	Gypsum	?Illite		2222	grey green fragmental, sandy
		AES_CEN00156	Gypsum	?Illite		2222	grey green fragmental, sandy
	100	AES_CEN00157	?Gypsum				grey green fragmental, sandy
		AES_CEN00158	?Gypsum				grey green fragmental, sandy
	134	AES_CEN00159	u/r				grey green fragmental, sandy
		AES_CEN00160	u/r				grey green fragmental, sandy
	153	AES_CEN00161	Zeolite				grey green, white multiple veinlets
		AES_CEN00162	Zeolite				grey green, white multiple veinlets, end of core
	169	AES_CEN00163	?Zeolite?				grey green, minor white veinlets
		AES_CEN00164	?Zeolite?				grey green, minor white veinlets
	201.5	AES_CEN00165	?Quartz				dark grey, fragmental
		AES_CEN00166	?Quartz				, dark grey, fragmental
	222	AES_CEN00167	?Quartz				pink, crystalline vein
		AES_CEN00168	?Quartz				pink, crystalline vein light
		AES_CEN00169	?Quartz				pink, crystalline vein fizzes
	232.5	AES_CEN00170	Illite	Chlorite		2210	grey green, sandy fragmental
		AES_CEN00171	Illite	Chlorite			grey green, sandy fragmental
	271	AES_CEN00172	Chlorite - Fe	tr Illite		2214	grey green, mottled, with hematite pink
		AES_CEN00173	?Chlorite				grey green, mottled, with hematite pink
	301.5	AES_CEN00174	?Chlorite				grey green, mottled, with hematite pink
		AES_CEN00175	u/r				grey green, mottled, with hematite pink

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Drill Hole	Depth FT	File Name	Mineral 1	Mineral 2	Mineral3	wvlgth	Description
PR 03	11	AES_PR_00001	?Montmorillonite			2210	pale green, dark green spots
		AES_PR_00002	?Montmorillonite			2210	pale green, dark green spots
	91	AES_PR_00003	?Kaolinite				dark grey, fine-grained
		AES_PR_00004	?Quartz				dark grey, fine-grained, white veinlet
		AES_PR_00005	?Quartz		Calcite (fizz)		dark grey, fine-grained, white veinlet fizzes!
	125	AES_PR_00006	Calcite	Quartz		2336	breccia veinlet in dark- grey-green host
		AES_PR_00007	u/r				dark- grey-green host
	168	AES_PR_00008	Quartz	?Montmorillonite		2202	white banded veinlet
		AES_PR_00009	Quartz				white banded veinlet
		AES_PR_00010	Chlorite	?Kaolinite			dark grey green host rock
	198	AES_PR_00011	Calcite	Quartz		2336	white banded vein in dark grey-black host
		AES_PR_00012	Quartz	Calcite		2332	green-grey fragment in cc veinlet
	256	AES_PR_00013	Calcite	?Dolomite		2334	white veinlet, pod in green fine-grained host
		AES_PR_00014	Dolomite	?Calcite		2324	green fine-grained host
	291	AES_PR_00015	Chlorite	Illite		2212	pale green-grey with disseminated py
		AES_PR_00016	Chlorite	Illite		2214	pale green-grey with disseminated py end of hole

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Depth FT	File Name RC	Mineral 1	Mineral 2	Mineral3	Al-OH wvlgth	Description
52	AES_RC_00001	Kaolinite				white, grey soft
	AES_RC_00002	Kaolinite				white, grey soft
74	AES_RC_00003	Pyrophyllite				white, grey soft, slick
	AES_RC_00004	Pyrophyllite	?Kaolinite			white, grey soft, slick
103	AES_RC_00005	Alunite (1482)				white, grey soft
	AES_RC_00006	Alunite (1482)	Kaolinite			white, grey soft, broken end
136.5	AES_RC_00007	Pyrophyllite				white, grey pale yellow stain, soft
	AES_RC_00008	Pyrophyllite	?Kaolinite			white, grey pale yellow stain, soft
171	AES_RC_00009	Beidellite			2192	grey pale yellow stain, mottled
	AES_RC_00010	Beidellite			2188	grey pale yellow stain, fresh surface
177	AES_RC_00011	Pyrophyllite				gouge, grey
	AES_RC_00012	Pyrophyllite	Gypsum			gouge, grey
199.5	AES_RC_00013	Illite	?Gypsum		2197	grey, pale yellow, white veinlets
	AES_RC_00014	Gypsum	Illite		2197	grey, pale yellow, white veinlets gypsum
226	AES_RC_00015	Illite	Gypsum		2198	grey, pale yellow, white veinlets gypsum
	AES_RC_00016					grey, pale yellow, white veinlets sulfides
259	AES_RC_00017	Beidellite			2188	grey, pale yellow, grey fractures
	AES_RC_00018	Beidellite			2192	grey, pale yellow, grey fractures
276	AES_RC_00019	Illite			2194	grey, pale yellow, grey fractures, hard fragmental
	AES_RC_00020	Illite	?Kaolinite		2198	grey, pale yellow, grey fractures, hard fragmental
312	AES_RC_00021	?Beidellite				grey, yellow-orange, sulfides, grey fractures,
	AES_RC_00022	Beidellite			2184	grey, yellow-orange, outside core
22.5	AES_RC_00023	Kaolinite	Smectite			grey, gritty, soft top of hole
	AES_RC_00024	Smectite	Kaolinite			grey, gritty, soft top of hole
352	AES_RC_00025	Pyrophyllite	?Dickite			grey, gritty, mottled with minor hematite
	AES_RC_00026	Pyrophyllite	Dickite			grey, gritty, mottled with minor hematite
	AES_RC_00027	Pyrophyllite	Dickite			grey, purple veinlet
362	AES_RC_00028	Beidellite	?Gypsum		2192	fragment with pale yellow fspr, mod soft
	AES_RC_00029	Gypsum				end of core
	AES_RC_00030	Beidellite	?Gypsum		2190	sawn surface, grey-yellow
373	AES_RC_00031	Beidellite	Kaolinite	Gypsum	2186	banded, tan tuffaceous material
	AES_RC_00032	Beidellite	Kaolinite		2188	banded, tan tuffaceous material end of piece
422	AES_RC_00033	Kaolinite	Gypsum	?Dickite		fine grained, grey-pink
	AES_RC_00034	Kaolinite	?Dickite			fine grained, grey-pink fresh surface
451	AES_RC_00035	Kaolinite	Beidellite		2180	fine grained, grey tan fragmental
	AES_RC_00036	Gypsum	Beidellite		2180	fine grained, grey tan fragmental white veinlet
473	AES_RC_00037	Gypsum	Kaolinite			white veinlet in grey mottled rock with fine grey veinlets

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Depth FT	File Name	Mineral 1	Mineral 2	Mineral3	Al-OH wvlgth	Description
	AES_RC_00038	Illite	Gypsum		2194	grey mottled rock with fine grey veinlets
504.5	AES_RC_00039	Gypsum	Kaolinite			grey mottled rock with fine sulfide
	AES_RC_00040	Gypsum	Kaolinite			grey mottled rock with fine sulfide end of core
613	AES_RC_00041	Chlorite - Mg	Beidellite			hard, grey, pink irregular zones
	AES_RC_00042	Gypsum	?Beidellite			white pocket hard, grey, pink irregular zones
663	AES_RC_00043	Beidellite	Chlorite		2184	soft, white-grey with sulfide
	AES_RC_00044	Beidellite	Chlorite		2184	soft, white-grey with sulfide broken end core
680	AES_RC_00045	Chlorite - Mg	Beidellite		2182	soft, white-grey with sulfide end of hole
	AES_RC_00046	Chlorite - Mg	Beidellite		2183	soft, white-grey with sulfide end of hole
	RC2					
27	AES_RC_00048	?Zeolite	Chlorite			grey green, moderately soft - same as previous
38	AES_RC_00047	Chlorite				grey green, moderately soft
47	AES_RC_00049	Chlorite	Illite		2208	grey green, moderately hard, homogeneous
	AES_RC_00050	Chlorite	Illite		2204	grey green, moderately hard, homogeneous
89	AES_RC_00051	Chlorite	?Beidellite		2194	grey green, moderately hard, homogeneous, pyrite veinlet
112	AES_RC_00052	Dickite	Quartz			white, brown vuggy oxidized
	AES_RC_00053	Dickite	Quartz			white, brown vuggy oxidized
118	AES_RC_00054	Dickite	Kaolinite			white, sandy, with pyrite
	AES_RC_00055	Dickite	Kaolinite	?tr Alunite		white, sandy, with pyrite
141.5	AES_RC_00056	Chlorite	?Smectite		2202	grey green, fine-grained
	AES_RC_00057	Chlorite	Smectite		2202	grey green, fine-grained
175	AES_RC_00058	Chlorite-Mg	Beidellite		2188	grey green, fine-grained fsprs
	AES_RC_00059	Chlorite-Mg	Beidellite		2192	grey green, fine-grained fsprs
200.5	AES_RC_00060	Chlorite	Illite/?Smectite		2198	grey green, fine-grained fsprs
	AES_RC_00061	Chlorite	Illite/?Smectite		2198	purple, dark fracture coating
228	AES_RC_00062	Beidellite	Chlorite		2192	light grey-green
	AES_RC_00063	Beidellite	Chlorite		2192	light grey-green
257	AES_RC_00064	u/r				dark black, fine-grained sulfide
	AES_RC_00065	u/r				dark black, fine-grained sulfide
285	AES_RC_00066	Chlorite	Smectite/?Illite		2194	grey with yellow stain irregular veinlets
	AES_RC_00067	Chlorite	Smectite/?Illite		2204	grey with yellow stain irregular veinlets
311	AES_RC_00068	Chlorite	Beidellite		2190	grey with yellow stain diss pyrite
	AES_RC_00069	Chlorite	Beidellite		2191	grey with yellow stain diss pyrite
333	AES_RC_00070	Pyrophyllite	Kaolinite	Dickite		grey-white, soft white minor pyrite
	AES_RC_00071	Pyrophyllite	Dickite	?Kaolinite		grey-white, soft white minor pyrite
376	AES_RC_00072	Chlorite	Beidellite		2192	grey-green, minor yellow stain
	AES_RC_00073	Chlorite	Beidellite		2194	grey-green, minor yellow stain

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Depth FT	File Name	Mineral 1	Mineral 2	Mineral3	Al-OH wvlgth	Description
416	AES_RC_00074	Illite	Beidellite		2198	grey-green, homogeneous
	AES_RC_00075	Beidellite			2194	grey-green, homogeneous
467	AES_RC_00076	Beidellite	Chlorite		2192	grey-green, homogeneous
	AES_RC_00077	Beidellite	Chlorite		2194	grey-green, homogeneous
490	AES_RC_00078	Chlorite	Smectite		2200	grey-green, homogeneous
	AES_RC_00079	Chlorite	Smectite		2200	grey-green, homogeneous

Easting	Northing	Filename	Mineral1	Mineral2	Mineral3	wvlgth	Description
3000	3625	ORN_00000	Montmorillonite	Kaolinite		2208	pale grey
		ORN_00001	Montmorillonite	Kaolinite		2208	pale grey
3015	3817	ORN_00002	Montmorillonite	Kaolinite		2208	pale grey
3000	4000	ORN_00003	Montmorillonite	Kaolinite		2208	dark grey, white spots
3000	4316	ORN_00004	Montmorillonite	?Quartz			dark grey, white spots
3000	4500	ORN_00005	Montmorillonite	?Quartz			grey, white spots
3500	3700	ORN_00006	?Montmorillonite				grey
3500	3900	ORN_00007	Illite	?Chlorite		2207	pale grey
3500	4200	ORN_00008	Illite	Chlorite	?Quartz		pale grey
		ORN_00009	Illite	Chlorite		2208	pale grey no petri dish
3500	4400	ORN_00010	Montmorillonite	Kaolinite		2214	dark grey
4150	3200	ORN_00011	Illite	?Chlorite	?Kaolinite	2206	pale grey
4000	3400	ORN_00012	?Silica				pale grey - grey mixed
		ORN_00013	?Silica				pale grey - grey mixed long integration
4000	3600	ORN_00014	?Silica				pale grey - grey-tan mixed long integration
4000	3816	ORN_00015	?Silica				pale grey - grey-tan mixed long integration
4000	4000	ORN_00016	Illite	Chlorite	?Quartz	2212	pale grey - yellow mixed
4000	4100	ORN_00017	Chlorite	?Quartz			pale grey - yellow mixed
4025	4300	ORN_00018	?Silica				dark grey -white spots
4000	3945	ORN_00019	Chlorite	Montmorillonite		2210	grey, tan white mixed
4560	3000	ORN_00020	Montmorillonite	?Chlorite		2208	pale grey tan mixed
4500	3200	ORN_00021	Chlorite	Montmorillonite		2210	pale grey tan mixed
4500	3384	ORN_00022	Illite	Chlorite		2210	pale grey tan mixed
4500	3585	ORN_00023	Illite	Chlorite		2212	pale grey tan mixed
4500	3800	ORN_00024	Chlorite	Illite	?Calcite	2216	pale grey mixed
4500	4000	ORN_00025	Chlorite	Kaolinite			pale grey-tan mixed
		ORN_00026	Chlorite	Kaolinite			pale grey-tan mixed long integration
4500	4200	ORN_00027	?Silica				grey-tan orange mixed long integration
4500	4400	ORN_00028	Montmorillonite			2210	hematitic pink long integration
4500	4500	ORN_00029	u/r				dark grey-brown long integration
5020	3015	ORN_00030	?Silica	?Chlorite			single tan-orange chip long integration
4850	3500	ORN_00031	?Silica	?Chlorite			single tan-orange , grey green chip long integration
5000	4000	ORN_00032	Kaolinite	?Quartz			single tan-orange , chip long integration
5000	4415	ORN_00033	?Silica				dark grey chips long integration
5500	3400	ORN_00034	u/r				hematitic, purple powder chips
5500	3894	ORN_00035	?Silica				hematitic, purple chips
7005	3800	ORN_00036	?Silica	Montmorillonite			tan, dark powder chips - no dish
7000	4300	ORN_00037	?Silica				grey, minor tan fine chips in dish
7100	4800	ORN_00038	Montmorillonite	?Kaolinite		2208	tan, fine powder agglomerate - no dish
		ORN_00039	Montmorillonite	?Kaolinite		2210	tan, fine powder agglomerate - no dish
6985	5325	ORN_00040	?Silica				dark tan, grey - no dish
6990	5800	ORN_00041	Dickite	Montmorillonite		2208	tan powder/rock no dish
7500	3818	ORN_00042	Dickite	Quartz			tan powder/rock no dish
7500	4400	ORN_00043	Montmorillonite	Kaolinite		2210	chips tan/orange - grey
7500	4900	ORN_00044	Montmorillonite				one chips tan/orange - white no dish
7500	5400	ORN_00045	?Silica				tan to grey chips in dish
7525	5900	ORN_00046	?Silica				tan to grey chips in dish dark
		ORN_00047	?Silica				single chip no dish dark
8000	2500	ORN_00048	Montmorillonite	Kaolinite		2210	single chip no dish dark tan
8000	2500	ORN_00049	Dickite	Kaolinite			several chips dish dark tan to white

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Easting	Northing	Filename	Mineral1	Mineral2	Mineral3	wvlgth	Description
8000	2900	ORN_00050	Montmorillonite	Kaolinite		2208	single clump tan clay
		ORN_00051	Dickite	?Kaolinite			numerous orange to white-grey in dish
8000	3400	ORN_00052	Montmorillonite	Kaolinite	?Chlorite	2210	numerous orange to pinkish in dish
8000	3900	ORN_00053	Dickite				one chip, white with minor orange one side
		ORN_00054	Dickite	Montmorillonite	?Chlorite		numerous chips, grey-white-orange in dish
8000	4390	ORN_00055	u/r ?clay				grey, homogeneous in dish
7988	4900	ORN_00056	Montmorillonite	Kaolinite		2208	dark grey, one chip strong pyrite smell
8000	5400	ORN_00057	Montmorillonite	Kaolinite		2206	mixed grey, white tan-orange in dish
		ORN_00058	Montmorillonite	Illite		2208	large white with orange stain single chip
8000	5900	ORN_00059	Dickite				single white with orange stain
		ORN_00060	Montmorillonite	Kaolinite		2210	numerous chips in dish white to grey
8580	2500	ORN_00061	Dickite	Kaolinite		2210	single chip orange-white
		ORN_00062	Kaolinite	Montmorillonite	?Chlorite	2210	dark grey dominate chips in dish
8500	3000	ORN_00063	Dickite	?Kaolinite			single white chip
		ORN_00064	Kaolinite	Calcite			numerous grey to tan white chips in dish
8500	3500	ORN_00065	Kaolinite	Montmorillonite		2208	numerous grey to tan white chips in dish
8500	4000	ORN_00066	Kaolinite	?Calcite			numerous grey to tan white chips in dish
		ORN_00067	Kaolinite	Montmorillonite		2208	numerous grey to tan white chips in dish long integration
8500	4500	ORN_00068	?Silica				dark tan-grey fine-grained single
		ORN_00069	?Silica				dark tan-grey fine-grained single
8500	5000	ORN_00070	?Silica				mixed dark tan-grey to rare white numerous
		ORN_00071	Montmorillonite	Kaolinite		2210	single clay lump
8500	6000	ORN_00072	Kaolinite	?Silica	?Carbonate	2206	single clay white
		ORN_00073	Dickite	Kaolinite		2208	numerous in dish, tan to white-orange
8510	6500	ORN_00074	?Clay				single chip, grey-white
		ORN_00075	Beidellite	Kaolinite	?Silica	2184	numerous, grey to orange-tan in dish
9000	4815	ORN_00076	?Silica	Kaolinite		2210	single tan-grey chip
		ORN_00077	Montmorillonite	Kaolinite		2206	numerous varied tan-white-grey in dish
9000	5300	ORN_00078	?Silica	Dickite		2208	single greyish lump
		ORN_00079	Dickite	Kaolinite		2208	numerous chips in dish grey, white orange
9000	5800	ORN_00080	?Dickite			2208	numerous chips in dish white-tan-orange
		ORN_00081	?Dickite	Montmorillonite		2208	lump clay
9500	4600	ORN_00082	?Silica	?Clay			mixed grey, minor tan chips
9500	5100	ORN_00083	Dickite	Montmorillonite		2206	mixed white, lesser grey, minor tan chips
		ORN_00084	Dickite	Kaolinite		2208	mixed white, lesser grey, minor tan chips
9500	5600	ORN_00085	Kaolinite	?Montmorillonite		2208	mixed grey, minor tan chips
10,000	4790	ORN_00086	Kaolinite	Chlorite	?Quartz		mixed white, tan chips
		ORN_00087	Kaolinite	Montmorillonite			lump tan clay
10,000	5300	ORN_00088	Montmorillonite	Illite		2194	lump grey clay
		ORN_00089	Montmorillonite	Kaolinite		2202	mixed chips, grey white, minor tan in dish
10,500	3400	ORN_00090	Montmorillonite			2214	mixed chips, grey minor tan in dish
10,500	3900	ORN_00091	Illite	Montmorillonite		2206	mixed chips tan to grey minor in dish
		ORN_00092	?Silica				single tan chip
10,500	4800	ORN_00093	?Silica				numerous, grey, fresh chips in dish
10,500	5300	ORN_00094	Montmorillonite			2206	numerous, grey to tan, minor white in dish
11,000	3200	ORN_00095	Illite	Montmorillonite		2214	numerous, dark grey minor orange, cc in dish
		ORN_00096	Illite	Montmorillonite		2215	hematite clump, chip single
11,000	3700	ORN_00097	?Silica				grey ?fresh large chip
11,000	4200	ORN_00098	Kaolinite	?Silica		2208	grey-tan chips in dish ?fresh
		ORN_00099	?Silica				large chip tan-grey

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Easting	Northing	Filename	Mineral1	Mineral2	Mineral3	wvlgth	Description
11,000	4900	ORN_00100	?Silica				grey, tan-pink numerous chips
11,000	5400	ORN_00101	Illite	?Chlorite		2202	tan, white, minor grey numerous chips
11,500	3500	ORN_00102	Montmorillonite	Kaolinite			tan, white, minor grey numerous chips
11,500	4000	ORN_00103	?Clay				mixed tan-grey numerous chips
		ORN_00104	Montmorillonite			2202	single tan lump
11,500	4500	ORN_00105	?Montmorillonite				mixed orange-tan minor white, grey chips
		ORN_00106	Montmorillonite			2200	orange-tan lump
11,500	5100	ORN_00107	Illite	Montmorillonite		2194	orange-tan, with chips embedded lump
11,500	5600	ORN_00108	Illite			2190	grey , minor tan with chips embedded lump
12,000	2600	ORN_00109	?Silica	?Clay			grey , minor tan with chips in dish
		ORN_00110	?Silica				single chip
12,000	3100	ORN_00111	Kaolinite	Montmorillonite			numerous grey, tan, minor white
		ORN_00112	Montmorillonite	Kaolinite			tan lump
12,000	4000	ORN_00113	Montmorillonite	Chlorite	?Kaolinite	2204	mixed grey, tan cream in dish
		ORN_00114	Montmorillonite	Chlorite	?Kaolinite	2194	lump, grey-tan
12,000	4490	ORN_00115	Montmorillonite	Kaolinite		2200	mixed tan, minor grey chips in dish
		ORN_00116	Montmorillonite			2204	single white with oxid brown chip
12,500	2800	ORN_00117	unknown				numerous dark grey in dish
		ORN_00118	?Silica				single dark brown lump
12,500	3300	ORN_00119	Montmorillonite	?Kaolinite/Dickit			numerous tan, orangish chips in dish
		ORN_00120	Montmorillonite	Dickite			lump of tan material
12,500	3800	ORN_00121	Dickite	Kaolinite			fine tan to white chips
		ORN_00122	Dickite	Kaolinite			single lump
12,500	4300	ORN_00123	Kaolinite	?Dickite	?Quartz		tan to grey numerous chips in dish
		ORN_00124	Dickite	?Kaolinite	?Quartz		single lump
12,500	4790	ORN_00125	?Montmorillonite				numerous dark grey, tan minor white in dish
		ORN_00126	Dickite	?Montmorillonite			clay lump
13,000	2400	ORN_00127	Kaolinite	Montmorillonite			fine white, grey tan chips
13,000	2900	ORN_00128	?Silica	?Clay			dark grey, purple chips
		ORN_00129	?Silica	?Clay			large purple lump
13,000	3400	ORN_00130	?Silica				grey lump with embedded tan, white minor chips
13,000	3900	ORN_00131	Illite	Dickite		2206	white to grey pale tan-orange chips in dish
		ORN_00132	Dickite	Kaolinite			white to cream lump
13,500	2700	ORN_00133	Quartz	Dickite			grey rock with white phenocrysts
		ORN_00134	Illite	?Kaolinite		2202	numerous grey chips minor tan-white
13,500	3200	ORN_00135	Illite	Montmorillonite		2206	numerous pale grey chips minor tan-white
		ORN_00136	Illite	Montmorillonite		2208	single greyish lump
13,500	3700	ORN_00137	?Silica				grey with white specks chips, minor tan
		ORN_00138	Montmorillonite	Illite		2198	tan-grey lump
13,500	4200	ORN_00139	Montmorillonite	Kaolinite			tan white, minor grey chips in dish
		ORN_00140	Montmorillonite	Kaolinite			tan orange lump
14,000	3000	ORN_00141	?Silica				pale grey chips to grey in dish
		ORN_00142	?Silica				pale grey to tan lump
14,000	3500	ORN_00143	Montmorillonite	Illite		2204	pale grey to tan-brown chips in dish
		ORN_00144	Montmorillonite	Illite		2204	pale grey lump
14,500	3400	ORN_00145	Kaolinite	Montmorillonite			grey and orange to white chips
		ORN_00146	Montmorillonite	Beidellite		2182, 2204	grey lump
14,500	3900	ORN_00147	?Silica				purple-brown homogeneous

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