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Zephyr Gold USA Ltd's

Designated Mining Regular (112d) Operation
Reclamation Permit Application
For
Dawson Gold Mine
Fremont County, CO

Appendices

Submitted
June 30, 2021

APPENDIX A: Underground Mine Design Figures

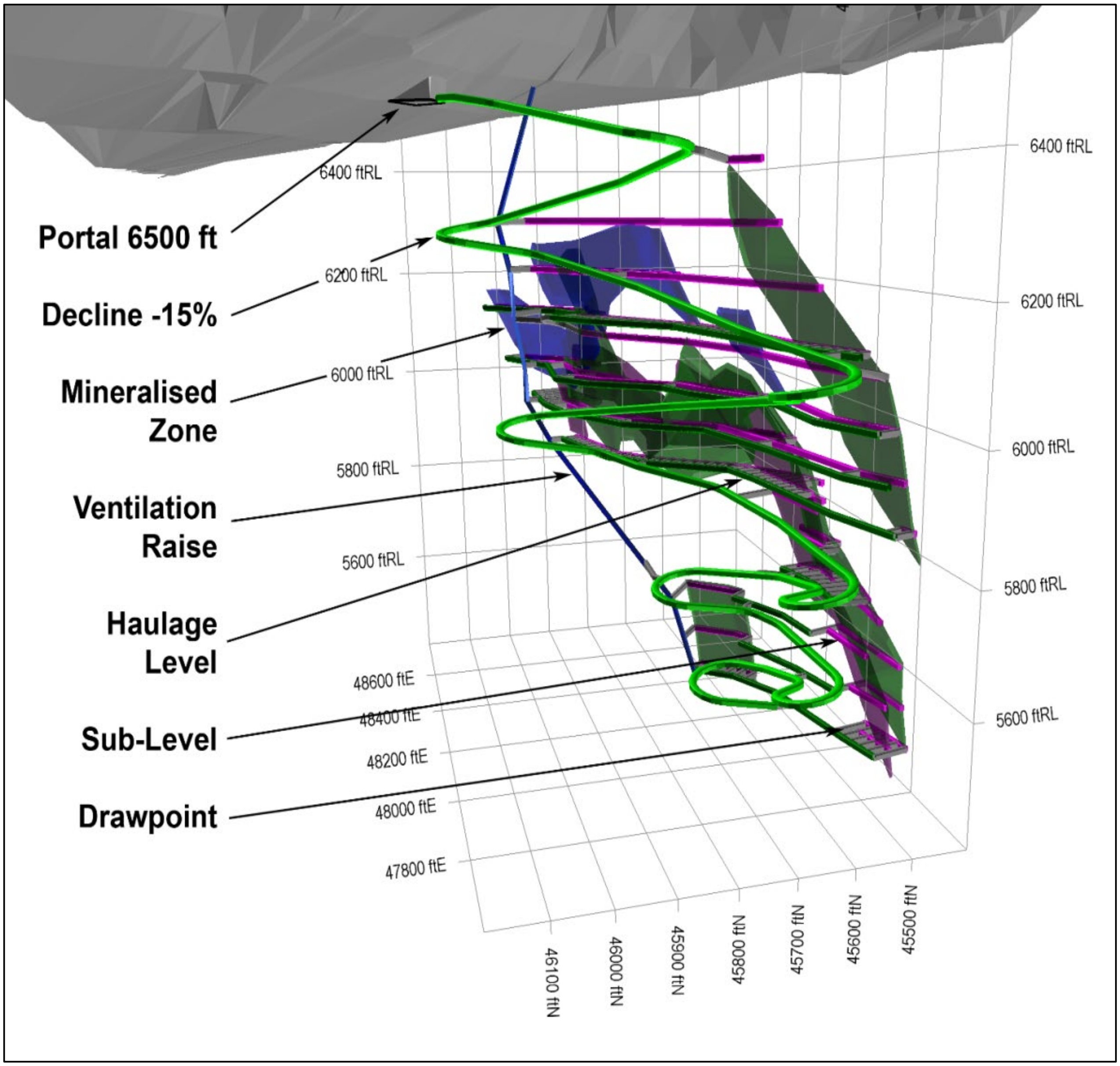
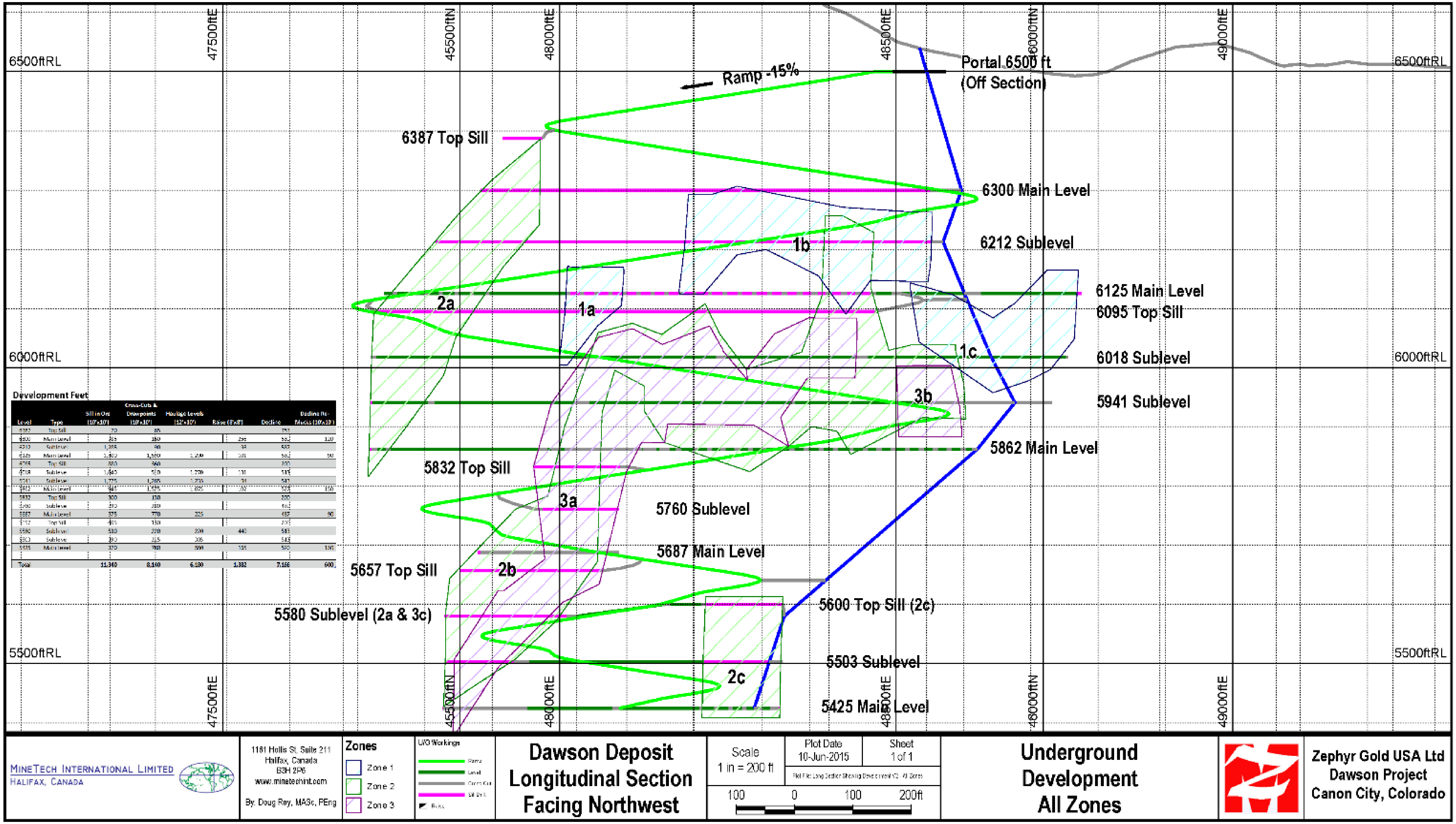


Figure 1: Three Dimensional View of DGM underground Development facing east



Development Feet

Level	Type	Sill in Ore (10'x10')	Cross-Cuts & Drawpoints (10'x10')	Haulage Levels (12'x10')	Raise (8'x8')	Decline	Decline Re-Mucks (10'x10')
6387	Top Sill	70	65			752	
6300	Main Level	385	180		295	582	120
6212	Sublevel	1,385	90		33	587	
6125	Main Level	1,300	1,550	1,200	101	582	90
6095	Top Sill	880	360			200	
6018	Sublevel	1,440	510	1,270	101	513	
5941	Sublevel	1,775	1,265	1,235	31	513	
5862	Main Level	345	1,575	1,075	102	523	150
5832	Top Sill	300	130			200	
5760	Sublevel	210	280			462	
5687	Main Level	375	770	225		457	90
5657	Top Sill	405	130			200	
5580	Sublevel	510	270	220	440	513	
5503	Sublevel	180	215	205		513	
5425	Main Level	370	780	590	125	520	150
Total		11,340	8,140	6,130	1,382	7,166	600

Figure 2: Longitudinal Section Facing Northwest

APPENDIX B: GEM Services Report

Tailings Geochemistry Characterization & Seepage Quality Estimate

Dawson Project

Interim Report

Prepared for:

Zephyr Minerals

Prepared by:

GEMSERVICES
GLOBAL ENVIRONMENTAL MINE SERVICES

Project Number B001.001

June 2021

Tailings Geochemistry Characterization & Seepage Quality Estimate

Dawson Project

Interim Report

Project Location: Cañon City, CO

Zephyr Minerals Ltd.

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Purdy's Wharf Tower 1
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Project Number B001.001

June 30, 2021

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1 Introduction

Zephyr Minerals Ltd. is preparing a mine permit application for the Dawson Project. The Dawson Project is a proposed underground gold mine located approximately 6 miles southwest of Cañon City, Colorado. GEM Services was retained to conduct a tailings geochemical characterization study as part of the mine permit application.

1.1 Project Description

The Dawson Project is located on the Dawson property in Fremont County, Colorado. The property comprises a group of patented and unpatented mining claims totalling approximately 1,000 acres. Within these mining claims are three gold deposits. Only the Dawson deposit is proposed for mining. Two ore types will be mined – altered and unaltered.

The proposed mining method is sublevel longhole stoping. Underground access will be via portal and decline. About 17,000 tons of granitic rock will be brought to surface from the construction of the decline. Approximately 4,200 tons of this rock will be used in the construction of the tailings storage facility, described below in Section 1.2.

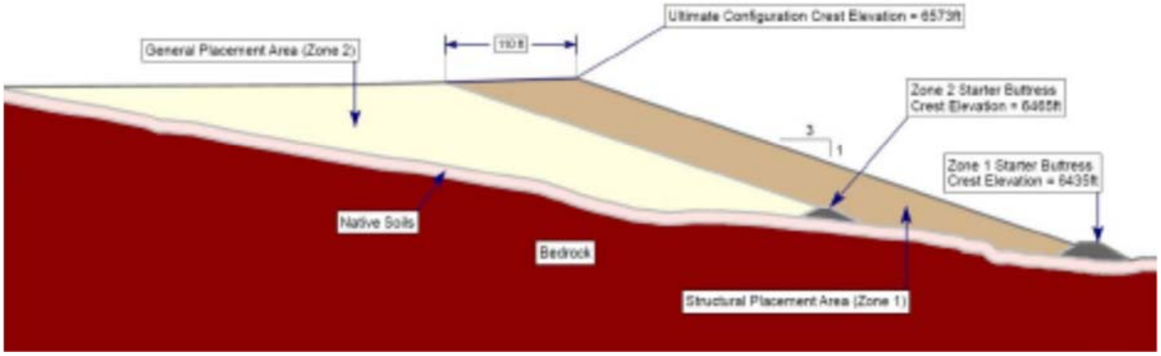
The proposed ore processing method is by gravity separation and flotation to recover native gold and sulfides to produce a gold concentrate that will be sold to a refinery for final extraction and purification of gold. No cyanide will be used in the ore processing. Tailings will be dewatered using a thickener and a pressure filter belt. The dewatered tailings, referred to as filter cake, will be trucked to the filtered tailings storage facility.

1.2 Filtered Tailings Storage Facility

The design of the filtered tailings storage facility (FTSF) is described in detail in Amec Foster Wheeler (2016). A summary description is provided below. A schematic is provided in Figure 1.

The FTSF will consist of a buttress of granitic rock and tailings filter cake compacted behind the buttress. The buttress rock will be the rock brought to surface during construction of the decline. The filter cake will be placed by end dumping and compacted by heavy equipment on top. The top will be crowned to shed precipitation. The filter cake will have the consistency of damp fine sand, having a moisture content of about 16%.

Water management will consist of minimizing the amount of clean water contacting the tailings and containing the water that does. Diversion ditches will be constructed on the upstream side of the FTSF to intercept surface water flow and direct it around the FTSF. Collection ditches will be constructed along the sides and downstream side of the FTSF to intercept precipitation that runs off the surface of the FTSF. This contact water will be captured in the lined seepage collection pond.



Source: Amec Foster Wheeler, 2016

Figure 1: Schematic of Filtered Tailings Storage Facility

While the FTSF will be crowned to shed as much precipitation as possible, some infiltration will occur. A seepage collection blanket will be installed underneath the FTSF to collect this infiltration water. This infiltration water will be captured in the lined seepage collection pond along with the contact water described above.

1.3 Scope of Work

GEM Services' brief is to characterize the geochemistry of the Dawson Deposit tailings. Given the design of the FTSF, the development rock earmarked for the supporting buttress was also characterized. The objectives of the characterization program include:

- Assessing the acid generation potential of the tailings and development rock
- Assess the potential for metal release from tailings and development rock during operations
- Assess the potential for long term metal release from tailings.

2 Laboratory Program

The laboratory testing program was conducted by Global ARD Testing Services Inc., located in Burnaby, BC Canada. The program was overseen by GEM Services.

2.1 Approach

As described in Section 1.2 above, the FTSF will be contain two distinct materials – development rock from the construction of the decline and dewatered tailings. The tailings are further delineated into altered and unaltered, based on the ore type from which they derived. Each of these materials (development rock, altered tailings and unaltered tailings) were characterized individually.

All material types were subjected to static tests. Acid generation potential was assessed using the modified Sobek method of acid base accounting (MEND, 2009). Short term metal release was assessed using the shake flask extraction procedure (MEND, 2009) for the development rock and analyzing the filtrate from the two tailings samples by ICP-MS. Solid phase elemental analysis was done to determine the total amount of 51 elements present in the sample solids. Analytical method was aqua regia digestion followed by ICP-MS analysis.

Typically, the decision to initiate long term metal release tests is made based on the results from the static testing results. However, given the Dawson project time frame and that the finer grain size of tailings makes them a higher probability source of long term metal release, kinetic testing on tailings began concurrently with the static testing. Long term metal release from tailings is being assessed by humidity cell testing following ASTM D 5744 – 07 (April 2010). At the time of writing, results for the first 15 weeks of a 52 week program have been received.

Development rock did not undergo long term leach testing due to the absence of sulfides and its associated potential for accelerated metal release due to oxidation.

A note on the testing methodology used for assessing the short term metal release from development rock. The State of Colorado requests the use of the Synthetic Precipitation Leaching Procedure (SPLP). This test is conducted at 1 part solid sample to 20 parts water. This ratio can dilute soluble metals to the extent that they are below the method detection limit for water analysis, particularly for rock samples with low metal content (such as the development rock samples). The shake flask extraction test is done using 1 part solid sample to 3 parts water. At this ratio soluble metals are more likely to be concentrated enough to be detected, yet dilute enough to avoid hitting solubility limits. To increase the probability of detecting metals, the shake flask extraction procedure was used to test short term metal release from development rock.

2.2 Samples

Samples were selected by Zephyr Minerals geologists from drill core retrieved from the Fall 2020 drilling program. Sample sources and descriptions are summarized in Table 1 below.

Table 1: Geochemistry Sample Descriptions

Sample Type	Hole ID	From (m)	To (m)	Length (m)	Weight (kg)	Description
Ore						
Altered	DA20-18	807	822	15	11.5	
	DA18-15	849	858	9	9.0	
Unaltered	DA18-16	659	662	3	4.2	
		724	727	3	3.3	
		752	773	21	17.5	
Development Rock	DA-9005	841	849		4.1	Pink, med grained granite
	DA-9007	1102	1109		5.4	Pink-black coarse grained granite & granite gneiss
	GC-18	582	588		4.0	Pink-black quartz-feldspar-biotite gneiss
	GC-21	554	563		5.1	Pink granite; weak foliation
	GC-29B	795	800		4.7	Pink coarse grained granite with gneiss bands

The altered and unaltered ore samples were used by BOMENCO for metallurgical testing to confirm the ore processing flowsheet. The tailings produced from these tests were used for the tailings geochemical characterization program overseen by GEM Services.

The five development rock samples received from Zephyr Minerals were prepared prior to geochemical testing. Each sample was crushed to minus ¼” and split to create a duplicate. Each prepared sample and its duplicate was tested.

3 Geochemical Characterization

3.1 Static Tests

3.1.1 Mineralogy

Mineralogical analysis was completed on the two tailings samples. The mineralogical report is provided in Appendix A. A summary of results are presented in Table 2.

The mineralogical results are consistent with the granitic host rock described in the drill logs. Both altered and unaltered tailings are dominated by silicates – quartz, micas and clinochlore. However, the altered tailings sample has approximately 4% carbonates present whereas the unaltered tailings is over 99% silicates.

The carbonates present are dominated by calcite. The altered tailings sample also has ankerite-dolomite and siderite. Carbonates are important acid neutralizing minerals. They dissolve more readily in the presence of acid to neutralize quickly and they buffer water at a circum-neutral pH.

The exception is siderite. Siderite is an iron carbonate where iron is in its reduced form. When siderite disassociates, the oxidation of the iron ion produces as much acidity as the carbonate ion consumes, thereby producing no net neutralizing capacity (MEND, 2009). The carbonate neutralization potential result from the acid base accounting test for the altered tailings sample (presented in Section 3.1.2 below) has been adjusted to take into account the presence of siderite.

No sulfides were detected in the tailings samples. This is expected given the ore processing flowsheet targets the capture of sulfides into the gold concentrate. The absence of sulfides means there is no source for future acidity production.

Table 2: Quantitative Mineralogical Analysis of Altered and Unaltered Tailings Samples

Mineral	**Ideal Formula**	**BL737-04 (Altered) wt%**	**BL737-05 (Unaltered) wt%**
Actinolite	$Ca_2(Mg,Fe^{2+})_5Si_8O_{22}(OH)_2$		0.3
Almandine	$Fe_3{}^{2+}Al_2(SiO_4)_3$		1.5
Ankerite-Dolomite	$Ca(Fe^{2+},Mg,Mn)(CO_3)_2$-$CaMg(CO_3)_2$	0.7	
Biotite	$K(Mg,Fe^{2+})_3AlSi_3O_{10}(OH)_2$	2.0	4.4
Calcite	$CaCO_3$	2.2	0.6
Clinochlore	$(Mg,Fe^{2+})_5Al(Si_3Al)O_{10}(OH)_8$	1.6	5.0
Illite-Muscovite 2M	$K_{0.65}Al_{2.0}Al_{0.65}Si_{3.35}O_{10}(OH)_2$ -$KAl_2AlSi_3O_{10}(OH)_2$	5.3	2.9
Kaolinite	$Al_2Si_2O_5(OH)_4$	1.5	
Quartz	SiO_2	83.9	83.9
Siderite	$Fe^{2+}CO_3$	0.7	
Sillimanite	Al_2SiO_5	2.1	1.4
Total		**100.0**	**100.0**

3.1.2 Acid Generation Potential

The potential of the development rock and tailings to generate net acidity was assessed using the modified Acid Base Accounting test. The laboratory reports are provided in Appendix B. A summary table of results is presented in Table 3.

The paste pH is a measure of a sample's current acidity status. Rinse pH was also measured for the development rock samples to determine the current acidity status of the development rock surfaces. The paste pH for all samples ranged from 6.9 to 9.6, indicating all samples are neutral to slightly alkaline. Rinse pH for development rock ranged from 8.8 to 9.4.

Sulfur is predominantly present as sulfide (its reduced form) or sulfate (its oxidized form). Sulfide is the sulfur species that once exposed to air and water will oxidize and produce acid. Sulfur speciation was completed on all samples to determine the sulfide content and is shown in Figure 2. While all samples contain sulfur, only one development rock sample (and its duplicate) contain sulfide sulfur above the detection limit of 0.01 wt%.

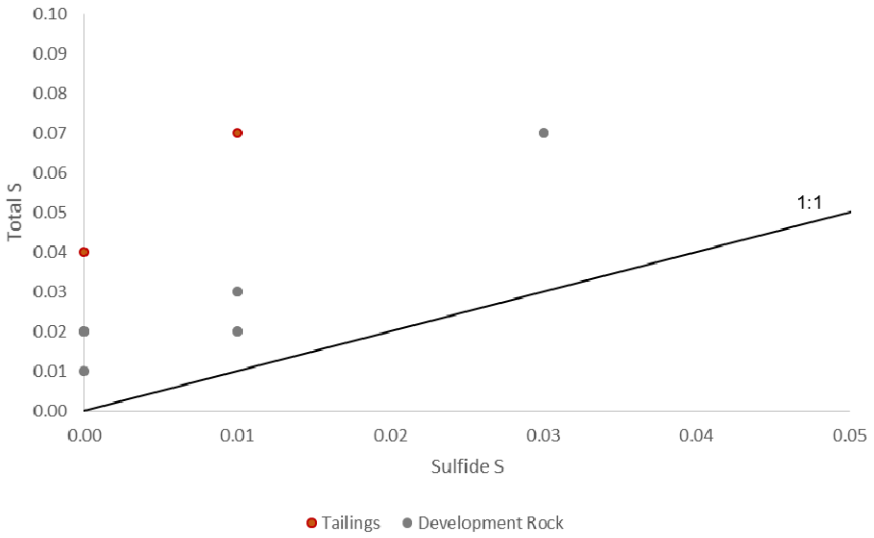


Figure 2: Total Sulfur vs. Sulfide Sulfur

The neutralization potential determination by the modified Sobek method (used in this study) is the measurement of the ability of a known amount of pulverized sample to neutralize a known volume and strength of a strong acid over a short exposure period. This bulk neutralization potential will account for the neutralization contributed by both carbonate and aluminosilicate minerals. However, the speed of neutralization and the pH to which these minerals will neutralize is different. The most effective neutralization is from carbonate minerals, which react with acid rapidly and neutralize water to a circum-neutral pH. For this study, carbonate neutralization was measured by determining the amount of total inorganic carbon present in the samples. As discussed in Section 3.1.1 above, siderite was measured in the altered tailings

Table 3: Acid Base Accounting Results for Development Rock and Tailings

Sample No.	Sample ID	Rinse pH (on <1/4" crush)	Paste pH	Fizz Rating	Total Inorganic C	CaCO$_3$ Equivalents^{*1}	Total Sulphur	Sulphate Sulphur	Sulphide Sulphur	Non-Extractable Sulphur^{*2}	AP^{*3}	Mod. ABA NP	NNP^{*4}	NPR^{*5}	NPR (CaCO$_3$)
Units:			***pH Units***		**wt %**	**kg CaCO$_3$/tonne**	**wt %**	**wt %**	**wt %**	**wt %**	***kg CaCO$_3$/tonne***				
Reported Detection Limit:			***0.01***		***0.02***	***1.7***	***0.01***	***0.01***	***0.01***	***0.01***	***0.3***	***0.5***			
Tailings Samples															
1	BL737-04 (altered)		7.9	Moderate	0.36	30.0	0.04	0.03	<0.01	0.01	<0.3	32.7	32.7	N/A	N/A
	BL737-04^{*6} (siderite corrected)		7.9		0.29	23.9	0.04	0.03	<0.01	0.01	<0.3	32.7	32.7	N/A	N/A
2	BL737-05 (unaltered)		6.9	Slight	0.05	4.2	0.07	0.03	0.01	0.03	0.3	55.7	55.4	178.2	13.3
Development Rock Samples															
1	GC-18	9.2	9.6	Moderate	0.08	6.7	0.01	0.01	<0.01	<0.01	<0.3	8.0	8.0	N/A	N/A
2	GC-21	9.2	9.0	Moderate	0.13	10.8	0.02	0.01	0.01	<0.01	0.3	11.4	11.1	36.5	34.7
3	GC-29B	8.8	9.0	None	0.02	1.7	0.03	0.02	0.01	<0.01	0.3	3.0	2.7	9.6	5.3
4	DA-9005	9.4	9.4	Slight	0.10	8.3	0.02	0.02	<0.01	<0.01	<0.3	7.5	7.5	N/A	N/A
5	DA-9007	9.4	9.3	Slight	0.05	4.2	0.07	0.04	0.03	<0.01	0.9	6.1	5.2	6.5	4.4
Duplicates:															
1 D	GC-18 (Dup)	9.0	9.7	Moderate	0.07	5.8	0.02	0.02	0.01	<0.01	0.3	8.1	7.8	25.9	18.7
2 D	GC-21 (Dup)	9.1	9.0	Moderate	0.12	10.0	0.02	0.02	<0.01	<0.01	<0.3	11.9	11.9	N/A	N/A
3 D	GC-29B (Dup)	9.0	9.0	None	0.02	1.7	0.03	0.02	0.01	<0.01	0.3	3.9	3.6	12.5	5.3
4 D	DA-9005 (Dup)	9.4	9.5	Slight	0.10	8.3	0.02	0.02	<0.01	<0.01	<0.3	8.8	8.8	N/A	N/A
5 D	DA-9007 (Dup)	9.4	9.3	Slight	0.05	4.2	0.07	0.04	0.03	<0.01	0.9	5.7	4.8	6.1	4.4

Notes:

[*1] CaCO$_3$ Equivalents: based on TIC

[*2] Sulphide-Sulphur: Total-sulphur - sulphate-sulphur

[*3] AP (Acid Potential): Sulphide-Sulphur x 31.25

[*4] NNP (Net Neutralization Potential): NP - AP

[*5] NPR (Neutralization Potential Ratio): NP/AP

[*6] %TIC = %TIC(uncorrected) - wt% siderite as %C (as reported in mineralogical analysis)

sample. Siderite would have been captured in the total inorganic carbon analysis used to calculate carbonate neutralization potential. Since siderite does not contribute net neutralization capacity, the total inorganic carbon value for the altered tailings sample was adjusted downward to compensate. The calculation for this adjustment is shown in Table 3.

A comparison of the bulk (ABA) neutralization potential to carbonate neutralization potential is shown in Figure 3. For the development rock samples, the bulk neutralization potential is from carbonates. The form of neutralization in the tailings samples is different. Carbonate neutralization is dominant in the altered tailings sample whereas aluminosilicate neutralization is the dominant form in the unaltered tailings sample.

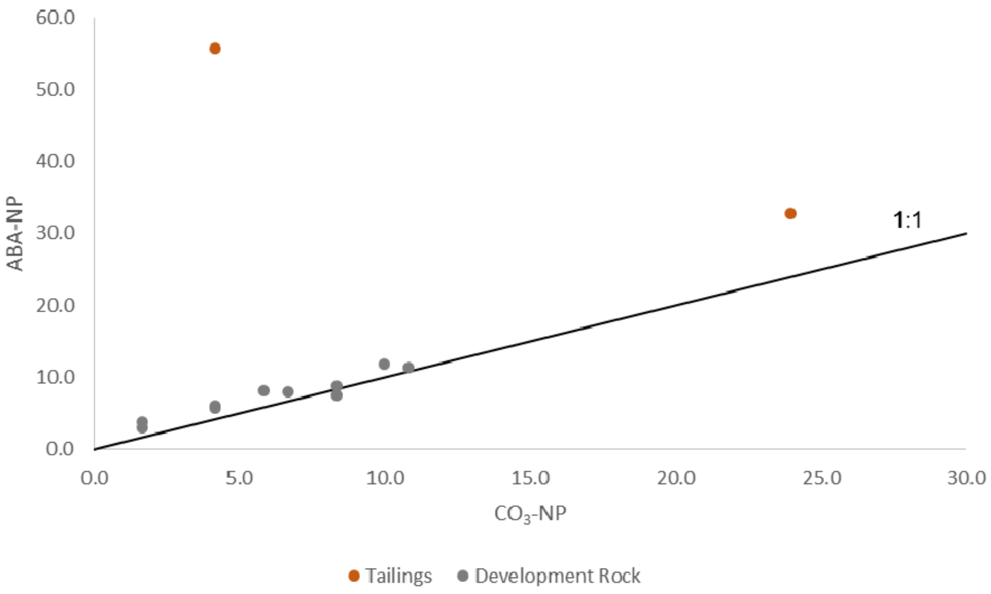


Figure 3: ABA NP vs. Carbonate NP

A material's potential to produce a net acidic drainage in the future is determined by the balance of acidity production potential and neutralization potential. This is plotted in Figure 4. Carbonate neutralization potential was used as it is the more effective component of the bulk neutralization potential.

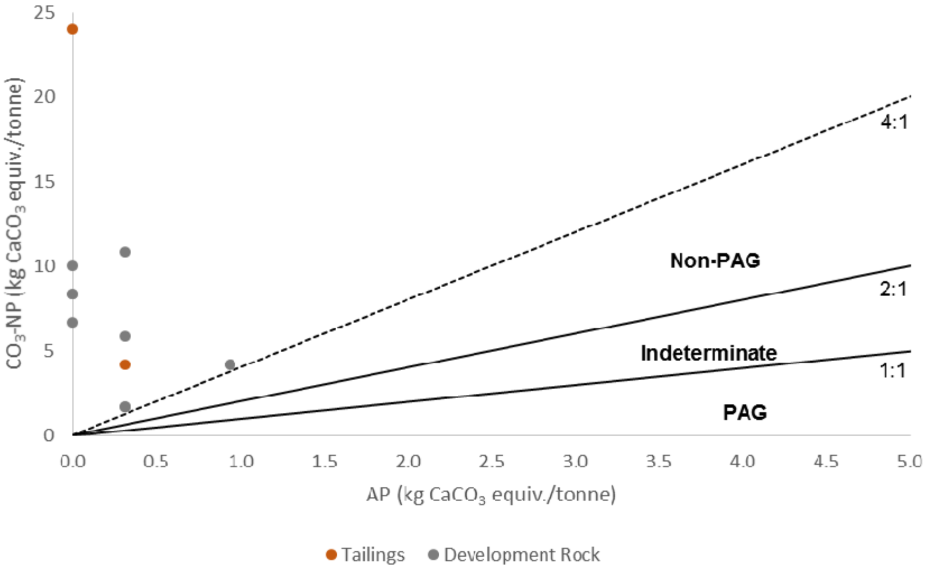


Figure 4: Carbonate NP vs Acidity Potential

The classification criteria are also shown on Figure 4. Material with a neutralization potential ratio (NP/AP) less than 1 is classified as potentially acidic drainage generating (PAG). Material with a neutralization potential between 1 and 2 is indeterminate and requires additional investigation. Material with a neutralization potential greater than 2 is classified non-PAG (MEND, 2009). These criteria lines are identified in Figure 4 with 1:1 and 2:1, respectively.

Also shown in Figure 4 is the 4:1 neutralization potential ratio line to more clearly show how distinctly the classification of non-PAG applies. All tailings and development rock samples are classified as non-potentially acidic drainage generating.

3.1.3 Solid Phase Elemental Content

The elemental content for tailings is shown in Table 4. The associated Geochemical Abundance Index (GAI), using crustal abundance as a reference, is given in Table 5. Elemental content and GAI for development rock is presented in Tables 6 and 7, respectively. Laboratory reports are provided in Appendix B.

The GAI is a means to compare the concentration of an element in a sample to a reference material to determine whether an element is significantly enriched and merits further investigation (INAP, 2009). The GAI ranges from 0 to 6, where 0 indicates the element is present at a concentration similar to or less than the typical abundance and a GAI of 6 represents approximately a 100-fold or greater enrichment above the typical abundance. A GAI of 3 or above (12 times or more than typical abundance) is considered significant and may warrant more detailed investigation (INAP, 2009).

Table 4: Elemental Content of Tailings Samples

Sample No.	Sample ID	Analyte	Silver (Ag)	Aluminum (Al)	Arsenic (As)	Gold (Au)	Boron (B)	Barium (Ba)	Beryllium (Be)	Bismuth (Bi)	Calcium (Ca)	Cadmium (Cd)	Cerium (Ce)	Cobalt (Co)	Chromium (Cr)	Cesium (Cs)	Copper (Cu)	Iron (Fe)	Gallium (Ga)	Germanium (Ge)	Hafnium (Hf)	Mercury (Hg)	Indium (In)	Potassium (K)	Lanthanum (La)	Lithium (Li)	Magnesium (Mg)	Manganese (Mn)
		Unit	ppm	%	ppm	ppm	ppm	ppm	ppm	ppm	%	ppm	ppm	ppm	ppm	ppm	ppm	%	ppm	ppm	ppm	ppm	ppm	%	ppm	ppm	%	ppm
		MDL	**0.01**	**0.01**	**0.1**	**0.0005**	**10**	**10**	**0.05**	**0.01**	**0.01**	**0.01**	**0.02**	**0.1**	**1**	**0.05**	**0.2**	**0.01**	**0.05**	**0.05**	**0.02**	**0.005**	**0.005**	**0.01**	**0.2**	**0.1**	**0.01**	**5**
Typical Crustal Abundance (granite)			0.037	7.2	1.5	0.004	10	840	3	0.01	0.51	0.13	92	1	4.1	4	10	1.4	17	1.3	3.9	0.08	0.26	4.2	55	40	0.16	390
1	BL737-04 (altered comp.)	Pulp	0.22	0.84	0.8	0.9518	<10	61	0.19	22.41	0.88	0.05	20.24	2.8	93	0.49	24.8	2.55	4.14	0.06	0.07	0.01	0.056	0.35	9.7	7.6	0.36	538
2	BL737-05 (unaltered comp.)	Pulp	0.07	2.15	0.6	0.4210	10	108	0.66	6.15	0.25	0.77	16.48	3.7	111	0.92	29.5	3.94	9.78	0.10	0.10	0.02	0.148	0.62	8.0	40.1	1.04	289

Sample No.	Sample ID	Analyte	Molybdenum (Mo)	Sodium (Na)	Niobium (Nb)	Nickel (Ni)	Phosphorous (P)	Lead (Pb)	Rubidium (Rb)	Rhenium[1] (Re)	Sulfur (S)	Antimony (Sb)	Scandium (Sc)	Selenium (Se)	Tin (Sn)	Stronium (Sr)	Tantalum (Ta)	Tellurium[1] (Te)	Thorium (Th)	Titanium (Ti)	Thallium (Tl)	Uranium (U)	Vandium (V)	Tungsten (W)	Yttrium (Y)	Zinc (Zn)	Zirconium (Zr)
		Unit	ppm	%	ppm	ppm	ppm	ppm	ppm	ppm	%	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	%	ppm	ppm	ppm	ppm	ppm	ppm	ppm
		MDL	**0.05**	**0.01**	**0.05**	**0.2**	**10**	**0.2**	**0.1**	**0.001**	**0.01**	**0.05**	**0.1**	**0.2**	**0.2**	**0.2**	**0.01**	**0.01**	**0.2**	**0.005**	**0.02**	**0.05**	**1**	**0.05**	**0.05**	**1**	**0.5**
Typical Crustal Abundance (granite)			1.3	2.6	21	4.5	600	19	170		0.030	0.2	7	0.05	3	100	4.2		17	0.12	2.3	3	44	2.2	40	39	175
1	BL737-04 (altered comp.)	Pulp	6.89	0.01	0.21	32.0	223	5.3	15.4	0.002	0.03	0.12	2.1	6.1	3.7	11.4	<0.01	0.05	2.5	0.023	0.08	1.91	3	0.24	3.41	28	2.5
2	BL737-05 (unaltered comp.)	Pulp	8.51	0.03	0.16	45.1	99	16.6	25.1	0.002	0.06	0.09	2.8	3.3	10.8	20.1	<0.01	0.08	2.0	0.062	0.21	2.53	5	0.27	3.12	136	3.8

[1] Crustal abundance data is missing or unreliable for this element

Table 5: Geochemical Abundance Index for Tailings Samples

Sample No.	Sample ID	Analyte	Silver (Ag)	Aluminum (Al)	Arsenic (As)	Gold (Au)	Boron (B)	Barium (Ba)	Beryllium (Be)	Bismuth (Bi)	Calcium (Ca)	Cadmium (Cd)	Cerium (Ce)	Cobalt (Co)	Chromium (Cr)	Cesium (Cs)	Copper (Cu)	Iron (Fe)	Gallium (Ga)	Germanium (Ge)	Hafnium (Hf)	Mercury (Hg)	Indium (In)	Potassium (K)	Lanthanum (La)	Lithium (Li)	Magnesium (Mg)	Manganese (Mn)
		Unit	ppm	%	ppm	ppm	ppm	ppm	ppm	ppm	%	ppm	ppm	ppm	ppm	ppm	ppm	%	ppm	ppm	ppm	ppm	ppm	%	ppm	ppm	%	ppm
		MDL	**0.01**	**0.01**	**0.1**	**0.0005**	**10**	**10**	**0.05**	**0.01**	**0.01**	**0.01**	**0.02**	**0.1**	**1**	**0.05**	**0.2**	**0.01**	**0.05**	**0.05**	**0.02**	**0.005**	**0.005**	**0.01**	**0.2**	**0.1**	**0.01**	**5**
Typical Crustal Abundance (granite)			0.037	7.2	1.5	0.004	10	840	3	0.01	0.51	0.13	92	1	4.1	4	10	1.4	17	1.3	3.9	0.08	0.26	4.2	55	40	0.16	390
1	BL737-04 (altered comp.)	Pulp	1	0	0	**7**	0	0	0	**10**	0	0	0	0	**3**	0	0	0	0	0	0	0	0	0	0	0	0	0
2	BL737-05 (unaltered comp.)	Pulp	0	0	0	**6**	0	0	0	**8**	0	1	0	1	**4**	0	0	0	0	0	0	0	0	0	0	0	2	0

Sample No.	Sample ID	Analyte	Molybdenum (Mo)	Sodium (Na)	Niobium (Nb)	Nickel (Ni)	Phosphorous (P)	Lead (Pb)	Rubidium (Rb)	Rhenium[1] (Re)	Sulfur (S)	Antimony (Sb)	Scandium (Sc)	Selenium (Se)	Tin (Sn)	Stronium (Sr)	Tantalum (Ta)	Tellurium[1] (Te)	Thorium (Th)	Titanium (Ti)	Thallium (Tl)	Uranium (U)	Vandium (V)	Tungsten (W)	Yttrium (Y)	Zinc (Zn)	Zirconium (Zr)
		Unit	ppm	%	ppm	ppm	ppm	ppm	ppm	ppm	%	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	%	ppm	ppm	ppm	ppm	ppm	ppm	ppm
		MDL	**0.05**	**0.01**	**0.05**	**0.2**	**10**	**0.2**	**0.1**	**0.001**	**0.01**	**0.05**	**0.1**	**0.2**	**0.2**	**0.2**	**0.01**	**0.01**	**0.2**	**0.005**	**0.02**	**0.05**	**1**	**0.05**	**0.05**	**1**	**0.5**
Typical Crustal Abundance (granite)			1.3	2.6	21	4.5	600	19	170		0.030	0.2	7	0.05	3	100	4.2		17	0.12	2.3	3	44	2.2	40	39	175
1	BL737-04 (altered comp.)	Pulp	1	0	0	2	0	0	0	n/a	0	0	0	**6**	0	0	0	n/a	0	0	0	0	0	0	0	0	0
2	BL737-05 (unaltered comp.)	Pulp	2	0	0	2	0	0	0	n/a	0	0	0	**5**	1	0	0	n/a	0	0	0	0	0	0	0	1	0

[1] Crustal abundance data is missing or unreliable for this element

Table 6: Elemental Content of Development Rock Samples

Sample No.	Sample ID	Analyte	Silver (Ag)	Aluminum (Al)	Arsenic (As)	Gold (Au)	Boron (B)	Barium (Ba)	Beryllium (Be)	Bismuth (Bi)	Calcium (Ca)	Cadmium (Cd)	Cerium (Ce)	Cobalt (Co)	Chromium (Cr)	Cesium (Cs)	Copper (Cu)	Iron (Fe)	Gallium (Ga)	Germanium (Ge)	Hafnium (Hf)	Mercury (Hg)	Indium (In)	Potassium (K)	Lanthanum (La)	Lithium (Li)	Magnesium (Mg)	Manganese (Mn)
		Unit	ppm	%	ppm	ppm	ppm	ppm	ppm	ppm	%	ppm	ppm	ppm	ppm	ppm	ppm	%	ppm	ppm	ppm	ppm	ppm	%	ppm	ppm	%	ppm
		MDL	**0.01**	**0.01**	**0.1**	**0.0005**	**10**	**10**	**0.05**	**0.01**	**0.01**	**0.01**	**0.02**	**0.1**	**1**	**0.05**	**0.2**	**0.01**	**0.05**	**0.05**	**0.02**	**0.005**	**0.005**	**0.01**	**0.2**	**0.1**	**0.01**	**5**
Typical Crustal Abundance (granite)			0.037	7.2	1.5	0.004	10	840	3	0.01	0.51	0.13	92	1	4.1	4	10	1.4	17	1.3	3.9	0.08	0.26	4.2	55	40	0.16	390
1	GC-18	Pulp	0.03	0.73	<0.1	<0.0005	<10	46	0.10	0.01	0.31	0.02	40.90	3.0	75	0.78	4.4	1.24	4.44	0.08	0.07	0.01	0.024	0.53	17.2	12.4	0.53	222
2	GC-21	Pulp	0.02	0.54	<0.1	<0.0005	<10	59	0.16	0.05	0.54	<0.01	45.77	2.6	85	0.58	10.0	1.43	3.69	0.08	0.06	<0.005	0.024	0.25	20.0	9.5	0.29	234
3	GC-29B	Pulp	0.04	1.22	0.2	<0.0005	<10	71	0.44	0.03	0.10	0.01	22.38	2.2	92	0.96	5.8	1.64	5.94	0.07	0.10	<0.005	0.057	0.60	9.1	16.2	0.67	128
4	DA-9005	Pulp	0.03	0.41	0.2	<0.0005	<10	12	0.17	0.02	0.39	0.01	62.09	1.3	85	0.19	4.4	0.77	3.26	0.08	0.06	0.01	0.011	0.07	27.4	5.6	0.23	152
5	DA-9007	Pulp	0.06	1.60	0.5	0.0018	<10	175	0.37	0.11	0.17	0.01	2.00	5.2	106	1.96	18.6	3.10	9.16	0.11	0.10	0.01	0.079	0.87	1.0	14.0	0.96	344
Duplicates:																												
1 D	GC-18 (Dup)	Pulp	0.02	0.73	0.2	<0.0005	<10	45	0.10	0.01	0.29	0.01	48.94	2.6	87	0.77	3.7	1.23	4.47	0.10	0.07	0.01	0.025	0.54	20.9	11.9	0.53	217
2 D	GC-21 (Dup)	Pulp	0.02	0.49	<0.1	<0.0005	<10	61	0.13	0.05	0.51	0.01	50.30	2.4	78	0.52	10.6	1.28	3.48	0.08	0.07	<0.005	0.019	0.23	21.9	8.4	0.27	222
3 D	GC-29B (Dup)	Pulp	0.04	1.09	<0.1	<0.0005	<10	62	0.41	0.02	0.09	0.01	21.51	2.0	73	0.89	6.3	1.51	5.45	0.06	0.07	<0.005	0.055	0.55	8.5	13.7	0.61	116
4 D	DA-9005 (Dup)	Pulp	0.03	0.38	0.2	<0.0005	<10	11	0.14	0.03	0.39	<0.01	60.34	1.3	82	0.17	4.9	0.73	3.03	0.08	0.06	0.01	0.011	0.05	27.0	6.0	0.22	147
5 D	DA-9007 (Dup)	Pulp	0.06	1.67	0.4	0.0017	<10	165	0.40	0.13	0.17	0.01	1.51	5.5	106	2.05	19.8	3.25	9.62	0.14	0.08	0.01	0.082	0.90	0.7	15.5	1.01	349

Sample No.	Sample ID	Analyte	Molybdenum (Mo)	Sodium (Na)	Niobium (Nb)	Nickel (Ni)	Phosphorous (P)	Lead (Pb)	Rubidium (Rb)	Rhenium (Re)	Sulfur (S)	Antimony (Sb)	Scandium (Sc)	Selenium (Se)	Tin (Sn)	Stronium (Sr)	Tantalum (Ta)	Tellurium[1] (Te)	Thorium (Th)	Titanium (Ti)	Thallium (Tl)	Uranium (U)	Vandium (V)	Tungsten (W)	Yttrium (Y)	Zinc (Zn)	Zirconium (Zr)
		Unit	ppm	%	ppm	ppm	ppm	ppm	ppm	ppm	%	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	%	ppm	ppm	ppm	ppm	ppm	ppm	ppm
		MDL	**0.05**	**0.01**	**0.05**	**0.2**	**10**	**0.2**	**0.1**	**0.001**	**0.01**	**0.05**	**0.1**	**0.2**	**0.2**	**0.2**	**0.01**	**0.01**	**0.2**	**0.005**	**0.02**	**0.05**	**1**	**0.05**	**0.05**	**1**	**0.5**
Typical Crustal Abundance (granite)			1.3	2.6	21	4.5	600	19	170	D	0.030	0.2	7	0.05	3	100	4.2		17	0.12	2.3	3	44	2.2	40	39	175
1	GC-18	Pulp	1.52	0.05	0.48	4.1	80	2.5	32.6	0.001	<0.01	0.09	3.1	<0.2	2	5.4	<0.01	0.03	10.7	0.065	0.16	3.03	12	0.07	3.46	22	3.6
2	GC-21	Pulp	0.38	0.05	0.22	2.3	221	3.4	18.6	<0.001	0.01	<0.05	3.3	0.4	0.8	8	<0.01	<0.01	11.6	0.045	0.09	4.26	14	0.07	9.45	20	3.8
3	GC-29B	Pulp	1.71	0.05	0.30	2.5	27	2.5	34.7	<0.001	0.02	<0.05	3.6	<0.2	2.2	9.7	<0.01	0.06	5.3	0.065	0.16	3.74	5	0.13	3.04	24	4.9
4	DA-9005	Pulp	0.88	0.06	0.07	2.4	83	8.3	4.5	<0.001	0.01	<0.05	1.0	<0.2	0.5	5.2	<0.01	<0.01	16.2	<0.005	0.03	15.23	4	0.09	30.28	15	3.6
5	DA-9007	Pulp	6.96	0.04	0.49	2.7	<10	3.2	68.8	<0.001	0.08	<0.05	5.4	0.5	3.4	5.2	<0.01	0.12	0.9	0.103	0.34	9.30	7	0.15	3.44	52	4.6
Duplicates:																											
1 D	GC-18 (Dup)	Pulp	2.00	0.05	0.53	3.8	67	2.4	33.2	<0.001	<0.01	0.05	2.8	<0.2	2	5.1	<0.01	<0.01	12.4	0.062	0.16	2.77	9	0.06	3.90	21	3.9
2 D	GC-21 (Dup)	Pulp	0.41	0.05	0.22	2.3	180	3.3	17.4	<0.001	0.01	<0.05	2.9	<0.2	0.7	7.8	<0.01	<0.01	14.5	0.042	0.09	4.68	14	0.07	9.78	19	3.8
3 D	GC-29B (Dup)	Pulp	1.97	0.04	0.25	1.9	27	2.4	31.2	<0.001	0.02	<0.05	3.2	<0.2	2.1	8.1	<0.01	0.08	5.4	0.058	0.15	3.39	4	0.13	3.02	22	4.2
4 D	DA-9005 (Dup)	Pulp	1.60	0.05	0.06	2.5	77	5.0	3.9	<0.001	<0.01	<0.05	1.0	<0.2	0.4	5	<0.01	0.03	15.5	<0.005	0.02	14.69	4	0.09	29.35	14	3.5
5 D	DA-9007 (Dup)	Pulp	8.29	0.04	0.36	2.8	<10	4.3	71.8	<0.001	0.09	<0.05	5.6	0.6	3.5	4.6	<0.01	0.15	1.1	0.105	0.34	13.96	8	0.17	2.85	55	4

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[1] Crustal abundance data is missing or unreliable for this element

Table 7: Geochemical Abundance Index for Development Rock Samples

Sample No.	Sample ID	Analyte	Silver (Ag)	Aluminum (Al)	Arsenic (As)	Gold (Au)	Boron (B)	Barium (Ba)	Beryllium (Be)	Bismuth (Bi)	Calcium (Ca)	Cadmium (Cd)	Cerium (Ce)	Cobalt (Co)	Chromium (Cr)	Cesium (Cs)	Copper (Cu)	Iron (Fe)	Gallium (Ga)	Germanium (Ge)	Hafnium (Hf)	Mercury (Hg)	Indium (In)	Potassium (K)	Lanthanum (La)	Lithium (Li)	Magnesium (Mg)	Manganese (Mn)
		Unit	ppm	%	ppm	ppm	ppm	ppm	ppm	ppm	%	ppm	ppm	ppm	ppm	ppm	ppm	%	ppm	ppm	ppm	ppm	ppm	%	ppm	ppm	%	ppm
		MDL	0.01	0.01	0.1	0.0005	10	10	0.05	0.01	0.01	0.01	0.02	0.1	1	0.05	0.2	0.01	0.05	0.05	0.02	0.005	0.005	0.01	0.2	0.1	0.01	5
Typical Crustal Abundance (granite)			0.037	7.2	1.5	0.004	10	840	3	0.01	0.51	0.13	92	1	4.1	4	10	1.4	17	1.3	3.9	0.08	0.26	4.2	55	40	0.16	390
1	GC-18		0	0	0	0	0	0	0	0	0	0	0	1	**3**	0	0	0	0	0	0	0	0	0	0	0	1	0
2	GC-21		0	0	0	0	0	0	0	1	0	0	0	0	**3**	0	0	0	0	0	0	0	0	0	0	0	0	0
3	GC-29B		0	0	0	0	0	0	0	1	0	0	0	0	**3**	0	0	0	0	0	0	0	0	0	0	0	1	0
4	DA-9005		0	0	0	0	0	0	0	0	0	0	0	0	**3**	0	0	0	0	0	0	0	0	0	0	0	0	0
5	DA-9007		0	0	0	0	0	0	0	2	0	0	0	1	**4**	0	0	0	0	0	0	0	0	0	0	0	2	0
Duplicates:																												
1 D	GC-18 (Dup)		0	0	0	0	0	0	0	0	0	0	0	0	**3**	0	0	0	0	0	0	0	0	0	0	0	1	0
2 D	GC-21 (Dup)		0	0	0	0	0	0	0	1	0	0	0	0	**3**	0	0	0	0	0	0	0	0	0	0	0	0	0
3 D	GC-29B (Dup)		0	0	0	0	0	0	0	0	0	0	0	0	**3**	0	0	0	0	0	0	0	0	0	0	0	1	0
4 D	DA-9005 (Dup)		0	0	0	0	0	0	0	1	0	0	0	0	**3**	0	0	0	0	0	0	0	0	0	0	0	0	0
5 D	DA-9007 (Dup)		0	0	0	0	0	0	0	3	0	0	0	1	**4**	0	0	0	0	0	0	0	0	0	0	0	2	0

Sample No.	Sample ID	Analyte	Molybdenum (Mo)	Sodium (Na)	Niobium (Nb)	Nickel (Ni)	Phosphorous (P)	Lead (Pb)	Rubidium (Rb)	Rhenium (Re)	Sulfur (S)	Antimony (Sb)	Scandium (Sc)	Selenium (Se)	Tin (Sn)	Stronium (Sr)	Tantalum (Ta)	Tellurium[1] (Te)	Thorium (Th)	Titanium (Ti)	Thallium (Tl)	Uranium (U)	Vandium (V)	Tungsten (W)	Yttrium (Y)	Zinc (Zn)	Zirconium (Zr)
		Unit	ppm	%	ppm	ppm	ppm	ppm	ppm	ppm	%	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	%	ppm	ppm	ppm	ppm	ppm	ppm	ppm
		MDL	0.05	0.01	0.05	0.2	10	0.2	0.1	0.001	0.01	0.05	0.1	0.2	0.2	0.2	0.01	0.01	0.2	0.005	0.02	0.05	1	0.05	0.05	1	0.5
Typical Crustal Abundance (granite)			1.3	2.6	21	4.5	600	19	170	D	0.030	0.2	7	0.05	3	100	4.2		17	0.12	2.3	3	44	2.2	40	39	175
1	GC-18		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	n/a	0	0	0	0	0	0	0	0	0
2	GC-21		0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	n/a	0	0	0	0	0	0	0	0	0
3	GC-29B		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	n/a	0	0	0	0	0	0	0	0	0
4	DA-9005		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	n/a	0	0	0	1	0	0	0	0	0
5	DA-9007		1	0	0	0	0	0	0	0	0	0	0	2	0	0	0	n/a	0	0	0	1	0	0	0	0	0
Duplicates:																											
1 D	GC-18 (Dup)		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	n/a	0	0	0	0	0	0	0	0	0
2 D	GC-21 (Dup)		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	n/a	0	0	0	0	0	0	0	0	0
3 D	GC-29B (Dup)		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	n/a	0	0	0	0	0	0	0	0	0
4 D	DA-9005 (Dup)		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	n/a	0	0	0	1	0	0	0	0	0
5 D	DA-9007 (Dup)		2	0	0	0	0	0	0	0	1	0	0	**3**	0	0	0	n/a	0	0	0	1	0	0	0	0	0

[1] Crustal abundance data is missing or unreliable for this element

For this study, the typical crustal abundance of elements in granite was used as a basis of comparison (Price, 1997). The following elements were found to be significantly enriched:

- Tailings: gold, bismuth, chromium and selenium
- Development rock: chromium, selenium (one sample)

Short term leach (shake flask extraction) tests were conducted on all development rock samples to assess whether soluble metal release is associated with these enrichments. Tailings filtrate was analyzed to assess the extent of soluble metal release associated with tailings.

3.1.4 Short Term Metal Release Potential

Results of the shake flask extraction tests on development rock are presented in Table 8. While there are no regulatory criteria against which test results can be directly compared, the criteria for the Toxic Characteristic Leach Procedure (TCLP) (State of Colorado, 2020) and the effluent limitations for mine drainage and beneficiation mill discharges (EPA, 2021) are also included in Table 8 to provide context for the leach results.

As discussed in Section 2.1 above, the Shake Flask Extraction (SFE) procedure is a more conservative approach compared to the Synthetic Precipitation Leaching Procedure (SPLP). The SFE is completed at a 1 to 3 solids to water ratio in a rotator operating for 24 hours, compared to the SPLP which is completed at a 1 to 20 solids to water ratio for 18 hours. The SFE tests were completed using de-ionized water at pH 5.51, similar to the pH of extraction water specified in the SPLP for materials west of the Mississippi River. In effect, metal concentrations will be higher in SFE results compared to SPLP test results due to lower dilution.

Parameter concentrations in all samples were less than the TCLP criteria and effluent discharge limitations. All samples were neutral to slightly alkaline pH and within the pH range for effluent discharge. No chromium or bismuth was released, although these elements were identified as being enriched in the solid phase, as discussed above in Section 3.1.3. Selenium was present in the tailings samples only, at 0.005 and 0.0032 mg/L. In general, heavy metal concentrations are low (near the analytical detection limit) or were not detected.

Short term metal release from tailings will be dominated by the quality of the filtrate remaining in the tailings filter cake. Filtrate from the metallurgical study that produced the tailings samples were analyzed by ICP-MS. The results are presented in Table 9.

Table 8: Shake Flask Extraction Results for Development Rock Samples

Parameter	Method	Unit	RDL	Development Rock					Haz Waste Regulation §261.24	EPA 40 CFR Part 440 Subpart J
				GC-18	GC-21	GC-29B	DA-9005	DA-9007		
Weight of dry sample used	Weighing Scale	g	0.01	250	250	250	250	250		
Volume of DI water used	Graduated Cylinder	mL	0.50	750	750	750	750	750		
On filtered samples (using 0.45 µm filter paper):										
pH	Meter	pH units	0.01	8.5	8.4	8.5	8.6	8.6		6 - 9
EC	Meter	mV	1.0	50	662	55	56	49		
Acidity (to pH 8.3)	Titration	mg $CaCO_3$/L	0.5	<0.5	<0.5	<0.5	<0.5	<0.5		
Total Alkalinity (to pH 4.5)	Titration	mg $CaCO_3$/L	0.5	16.0	16.5	17.3	16.0	14.5		
Dissolved Sulphate (SO_4)	Colourimetry	mg/L	0.5	<0.5	<0.5	<0.5	<0.5	<0.5		
Chloride	IC	mg/L	0.05							
Fluoride	IC	mg/L	0.02							
Dissolved Metals Analysis by ICP-MS:										
Hardness, Total (as $CaCO_3$)	Calc.	mg $CaCO_3$/L	0.5	14.6	21.2	15.0	15.8	14.1		
Aluminum Dissolved	ICP-MS	mg/L	0.001	0.41	0.237	0.239	0.543	0.277		
Antimony Dissolved	ICP-MS	mg/L	0.0001	0.0003	0.0002	0.0003	0.0004	0.0005		
Arsenic Dissolved	ICP-MS	mg/L	0.0002	0.0016	0.0009	0.0008	0.0017	0.0015	5	
Barium Dissolved	ICP-MS	mg/L	0.0002	0.0028	0.0057	0.0042	0.0033	0.0843	100	
Beryllium Dissolved	ICP-MS	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001		
Bismuth Dissolved	ICP-MS	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001		
Boron Dissolved	ICP-MS	mg/L	0.01	0.01	0.03	0.01	0.03	0.03		
Cadmium Dissolved	ICP-MS	mg/L	0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	1	0.05
Calcium Dissolved	ICP-MS	mg/L	0.05	5.1	7.3	4.6	5.6	5.2		
Chromium Dissolved	ICP-MS	mg/L	0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005		
Cobalt Dissolved	ICP-MS	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001		
Copper Dissolved	ICP-MS	mg/L	0.0005	<0.0005	<0.0005	<0.0005	0.001	0.0007		0.15
Iron Dissolved	ICP-MS	mg/L	0.01	0.01	0.02	0.01	0.02	0.04		
Lead Dissolved	ICP-MS	mg/L	0.0005	0.0007	0.0028	<0.0005	0.0057	0.0017	5	0.3
Lithium Dissolved	ICP-MS	mg/L	0.0005	0.0011	0.0008	0.0042	0.0007	<0.0005		
Magnesium Dissolved	ICP-MS	mg/L	0.05	0.470	0.7	0.8	0.4	0.3		
Manganese Dissolved	ICP-MS	mg/L	0.0002	0.002	0.0039	0.0021	0.0021	0.0037		
Mercury Dissolved	ICP-MS	mg/L	0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	0.2	0.001
Molybdenum Dissolved	ICP-MS	mg/L	0.0001	0.0011	0.0006	0.0463	0.0028	0.0019		
Nickel Dissolved	ICP-MS	mg/L	0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005		
Phosphorus Dissolved	ICP-MS	mg/L	0.05	0.08	0.07	0.08	<0.05	0.05		
Potassium Dissolved	ICP-MS	mg/L	0.05	2.09	1.11	1.99	0.9	1.79		
Selenium Dissolved	ICP-MS	mg/L	0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	1	
Silicon Dissolved	ICP-MS	mg/L	0.05	1.55	1.28	1.19	1.89	1.08		
Silver Dissolved	ICP-MS	mg/L	0.00008	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008	5	
Sodium Dissolved	ICP-MS	mg/L	0.02	1.15	1.25	2.03	2.88	1.33		
Strontium Dissolved	ICP-MS	mg/L	0.0002	0.0303	0.0424	0.128	0.0443	0.0609		
Sulphur Dissolved	ICP-MS	mg/L	0.5	<0.5	<0.5	<0.5	<0.5	0.6		
Tellurium Dissolved	ICP-MS	mg/L	0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002		
Thallium Dissolved	ICP-MS	mg/L	0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005		
Thorium Dissolved	ICP-MS	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001		
Tin Dissolved	ICP-MS	mg/L	0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005		
Titanium Dissolved	ICP-MS	mg/L	0.0005	0.001	0.0006	<0.0005	0.0008	0.0016		
Tungsten Dissolved	ICP-MS	mg/L	0.0001	0.001	0.0003	0.0011	0.0004	0.0006		
Uranium Dissolved	ICP-MS	mg/L	0.00005	0.00068	0.00075	0.00025	0.00692	0.00156		
Vanadium Dissolved	ICP-MS	mg/L	0.001	0.002	0.002	<0.001	0.001	<0.001		
Zinc Dissolved	ICP-MS	mg/L	0.001	<0.001	<0.001	0.002	<0.001	<0.001		0.5
Zirconium Dissolved	ICP-MS	mg/L	0.0001	0.0001	<0.0001	<0.0001	0.0003	0.0001		

Bold = Exceedance of Hazardous Waste Reg §261.24 or 40 CFR Part 440 Subpart J

Table 9: Water Quality of Tailings Filtrate Samples

Parameter	Method	Unit	RDL	Tailings Filtrate		EPA	5 CCR 1002-32	Background	Reg. 41
				BL737-04 (altered)	BL737-05 (unaltered)	40 CFR Part 440 Subpart J	WQ Standard[1] Grape Creek	Groundwater Quality	Groundwater Standard
On filtered samples (using 0.45 µm filter paper):									
pH	Meter	pH units	0.01	7.4	7.4	6 - 9			
EC	Meter	mV	1.0	260	178				
Acidity (to pH 8.3)	Titration	mg $CaCO_3$/L	0.5	7.5	9.0				
Total Alkalinity (to pH 4.5)	Titration	mg $CaCO_3$/L	0.5	69.0	56.5				
Dissolved Sulphate (SO_4)	Colourimetry	mg/L	0.5	52.1	23.2		250		
Chloride	IC	mg/L	0.05	8.77	8.3				
Fluoride	IC	mg/L	0.02	0.63	0.8		2.6		
Dissolved Metals Analysis by ICP-MS:									
Hardness, Total (as $CaCO_3$)	Calc.	mg $CaCO_3$/L	0.5	82.7	43.7				
Aluminum Dissolved	ICP-MS	mg/L	0.001	0.008	0.015		0.157	0.459	5
Antimony Dissolved	ICP-MS	mg/L	0.0001	0.0003	0.0004				
Arsenic Dissolved	ICP-MS	mg/L	0.0002	0.0002	0.0003		0.34	<0.01	0.01
Barium Dissolved	ICP-MS	mg/L	0.0002	0.0235	0.0123				
Beryllium Dissolved	ICP-MS	mg/L	0.0001	<0.0001	<0.0001			<0.005	0.004
Bismuth Dissolved	ICP-MS	mg/L	0.0001	<0.0001	<0.0001				
Boron Dissolved	ICP-MS	mg/L	0.01	<0.01	<0.01		0.00075	0.23	0.75
Cadmium Dissolved	ICP-MS	mg/L	0.00001	0.00005	0.00007	0.05	0.00039	<0.005	0.005
Calcium Dissolved	ICP-MS	mg/L	0.05	26.4	13.5			73.8	
Chromium Dissolved	ICP-MS	mg/L	0.0005	<0.0005	<0.0005		0.011	<0.01	0.1
Cobalt Dissolved	ICP-MS	mg/L	0.0001	<0.0001	0.0006			<0.01	0.05
Copper Dissolved	ICP-MS	mg/L	0.0005	<0.0005	0.0018	0.15	0.0044	0.02	0.2
Iron Dissolved	ICP-MS	mg/L	0.01	<0.01	<0.01		0.3	0.34	0.1
Lead Dissolved	ICP-MS	mg/L	0.0005	<0.0005	<0.0005	0.3	0.001	<0.003	0.05
Lithium Dissolved	ICP-MS	mg/L	0.0005	0.0092	0.0108			0.044	2.5
Magnesium Dissolved	ICP-MS	mg/L	0.05	4.07	2.4			24.9	
Manganese Dissolved	ICP-MS	mg/L	0.0002	0.0713	0.0138		1.3	0.143	0.05
Mercury Dissolved	ICP-MS	mg/L	0.0005	<0.0005	<0.0005	0.001	0.00001	<0.0002	0.002
Molybdenum Dissolved	ICP-MS	mg/L	0.0001	0.0783	0.0572		0.15		
Nickel Dissolved	ICP-MS	mg/L	0.0005	<0.0005	*0.0317*		0.026	0.03755	0.1
Phosphorus Dissolved	ICP-MS	mg/L	0.05	0.61	0.56				
Potassium Dissolved	ICP-MS	mg/L	0.05	16.7	13.1			6.2	
Selenium Dissolved	ICP-MS	mg/L	0.0005	*0.005*	0.0032		0.0046	<0.005	0.02
Silicon Dissolved	ICP-MS	mg/L	0.05	0.75	0.4				
Silver Dissolved	ICP-MS	mg/L	0.00008	<0.00008	<0.00008		0.00008		
Sodium Dissolved	ICP-MS	mg/L	0.02	10.4	10.8			55.8	
Strontium Dissolved	ICP-MS	mg/L	0.0002	0.391	0.392				
Sulphur Dissolved	ICP-MS	mg/L	0.5	15	7.3				
Tellurium Dissolved	ICP-MS	mg/L	0.0002	<0.0002	<0.0002				
Thallium Dissolved	ICP-MS	mg/L	0.00005	<0.00005	<0.00005				
Thorium Dissolved	ICP-MS	mg/L	0.0001	<0.0001	<0.0001				
Tin Dissolved	ICP-MS	mg/L	0.0005	<0.0005	<0.0005				
Titanium Dissolved	ICP-MS	mg/L	0.0005	0.0013	0.0013				
Tungsten Dissolved	ICP-MS	mg/L	0.0001	<0.0001	<0.0001				
Uranium Dissolved	ICP-MS	mg/L	0.00005	0.00022	0.00023		0.60		
Vanadium Dissolved	ICP-MS	mg/L	0.001	<0.001	<0.001				0.1
Zinc Dissolved	ICP-MS	mg/L	0.001	<0.001	0.002	0.5	0.057	0.12	2
Zirconium Dissolved	ICP-MS	mg/L	0.0001	<0.0001	<0.0001				

Bold = Exceedance of 40 CFR Part 440 Subpart J

Italics = Exceedance of water quality standard (chronic) for Grape Creek

[1] Water quality standard for several parameters are hardness dependent. The lower value for the two tailings filtrate samples is shown

Both filtrate samples have neutral pH, low concentrations of sulfate and low concentrations of metals, with many parameters less than the detection limit. The altered tailings filtrate exceeds the water quality standard for Grape Creek for selenium (0.005 mg/L versus the standard of 0.0046 mg/L). The unaltered tailings filtrate exceeds the water quality standard for Grape Creek for nickel (0.0317 mg/L versus the standard of 0.026 mg/L). Both filtrates meet the groundwater quality standard and are less than the background groundwater quality.

3.2 Kinetic Tests

Kinetic tests were initiated for the two tailings samples to evaluate the potential metal release during the post-closure period of the mine. The humidity cell test is being utilized. The tests are ongoing.

Data to date are presented in Figures 5 and 6 below. The laboratory report is provided in Appendix C. A detailed interpretation and discussion of the results will be provided at the completion of the testing program, later in 2021.

In general, the tailings sample leachates are maintaining a neutral to slightly alkaline pH and showing decreasing concentrations in sulfate, acidity and metals. Most metals are below the detection limit. Detectable metals are shown in Figure 6.

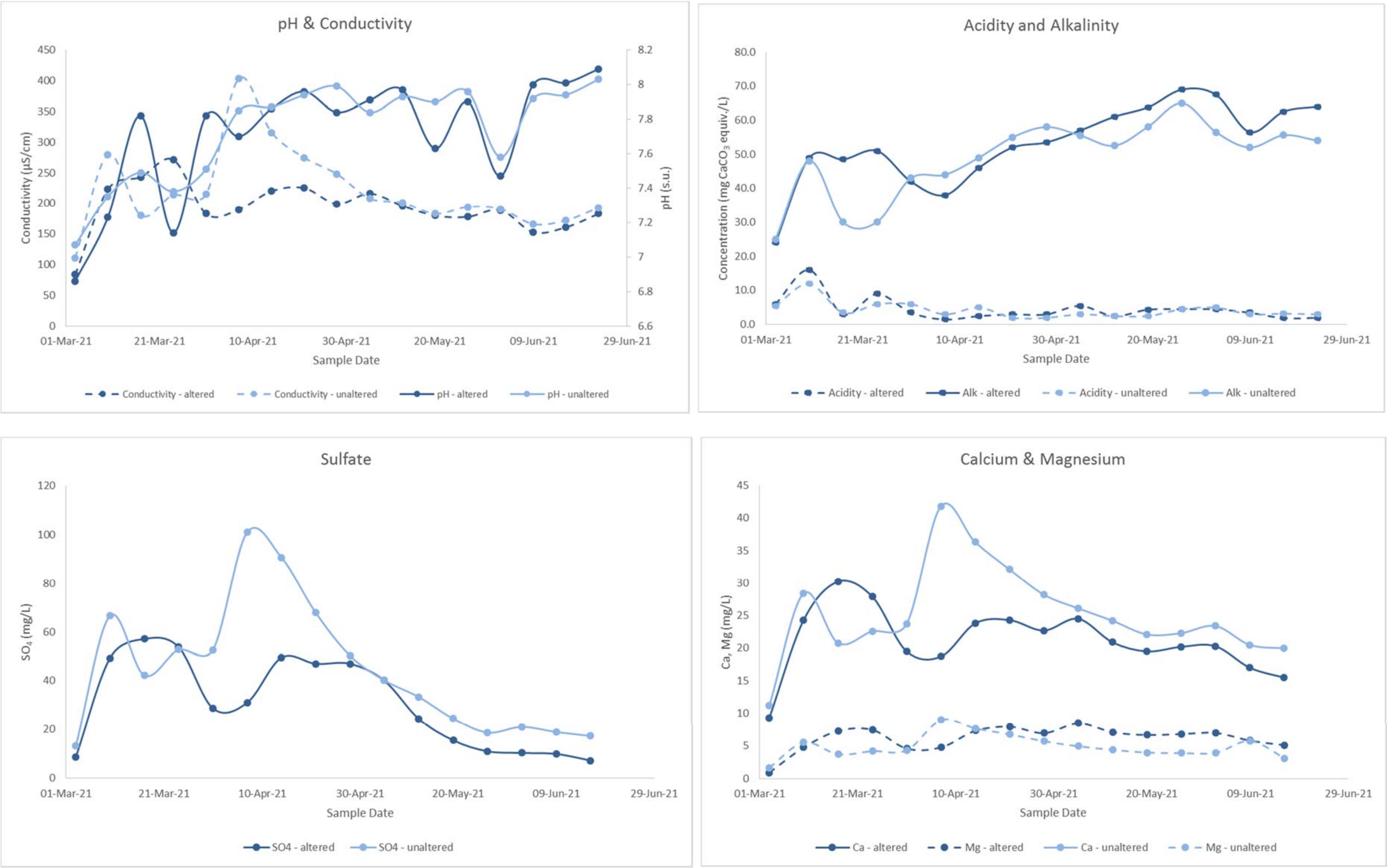

Figure 5: Tailings Humidity Cells – Major Elements

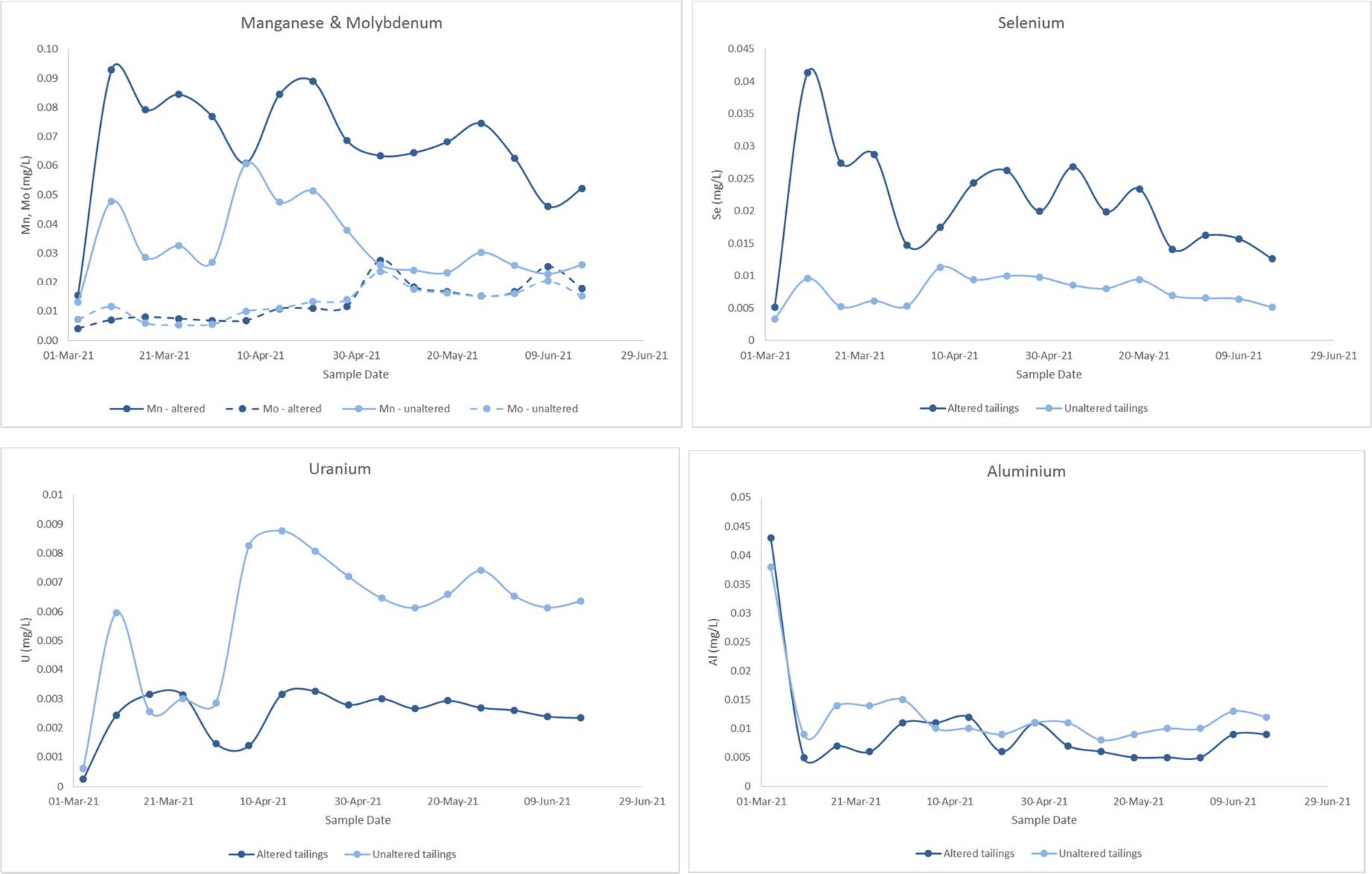

Figure 6: Tailings Humidity Cells – Minor Elements

4 FTSF Seepage Quality

The seepage from the FTSF will comprise of filtrate introduced to the facility with the tailings and infiltration water that contacts the tailings and the support buttresses (development rock). The metal release data presented in Section 3 above were combined with the seepage estimates presented in Amec Foster Wheeler (2016) to derive a seepage quality estimate for the facility.

An empirical, mass balance approach was used to derive the seepage quality estimate. The following data was used in the estimate:

- Filtrate quality presented in Table 9 representing solute contribution from tailings
- The SFE data presented in Table 8 representing solute contribution from development rock
- Seepage volume of 259,548 ft^3/yr (Amec Foster Wheeler, 2016)
- Development rock (support buttress) volume of 1,881 cu.yd. (4,200 short tons) in FTSF (Amec Foster Wheeler, 2016)
- Tailings amount of 500,000 short tons in FTST (Amec Foster Wheeler, 2016)

The amount of each element contributed by development rock and tails was combined in proportion to the tonnage of each material expected in the FTSF. Given the significantly larger volume of tailings compared to development rock in the FTSF, it is expected that tailings will dominate overall seepage quality.

The concentration of element ί in seepage was calculated as follows:

$$seepage\ conc_{\imath}\ \left({}^{mg}/_{L}\right) = \frac{mg\ DR_{\imath} + mg\ tails_{\imath}}{FTSF\ seepage\ volume\ (L)}$$

Where

$$mg\ DR_{\imath} = \ conc.DR_{\imath}\left({}^{mg}/_{L}\right) * \left(\frac{ton\ DR}{ton\ DR + ton\ tails} * FTSF\ seepage\ volume\ (L)\right)$$

$$mg\ tails_{\imath} = \ conc.tails_{\imath}\left({}^{mg}/_{L}\right) * \left(\frac{ton\ tails}{ton\ DR + ton\ tails} * FTSF\ seepage\ volume\ (L)\right)$$

And

DR = development rock (supporting buttress)
Tails = tailings

The estimated seepage quality thus derived was then compared to the groundwater quality standard and the baseline groundwater quality to ascertain its suitability for discharge.

In deriving the seepage quality estimate, a number of assumptions were made:

1. All infiltration water contacting the tailings will acquire the quality of the filtrate.
2. If the element concentration is different between altered and unaltered filtrate, the higher concentration was used.
3. The element concentration in the development rock SFE tests represents an ongoing release rate. This is a conservative assumption since an SFE result represents the total amount of soluble metal available for release, not the rate at which it is released.
4. The largest element concentration in the five development rock SFE results was used.
5. Leaching of development rock in the FTSF will occur at a 1:1 water to solid ratio. The 3:1 ratio at which the SFE test is conducted is too dilute to represent development rock leachate. SFE results were re-calculated to produce higher element concentrations.
6. No elements precipitate out of solution. This is a conservative approach.
7. The ratio of tailings volume to development rock volume is similar to the ratio of tailings footprint area to buttress footprint area.

The estimated FTSF seepage quality is presented in Table 10. As expected, the predicted seepage quality is very similar to tailings filtrate. The predicted seepage quality meets the groundwater quality standard, with the exception for manganese. However, the predicted manganese concentration (0.071 mg/L) is less than the background groundwater concentration (0.14 mg/L). The groundwater quality standard is 0.05 mg/L.

As with the tailings filtrate, the estimated concentrations of nickel and selenium in the seepage exceed the water quality standard for Grape Creek. However, both elements meet the groundwater quality standard.

Based on the above analysis, it is expected that FTSF seepage will not require treatment prior to discharge. The FTSF seepage quality is suitable for discharge via an exfiltration pond.

The predicted seepage quality presented herein would be reflective of short term and operating conditions when fresh tailings are added on a continual basis. The seepage quality estimates for the long term (ie. post-closure) will be developed once the kinetic tests on tailings are complete.

Table 10: Predicted Seepage Quality from FTSF

	Development Rock		**Tailings**		**FTSF Seepage**		**5 CCR 1002-32 WQ Standard[1] Grape Creek**	**Background Groundwater Quality**	**Reg. 41 Groundwater Standard**
	Conc.	Amount	Conc.	Amount	Total Amount	Conc.			
	mg/L	mg	mg/L	mg	mg	mg/L			
pH						7 - 9	6 - 9		
Aluminum Dissolved	1.6	273	0.015	300	573	0.028	0.157	0.459	5
Antimony Dissolved	0.0015	0.25	0.0004	8.0	8.2	0.00041			
Arsenic Dissolved	0.0051	0.86	0.0003	6.0	6.8	0.00034	0.34	<0.01	0.01
Barium Dissolved	0.25	42	0.0235	469	512	0.025			
Beryllium Dissolved	0	0	0	0	0	0		<0.005	0.004
Bismuth Dissolved	0	0	0	0	0	0			
Boron Dissolved	0.090	15	0	0	15	0.00075	0.00075	0.23	0.75
Cadmium Dissolved	0	0	0.00007	1.4	1.4	6.9E-05	0.00039	<0.005	0.005
Calcium Dissolved	22	3659	26.4	527157	530816	26		73.8	
Chromium Dissolved	0	0	0.0000	0	0	0	0.011	<0.01	0.1
Cobalt Dissolved	0	0	0.0006	12	12	0.00060		<0.01	0.05
Copper Dissolved	0.003	0.50	0.0018	36	36	0.0018	0.0044	0.02	0.2
Iron Dissolved	0.12	20	0	0	20	0.0010	0.3	0.34	0.1
Lead Dissolved	0.017	2.9	0	0	2.9	0.00014	0.001	<0.003	0.05
Lithium Dissolved	0.013	2.1	0.0108	216	218	0.011		0.044	2.5
Magnesium Dissolved	2.5	413	4.07	81270	81683	4.1		24.9	
Manganese Dissolved	0.012	2.0	0.0713	1424	1426	**0.071**	1.3	0.143	0.05
Mercury Dissolved	0	0	0	0	0	0	0.00001	<0.0002	0.002
Molybdenum Dissolved	0.14	23	0.0783	1563	1587	0.079	0.15		
Nickel Dissolved	0	0	*0.0317*	633	633	*0.0314*	0.026	0.0376	0.1
Phosphorus Dissolved	0.24	40	0.61	12181	12221	0.61			
Potassium Dissolved	6.3	1052	16.7	333467	334519	17		6.2	
Selenium Dissolved	0	0	0.005	100	100	*0.0050*	0.0046	<0.005	0.02
Silicon Dissolved	5.7	951	0.75	14976	15927	0.79			
Silver Dissolved	0	0	0	0	0	0	0.00008		
Sodium Dissolved	8.6	1449	10.8	215655	217105	11		55.8	
Strontium Dissolved	0.38	64	0.392	7827	7892	0.39			
Sulphur Dissolved	1.8	302	15	295527	295829	15			
Tellurium Dissolved	0	0	0	0	0	0			
Thallium Dissolved	0	0	0	0	0	0			
Thorium Dissolved	0	0	0	0	0	0			
Tin Dissolved	0	0	0	0	0	0			
Titanium Dissolved	0.0048	0.81	0.0013	26	27	0.0013			
Tungsten Dissolved	0.0033	0.55	0	0	0.55	2.7E-05			
Uranium Dissolved	0.02076	3.5	0.00023	4.6	8.1	0.00040	0.60		
Vanadium Dissolved	0.006	1.0	0	0	1.0	5.0E-05			0.1
Zinc Dissolved	0.006	1.0	0.002	40	41	0.0020	0.057	0.12	2
Zirconium Dissolved	0.0009	0.15	0.0000	0	0.15	7.5E-06			

Bold = Exceeds groundwater quality standard

Italics = Exceeds water quality standard for Grape Creek

5 Summary

The two components of the FTSF, development rock and tailings, have been characterized to assess their potential to produce acidic drainage and metal leaching. All tailings and development rock are classified as non-potentially acid generating. Only 1 development rock sample contained sulfide sulfur above the detection limit.

Metal release from tailings was measured directly by analyzing tailings filtrate. Tailings filtrate quality meets the groundwater quality standard, with the exception of manganese. Manganese concentration is less than in background groundwater at the site. Tailings filtrate has a neutral pH.

Long term metal release from tailings is being assessed using the humidity cell test. These tests are ongoing. Data to date show alkalinity is being maintained and acidity, sulfate and metal concentrations are generally decreasing. A more detailed interpretation will be provided when testing is complete later in 2021.

Metal release from the development rock is generally low. Many metals were less than the detection limit in shake flask extraction tests. Sulfate was also less than the detection limit. The shake flask extraction results are consistent with the lack of metal enrichment in the development rock.

FTSF seepage quality during operations was estimated. The metal release from development rock and tailings were combined on a mass balance basis using conservative assumptions. Seepage quality is dominated by tailings filtrate quality and as a result its characterization is the same. Seepage quality meets the groundwater quality standard, with the exception of manganese. However, manganese is less than the concentration in background groundwater.

FTSF seepage produced during operations is not expected to require treatment prior to discharge. The FTSF seepage quality is suitable for discharge via an exfiltration pond.

Seepage quality during post-closure will be estimated when the tailings kinetic testing is completed later in 2021.

6 Signature

This report “Tailings Geochemistry Characterization & Seepage Quality Estimate, Dawson Project, Interim Report” was prepared by:

GEM Services

D. D. D. SOLLNER

June 30, 2021

Diana Sollner, MASc, MBA, PEng (BC), CDI.D
Principal, Mining Environmental Engineering

7 References

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Appendix A:
Mineralogy Report

QUANTITATIVE PHASE ANALYSIS OF TWO POWDER SAMPLES USING THE RIETVELD METHOD AND X-RAY POWDER DIFFRACTION DATA.

Project #: 2102 (B2)
PO #: GL21-169

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March 23, 2021

EXPERIMENTAL METHOD

The 2 samples of **Project #: 2102 (B2)** were reduced to the optimum grain-size range for quantitative X-ray analysis (<10 μm) by grinding under ethanol in a vibratory McCrone XRD Mill (Retsch GmbH, Germany) for 10 minutes. Continuous-scan X-ray powder-diffraction data were collected over a range 3-80°2θ with CoKα radiation on a Bruker D8 Advance Bragg-Brentano diffractometer equipped with an Fe filter foil, 0.6 mm (0.3°) divergence slit, incident- and diffracted-beam Soller slits and a LynxEye-XE detector. The long fine-focus Co X-ray tube was operated at 35 kV and 40 mA, using a take-off angle of 6°.

RESULTS

The X-ray diffractograms were analyzed using the International Centre for Diffraction Database PDF-4 and Search-Match software by Bruker. X-ray powder-diffraction data of the samples were refined with Rietveld program Topas 4.2 (Bruker AXS). The results of quantitative phase analysis by Rietveld refinements are given in Table 1. These amounts represent the relative amounts of crystalline phases normalized to 100%. The Rietveld refinement plots are shown in Figures 1 and 2.

Note that Figures 1 and 2 show the presence of some amorphous and/or nanoscale material that was accounted fitting the pattern with a broad calculated peak at about 31 º2θ (indicated by vertical blue line) which could not be refined and measured.

Table 1. Results of quantitative phase analysis (wt.%) for Project 2102 (B2)

Mineral	**Ideal Formula**	**BL737-04**	**BL737-05**
Actinolite	$Ca_2(Mg,Fe^{2+})_5Si_8O_{22}(OH)_2$		0.3
Almandine	$Fe_3^{2+}Al_2(SiO_4)_3$		1.5
Ankerite-Dolomite	$Ca(Fe^{2+},Mg,Mn)(CO_3)_2$-$CaMg(CO_3)_2$	0.7	
Biotite	$K(Mg,Fe^{2+})_3AlSi_3O_{10}(OH)_2$	2.0	4.4
Calcite	$CaCO_3$	2.2	0.6
Clinochlore	$(Mg,Fe^{2+})_5Al(Si_3Al)O_{10}(OH)_8$	1.6	5.0
Illite-Muscovite 2M	$K_{0.65}Al_{2.0}Al_{0.65}Si_{3.35}O_{10}(OH)_2$ -$KAl_2AlSi_3O_{10}(OH)_2$	5.3	2.9
Kaolinite	$Al_2Si_2O_5(OH)_4$	1.5	
Quartz	SiO_2	83.9	83.9
Siderite	$Fe^{2+}CO_3$	0.7	
Sillimanite	Al_2SiO_5	2.1	1.4
Total		**100.0**	**100.0**

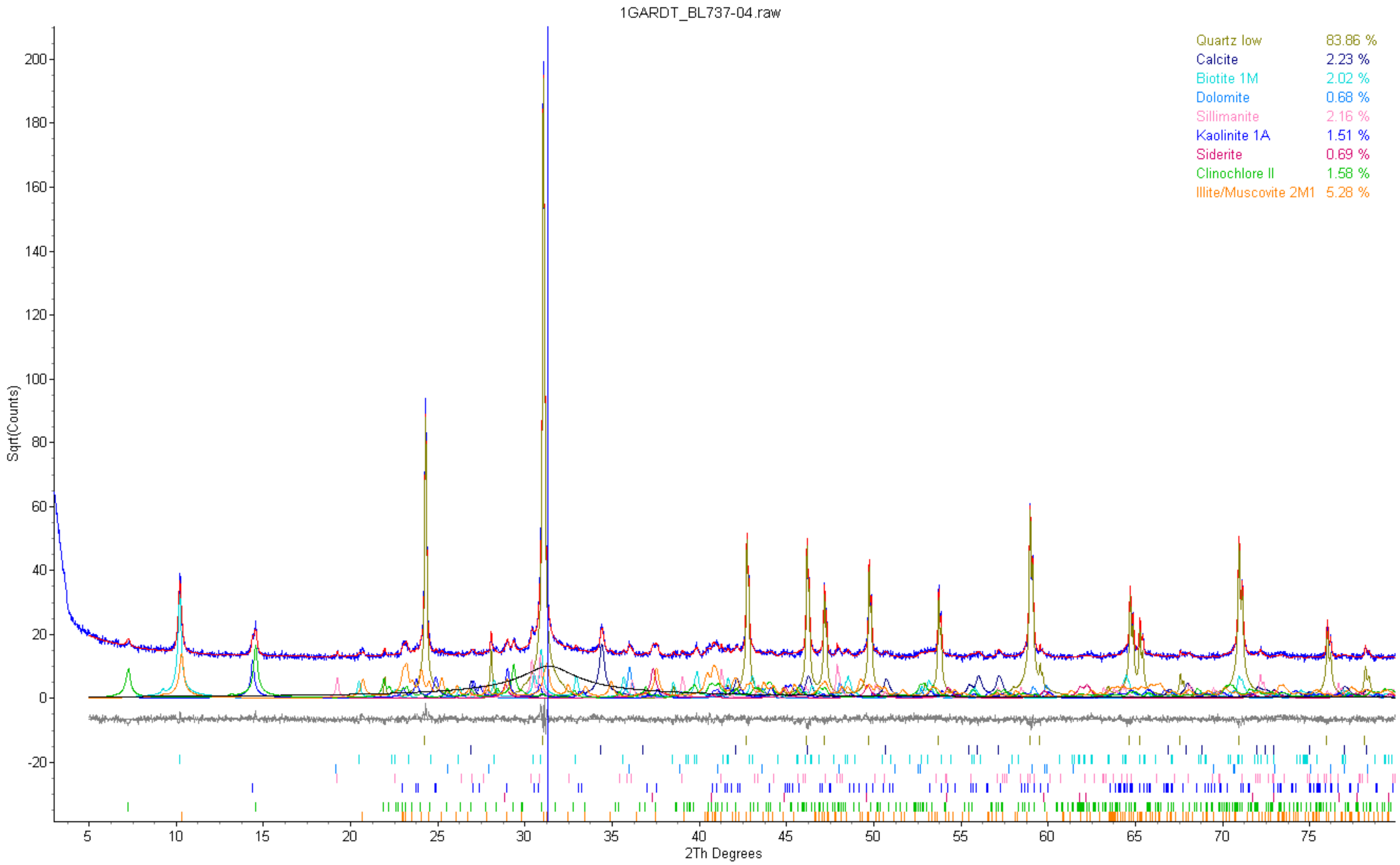

Figure 1. Rietveld refinement plot of sample **Global ARD Testing Services Inc – 1_BL737-04** (blue line - observed intensity at each step; red line - calculated pattern; solid grey line below – difference between observed and calculated intensities; vertical bars, positions of all Bragg reflections; vertical blue line - position of peak phase). Coloured lines are individual diffraction patterns of all phases.

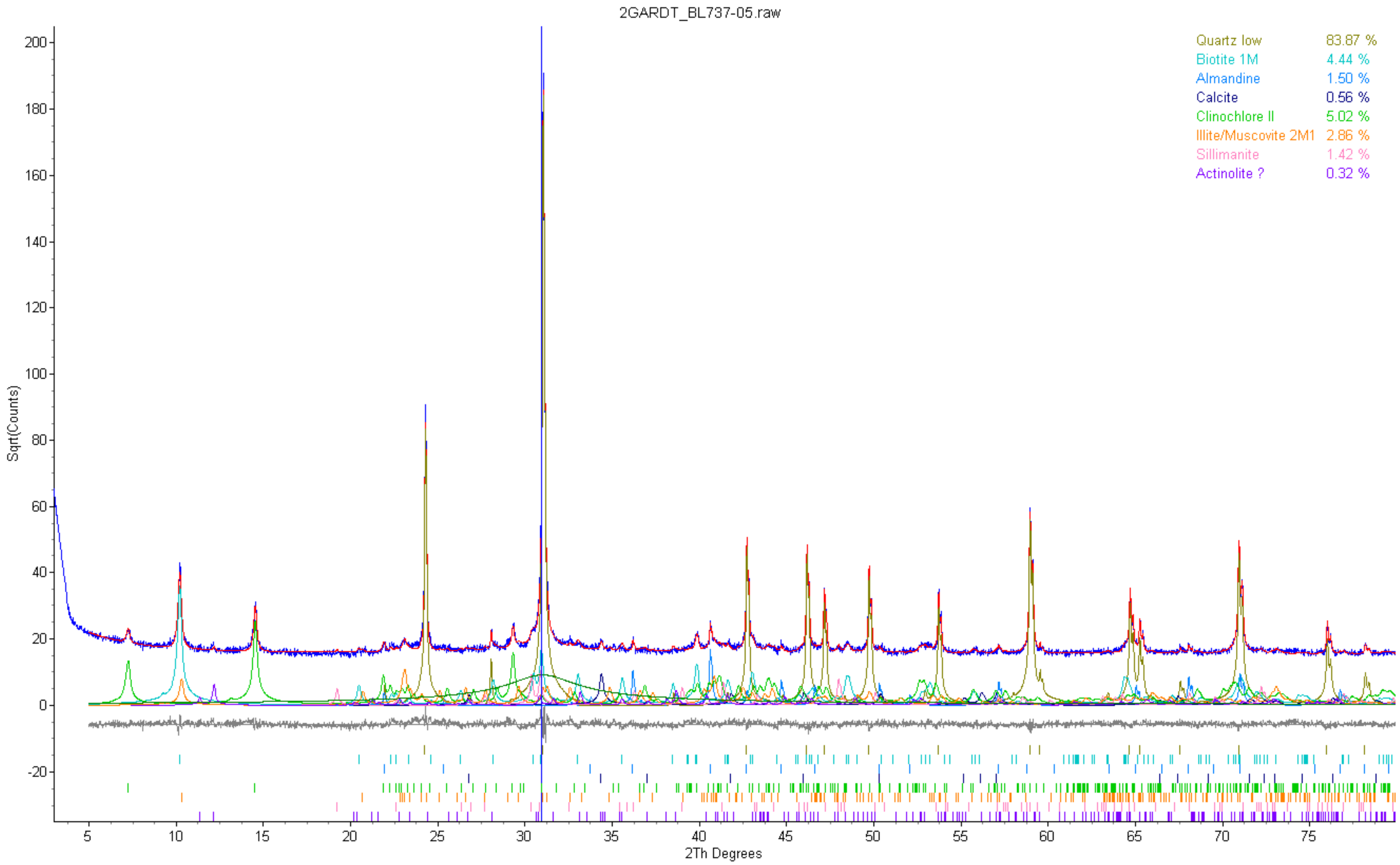

Figure 2. Rietveld refinement plot of sample **Global ARD Testing Services Inc – 2_BL737-05** (blue line - observed intensity at each step; red line - calculated pattern; solid grey line below – difference between observed and calculated intensities; vertical bars, positions of all Bragg reflections; vertical blue line - position of peak phase). Coloured lines are individual diffraction patterns of all phases.

Appendix B:

Laboratory Reports for Static Tests Development Rock and Tailings

CERTIFICATE OF ANALYSIS ▪ COVER PAGE

Global
ARD Testing Services Inc.

CLIENT INFORMATION

Client:		Zephyr Minerals Ltd
Consulting Client:		GEM Services
Project Manager(s):	**1**	Diana Sollner, M.A.Sc., MBA, P.Eng., CDI.D, Principal Engineer
	2	N/A
Contact Person:		Diana Sollner
Mailing Address:	**Zephyr Minerals:**	1301, 1959 Upper Water St, Purdy's Wharf Tower 1, Halifax, NS B3J 3N2, Canada.
	GEM Services:	1473 West 15th Street, North Vancouver, BC V7P 1N3.
Contact No:	**Zephyr Minerals:**	General: +1 (902) 446-4189; Loren Komperdo: +1 (403) 614-2877
	GEM Services:	Diana Sollner: (778) 828-7753
Fax No:		+1 (866) 941-4715

COMPANY INFORMATION

Legal Name:	Global ARD Testing Services Inc.
Mailing Address:	6891 Antrim Avenue, Burnaby, BC, Canada, V5J 4M5.
Contact No:	Main: 604-428-2730
	Ivy Rajan (Cell): 604-319-7707
	Prab Bhatia (Cell): 604-603-1359
Fax No:	604-428-2731

PROJECT INFORMATION

Project Name:	Dawson Gold Project
Project Number:	N/A

REPORT INFORMATION

Global Project No:	2102
Report Version:	2
Pages (Including Cover):	6
Report Title:	COA 5 Zephyr Samples (rec'd 13-Jan21)
Analysis Reviewed By:	Ivy Rajan (IRajan@GlobalARDTesting.com)
Position:	Acid Rock Drainage (ARD) Lab & Project Manager
Report Certified By:	Ivy Rajan
Signature:	Ivy Rajan

RESULTS

Reported To:	**1**	Diana Sollner (dsollner@gemservices.ca)
	2	Loren Komperdo, PGeo, CEO (l.komperdo@shaw.ca)
	3	N/A
cc:		NA
Date Reported:	**Version-1**	Feb. 08, 2021 (Monday): ABA, Metals
	Version-2	Jun. 11, 2021 (Friday): SFE

INVOICE

Submitted To:		Loren Komperdo, PGeo, CEO (l.komperdo@shaw.ca)
cc:	**1**	Diana Sollner (dsollner@gemservices.ca)
	2	N/A
Mailing Address:		**Zephyr Minerals Ltd**
		1301, 1959 Upper Water St, Purdy's Wharf Tower 1,
		Halifax, NS B3J 3N2, Canada.
Client PO No:		N/A
Global Invoice No:		ARD2102-0221A, ARD2102-0621A
Date Submitted:		Feb. 08, 2021 (Monday); Jun. 11, 2021 (Friday)

NOTES

All samples are stored at no charge for 90 days past reporting date.
HCT, column, custom leach columns (Lysimeters) & SAD column samples
will be stored free for 90 days past kinetic testing program or Closedown.
Please contact the lab if you require additional sample storage time.
Storage charges will apply.

CERTIFICATE OF ANALYSIS ▪ SAMPLE DETAILS

Global
ARD Testing Services Inc.

PAGE: 2 of 6
GLOBAL PROJECT NO: 2102
CLIENT: Zephyr Minerals Ltd
PROJECT NAME: Dawson Gold Project
PROJECT NO: N/A
REPORT VERSION: 2

S. No.	Sample ID	Depth	Sample Description	Condition	Total Sample Wt Rec'd (kg)	Global Notes
1	GC-18	582-588	Drill Cores	Dry	3.45	
2	GC-21	554-563	Drill Cores	Dry	3.55	
3	GC-29B	795-800	Drill Cores	Dry	3.25	Hole in the sample bag
4	DA-9005	841-849	Drill Cores	Dry	3.30	
5	DA-9007	1102-1109	Drill Cores	Dry	4.25	

Total wt. rec'd (kg): ***17.80***

NOTE:

Samples were requested to be analyzed in duplicate.

SAMPLE RECEIPT INFO:

Date Samples Rec'd:	Jan. 13, 2021 (Wed.)
No. of Samples Rec'd:	5
Samples Rec'd By:	Andrew

ANALYTICAL INSTRUCTIONS:

From:	Diana Sollner (dsollner@gemservices.ca)
	by email
Date:	Jan. 04, 2021 (Monday)
	May 25, 2021 (SFE Added)

QAQC: Sieving - % Passing Pulverized Material

Analyte:	**Pass %**
Unit:	**%**
RDL:	**0.01**
	N/A to this batch

CERTIFICATE OF ANALYSIS ▪ ABA RESULTS

Global
ARD Testing Services Inc.

PAGE: 3 of 6
GLOBAL PROJECT NO: 2102
CLIENT: Zephyr Minerals Ltd
PROJECT NAME: Dawson Gold Project
PROJECT NO: N/A
REPORT VERSION: 2

		On <1/4"						**Modified ASTM D2492-02 Method**						
S. No.	**Sample ID**	**Rinse pH**	**Paste pH**	**Fizz Rating**	**Total Inorganic C**	**CaCO$_3$ Equivalents^{*1}**	**Total Sulphur**	**Sulphate Sulphur**	**Sulphide Sulphur**	**Non-Extractable Sulphur^{*2}**	**AP^{*3}**	**Mod. ABA NP**	**NNP^{*4}**	**NPR^{*5}**
	Units:	***pH Units***	***pH Units***		***wt %***	***kg CaCO3/tonne***	***wt %***	***wt %***	***wt %***	***wt %***	***kg CaCO3/tonne***			
	Reported Detection Limit:	***0.01***	***0.01***		***0.02***	***1.7***	***0.01***	***0.01***	***0.01***	***0.01***	***0.3***	***0.5***		
1	GC-18	9.2	9.6	Moderate	0.08	6.7	0.01	0.01	<0.01	<0.01	<0.3	8.0	8.0	N/A
2	GC-21	9.2	9.0	Moderate	0.13	10.8	0.02	0.01	0.01	<0.01	0.3	11.4	11.1	36.5
3	GC-29B	8.8	9.0	None	0.02	1.7	0.03	0.02	0.01	<0.01	0.3	3.0	2.7	9.6
4	DA-9005	9.4	9.4	Slight	0.10	8.3	0.02	0.02	<0.01	<0.01	<0.3	7.5	7.5	N/A
5	DA-9007	9.4	9.3	Slight	0.05	4.2	0.07	0.04	0.03	<0.01	0.9	6.1	5.2	6.5
Duplicates:											0.0			
1 D	GC-18 (Dup)	9.0	9.7	Moderate	0.07	5.8	0.02	0.02	0.01	<0.01	0.3	8.1	7.8	25.9
2 D	GC-21 (Dup)	9.1	9.0	Moderate	0.12	10.0	0.02	0.02	<0.01	<0.01	<0.3	11.9	11.9	N/A
3 D	GC-29B (Dup)	9.0	9.0	None	0.02	1.7	0.03	0.02	0.01	<0.01	0.3	3.9	3.6	12.5
4 D	DA-9005 (Dup)	9.4	9.5	Slight	0.10	8.3	0.02	0.02	<0.01	<0.01	<0.3	8.8	8.8	N/A
5 D	DA-9007 (Dup)	9.4	9.3	Slight	0.05	4.2	0.07	0.04	0.03	<0.01	0.9	5.7	4.8	6.1
QUALITY ASSURANCE / QUALITY CONTROL														
Replicate Analysis:														
1	GC-18				0.08		0.01							
1 R	GC-18 (Rep)				0.08		0.01							
Duplicates Analysis:														
5 D	DA-9007 (Dup)				0.05									
5 D	DA-9007 (Dup)				0.05									
Certified Reference Material (CRM) Analysis:														
Certified Reference Material			KZK-1		CaCO3		KZK-1	RTS-3a	KZK-1			1) KZK-1 (Slight) 2) KZK-1 (Moderate)		
CRM True Value			**8.80**		**12.00**		**0.80**	**1.10**	**0.37**			**1) 58.9** **2) 61.6**		
Reference Material Results			8.86		11.97, 11.97		0.81	1.04	0.37			1) 56.6 2) N/A		
Tolerance (+/-) or Acceptance Range			***0.09***		***90% - 110%***		***80% - 120%***	***0.99% - 1.21%***	***0.33% - 0.41%***			***1) 1.1*** ***2) 3.4***		
Method Blank Analysis:														
Method Blank Results					<0.02, <0.02		<0.01, <0.01	<0.01	<0.01					
GLOBAL SOP No. / Method:		*ARD-016*	*ARD-004*	*ARD-005*	*HCl Leach/by CO2-Coulometer*	*Calc.*	*LECO*	*ARD-013 (Seq. HCl/HNO3 leach)*		*Calc.*	*Calc.*	*ARD-005*	*Calc.*	*Calc.*

NOTES:

Acceptance criteria at Global ARD Testing for all CRMs is ±10 % of certified value.
Job No: 21T701223 (TIC); 21V700215 (TS)

Date of Analysis (24 h): Feb. 03/04, 2021
pH of DI water (pH Units): 5.56
EC of DI water (µS/cm): 0.89

METHODS:

Total sulphur by Leco.
Total Inorganic Carbon (TIC): HCl leach, evolved CO_2 analysed by CO_2 Coulometer.

ABBREVIATIONS:

R = Rep = Replicate (is a sub-sample scooped from a single pulp sample bag produced per client sample)
D = Dup = Duplicate (is 2nd sub-pulp sample bag produced by processing a 2nd split of the head sample received. A duplicate pulp sample is prepared only at client request)
EC = Electric Conductivity
ORP = Oxidation Reduction Potential
NP = Neutralization Potential
Calc. = Calculation
IND = Indeterminate
NR = Not Requested

CALCULATIONS:

*[1] CaCO3 Equivalents: based on TIC
*[2] Sulphide-Sulphur: Total-sulphur - sulphate-sulphur
*[3] AP (Acid Potential): Sulphide-Sulphur x 31.25
*[4] NNP (Net Neutralization Potential): NP - AP
*[5] NPR (Neutralization Potential Ratio): NP/AP

REFERENCES:

Sample Preparation: ASTM E877-08; MEND Report 1.20.1, Version 0 (2009)
ABA: Dried below 40°C (as requested by client), jaw-crushed if necessary, split by riffling and pulverized to 85% passing 200 mesh (75 µm).
Modified ABA (Sobek) NP: MEND Acid Rock Drainage Prediction Manual, MEND Project 1.16.1b (pages 6.2-11 to 17), March 1991.
Paste pH / Fizz Rating: Sobek, A.A., Schuller, W.A., Freeman, J.R. and Smith, R.M.; US EPA-600/2-78-054 (1978).
Sulphate Sulphur: Based on MEND method. The S extracted is determined by analysing the extract for SO4 using UV-Vis Spectrophotometer (STD Method 4500-SO42- E).

Global ARD Testing Services Inc.

CERTIFICATE OF ANALYSIS ▪ METALS RESULTS BY AQUA REGIA DIGEST & ICP-MS ANALYSIS ON SOLIDS

PAGE: 4a of 6
GLOBAL PROJECT NO: 2102
CLIENT: Zephyr Minerals Ltd
PROJECT NAME: Dawson Gold Project
PROJECT NO: N/A
REPORT VERSION: 2

S. No.	Sample ID	Method	IMS-130																									
		Analyte	Silver (Ag)	Aluminum (Al)	Arsenic (As)	Gold (Au)	Boron (B)	Barium (Ba)	Beryllium (Be)	Bismuth (Bi)	Calcium (Ca)	Cadmium (Cd)	Cerium (Ce)	Cobalt (Co)	Chromium (Cr)	Cesium (Cs)	Copper (Cu)	Iron (Fe)	Gallium (Ga)	Germanium (Ge)	Hafnium (Hf)	Mercury (Hg)	Indium (In)	Potassium (K)	Lanthanum (La)	Lithium (Li)	Magnesium (Mg)	Manganese (Mn)
		Unit	ppm	%	ppm	ppm	ppm	ppm	ppm	ppm	%	ppm	ppm	ppm	ppm	ppm	ppm	%	ppm	ppm	ppm	ppm	ppm	%	ppm	ppm	%	ppm
		MDL	0.01	0.01	0.1	0.0005	10	10	0.05	0.01	0.01	0.01	0.02	0.1	1	0.05	0.2	0.01	0.05	0.05	0.02	0.005	0.005	0.01	0.2	0.1	0.01	5
		Sample Type																										
1	GC-18	Pulp	0.03	0.73	<0.1	<0.0005	<10	46	0.10	0.01	0.31	0.02	40.90	3.0	75	0.78	4.4	1.24	4.44	0.08	0.07	0.01	0.024	0.53	17.2	12.4	0.53	222
2	GC-21	Pulp	0.02	0.54	<0.1	<0.0005	<10	59	0.16	0.05	0.54	<0.01	45.77	2.6	85	0.58	10.0	1.43	3.69	0.08	0.06	<0.005	0.024	0.25	20.0	9.5	0.29	234
3	GC-29B	Pulp	0.04	1.22	0.2	<0.0005	<10	71	0.44	0.03	0.10	0.01	22.38	2.2	92	0.96	5.8	1.64	5.94	0.07	0.10	<0.005	0.057	0.60	9.1	16.2	0.67	128
4	DA-9005	Pulp	0.03	0.41	0.2	<0.0005	<10	12	0.17	0.02	0.39	0.01	62.09	1.3	85	0.19	4.4	0.77	3.26	0.08	0.06	0.01	0.011	0.07	27.4	5.6	0.23	152
5	DA-9007	Pulp	0.06	1.60	0.5	0.0018	<10	175	0.37	0.11	0.17	0.01	2.00	5.2	106	1.96	18.6	3.10	9.16	0.11	0.10	0.01	0.079	0.87	1.0	14.0	0.96	344
Duplicates:																												
1 D	GC-18 (Dup)	Pulp	0.02	0.73	0.2	<0.0005	<10	45	0.10	0.01	0.29	0.01	48.94	2.6	87	0.77	3.7	1.23	4.47	0.10	0.07	0.01	0.025	0.54	20.9	11.9	0.53	217
2 D	GC-21 (Dup)	Pulp	0.02	0.49	<0.1	<0.0005	<10	61	0.13	0.05	0.51	0.01	50.30	2.4	78	0.52	10.6	1.28	3.48	0.08	0.07	<0.005	0.019	0.23	21.9	8.4	0.27	222
3 D	GC-29B (Dup)	Pulp	0.04	1.09	<0.1	<0.0005	<10	62	0.41	0.02	0.09	0.01	21.51	2.0	73	0.89	6.3	1.51	5.45	0.06	0.07	<0.005	0.055	0.55	8.5	13.7	0.61	116
4 D	DA-9005 (Dup)	Pulp	0.03	0.38	0.2	<0.0005	<10	11	0.14	0.03	0.39	<0.01	60.34	1.3	82	0.17	4.9	0.73	3.03	0.08	0.06	0.01	0.011	0.05	27.0	6.0	0.22	147
5 D	DA-9007 (Dup)	Pulp	0.06	1.67	0.4	0.0017	<10	165	0.40	0.13	0.17	0.01	1.51	5.5	106	2.05	19.8	3.25	9.62	0.14	0.08	0.01	0.082	0.90	0.7	15.5	1.01	349
QUALITY ASSURANCE / QUALITY CONTROL																												
Pulp Replicates																												
		Pulp																										
		Pulp-Rep																										
Certified Reference Material:																												
STD OREAS 601			50.50	0.890	301.5	0.787	<10	249	0.60	21.21	1.13	7.59	47.6	4.70	47.0	2.04	1022.8	2.20	4.86	0.11	0.68	0.319	1.750	0.270	21.3	8.10	0.200	453
True Value STD OREAS 601			**49.40**	**0.826**	**305.0**	**0.774**	**<10**	**2714**	**0.62**	**20.60**	**1.07**	**7.81**	**44.8**	**4.70**	**44.2**	**1.98**	**1010.0**	**2.20**	**5.17**	**<0.1**	**<1**	**<3**	**1.680**	**0.251**	**21.2**	**7.95**	**0.195**	**450**
% Difference			2.2	7.7	-1.1	1.6	0.0	-90.8	-3.2	3.0	5.6	-2.8	6.3	0.0	6.3	3.0	1.3	0.0	-6.0				4.2	7.6	0.5	1.9	2.6	0.7
Tolerance (%)			***2.60***	***0.054***	***15.0***	***0.025***	***IND***	***NR***	***0.10***	***1.50***	***0.05***	***0.48***	***2.4***	***0.27***	***7.4***	***0.15***	***40.0***	***0.11***	***0.28***	***NR***	***IND***	***IND***	***0.10***	***0.021***	***1.50***	***0.76***	***0.016***	***20.0***
Method Blank:																												
Method Blank			<0.01	<0.01	<0.1	<0.0005	<10	<10	<0.05	<0.01	<0.01	<0.01	<0.02	<0.1	<1	<0.05	<0.2	<0.01	<0.05	<0.05	<0.02	<0.005	<0.005	<0.01	<0.2	<0.1	<0.01	<5

NOTES:

Job No: YVR2110140

Analytical Methods (IMS-130):

A 0.5 g of pulp sample is leached in hot (95°C) 3:1 aqua regia digestion followed by ICP Mass Spec analysis.
Gold determinations by this method are semi-quantitative due to the small sample weight used (0.5 g).
Refractory and graphitic samples can limit Au solubility.

Abbreviations:

R / Rep = Replicate (a replicate is a sub-sample scooped from a single sample bag produced per client sample)
D / Dup = Duplicate (a duplicate is 2nd sub-sample bag produced by processing a second split of the original client sample received)
MDL = Measurable Detection Limit
IND = Indeterminate
INV = Indicative Value (not certified)
NR = Not Requested

On Cerfified Reference Material and Tolerance:

Any one element in a run reporting outside tolerance limits does not constitute failure of the standard.
As per Certificate of Analysis (COA): All values indicated are Certified. Values indicated in green are indicative only.
NR = Not Reported (in the Certificate Of Analysis).

On Tolerance:

Any one element in a run reporting outside tolerance limits does not constitute failure of the standard.
All 'True Values' indicated in green are indicative values as per Certificate Of Analysis (COA) - not certified values.

Global
ARD Testing Services Inc.

CERTIFICATE OF ANALYSIS ▪ METALS RESULTS BY AQUA REGIA DIGEST & ICP-MS ANALYSIS ON SOLIDS

PAGE: 4b of 6
GLOBAL PROJECT NO: 2102
CLIENT: Zephyr Minerals Ltd
PROJECT NAME: Dawson Gold Project
PROJECT NO: N/A
REPORT VERSION: 2

S. No.	Sample ID	Method	IMS-130																								
		Analyte	Molybdenum (Mo)	Sodium (Na)	Niobium (Nb)	Nickel (Ni)	Phosphorous (P)	Lead (Pb)	Rubidium (Rb)	Rhenium (Re)	Sulphur (S)	Antimony (Sb)	Scandium (Sc)	Selenium (Se)	Tin (Sn)	Stronium (Sr)	Tantalum (Ta)	Tellurium (Te)	Thorium (Th)	Titanium (Ti)	Thallium (Tl)	Uranium (U)	Vandium (V)	Tungsten (W)	Yttrium (Y)	Zinc (Zn)	Zirconium (Zr)
		Unit	ppm	%	ppm	ppm	ppm	ppm	ppm	ppm	%	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	%	ppm	ppm	ppm	ppm	ppm	ppm	ppm
		MDL	0.05	0.01	0.05	0.2	10	0.2	0.1	0.001	0.01	0.05	0.1	0.2	0.2	0.2	0.01	0.01	0.2	0.005	0.02	0.05	1	0.05	0.05	1	0.5
		Sample Ty																									
1	GC-18	Pulp	1.52	0.05	0.48	4.1	80	2.5	32.6	0.001	<0.01	0.09	3.1	<0.2	2	5.4	<0.01	0.03	10.7	0.065	0.16	3.03	12	0.07	3.46	22	3.6
2	GC-21	Pulp	0.38	0.05	0.22	2.3	221	3.4	18.6	<0.001	0.01	<0.05	3.3	0.4	0.8	8	<0.01	<0.01	11.6	0.045	0.09	4.26	14	0.07	9.45	20	3.8
3	GC-29B	Pulp	1.71	0.05	0.30	2.5	27	2.5	34.7	<0.001	0.02	<0.05	3.6	<0.2	2.2	9.7	<0.01	0.06	5.3	0.065	0.16	3.74	5	0.13	3.04	24	4.9
4	DA-9005	Pulp	0.88	0.06	0.07	2.4	83	8.3	4.5	<0.001	0.01	<0.05	1.0	<0.2	0.5	5.2	<0.01	<0.01	16.2	<0.005	0.03	15.23	4	0.09	30.28	15	3.6
5	DA-9007	Pulp	6.96	0.04	0.49	2.7	<10	3.2	68.8	<0.001	0.08	<0.05	5.4	0.5	3.4	5.2	<0.01	0.12	0.9	0.103	0.34	9.30	7	0.15	3.44	52	4.6
Duplicates:																											
1 D	GC-18 (Dup)	Pulp	2.00	0.05	0.53	3.8	67	2.4	33.2	<0.001	<0.01	0.05	2.8	<0.2	2	5.1	<0.01	<0.01	12.4	0.062	0.16	2.77	9	0.06	3.90	21	3.9
2 D	GC-21 (Dup)	Pulp	0.41	0.05	0.22	2.3	180	3.3	17.4	<0.001	0.01	<0.05	2.9	<0.2	0.7	7.8	<0.01	<0.01	14.5	0.042	0.09	4.68	14	0.07	9.78	19	3.8
3 D	GC-29B (Dup)	Pulp	1.97	0.04	0.25	1.9	27	2.4	31.2	<0.001	0.02	<0.05	3.2	<0.2	2.1	8.1	<0.01	0.08	5.4	0.058	0.15	3.39	4	0.13	3.02	22	4.2
4 D	DA-9005 (Dup)	Pulp	1.60	0.05	0.06	2.5	77	5.0	3.9	<0.001	<0.01	<0.05	1.0	<0.2	0.4	5	<0.01	0.03	15.5	<0.005	0.02	14.69	4	0.09	29.35	14	3.5
5 D	DA-9007 (Dup)	Pulp	8.29	0.04	0.36	2.8	<10	4.3	71.8	<0.001	0.09	<0.05	5.6	0.6	3.5	4.6	<0.01	0.15	1.1	0.105	0.34	13.96	8	0.17	2.85	55	4
QUALITY ASSURANCE / QUALITY CO																											
Pulp Replicates																											
		Pulp																									
		Pulp-Rep																									
Certified Reference Material:																											
STD OREAS 601			3.68	0.10	0.21	25.6	370	275.9	15.8	<0.001	1.11	19.27	1.80	11.7	2.70	38.3	<0.01	15.48	6.9	0.010	0.77	1.96	9.00	1.04	5.76	1329	28.2
True Value STD OREAS 601			**3.80**	**0.07**	**<1**	**24.1**	**360**	**283.0**	**16.0**	**<1**	**1.04**	**21.10**	**1.83**	**12.3**	**2.61**	**36.2**	**0.099**	**15.40**	**6.7**	**0.010**	**0.74**	**1.94**	**9.24**	**1.06**	**5.87**	**1293**	**26.7**
% Difference			-3.2	42.9		6.2	2.8	-2.5	-1.3		6.7	-8.7	-1.6	-4.9	3.4	5.8		0.5	3.0	-2.9	4.1	1.0	-2.6	-1.9	-1.9	2.8	5.6
Tolerance (%)			***0.95***	***IND***	***IND***	***3.80***	***40.0***	***16.0***	***1.3***	***NR***	***0.06***	***2.30***	***0.19***	***1.1***	***0.21***	***2.1***	***NR***	***1.80***	***0.42***	***IND***	***0.08***	***0.19***	***1.42***	***0.15***	***0.40***	***47.0***	***2.1***
Method Blank:																											
Method Blank			<0.05	<0.01	<0.05	<0.2	<10	<0.2	<0.1	<0.001	<0.01	<0.05	<0.1	<0.2	<0.2	<0.2	<0.01	<0.01	<0.2	<0.005	<0.02	<0.05	<1	<0.05	<0.05	<1	<0.5

Global ARD Testing Services Inc.

CERTIFICATE OF ANALYSIS ▪ MEND-SHAKE FLASK EXTRACTION RESULTS

PAGE: 5 of 6
GLOBAL PROJECT NO: 2102
CLIENT: Zephyr Minerals Ltd
PROJECT NAME: Dawson Gold Project
PROJECT NO: N/A
REPORT VERSION: 2

Parameter	**Method**	**Unit**	**RDL**	**1**	**1R**	**1D**	**2**	**3**	**4**	**5**	**Method Blank**
				Sample ID							
				GC-18	**GC-18 (Rep)**	**GC-18 (Dup)**	**GC-21**	**GC-29B**	**DA-9005**	**DA-9007**	
Weight of dry sample used	Weighing Scale	g	0.01	250	N/A	250	250	250	250	250	N/A
Volume of DI water used	Graduated Cylinder	mL	0.50	750	N/A	750	750	750	750	750	750
On filtered samples (using 0.45 µm filter paper):											
pH	Meter	pH units	0.01	8.5		8.5	8.4	8.5	8.6	8.6	5.87
EC	Meter	µS/cm	1.0	50		53	662	55	56	49	0.85
Acidity (to pH 8.3)	Titration	mg CaCO$_3$/L	0.5	<0.5		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Alkalinity (to pH 4.5)	Titration	mg CaCO$_3$/L	0.5	16.0		16.0	16.5	17.3	16.0	14.5	5.0
Sulphate	Colourimetry	mg/L	0.5	<0.5		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Dissolved Metals Analysis by ICP-MS:											
Dissolved Hardness (CaCO3)	ICP-MS	mg/L	0.5	14.6		15.9	21.2	15.0	15.8	14.1	<0.5
Aluminum Dissolved	ICP-MS	mg/L	0.001	0.41	0.378	0.385	0.237	0.239	0.543	0.277	<0.001
Antimony Dissolved	ICP-MS	mg/L	0.0001	0.0003	0.0003	0.0002	0.0002	0.0003	0.0004	0.0005	<0.0001
Arsenic Dissolved	ICP-MS	mg/L	0.0002	0.0016	0.0015	0.001	0.0009	0.0008	0.0017	0.0015	<0.0002
Barium Dissolved	ICP-MS	mg/L	0.0002	0.0028	0.0025	0.0028	0.0057	0.0042	0.0033	0.0843	<0.0002
Beryllium Dissolved	ICP-MS	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Bismuth Dissolved	ICP-MS	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Boron Dissolved	ICP-MS	mg/L	0.01	0.01	0.01	0.01	0.03	0.01	0.03	0.03	<0.01
Cadmium Dissolved	ICP-MS	mg/L	0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
Calcium Dissolved	ICP-MS	mg/L	0.05	5.1	5.07	5.5	7.3	4.6	5.6	5.2	<0.05
Chromium Dissolved	ICP-MS	mg/L	0.001	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Cobalt Dissolved	ICP-MS	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Copper Dissolved	ICP-MS	mg/L	0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	0.001	0.0007	<0.0005
Iron Dissolved	ICP-MS	mg/L	0.01	0.01	0.01	0.01	0.02	0.01	0.02	0.04	<0.01
Lead Dissolved	ICP-MS	mg/L	0.0005	0.0007	0.0007	0.0007	0.0028	<0.0005	0.0057	0.0017	<0.0005
Lithium Dissolved	ICP-MS	mg/L	0.001	0.0011	0.0014	0.0013	0.0008	0.0042	0.0007	<0.0005	<0.0005
Magnesium Dissolved	ICP-MS	mg/L	0.005	0.470	0.47	0.5	0.7	0.8	0.4	0.3	<0.005
Manganese Dissolved	ICP-MS	mg/L	0.0002	0.002	0.0019	0.0021	0.0039	0.0021	0.0021	0.0037	<0.0002
Mercury Dissolved	ICP-MS	mg/L	0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Molybdenum Dissolved	ICP-MS	mg/L	0.0001	0.0011	0.0011	0.001	0.0006	0.0463	0.0028	0.0019	<0.0001
Nickel Dissolved	ICP-MS	mg/L	0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Phosphorus Dissolved	ICP-MS	mg/L	0.05	0.08	0.07	0.06	0.07	0.08	<0.05	0.05	<0.05
Potassium Dissolved	ICP-MS	mg/L	0.05	2.09	2.11	2.18	1.11	1.99	0.9	1.79	<0.05
Selenium Dissolved	ICP-MS	mg/L	0.0005	<0.0005	0.0006	0.0006	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Silicon Dissolved	ICP-MS	mg/L	0.05	1.55	1.53	1.52	1.28	1.19	1.89	1.08	<0.05
Silver Dissolved	ICP-MS	mg/L	0.00008	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008	<0.00008
Sodium Dissolved	ICP-MS	mg/L	0.02	1.15	1.17	1.29	1.25	2.03	2.88	1.33	<0.02
Strontium Dissolved	ICP-MS	mg/L	0.0002	0.0303	0.0296	0.035	0.0424	0.128	0.0443	0.0609	<0.0002
Sulphur Dissolved	ICP-MS	mg/L	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.6	<0.5
Tellurium Dissolved	ICP-MS	mg/L	0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Thallium Dissolved	ICP-MS	mg/L	0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005
Thorium Dissolved	ICP-MS	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Tin Dissolved	ICP-MS	mg/L	0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Titanium Dissolved	ICP-MS	mg/L	0.0005	0.001	0.0006	0.0011	0.0006	<0.0005	0.0008	0.0016	<0.0005
Tungsten Dissolved	ICP-MS	mg/L	0.0001	0.001	0.001	0.001	0.0003	0.0011	0.0004	0.0006	<0.0001
Uranium Dissolved	ICP-MS	mg/L	0.00005	0.00068	0.0007	0.00062	0.00075	0.00025	0.00692	0.00156	<0.00005
Vanadium Dissolved	ICP-MS	mg/L	0.001	0.002	0.002	0.002	0.002	<0.001	0.001	<0.001	<0.001
Zinc Dissolved	ICP-MS	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	0.002	<0.001	<0.001	<0.001
Zirconium Dissolved	ICP-MS	mg/L	0.0001	0.0001	0.0001	0.0002	<0.0001	<0.0001	0.0003	0.0001	<0.0001
Ion Balance:											
Major Anions	Calc.	meq/L		0.32	0.32	0.32	0.33	0.35	0.32	0.29	
Major Cations	Calc.	meq/L		0.44	0.44	0.47	0.53	0.47	0.53	0.42	
Difference	Calc.	meq/L		0.12	0.12	0.15	0.20	0.12	0.21	0.13	
Balance (%)	Calc.	%		16.0%	15.7%	19.4%	23.6%	14.9%	24.3%	18.2%	
			Shake Flask Extract ID:	*2569991*	*2569991*	*2570095*	*2570096*	*2570097*	*2570098*	*2570099*	*2570100*

NOTES:
Job No: 21V757417
Date of Analysis (24h): June 3/4, 2021
pH of DI water used (pH Units): 5.51
EC of DI water used (µS/cm): 0.76

ABBREVIATIONS:
R / Rep = Replicate (which involves the analysis of the same Shake Flask Extract aliquot).
D / Dup = Duplicate (which involves the analysis of a separate SF extract, produced by processing a secopnd split of the original client sample received).
Calc. = Calculation
EC = Electrical Conductivity
IC = Ion Chromatography
N/A = Not Applicable.
mg/L = Milligrams per Litre

REFERENCE:
Prediction Manual for Drainage Chemistry from Sulphidic Geologic Material, MEND Report 1.20.1; Version 0 - Dec. 2009. Section 11.5; P 11 (8-9).

Extraction Method used: Using gyratory shaker for 24 h (± 2 h; gentle agitation).
Liquid: Solid ratio used: 3: 1; L: S; 750 mL DI H_2O: 250 g of sieved <1/4 inch (<6.35 mm) of homogenized crushed material.

CERTIFICATE OF ANALYSIS ▪ MEND-SFE QA/QC RESULTS

Global ARD Testing Services Inc.

PAGE: 6 of 6
GLOBAL PROJECT NO: 2102
CLIENT: Zephyr Minerals Ltd
PROJECT NAME: Dawson Gold Project
PROJECT NO: N/A
REPORT VERSION: 2

Sulphate:

Certified Reference Material	Parameter: Sulphate	% Recovery	Matrix Spike % Recovery	Units	QC Limits
STD Mineral Water (28.5 mg/L)	28.8	101.1%		%	80 - 120
Spiked Blank (19.61 mg/L)	23.1		117.8%	%	80 - 120

Parameter	Batch	Sample ID	Dup #1	Dup #2	RPD	Method Blank	Reference Material	Lower	Upper	Method Blank Spike	Lower	Upper
Dissolved Metals by ICP-MS:												
Aluminum Dissolved	2569991	GC-18	0.410	0.378	8.2%	< 0.001	98%	70%	130%	100%	85%	115%
Antimony Dissolved	2569991		0.0003	0.0003	NA	< 0.0001	93%	70%	130%	105%	85%	115%
Arsenic Dissolved	2569991		0.0016	0.0015	9.5%	< 0.0002	101%	70%	130%	97%	85%	115%
Barium Dissolved	2569991		0.0028	0.0025	10.5%	< 0.0002	95%	70%	130%	107%	85%	115%
Beryllium Dissolved	2569991		<0.0001	<0.0001	NA	< 0.0001	103%	70%	130%	103%	85%	115%
Bismuth Dissolved	2569991		<0.0001	<0.0001	NA	< 0.0001				101%	85%	115%
Boron Dissolved	2569991		0.01	0.01	NA	< 0.01	100%	70%	130%	110%	85%	115%
Cadmium Dissolved	2569991		<0.00001	<0.00001	NA	< 0.00001	98%	70%	130%	103%	85%	115%
Calcium Dissolved	2569991		5.08	5.07	0.2%	< 0.05	100%	70%	130%	96%	85%	115%
Chromium Dissolved	2569991		<0.0005	<0.0005	NA	< 0.0005	100%	70%	130%	99%	85%	115%
Cobalt Dissolved	2569991		<0.0001	<0.0001	NA	< 0.0001	101%	70%	130%	100%	85%	115%
Copper Dissolved	2569991		<0.0005	<0.0005	NA	< 0.0005	104%	70%	130%	103%	85%	115%
Iron Dissolved	2569991		0.01	0.01	NA	< 0.01				96%	85%	115%
Lead Dissolved	2569991		0.0007	0.0007	NA	< 0.0005	105%	70%	130%	103%	85%	115%
Lithium Dissolved	2569991		0.0011	0.0014	NA	< 0.0005				97%	85%	115%
Magnesium Dissolved	2569991		0.472	0.470	0.4%	< 0.005	97%	70%	130%	96%	85%	115%
Manganese Dissolved	2569991		0.0020	0.0019	6.9%	< 0.0002	99%	70%	130%	101%	85%	115%
Mercury Dissolved	2569991		<0.0005	<0.0005	NA	< 0.0005				108%	85%	115%
Molybdenum Dissolved	2569991		0.0011	0.0011	3.7%	< 0.0001				99%	85%	115%
Nickel Dissolved	2569991		<0.0005	<0.0005	NA	< 0.0005	104%	70%	130%	108%	85%	115%
Phosphorus Dissolved	2569991		0.08	0.07	NA	< 0.05	86%	70%	130%	93%	85%	115%
Potassium Dissolved	2569991		2.09	2.11	1.2%	< 0.05	100%	70%	130%	100%	85%	115%
Selenium Dissolved	2569991		<0.0005	0.0006	NA	< 0.0005	105%	70%	130%	100%	85%	115%
Silicon Dissolved	2569991		1.55	1.53	1.4%	< 0.05				109%	85%	115%
Silver Dissolved	2569991		<0.00008	<0.00008	NA	< 0.00008				106%	85%	115%
Sodium Dissolved	2569991		1.15	1.17	1.6%	< 0.02				104%	85%	115%
Strontium Dissolved	2569991		0.0303	0.0296	2.4%	< 0.0002	105%	70%	130%	105%	85%	115%
Sulphur Dissolved	2569991		<0.5	<0.5	NA	< 0.5				111%	85%	115%
Tellurium Dissolved	2569991		<0.0002	<0.0002	NA	< 0.0002				103%	85%	115%
Thallium Dissolved	2569991		<0.00005	<0.00005	NA	< 0.00005	104%	70%	130%	100%	85%	115%
Thorium Dissolved	2569991		<0.0001	<0.0001	NA	< 0.0001				102%	85%	115%
Tin Dissolved	2569991		<0.0005	<0.0005	NA	< 0.0005				106%	85%	115%
Titanium Dissolved	2569991		0.0010	0.0006	NA	< 0.0005				104%	85%	115%
Tungsten Dissolved	2569991		0.0010	0.0010	1.4%	< 0.0001				104%	85%	115%
Uranium Dissolved	2569991		0.00068	0.00070	2.0%	< 0.00005	98%	70%	130%	98%	85%	115%
Vanadium Dissolved	2569991		0.002	0.002	NA	< 0.001	104%	70%	130%	104%	85%	115%
Zinc Dissolved	2569991		<0.001	<0.001	NA	< 0.001	107%	70%	130%	107%	85%	115%
Zirconium Dissolved	2569991		0.0001	0.0001	NA	< 0.0001				104%	85%	115%

NOTES:

Job No: 21V757417

RPDs are calculated using raw analytical data and not the rounded duplicate values reported.

Greyed data does not belong to this report.

CERTIFICATE OF ANALYSIS ▪ COVER PAGE

Global ARD Testing Services Inc.

CLIENT INFORMATION

Client:		Zephyr Minerals Ltd
Consulting Client:		GEM Services
Project Manager(s):	**1**	Diana Sollner, M.A.Sc., MBA, P.Eng., CDI.D, Principal Engineer
	2	N/A
Contact Person:		Diana Sollner
Mailing Address:	**Zephyr Minerals:**	1301, 1959 Upper Water St, Purdy's Wharf Tower 1, Halifax, NS, Canada B3J 3N2.
	GEM Services:	1473 West 15th Street, North Vancouver, BC, Canada V7P 1N3.
Contact No:	**Zephyr Minerals:**	General: +1 (902) 446-4189; Loren Komperdo: +1 (403) 614-2877
	GEM Services:	Diana Sollner: (778) 828-7753
Fax No:		+1 (866) 941-4715

COMPANY INFORMATION

Legal Name:	Global ARD Testing Services Inc.
Mailing Address:	6891 Antrim Avenue, Burnaby, BC, Canada, V5J 4M5.
Contact No:	Main: 604-428-2730
	Ivy Rajan (Cell): 604-319-7707
	Prab Bhatia (Cell): 604-603-1359
Fax No:	604-428-2731

PROJECT INFORMATION

Project Name:	Dawson Gold Project
Project Number:	N/A

RESULTS

Reported To:	**1**	Diana Sollner (dsollner@gemservices.ca)
	2	Loren Komperdo, PGeo, CEO (l.komperdo@shaw.ca)
	3	N/A
cc:		NA
Date Reported:		March 24, 2021 (Wed.)

REPORT INFORMATION

Global Project No:	2102 (B2)
Report Version:	1
Pages (Including Cover):	6
Report Title:	COA (B2) 2 Dawson Gold Samples (rec'd 24-Feb21)
Analysis Reviewed By:	Ivy Rajan (IRajan@GlobalARDTesting.com)
Position:	Acid Rock Drainage (ARD) Lab & Project Manager
Report Certified By:	Ivy Rajan
Signature:	Ivy Rajan

INVOICE

Submitted To:		Loren Komperdo, PGeo, CEO (l.komperdo@shaw.ca)
cc:	**1**	Diana Sollner (dsollner@gemservices.ca)
	2	N/A
Mailing Address:		**Zephyr Minerals Ltd** 1301, 1959 Upper Water St, Purdy's Wharf Tower 1, Halifax, NS B3J 3N2, Canada.
Client PO No:		N/A
Global Invoice No:		ARD2102-0321A
Date Submitted:		March 24, 2021 (Wed.)

NOTES

All samples are stored at no charge for 90 days past reporting date.

HCT, column, custom leach columns (Lysimeters) & SAD column samples will be stored free for 90 days past kinetic testing program or Closedown.

Please contact the lab if you require additional sample storage time.

Storage charges will apply.

CERTIFICATE OF ANALYSIS ▪ SAMPLE DETAILS

Global
ARD Testing Services Inc.

PAGE: 2 of 6
GLOBAL PROJECT NO: 2102 (B2)
CLIENT: Zephyr Minerals Ltd
PROJECT NAME: Dawson Gold Project
REPORT VERSION: 1

S. No.	Sample ID	Sample Description	Condition	Total Sample Wt Rec'd (kg)	Global Notes (if any)
Tailings:					
1	BL737-04	Tailings	Wet	16.15	Altered Composite
2	BL737-05	Tailings	Wet	21.20	Unaltered Composite
Tailings Supernatant:					
1	BL737-04	Filtrate			Analyzed per quote
2	BL737-05	Filtrate			Analyzed per quote

Total wt. rec'd (kg): ***37.35***

NOTE:

Samples were requested to be analyzed in duplicate.

SAMPLE RECEIPT INFO:	
Date Samples Rec'd:	Feb. 24, 2021 (Wed.)
No. of Samples Rec'd:	2 Tailings with supernatants
Samples Rec'd By:	Andrew

ANALYTICAL INSTRUCTIONS:	
From:	Diana Sollner (dsollner@gemservices.ca) by email
Date:	Jan. 04, 2021 (Monday)

QAQC: Sieving - % Passing Pulverized Material	
Analyte:	**Pass %**
Unit:	**%**
RDL:	**0.01**
	N/A to this batch

CERTIFICATE OF ANALYSIS ▪ SUPERNATANT RESULTS

PAGE: 3 of 6
GLOBAL PROJECT NO: 2102 (B2)
CLIENT: Zephyr Minerals Ltd
PROJECT NAME: Dawson Gold Project
REPORT VERSION: 1

Parameter	**Method**	**Unit**	**RDL**	**1**	**2**
				Sample ID	
				BL737-04	**BL737-05**
On filtered samples (using 0.45 µm filter paper):					
pH	Meter	pH units	0.01	7.4	7.4
EC	Meter	mV	1.0	260	178
Acidity (to pH 8.3)	Titration	mg $CaCO_3$/L	0.5	7.5	9.0
Total Alkalinity (to pH 4.5)	Titration	mg $CaCO_3$/L	0.5	69.0	56.5
Dissolved Sulphate (SO4)	Colourimetry	mg/L	0.5	52.1	23.2
Chloride	IC	mg/L	0.05	8.77	8.3
Fluoride	IC	mg/L	0.02	0.63	0.8
Dissolved Metals Analysis by ICP-MS:					
Hardness, Total (as CaCO3)	Calc.	mg CaCO3/L	0.5	82.7	43.7
Aluminum Dissolved	ICP-MS	mg/L	0.001	0.008	0.015
Antimony Dissolved	ICP-MS	mg/L	0.0001	0.0003	0.0004
Arsenic Dissolved	ICP-MS	mg/L	0.0002	0.0002	0.0003
Barium Dissolved	ICP-MS	mg/L	0.0002	0.0235	0.0123
Beryllium Dissolved	ICP-MS	mg/L	0.0001	<0.0001	<0.0001
Bismuth Dissolved	ICP-MS	mg/L	0.0001	<0.0001	<0.0001
Boron Dissolved	ICP-MS	mg/L	0.01	<0.01	<0.01
Cadmium Dissolved	ICP-MS	mg/L	0.00001	0.00005	0.00007
Calcium Dissolved	ICP-MS	mg/L	0.05	26.4	13.5
Chromium Dissolved	ICP-MS	mg/L	0.0005	<0.0005	<0.0005
Cobalt Dissolved	ICP-MS	mg/L	0.0001	<0.0001	0.0006
Copper Dissolved	ICP-MS	mg/L	0.0005	<0.0005	0.0018
Iron Dissolved	ICP-MS	mg/L	0.01	<0.01	<0.01
Lead Dissolved	ICP-MS	mg/L	0.0005	<0.0005	<0.0005
Lithium Dissolved	ICP-MS	mg/L	0.0005	0.0092	0.0108
Magnesium Dissolved	ICP-MS	mg/L	0.05	4.07	2.4
Manganese Dissolved	ICP-MS	mg/L	0.0002	0.0713	0.0138
Mercury Dissolved	ICP-MS	mg/L	0.0005	<0.0005	<0.0005
Molybdenum Dissolved	ICP-MS	mg/L	0.0001	0.0783	0.0572
Nickel Dissolved	ICP-MS	mg/L	0.0005	<0.0005	0.0317
Phosphorus Dissolved	ICP-MS	mg/L	0.05	0.61	0.56
Potassium Dissolved	ICP-MS	mg/L	0.05	16.7	13.1
Selenium Dissolved	ICP-MS	mg/L	0.0005	0.005	0.0032
Silicon Dissolved	ICP-MS	mg/L	0.05	0.75	0.4
Silver Dissolved	ICP-MS	mg/L	0.00008	<0.00008	<0.00008
Sodium Dissolved	ICP-MS	mg/L	0.02	10.4	10.8
Strontium Dissolved	ICP-MS	mg/L	0.0002	0.391	0.392
Sulphur Dissolved	ICP-MS	mg/L	0.5	15	7.3
Tellurium Dissolved	ICP-MS	mg/L	0.0002	<0.0002	<0.0002
Thallium Dissolved	ICP-MS	mg/L	0.00005	<0.00005	<0.00005
Thorium Dissolved	ICP-MS	mg/L	0.0001	<0.0001	<0.0001
Tin Dissolved	ICP-MS	mg/L	0.0005	<0.0005	<0.0005
Titanium Dissolved	ICP-MS	mg/L	0.0005	0.0013	0.0013
Tungsten Dissolved	ICP-MS	mg/L	0.0001	<0.0001	<0.0001
Uranium Dissolved	ICP-MS	mg/L	0.00005	0.00022	0.00023
Vanadium Dissolved	ICP-MS	mg/L	0.001	<0.001	<0.001
Zinc Dissolved	ICP-MS	mg/L	0.001	<0.001	0.002
Zirconium Dissolved	ICP-MS	mg/L	0.0001	<0.0001	<0.0001
Ion Balance:					
Major Anions	Calc.	meq/L		2.47	1.61
Major Cations	Calc.	meq/L		2.54	1.69
Difference	Calc.	meq/L		0.08	0.08
Balance (%)	Calc.	%		1.6%	2.4%
			Supernatant ID:	*2178714*	*2178794*

NOTES:

Job No: 21V718399

Date of Analysis (24 h): March 02, 2021

ABBREVIATIONS:

R / Rep = Replicate (which involves the analysis of the same aliquot)
D / Dup = Duplicate (which involves the analysis of a second split aliquot)
Calc. = Calculation
EC = Electrical Conductivity
IC = Ion Chromatography
N/A = Not Applicable.
mg/L = Milligrams per Litre

CERTIFICATE OF ANALYSIS ▪ SUPERNATANT QA/QC RESULTS

Global ARD Testing Services Inc.

PAGE: 4 of 6
GLOBAL PROJECT NO: 2102 (B2)
CLIENT: Zephyr Minerals Ltd
PROJECT NAME: Dawson Gold Project
REPORT VERSION: 1

Parameter	Batch	Sample ID	Dup #1	Dup #2	RPD	Method Blank	Reference Material	Lower	Upper	Method Blank Spike	Lower	Upper
Anion Scan:												
Sulphate	2178714	BL737-04	32.1	32.1	0.20%	<0.5	101%	90%	110%	98%	90%	110%
Chloride	2178714		8.77	8.78	0.10%	<0.05	107%	90%	110%	107%	90%	110%
Fluoride	2178714		0.63	0.63	0.00%	<0.02	98%	85%	115%	99%	90%	110%
Dissolved Metals by ICP-MS:												
Aluminum Dissolved	2179472		0.003	0.003	NA	<0.001	92%	70%	130%	99%	85%	115%
Antimony Dissolved	2179472		<0.0001	<0.0001	NA	<0.0001	108%	70%	130%	96%	85%	115%
Arsenic Dissolved	2179472		<0.0002	<0.0002	NA	<0.0002	99%	70%	130%	104%	85%	115%
Barium Dissolved	2179472		0.0616	0.0611	0.90%	<0.0002	94%	70%	130%	101%	85%	115%
Beryllium Dissolved	2179472		<0.0001	<0.0001	NA	<0.0001	94%	70%	130%	92%	85%	115%
Bismuth Dissolved	2179472		<0.0001	<0.0001	NA	<0.0001				99%	85%	115%
Boron Dissolved	2179472		0.01	0.01	NA	<0.01	88%	70%	130%	99%	85%	115%
Cadmium Dissolved	2179472		<0.00001	<0.00001	NA	<0.00001	101%	70%	130%	99%	85%	115%
Calcium Dissolved	2179472		165	172	4.70%	<0.05	99%	70%	130%	102%	85%	115%
Chromium Dissolved	2179472		<0.0005	<0.0005	NA	<0.0005	103%	70%	130%	106%	85%	115%
Cobalt Dissolved	2179472		<0.0001	<0.0001	NA	<0.0001	87%	70%	130%	99%	85%	115%
Copper Dissolved	2179472		<0.0005	<0.0005	NA	<0.0005	97%	70%	130%	96%	85%	115%
Iron Dissolved	2179472		0.01	0.01	NA	<0.01				101%	85%	115%
Lead Dissolved	2179472		<0.0005	<0.0005	NA	<0.0005	95%	70%	130%	96%	85%	115%
Lithium Dissolved	2179472		0.0332	0.0335	0.90%	<0.0005				97%	85%	115%
Magnesium Dissolved	2179472		81.9	86.2	5.10%	<0.005	105%	70%	130%	101%	85%	115%
Manganese Dissolved	2179472		0.006	0.0055	9.20%	<0.0002	101%	70%	130%	100%	85%	115%
Mercury Dissolved	2179472		<0.0005	<0.0005	NA	<0.0005				102%	85%	115%
Molybdenum Dissolved	2179472		0.0002	0.0001	NA	<0.0001				98%	85%	115%
Nickel Dissolved	2179472		0.0017	0.0012	NA	<0.0005	90%	70%	130%	94%	85%	115%
Phosphorus Dissolved	2179472		<0.05	<0.05	NA	<0.05	88%	70%	130%	93%	85%	115%
Potassium Dissolved	2179472		2.79	2.86	2.40%	<0.05	100%	70%	130%	105%	85%	115%
Selenium Dissolved	2179472		0.0012	0.0008	NA	<0.0005	82%	70%	130%	100%	85%	115%
Silicon Dissolved	2179472		1.04	1.08	4.00%	<0.05				105%	85%	115%
Silver Dissolved	2179472		<0.00008	<0.00008	NA	<0.00008				91%	85%	115%
Sodium Dissolved	2179472		13.8	13.7	0.40%	<0.02				106%	85%	115%
Strontium Dissolved	2179472		0.261	0.255	2.30%	<0.0002	96%	70%	130%	97%	85%	115%
Sulphur Dissolved	2179472		193	194	0.30%	<0.5				110%	85%	115%
Tellurium Dissolved	2179472		<0.0002	<0.0002	NA	<0.0002				95%	85%	115%
Thallium Dissolved	2179472		<0.00005	<0.00005	NA	<0.00005	99%	70%	130%	99%	85%	115%
Thorium Dissolved	2179472		<0.0001	<0.0001	NA	<0.0001				97%	85%	115%
Tin Dissolved	2179472		<0.0005	<0.0005	NA	<0.0005				95%	85%	115%
Titanium Dissolved	2179472		0.0005	<0.0005	NA	<0.0005				108%	85%	115%
Tungsten Dissolved	2179472		<0.0001	<0.0001	NA	<0.0001				98%	85%	115%
Uranium Dissolved	2179472		0.00677	0.0069	1.90%	<0.00005	104%	70%	130%	103%	85%	115%
Vanadium Dissolved	2179472		<0.001	<0.001	NA	<0.001	100%	70%	130%	101%	85%	115%
Zinc Dissolved	2179472		<0.001	<0.001	NA	<0.001	93%	70%	130%	93%	85%	115%
Zirconium Dissolved	2179472		<0.0001	<0.0001	NA	<0.0001				99%	85%	115%

NOTES:

Job No: 21V718399

RPDs are calculated using raw analytical data and not the rounded duplicate values reported.

If greyed data does not belong to this report but to the batch run.

CERTIFICATE OF ANALYSIS ▪ ABA RESULTS

Global
ARD Testing Services Inc.

PAGE: 5 of 6
GLOBAL PROJECT NO: 2102 (B2)
CLIENT: Zephyr Minerals Ltd
PROJECT NAME: Dawson Gold Project
PROJECT NO: N/A
REPORT VERSION: 1

							Modified ASTM D2492-02 Method						
S. No.	**Sample ID**	**Paste pH**	**Fizz Rating**	**Total Inorganic C**	**CaCO$_3$ Equivalents[*1]**	**Total Sulphur**	**Sulphate Sulphur**	**Sulphide Sulphur**	**Non-Extractable Sulphur[*2]**	**AP[*3]**	**Mod. ABA NP**	**NNP[*4]**	**NPR[*5]**
	Units:	***pH Units***		**wt %**	**kg CaCO3/tonne**	**wt %**	**wt %**	**wt %**	**wt %**	***kg CaCO3/tonne***			
	Reported Detection Limit:	***0.01***		***0.02***	***1.7***	***0.01***	***0.01***	***0.01***	***0.01***	***0.3***	***0.5***		
1	BL737-04	7.9	Moderate	0.36	30.0	0.04	0.03	<0.01	0.01	<0.3	32.7	32.7	N/A
2	BL737-05	6.9	Slight	0.05	4.2	0.07	0.03	0.01	0.03	0.3	55.7	55.4	178.2
QUALITY ASSURANCE / QUALITY CONTROL													
Replicate Analysis:													
1	BL737-04			0.36	30.0								
1 R	BL737-04 (Rep)			0.36	30.0								
2	BL737-05			0.05	4.2								
2 R	BL737-05 (Rep)			0.05	4.2								
Certified Reference Material (CRM) Analysis:													
Certified Reference Material		KZK-1		CaCO3		KZK-1	RTS-3a	KZK-1			1) KZK-1 (Slight) 2) KZK-1 (Moderate)		
CRM True Value		**8.80**		**12.00**		**0.800**	**1.10**	**0.37**			**1) 58.9** **2) 61.6**		
Reference Material Results		8.91		12.4, 11.73		0.809	1.04	0.39			1) 55.5 2) N/A		
Tolerance (+/-) or Acceptance Range		***0.09***		***90% - 110%***		***80% - 120%***	***0.99% - 1.21%***	***0.33% - 0.41%***			***1) 1.1*** ***2) 3.4***		
Method Blank Analysis:													
Method Blank Results				<0.02, <0.02		<0.01, <0.01	<0.01	<0.01					
GLOBAL SOP No. / Method:		*ARD-004*	*ARD-005*	*HCl Leach/by CO2-Coulometer*	*Calc.*	*LECO*	*ARD-013 (Seq. HCl/HNO3 leach)*		*Calc.*	*Calc.*	*ARD-005*	*Calc.*	*Calc.*

NOTES:

Acceptance criteria at Global ARD Testing for all CRMs is ±10 % of certified value.

Job No: 21T718029 (TIC); 21V717169 (TS)

Date of Analysis (24 h): March 16/17, 2021

pH of DI water (pH Units): 5.94

EC of DI water (µS/cm): 0.73

METHODS:

Total sulphur by Leco.

Total Inorganic Carbon (TIC): HCl leach, evolved CO$_2$ analysed by CO$_2$ Coulometer.

ABBREVIATIONS:

R = Rep = Replicate (is a sub-sample scooped from a single pulp sample bag produced per client sample)
D = Dup = Duplicate (is 2nd sub-pulp sample bag produced by processing a 2nd split of the head sample received. A duplicate pulp sample is prepared only at client request)
EC = Electric Conductivity
ORP = Oxidation Reduction Potential
NP = Neutralization Potential
Calc. = Calculation
IND = Indeterminate
NR = Not Requested

CALCULATIONS:

[*1] CaCO3 Equivalents: based on TIC
[*2] Sulphide-Sulphur: Total-sulphur - sulphate-sulphur
[*3] AP (Acid Potential): Sulphide-Sulphur x 31.25
[*4] NNP (Net Neutralization Potential): NP - AP
[*5] NPR (Neutralization Potential Ratio): NP/AP

REFERENCES:

Sample Preparation: ASTM E877-08; MEND Report 1.20.1, Version 0 (2009)

ABA: Dried below 40°C (as requested by client), jaw-crushed if necessary, split by riffling and pulverized to 85% passing 200 mesh (75 µm).

Modified ABA (Sobek) NP: MEND Acid Rock Drainage Prediction Manual, MEND Project 1.16.1b (pages 6.2-11 to 17), March 1991.

Paste pH / Fizz Rating: Sobek, A.A., Schuller, W.A., Freeman, J.R. and Smith, R.M.; US EPA-600/2-78-054 (1978).

Sulphate Sulphur: Based on MEND method. The S extracted is determined by analysing the extract for SO4 using UV-Vis Spectrophotometer (STD Method 4500-SO42- E).

Global ARD Testing Services Inc.

CERTIFICATE OF ANALYSIS ▪ METALS RESULTS BY AQUA REGIA DIGEST & ICP-MS ANALYSIS ON SOLIDS

PAGE: 6a of 6
GLOBAL PROJECT NO: 2102 (B2)
CLIENT: Zephyr Minerals Ltd
PROJECT NAME: Dawson Gold Project
REPORT VERSION: 1

S. No.	Sample ID	Method	IMS-130																									
		Analyte	Silver (Ag)	Aluminum (Al)	Arsenic (As)	Gold (Au)	Boron (B)	Barium (Ba)	Beryllium (Be)	Bismuth (Bi)	Calcium (Ca)	Cadmium (Cd)	Cerium (Ce)	Cobalt (Co)	Chromium (Cr)	Cesium (Cs)	Copper (Cu)	Iron (Fe)	Gallium (Ga)	Germanium (Ge)	Hafnium (Hf)	Mercury (Hg)	Indium (In)	Potassium (K)	Lanthanum (La)	Lithium (Li)	Magnesium (Mg)	Manganese (Mn)
		Unit	ppm	%	ppm	ppm	ppm	ppm	ppm	ppm	%	ppm	ppm	ppm	ppm	ppm	ppm	%	ppm	ppm	ppm	ppm	ppm	%	ppm	ppm	%	ppm
		MDL	0.01	0.01	0.1	0.0005	10	10	0.05	0.01	0.01	0.01	0.02	0.1	1	0.05	0.2	0.01	0.05	0.05	0.02	0.005	0.005	0.01	0.2	0.1	0.01	5
		Sample Type																										
1	BL737-04	Pulp	0.22	0.84	0.8	0.9518	<10	61	0.19	22.41	0.88	0.05	20.24	2.8	93	0.49	24.8	2.55	4.14	0.06	0.07	0.01	0.056	0.35	9.7	7.6	0.36	538
2	BL737-05	Pulp	0.07	2.15	0.6	0.4210	10	108	0.66	6.15	0.25	0.77	16.48	3.7	111	0.92	29.5	3.94	9.78	0.10	0.10	0.02	0.148	0.62	8.0	40.1	1.04	289
QUALITY ASSURANCE / QUALITY CONTROL																												
Pulp Replicates																												
		Pulp																										
		Pulp-Rep																										
Certified Reference Material:																												
STD OREAS 601			48.71	0.820	309.0	0.787	<10	119	0.62	20.92	1.07	7.63	43.6	4.80	47.0	1.82	1050.9	2.20	5.26	0.10	0.67	0.296	1.680	0.250	21.6	7.60	0.190	442
True Value STD OREAS 601			**49.40**	**0.826**	**305.0**	**0.774**	**<10**	2714	**0.62**	**20.60**	**1.07**	**7.81**	**44.8**	**4.70**	**44.2**	**1.98**	**1010.0**	**2.20**	**5.17**	**<0.1**	**<1**	**<3**	**1.680**	**0.251**	**21.2**	**7.95**	**0.195**	**450**
% Difference			-1.4	-0.7	1.3	1.7	0.0	-95.6	0.0	1.6	0.0	-2.3	-2.6	2.1	6.3	-8.1	4.0	0.0	1.7				0.0	-0.4	1.9	-4.4	-2.6	-1.8
Tolerance (%)			***2.60***	***0.054***	***15.0***	***0.025***	***IND***	***NR***	***0.10***	***1.50***	***0.05***	***0.48***	***2.4***	***0.27***	***7.4***	***0.15***	***40.0***	***0.11***	***0.28***	***NR***	***IND***	***IND***	***0.10***	***0.021***	***1.50***	***0.76***	***0.016***	***20.0***
Method Blank:																												
Method Blank			<0.01	<0.01	<0.1	<0.0005	<10	<10	<0.05	<0.01	<0.01	<0.01	<0.02	<0.1	<1	<0.05	<0.2	<0.01	<0.05	<0.05	<0.02	<0.005	<0.005	<0.01	<0.2	<0.1	<0.01	<5

NOTES:

Job No: YVR2110244

Analytical Methods (IMS-130):

A 0.5 g of pulp sample is leached in hot (95°C) 3:1 aqua regia digestion followed by ICP Mass Spec analysis.
Gold determinations by this method are semi-quantitative due to the small sample weight used (0.5 g).
Refractory and graphitic samples can limit Au solubility.

Abbreviations:

R / Rep = Replicate (a replicate is a sub-sample scooped from a single sample bag produced per client sample)
D / Dup = Duplicate (a duplicate is 2nd sub-sample bag produced by processing a second split of the original client sample received)
MDL = Measurable Detection Limit
IND = Indeterminate
INV = Indicative Value (not certified)
NR = Not Requested

On Cerfified Reference Material and Tolerance:

Any one element in a run reporting outside tolerance limits does not constitute failure of the standard.
As per Certificate of Analysis (COA): All values indicated are Certified. Values indicated in green are indicative only.
NR = Not Reported (in the Certificate Of Analysis).

On Tolerance:

Any one element in a run reporting outside tolerance limits does not constitute failure of the standard.
All 'True Values' indicated in green are indicative values as per Certificate Of Analysis (COA) - not certified values.

CERTIFICATE OF ANALYSIS ▪ METALS RESULTS BY AQUA REGIA DIGEST & ICP-MS ANALYSIS ON SOLIDS

Global
ARD Testing Services Inc

PAGE: 6b of 6
GLOBAL PROJECT NO: 2102 (B2)
CLIENT: Zephyr Minerals Ltd
PROJECT NAME: Dawson Gold Project
REPORT VERSION: 1

S. No.	Sample ID	**Method**	**IMS-130**																								
		Analyte	**Molybdenum (Mo)**	**Sodium (Na)**	**Niobium (Nb)**	**Nickel (Ni)**	**Phosphorous (P)**	**Lead (Pb)**	**Rubidium (Rb)**	**Rhenium (Re)**	**Sulphur (S)**	**Antimony (Sb)**	**Scandium (Sc)**	**Selenium (Se)**	**Tin (Sn)**	**Stronium (Sr)**	**Tantalum (Ta)**	**Tellurium (Te)**	**Thorium (Th)**	**Titanium (Ti)**	**Thallium (Tl)**	**Uranium (U)**	**Vandium (V)**	**Tungsten (W)**	**Yttrium (Y)**	**Zinc (Zn)**	**Zirconium (Zr)**
		Unit	**ppm**	**%**	**ppm**	**ppm**	**ppm**	**ppm**	**ppm**	**ppm**	**%**	**ppm**	**ppm**	**ppm**	**ppm**	**ppm**	**ppm**	**ppm**	**ppm**	**%**	**ppm**	**ppm**	**ppm**	**ppm**	**ppm**	**ppm**	**ppm**
		MDL	**0.05**	**0.01**	**0.05**	**0.2**	**10**	**0.2**	**0.1**	**0.001**	**0.01**	**0.05**	**0.1**	**0.2**	**0.2**	**0.2**	**0.01**	**0.01**	**0.2**	**0.005**	**0.02**	**0.05**	**1**	**0.05**	**0.05**	**1**	**0.5**
		Sample Ty																									
1	BL737-04	Pulp	6.89	0.01	0.21	32.0	223	5.3	15.4	0.002	0.03	0.12	2.1	6.1	3.7	11.4	<0.01	0.05	2.5	0.023	0.08	1.91	3	0.24	3.41	28	2.5
2	BL737-05	Pulp	8.51	0.03	0.16	45.1	99	16.6	25.1	0.002	0.06	0.09	2.8	3.3	10.8	20.1	<0.01	0.08	2.0	0.062	0.21	2.53	5	0.27	3.12	136	3.8
QUALITY ASSURANCE / QUAL																											
Pulp Replicates																											
		Pulp																									
		Pulp-Rep																									
Certified Reference Material:																											
STD OREAS 601			3.45	0.07	0.27	25.4	355	284.2	14.8	0.002	1.04	20.86	1.70	13.0	2.40	34.0	<0.01	14.25	6.2	0.010	0.75	1.86	9.00	1.04	5.86	1334	24.5
True Value STD OREAS 601			**3.80**	**0.07**	**<1**	**24.1**	**360**	**283.0**	**16.0**	**<1**	**1.04**	**21.10**	**1.83**	**12.3**	**2.61**	**36.2**	**0.099**	**15.40**	**6.7**	**0.010**	**0.74**	**1.94**	**9.24**	**1.06**	**5.87**	**1293**	**26.7**
% Difference			-9.2	0.0		5.4	-1.4	0.4	-7.5		0.0	-1.1	-7.1	5.7	-8.0	-6.1		-7.5	-7.5	-2.9	1.4	-4.1	-2.6	-1.9	-0.2	3.2	-8.2
Tolerance (%)			***0.95***	***IND***	***IND***	***3.80***	***40.0***	***16.0***	***1.3***	***NR***	***0.06***	***2.30***	***0.19***	***1.1***	***0.21***	***2.1***	***NR***	***1.80***	***0.42***	***IND***	***0.08***	***0.19***	***1.42***	***0.15***	***0.40***	***47.0***	***2.1***
Method Blank:																											
Method Blank			<0.05	<0.01	<0.05	<0.2	<10	<0.2	<0.1	<0.001	<0.01	<0.05	<0.1	<0.2	<0.2	<0.2	<0.01	<0.01	<0.2	<0.005	<0.02	<0.05	<1	<0.05	<0.05	<1	<0.5

Appendix C:
Laboratory Reports for Kinetic Tests
Tailings

CERTIFICATE OF ANALYSIS ▪ COVER PAGE

Global
ARD Testing Services Inc.

CLIENT INFORMATION

Client:		Zephyr Minerals Ltd.
Consulting Client:		Gem Services Ltc.
Project Manager:	**Gem Services:**	Diana Sollner, M.A.Sc., MBA, P.Eng., CDI.D, Principal Engineer
	Zephyr Minerals:	Loren Komperdo, PGeo, CEO
Mailing Address:	**Gem Services:**	
	Zephyr Minerals:	1301, 1959 Upper Water St, Purdy's Wharf Tower 1, Halifax, NS B3J 3N2.
Contact No:	**Gem Services:**	Diana S: (778) 828-7753
	Zephyr Minerals:	Loren K: (403) 614-2877
Fax No:		

PROJECT INFORMATION

Project Name:	Dawson Gold Project
Project Number:	N/A

RESULTS

Reported To:	1	Diana Sollner (dsollner@gemservices.ca)
	2	Loren Komperdo (l.komperdo@shaw.ca)
cc:		N/A
Date(s) Reported:		1st Update: 24-Mar21; 2nd: 27-Apr21; 3rd: 26-May21; 4th: 28-Jun21.

INVOICE

Submitted To:		Loren Komperdo (l.komperdo@shaw.ca)
Company:		Zephyr Minerals Ltd.
Address:		1301, 1959 Upper Water St, Purdy's Wharf Tower 1, Halifax, NS B3J 3N2.
Contact No:		Loren K: (403) 614-2877
cc:	1	Diana Sollner (dsollner@gemservices.ca)
	2	N/A
Client PO No:		N/A
Global Invoice No:		ARD2102-0621-4 (for the month of June 2021 - Week 13 - 17)
Dates Submitted:		June 28, 2021 (Monday)

COMPANY INFORMATION

Legal Name:	Global ARD Testing Services Inc.
Mailing Address:	6891 Antrim Avenue, Burnaby, BC, Canada V5J 4M5.
Contact No:	Main: (604) 428-2730 Ivy Rajan (Cell): (604) 319-7707 Prab Bhatia (Cell): (604) 603-1359
Fax No:	(604) 428-2731

REPORTING

Global Project No:	2102 (B2)
Pages (Including Cover):	7
Report Title:	Dawson Gold HCT Report
Analysis Reviewed By:	Ivy Rajan (IRajan@GlobalARDTesting.com)
Position:	Acid Rock Drainage (ARD) Lab & Project Manager
Report Certified By:	Ivy Rajan
Signature:	Ivy Rajan

GLOBAL NOTES

HCT, column, custom leach columns (Lysimeters) & SAD column samples will be stored free for 90 days past kinetic testing program or Closedown.
Please contact the lab if you require additional sample storage time. Storage charges will apply.

Requested # of Weeks of Testing: 52 Weeks
Reporting & Invoicing Schedule: Once a month.
Analyses requested on HCT leachates:
1) Particle Size Analysis on head HCT sample.
2) pH, EC, acidity & alkalinity.
3) Anion Pkg: Sulphate, Chloride & Fluoride.
4) Dissolved metals by ICP-MS scan

CERTIFICATE OF ANALYSIS ▪ SAMPLE DETAILS

Global ARD Testing Services Inc.

PAGE: 2 of 7
GLOBAL PROJECT NO: 2102 (B2)
PROJECT NAME: Dawson Gold Project
PROJECT NO: N/A

S. No.	Sample ID	Sample Description	Condition	Total Sample Wt Rec'd (kg)	Global Notes (if any)
Slurry - Solids:					
1	BL737-04	Tailings	Wet	16.15	Altered Composite
2	BL737-05	Tailings	Wet	21.20	Unaltered Composite
Slurry - Supernatants:					
1	BL737-04	Filtrate			Analyzed per quote
2	BL737-05	Filtrate			Analyzed per quote

Total wt. rec'd (kg): ***37.35***

SAMPLE RECEIPT INFO:	
Date Samples Rec'd:	Feb. 24, 2021 (Wed.)
No. of Samples Rec'd:	2 Tailings, 2 Filtrates
Samples Rec'd By:	Andrew

ANALYTICAL INSTRUCTIONS:	
From:	Diana Sollner (dsollner@gemservices.ca) by email
Date:	Feb. 19, 2021 (Friday)

CERTIFICATE OF ANALYSIS ▪ HUMIDITY CELL TESTING RESULTS OF HC-1

Global
ARD Testing Services Inc.

PAGE: 3 of 11
GLOBAL PROJECT NO: 2102 (B2)
PROJECT NAME: Dawson Gold Project
PROJECT NO: N/A
Sample ID: BL737-04
Sample Wt. used (g): 1000.0

			Instrument/Method:	pH Meter	EC Meter	Tiration/Calc.	Tiration/Calc.	Colourimetry	IC	SIE	Calc.	Dissolved Metals by ICP-MS					
Sampling Date	Week No. Unit: RDL:	Input Vol. (DI Water) mL 5	Output Vol. (Leachate) mL 5	pH pH Units 0.01	EC µS/cm 1	Acidity (to pH 8.3) mg CaCO3/L 0.5	Alkalinity (to pH 4.5) mg CaCO3/L 0.5	Sulphate mg/L 5.0	Chloride mg/L 0.05	Fluoride mg/L 0.02	Hardness (as CaCO3) mg/L 0.1	Aluminum (Al) mg/L 0.001	Antimony (Sb) mg/L 0.00005	Arsenic (As) mg/L 0.00005	Barium (Ba) mg/L 0.0001	Beryllium (Be) mg/L 0.00001	Bismuth (Bi) mg/L 0.00001
03-Mar-21	0	750	240	6.86	84	6.0	24.0	8.6	0.89	0.07	27.0	0.043	0.0002	<0.0002	0.0045	<0.0001	<0.0001
10-Mar-21	1	500	476	7.23	223	16.0	49.0	49.3	1.89	0.27	80.4	0.005	0.0004	<0.0002	0.0156	<0.0001	<0.0001
17-Mar-21	2	500	482	7.82	243	3.0	48.5	57.1	1.27	0.32	106.0	0.007	<0.0001	<0.0002	0.0105	<0.0001	<0.0001
24-Mar-21	3	500	480	7.14	271	9.0	51.0	53.8	0.82	0.41	100.0	0.006	<0.0001	<0.0002	0.0116	<0.0001	<0.0001
31-Mar-21	4	500	475	7.82	183	3.5	42.0	28.7	0.37	0.36	67.6	0.011	<0.0001	<0.0002	0.0064	<0.0001	<0.0001
07-Apr-21	5	500	482	7.70	190	1.5	38.0	31.0	0.27	0.39	66.4	0.011	<0.0001	<0.0002	0.0064	<0.0001	<0.0001
14-Apr-21	6	500	471	7.86	220	2.5	46.0	49.5	0.31	0.62	89.7	0.012	<0.0001	0.0004	0.0086	<0.0001	<0.0001
21-Apr-21	7	500	480	7.96	225	3.0	52.0	47.0	0.19	0.49	93.5	0.006	<0.0001	<0.0002	0.0096	<0.0001	<0.0001
28-Apr-21	8	500	477	7.84	199	3.0	53.5	47.0	0.13	0.61	85.4	0.011	<0.0001	<0.0002	0.0078	<0.0001	<0.0001
05-May-21	9	500	473	7.91	216	5.5	57.0	40.1	0.11	1.14	96.1	0.007	0.0001	<0.0002	0.009	<0.0001	<0.0001
12-May-21	10	500	472	7.97	196	2.5	61.0	24.4	0.11	0.87	81.4	0.006	0.0002	<0.0002	0.0072	<0.0001	<0.0001
19-May-21	11	500	474	7.63	180	4.4	63.8	15.5	<0.05	0.95	76.2	0.005	<0.0001	<0.0002	0.0065	<0.0001	<0.0001
26-May-21	12	500	475	7.90	178	4.5	69.0	11.0	<0.5	0.60	78.6	0.005	<0.0001	<0.0002	0.0073	<0.0001	<0.0001
02-Jun-21	13	500	478	7.47	189	4.5	67.5	10.3	0.06	0.73	79.5	0.005	<0.0001	<0.0002	0.0073	<0.0001	<0.0001
09-Jun-21	14	500	480	8.00	153	3.5	56.5	9.9	<0.05	0.95	66.3	0.009	<0.0001	<0.0002	0.0065	<0.0001	<0.0001
										Replicate analysis:	65.8	0.009	<0.0001	<0.0002	0.0064	<0.0001	<0.0001
16-Jun-21	15	500	480	8.01	161	1.9	62.5	7.2	<0.05	0.71	59.7	0.009	<0.0001	<0.0002	0.007	<0.0001	<0.0001
										Replicate analysis:	60.2	0.008	<0.0001	0.0004	0.0072	<0.0001	<0.0001
23-Jun-21	16	500	473	8.09	183	2.0	64.0										

NOTES:

Number of weeks of testing requested = 35 weeks (includes week-0).

RDL may be raised for some samples due to sample matrix interference.

Abbreviations:

RDL: Reportable Detection Limits
EC: Electric Conductivity
IC: Ion Chromatograph
SIE: Selective Ion Electrode
ICP-MS: Inductively Coupled Plasma - Mass Spectrometry
Calc: Calculation

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			Instrument/Method:														
Sampling Date	Week No.	Input Vol. (DI Water)	Output Vol. (Leachate)	Boron (B)	Cadmium (Cd)	Calcium (Ca)	Chromium (Cr)	Cobalt (Co)	Copper (Cu)	Iron (Fe)	Lead (Pb)	Lithium (Li)	Magnesium (Mg)	Manganese (Mn)	Mercury (Hg)	Molybdenum (Mo)	Nickel (Ni)
	Unit:	mL	mL	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
	RDL:	5	5	0.002	0.000002	0.04	0.0001	0.000005	0.0001	0.002	0.00005	0.00005	0.005	0.00005	0.00002	0.00001	0.00004
03-Mar-21	0	750	240	<0.01	0.00003	9.3	<0.0005	<0.0001	0.0017	<0.01	<0.0005	0.0012	0.91	0.02	<0.0005	0.0041	<0.0005
10-Mar-21	1	500	476	0.03	<0.00001	24.3	<0.0005	<0.0001	0.0008	<0.01	<0.0005	0.0268	4.78	0.09	<0.0005	0.0071	0.0006
17-Mar-21	2	500	482	<0.01	0.00002	30.2	<0.0005	<0.0001	<0.0005	<0.01	<0.0005	0.0068	7.31	0.0792	<0.0005	0.008	<0.0005
24-Mar-21	3	500	480	<0.01	<0.00001	27.9	<0.0005	<0.0001	<0.0005	<0.01	<0.0005	0.0066	7.46	0.0845	<0.0005	0.0075	<0.0005
31-Mar-21	4	500	475	<0.01	<0.00001	19.5	<0.0005	0.0001	<0.0005	0.11	<0.0005	0.0038	4.59	0.0769	<0.0005	0.0068	0.0027
07-Apr-21	5	500	482	<0.01	<0.00001	18.7	<0.0005	<0.0001	<0.0005	<0.01	<0.0005	0.0038	4.78	0.0609	<0.0005	0.0069	<0.0005
14-Apr-21	6	500	471	0.01	<0.00001	23.8	<0.0005	0.0003	<0.0005	<0.01	<0.0005	0.0052	7.34	0.0845	<0.0005	0.0109	0.0067
21-Apr-21	7	500	480	<0.01	<0.00001	24.3	<0.0005	<0.0001	<0.0005	<0.01	<0.0005	0.0061	7.97	0.089	<0.0005	0.011	<0.0005
28-Apr-21	8	500	477	0.01	<0.00001	22.7	<0.0005	<0.0001	<0.0005	0.01	<0.0005	0.0063	6.97	0.0687	<0.0005	0.0117	<0.0005
05-May-21	9	500	473	<0.01	0.00001	24.5	<0.0005	<0.0001	<0.0005	<0.01	<0.0005	0.0068	8.48	0.0634	<0.0005	0.0276	<0.0005
12-May-21	10	500	472	<0.01	0.00002	20.9	<0.0005	<0.0001	<0.0005	<0.01	<0.0005	0.0044	7.1	0.0644	<0.0005	0.0185	<0.0005
19-May-21	11	500	474	<0.01	<0.00001	19.5	<0.0005	<0.0001	<0.0005	<0.01	<0.0005	0.0049	6.68	0.0682	<0.0005	0.0168	<0.0005
26-May-21	12	500	475	<0.01	<0.00001	20.2	<0.0005	<0.0001	<0.0005	0.02	<0.0005	0.0053	6.83	0.0746	<0.0005	0.0152	<0.0005
02-Jun-21	13	500	478	<0.01	0.00002	20.3	<0.0005	<0.0001	<0.0005	<0.01	<0.0005	0.0049	6.99	0.0626	<0.0005	0.0167	<0.0005
09-Jun-21	14	500	480	<0.01	0.00003	17.0	<0.0005	<0.0001	<0.0005	<0.01	<0.0005	0.0041	5.80	0.046	<0.0005	0.0255	<0.0005
				<0.01	0.00001	16.9	<0.0005	<0.0001	<0.0005	<0.01	<0.0005	0.0043	5.77	0.0484	<0.0005	0.0254	<0.0005
16-Jun-21	15	500	480	<0.01	0.00002	15.5	<0.0005	<0.0001	0.0006	<0.01	<0.0005	0.004	5.11	0.0522	<0.0005	0.0178	<0.0005
				<0.01	<0.00001	15.7	<0.0005	<0.0001	0.0007	<0.01	<0.0005	0.0041	5.12	0.0505	<0.0005	0.0177	<0.0005
23-Jun-21	16	500	473														

NOTES:

Number of weeks of testing requested = 35 week

RDL may be raised for some samples due to san

Abbreviations:

RDL: Reportable Detection Limits

EC: Electric Conductivity

IC: Ion Chromatograph

SIE: Selective Ion Electrode

ICP-MS: Inductively Coupled Plasma - Mass Spe

Calc: Calculation

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			Instrument/Method:													
Sampling Date	**Week No.**	**Input Vol. (DI Water)**	**Output Vol. (Leachate)**	**Phosphorus (P)**	**Potassium (K)**	**Selenium (Se)**	**Silicon (Si)**	**Silver (Ag)**	**Sodium (Na)**	**Strontium (Sr)**	**Sulphur (S)**	**Tellurium (Te)**	**Thallium (Tl)**	**Thorium (Th)**	**Tin (Sn)**	**Titanium (Ti)**
	Unit:	**mL**	**mL**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**
	RDL:	**5**	**5**	**0.01**	**0.01**	**0.0001**	**0.1**	**0.00001**	**0.02**	**0.0001**	**1**	**0.00005**	**0.000004**	**0.00001**	**0.00005**	**0.0002**
03-Mar-21	0	750	240	<0.05	2.51	0.0051	0.24	<0.00008	1.24	0.0563	4.1	<0.0002	<0.00005	<0.0001	<0.0005	<0.0005
10-Mar-21	1	500	476	<0.05	7.13	0.0414	0.46	<0.00008	3.5	0.186	20	<0.0002	<0.00005	<0.0001	<0.0005	0.207
17-Mar-21	2	500	482	<0.05	6.96	0.0274	0.58	<0.00008	2.46	0.169	24.6	<0.0002	<0.00005	<0.0001	<0.0005	<0.0005
24-Mar-21	3	500	480	<0.05	6.65	0.0287	0.63	<0.00008	1.92	0.196	23.2	<0.0002	<0.00005	<0.0001	<0.0005	<0.0005
31-Mar-21	4	500	475	<0.05	4.33	0.0147	0.54	<0.00008	0.9	0.109	11.4	<0.0002	<0.00005	<0.0001	<0.0005	<0.0005
07-Apr-21	5	500	482	<0.05	3.78	0.0175	0.49	<0.00008	0.67	0.112	11.1	<0.0002	<0.00005	<0.0001	<0.0005	<0.0005
14-Apr-21	6	500	471	<0.05	4.98	0.0243	0.63	<0.00008	0.95	0.164	17.2	<0.0002	<0.00005	<0.0001	<0.0005	0.0006
21-Apr-21	7	500	480	<0.05	5.08	0.0262	0.75	<0.00008	0.86	0.167	17	<0.0002	<0.00005	<0.0001	<0.0005	<0.0005
28-Apr-21	8	500	477	0.07	4.34	0.02	0.8	<0.00008	0.6	0.132	11.1	<0.0002	<0.00005	<0.0001	<0.0005	<0.0005
05-May-21	9	500	473	<0.05	5.43	0.0268	1.04	<0.00008	0.68	0.153	12.5	<0.0002	<0.00005	<0.0001	<0.0005	<0.0005
12-May-21	10	500	472	<0.05	4.26	0.0199	0.92	<0.00008	0.44	0.115	7.6	<0.0002	<0.00005	0.0001	<0.0005	<0.0005
19-May-21	11	500	474	<0.05	3.55	0.0234	0.87	<0.00008	0.37	0.119	4.9	0.0003	<0.00005	<0.0001	<0.0005	0.0006
26-May-21	12	500	475	<0.05	3.60	0.0141	0.95	<0.00008	0.28	0.121	4.0	<0.0002	<0.00005	<0.0001	<0.0005	<0.0005
02-Jun-21	13	500	478	0.06	3.37	0.0162	1.07	<0.00008	0.10	0.105	3.5	<0.0002	<0.00005	<0.0001	<0.0005	<0.0005
09-Jun-21	14	500	480	<0.05	3.47	0.0157	0.95	<0.00008	0.16	0.0896	3.3	<0.0002	<0.00005	0.0001	<0.0005	<0.0005
				<0.05	3.49	0.0172	0.96	<0.00008	0.16	0.09	3.5	<0.0002	<0.00005	<0.0001	<0.0005	<0.0005
16-Jun-21	15	500	480	<0.05	3.02	0.0126	0.90	<0.00008	0.13	0.0926	2.0	<0.0002	<0.00005	<0.0001	<0.0005	0.0005
				0.06	3.02	0.0139	0.92	<0.00008	0.15	0.0892	2	<0.0002	<0.00005	<0.0001	<0.0005	<0.0005
23-Jun-21	16	500	473													

NOTES:

Number of weeks of testing requested = 35 week

RDL may be raised for some samples due to san

Abbreviations:

RDL: Reportable Detection Limits

EC: Electric Conductivity

IC: Ion Chromatograph

SIE: Selective Ion Electrode

ICP-MS: Inductively Coupled Plasma - Mass Spe

Calc: Calculation

CERTIFICATE OF ANALYSIS ▪ HU

Global ARD Testing Services Inc.

Instrument/Method:									Ion Balance			Job ID	Leachate ID
Sampling Date	Week No.	Input Vol. (DI Water)	Output Vol. (Leachate)	Tungsten (W)	Uranium (U)	Vanadium (V)	Zinc (Zn)	Zirconium (Zr)	Anions	Cations	% Difference		
	Unit:	mL	mL	µg/L	mg/L	mg/L	mg/L	mg/L	meq/L	meq/L	meq/L		
	RDL:	5	5	0.2	0.000001	0.0002	0.001	0.00002					
03-Mar-21	0	750	240	<0.0001	0.00025	<0.001	<0.001	<0.0001	0.69	0.66	1.79	21V718381	2178493
10-Mar-21	1	500	476	<0.0001	0.00244	<0.001	<0.001	<0.0001	2.07	1.96	2.91	21V721168	2209748
17-Mar-21	2	500	482	<0.0001	0.00315	<0.001	<0.001	<0.0001	2.21	2.40	-4.09	21V724078	2241306
24-Mar-21	3	500	480	<0.0001	0.00314	<0.001	<0.001	0.0003	2.19	2.27	-1.85	21V726750	2274020
31-Mar-21	4	500	475	<0.0001	0.00146	<0.001	<0.001	<0.0001	1.47	1.51	-1.48	21V730132	2310833
07-Apr-21	5	500	482	<0.0001	0.00139	<0.001	<0.001	<0.0001	1.43	1.46	-0.84	21V732017	2328336
14-Apr-21	6	500	471	<0.0001	0.00316	<0.001	0.002	0.0001	1.99	1.97	0.53	21V734969	2357842
21-Apr-21	7	500	480	<0.0001	0.00326	<0.001	<0.001	0.0003	2.05	2.04	0.17	21V737301	2377419
28-Apr-21	8	500	477	<0.0001	0.00279	<0.001	<0.001	0.0005	2.08	1.85	5.88	21V741053	2418371
05-May-21	9	500	473	<0.0001	0.003	<0.001	0.001	0.0004	2.04	2.10	-1.38	21V744869	2457771
12-May-21	10	500	472	<0.0001	0.00266	<0.001	<0.001	0.0004	1.78	1.76	0.46	21V747543	2472148
19-May-21	11	500	474	<0.0001	0.00293	<0.001	<0.001	0.0004	1.65	1.64	0.41	21V751231	2509914
26-May-21	12	500	475	<0.0001	0.00269	<0.001	<0.001	0.0001	1.64	1.68	-1.21	21V754050	2537798
02-Jun-21	13	500	478	<0.0001	0.0026	<0.001	<0.001	<0.0001	1.60	1.68	-2.41	21V756895	2567401
09-Jun-21	14	500	480	<0.0001	0.00239	<0.001	<0.001	0.0002	1.39	1.43	-1.41	21V760161	2610167
				<0.0001	0.00226	<0.001	<0.001	0.0009	1.39	1.42	-1.17		
16-Jun-21	15	500	480	<0.0001	0.00234	<0.001	<0.001	0.0002	1.44	1.28	5.72	21V762788	2624718
				<0.0001	0.00238	<0.001	<0.001	<0.0001	1.44	1.29	5.27		
23-Jun-21	16	500	473						1.28	0.00	100.00		

NOTES:

Number of weeks of testing requested = 35 week

RDL may be raised for some samples due to sa

Abbreviations:

RDL: Reportable Detection Limits

EC: Electric Conductivity

IC: Ion Chromatograph

SIE: Selective Ion Electrode

ICP-MS: Inductively Coupled Plasma - Mass Spe

Calc: Calculation

CERTIFICATE OF ANALYSIS ▪ HUMIDITY CELL TESTING RESULTS OF HC-2

Global
ARD Testing Services Inc.

PAGE: 4 of 11
GLOBAL PROJECT NO: 2102 (B2)
PROJECT NAME: Dawson Gold Project
PROJECT NO: N/A
Sample ID: BL737-05
Sample Wt. used (g): 1000.0

			Instrument/Method:	pH Meter	EC Meter	Tiration/Calc.	Tiration/Calc.	Colourimetry	IC	SIE	Calc.	Dissolved Metals by ICP-MS					
Sampling Date	Week No.	Input Vol. (DI Water)	Output Vol. (Leachate)	pH	EC	Acidity (to pH 8.3)	Alkalinity (to pH 4.5)	Sulphate	Chloride	Fluoride	Hardness (as CaCO3)	Aluminum (Al)	Antimony (Sb)	Arsenic (As)	Barium (Ba)	Beryllium (Be)	Bismuth (Bi)
	Unit:	mL	mL	pH Units	µS/cm	mg CaCO3/L	mg CaCO3/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
	RDL:	5	5	0.01	1	0.5	0.5	5.0	0.05	0.02	0.1	0.001	0.00005	0.00005	0.0001	0.00001	0.00001
03-Mar-21	0	750	220	7.07	111	5.5	25.0	13.2	1.63	0.11	34.9	0.038	0.0003	<0.0002	0.0076	<0.0001	<0.0001
10-Mar-21	1	500	483	7.35	280	12.0	48.0	66.6	2.43	0.15	93.7	0.009	0.0002	<0.0002	0.0204	<0.0001	<0.0001
17-Mar-21	2	500	481	7.49	180	3.5	30.0	42.2	0.8	0.07	67.2	0.014	<0.0001	<0.0002	0.0081	<0.0001	<0.0001
24-Mar-21	3	500	473	7.38	214	6.0	30.1	52.7	0.61	0.08	73.7	0.014	<0.0001	<0.0002	0.0121	<0.0001	<0.0001
31-Mar-21	4	500	476	7.51	215	6.0	43.0	52.6	0.32	0.10	77.1	0.015	<0.0001	<0.0002	0.0098	<0.0001	<0.0001
07-Apr-21	5	500	480	7.85	404	3.0	44.0	101	0.57	0.16	141.0	0.01	0.0001	<0.0002	0.0205	<0.0001	<0.0001
14-Apr-21	6	500	480	7.87	316	5.0	49.0	90.7	0.48	0.17	122.0	0.01	<0.0001	0.0005	0.0161	<0.0001	<0.0001
21-Apr-21	7	500	477	7.94	275	2.0	55.0	67.9	0.16	0.19	108.0	0.009	<0.0001	<0.0002	0.0174	<0.0001	<0.0001
28-Apr-21	8	500	478	7.99	248	2.0	58.0	50.3	0.08	0.28	93.9	0.011	0.0001	<0.0002	0.0134	<0.0001	<0.0001
05-May-21	9	500	476	7.84	208	3.0	55.5	40.2	<0.05	0.33	85.5	0.011	0.0001	<0.0002	0.0116	<0.0001	<0.0001
12-May-21	10	500	476	7.93	201	2.5	52.5	33.4	0.07	0.28	79	0.008	0.0001	<0.0002	0.0103	<0.0001	<0.0001
19-May-21	11	500	473	7.90	183	2.5	58.1	24.5	0.12	0.21	72	0.009	<0.0001	0.0002	0.0082	<0.0001	<0.0001
26-May-21	12	500	479	7.96	194	4.5	65.0	18.7	<0.05	0.22	72	0.01	<0.0001	<0.0002	0.0095	<0.0001	<0.0001
02-Jun-21	13	500	478	7.58	191	5.0	56.5	21.0	<0.05	0.23	74.7	0.01	0.0001	<0.0002	0.0087	<0.0001	<0.0001
09-Jun-21	14	500	480	7.92	166	3.0	52.0	18.9	<0.05	0.30	75.0	0.013	<0.0001	<0.0002	0.0082	<0.0001	<0.0001
16-Jun-21	15	500	475	7.94	172	3.2	55.6	17.3	<0.05	0.25	62.5	0.012	0.0001	<0.0002	0.0078	<0.0001	<0.0001

NOTES:

Number of weeks of testing requested = 35 weeks (includes week-0).
RDL may be raised for some samples due to sample matrix interference.

Abbreviations:

RDL: Reportable Detection Limits
EC: Electric Conductivity
IC: Ion Chromatograph
SIE: Selective Ion Electrode
ICP-MS: Inductively Coupled Plasma - Mass Spectrometry
Calc: Calculation

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Global
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			Instrument/Method:														
Sampling Date	Week No.	Input Vol. (DI Water)	Output Vol. (Leachate)	Boron (B)	Cadmium (Cd)	Calcium (Ca)	Chromium (Cr)	Cobalt (Co)	Copper (Cu)	Iron (Fe)	Lead (Pb)	Lithium (Li)	Magnesium (Mg)	Manganese (Mn)	Mercury (Hg)	Molybdenum (Mo)	Nickel (Ni)
	Unit:	mL	mL	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
	RDL:	5	5	0.002	0.000002	0.04	0.0001	0.000005	0.0001	0.002	0.00005	0.00005	0.005	0.00005	0.00002	0.00001	0.00004
03-Mar-21	0	750	220	<0.01	<0.00001	11.2	<0.0005	<0.0001	0.001	<0.01	<0.0005	0.0062	1.68	0.01	<0.0005	0.0073	<0.0005
10-Mar-21	1	500	483	0.02	0.00001	28.4	<0.0005	0.0001	0.0009	<0.01	<0.0005	0.031	5.54	0.05	<0.0005	0.0117	0.0006
17-Mar-21	2	500	481	<0.01	<0.00001	20.8	<0.0005	<0.0001	<0.0005	<0.01	<0.0005	0.0085	3.71	0.0287	0.0007	0.006	<0.0005
24-Mar-21	3	500	473	<0.01	0.00001	22.6	<0.0005	<0.0001	<0.0005	<0.01	<0.0005	0.0124	4.19	0.0326	<0.0005	0.0054	<0.0005
31-Mar-21	4	500	476	<0.01	<0.00001	23.7	<0.0005	0.0001	<0.0005	0.07	<0.0005	0.0151	4.34	0.027	<0.0005	0.0056	0.0016
07-Apr-21	5	500	480	0.01	<0.00001	41.8	<0.0005	<0.0001	<0.0005	<0.01	<0.0005	0.0214	8.99	0.0606	<0.0005	0.01	<0.0005
14-Apr-21	6	500	480	0.01	<0.00001	36.3	<0.0005	0.0001	<0.0005	<0.01	<0.0005	0.022	7.69	0.0475	<0.0005	0.0111	0.0016
21-Apr-21	7	500	477	0.01	<0.00001	32.1	<0.0005	<0.0001	<0.0005	<0.01	<0.0005	0.0212	6.77	0.0513	<0.0005	0.0133	<0.0005
28-Apr-21	8	500	478	0.01	<0.00001	28.2	<0.0005	<0.0001	0.0006	<0.01	<0.0005	0.0221	5.71	0.038	<0.0005	0.014	<0.0005
05-May-21	9	500	476	0.01	<0.00001	26.1	<0.0005	<0.0001	<0.0005	<0.01	<0.0005	0.0204	4.94	0.0261	<0.0005	0.0237	<0.0005
12-May-21	10	500	476	<0.01	<0.00001	24.2	<0.0005	<0.0001	<0.0005	<0.01	<0.0005	0.0164	4.39	0.0242	<0.0005	0.0177	<0.0005
19-May-21	11	500	473	<0.01	0.00002	22.1	<0.0005	<0.0001	<0.0005	<0.01	<0.0005	0.0152	3.97	0.0234	<0.0005	0.0164	<0.0005
26-May-21	12	500	479	0.01	0.00001	22.3	<0.0005	<0.0001	<0.0005	0.01	<0.0005	0.019	3.89	0.0303	<0.0005	0.0152	<0.0005
02-Jun-21	13	500	478	<0.01	0.00003	23.4	<0.0005	<0.0001	<0.0005	<0.01	<0.0005	0.0169	3.96	0.0258	<0.0005	0.0162	<0.0005
09-Jun-21	14	500	480	<0.01	0.00002	20.5	<0.0005	<0.0001	<0.0005	<0.01	<0.0005	0.0171	5.77	0.023	<0.0005	0.0205	<0.0005
16-Jun-21	15	500	475	<0.01	<0.00001	20	<0.0005	<0.0001	0.0006	<0.01	<0.0005	0.0166	3.05	0.0261	<0.0005	0.0152	<0.0005

NOTES:

Number of weeks of testing requested = 35 week

RDL may be raised for some samples due to sa

Abbreviations:

RDL: Reportable Detection Limits

EC: Electric Conductivity

IC: Ion Chromatograph

SIE: Selective Ion Electrode

ICP-MS: Inductively Coupled Plasma - Mass Spe

Calc: Calculation

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Sampling Date	Week No.	Input Vol. (DI Water)	Output Vol. (Leachate)	Phosphorus (P)	Potassium (K)	Selenium (Se)	Silicon (Si)	Silver (Ag)	Sodium (Na)	Strontium (Sr)	Sulphur (S)	Tellurium (Te)	Thallium (Tl)	Thorium (Th)	Tin (Sn)	Titanium (Ti)
			Instrument/Method:													
	Unit:	mL	mL	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
	RDL:	5	5	0.01	0.01	0.0001	0.1	0.00001	0.02	0.0001	1	0.00005	0.000004	0.00001	0.00005	0.0002
03-Mar-21	0	750	220	<0.05	4.34	0.0033	0.32	<0.00008	2.81	0.17	8.4	<0.0002	<0.00005	<0.0001	<0.0005	<0.0005
10-Mar-21	1	500	483	<0.05	9.79	0.0096	0.58	<0.00008	6.91	0.481	30.3	<0.0002	<0.00005	<0.0001	<0.0005	0.147
17-Mar-21	2	500	481	<0.05	5.51	0.0052	0.44	<0.00008	2.77	0.24	15.4	<0.0002	0.0001	<0.0001	<0.0005	<0.0005
24-Mar-21	3	500	473	<0.05	5.89	0.0061	0.52	<0.00008	2.63	0.298	18.1	<0.0002	<0.00005	<0.0001	<0.0005	<0.0005
31-Mar-21	4	500	476	<0.05	5.79	0.0053	0.58	<0.00008	2.3	0.283	17.6	<0.0002	<0.00005	<0.0001	<0.0005	<0.0005
07-Apr-21	5	500	480	<0.05	9.92	0.0113	0.87	<0.00008	3.94	0.651	35.8	<0.0002	<0.00005	<0.0001	<0.0005	<0.0005
14-Apr-21	6	500	480	<0.05	9.17	0.0094	0.89	<0.00008	3.14	0.517	28.9	<0.0002	<0.00005	<0.0001	<0.0005	<0.0005
21-Apr-21	7	500	477	<0.05	8.6	0.01	1.02	<0.00008	2.48	0.513	23.2	<0.0002	<0.00005	<0.0001	<0.0005	<0.0005
28-Apr-21	8	500	478	<0.05	7.46	0.0098	1.12	<0.00008	1.73	0.412	14.8	<0.0002	<0.00005	<0.0001	<0.0005	<0.0005
05-May-21	9	500	476	0.08	7.18	0.0085	1.17	<0.00008	1.56	0.354	12.4	<0.0002	<0.00005	<0.0001	<0.0005	<0.0005
12-May-21	10	500	476	<0.05	6.25	0.008	1.08	<0.00008	1.12	0.299	10.3	<0.0002	<0.00005	<0.0001	<0.0005	<0.0005
19-May-21	11	500	473	0.05	5.21	0.0094	1.01	<0.00008	0.86	0.287	7.5	<0.0002	<0.00005	<0.0001	<0.0005	<0.0005
26-May-21	12	500	479	<0.05	5.62	0.0069	1.09	<0.00008	0.84	0.331	6.8	<0.0002	<0.00005	<0.0001	<0.0005	<0.0005
02-Jun-21	13	500	478	<0.05	5.16	0.0065	1.15	<0.00008	0.58	0.272	7.0	<0.0002	<0.00005	<0.0001	<0.0005	<0.0005
09-Jun-21	14	500	480	<0.05	5.11	0.0064	1.18	<0.00008	0.58	0.25	6.4	<0.0002	<0.00005	<0.0001	<0.0005	<0.0005
16-Jun-21	15	500	475	<0.05	4.63	0.0051	1.19	<0.00008	0.48	0.247	5.0	<0.0002	<0.00005	<0.0001	<0.0005	<0.0005

NOTES:

Number of weeks of testing requested = 35 week

RDL may be raised for some samples due to san

Abbreviations:

RDL: Reportable Detection Limits
EC: Electric Conductivity
IC: Ion Chromatograph
SIE: Selective Ion Electrode
ICP-MS: Inductively Coupled Plasma - Mass Spe
Calc: Calculation

CERTIFICATE OF ANALYSIS ▪ HU

Global
ARD Testing Services Inc.

			Instrument/Method:						Ion Balance				
Sampling Date	**Week No.**	**Input Vol. (DI Water)**	**Output Vol. (Leachate)**	**Tungsten (W)**	**Uranium (U)**	**Vanadium (V)**	**Zinc (Zn)**	**Zirconium (Zr)**	**Anions**	**Cations**	**% Difference**	**Job ID**	**Leachate ID**
	Unit:	**mL**	**mL**	**µg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**meq/L**	**meq/L**	**meq/L**		
	RDL:	**5**	**5**	**0.2**	**0.000001**	**0.0002**	**0.001**	**0.00002**					
03-Mar-21	0	750	220	<0.0001	0.00062	<0.001	<0.001	<0.0001	0.83	0.94	-6.36	21V718381	2178508
10-Mar-21	1	500	483	<0.0001	0.00596	<0.001	0.004	<0.0001	2.42	2.44	-0.40	21V721168	2209818
17-Mar-21	2	500	481	0.0004	0.00256	<0.001	<0.001	<0.0001	1.51	1.61	-3.44	21V724078	2241307
24-Mar-21	3	500	473	<0.0001	0.003	<0.001	<0.001	<0.0001	1.72	1.75	-0.75	21V726750	2274021
31-Mar-21	4	500	476	<0.0001	0.00286	<0.001	<0.001	<0.0001	1.97	1.80	4.57	21V730132	2310835
07-Apr-21	5	500	480	<0.0001	0.00826	<0.001	<0.001	<0.0001	3.01	3.27	-4.19	21V732017	2328338
14-Apr-21	6	500	480	<0.0001	0.00877	<0.001	<0.001	<0.0001	2.89	2.83	1.03	21V734969	2357845
21-Apr-21	7	500	477	<0.0001	0.00808	<0.001	<0.001	<0.0001	2.53	2.50	0.50	21V737301	2377420
28-Apr-21	8	500	478	<0.0001	0.0072	<0.001	<0.001	0.0002	2.22	2.16	1.53	21V741053	2418373
05-May-21	9	500	476	<0.0001	0.00646	0.002	<0.001	<0.0001	1.96	1.97	-0.22	21V744869	2457772
12-May-21	10	500	476	<0.0001	0.00613	<0.001	<0.001	<0.0001	1.76	1.79	-0.66	21V747543	2472149
19-May-21	11	500	473	<0.0001	0.00659	<0.001	<0.001	<0.0001	1.69	1.61	2.38	21V751231	2510177
26-May-21	12	500	479	<0.0001	0.00741	<0.001	<0.001	<0.0001	1.70	1.63	2.26	21V754050	2537814
02-Jun-21	13	500	478	<0.0001	0.00654	<0.001	<0.001	<0.0001	1.58	1.66	-2.45	21V756895	2567412
09-Jun-21	14	500	480	<0.0001	0.00614	<0.001	<0.001	<0.0001	1.45	1.66	-6.82	21V760161	2610173
16-Jun-21	15	500	475	<0.0001	0.00636	<0.001	<0.001	<0.0001	1.49	1.40	3.10	21V762788	2624721

NOTES:

Number of weeks of testing requested = 35 week

RDL may be raised for some samples due to san

Abbreviations:

RDL: Reportable Detection Limits
EC: Electric Conductivity
IC: Ion Chromatograph
SIE: Selective Ion Electrode
ICP-MS: Inductively Coupled Plasma - Mass Spe
Calc: Calculation

CERTIFICATE OF ANALYSIS ▪ pH & EC OF DI WATER AND HCT ROOM TEMPERATURE READINGS

Global
ARD Testing Services Inc.

PAGE: 9 of 11
GLOBAL PROJECT NO: 2102 (B2)
PROJECT NAME: Dawson Gold Projec
PROJECT NO: N/A

Sampling Date	Week No.	Deionized Water		Temperature ºC
		pH (pH Units) RDL: 0.01	EC (µS/cm) RDL: 0.01	
03-Mar-21	0	5.60	0.63	24.5
10-Mar-21	1	5.55	0.18	24.0
17-Mar-21	2	5.66	0.73	24.5
24-Mar-21	3	5.63	0.39	24.0
31-Mar-21	4	5.63	0.19	24.0
7-Apr-21	5	5.54	0.39	24.5
14-Apr-21	6	5.67	0.64	24.5
21-Apr-21	7	5.58	0.45	24.0
28-Apr-21	8	5.57	0.48	24.5
5-May-21	9	5.64	0.81	24.0
12-May-21	10	5.58	0.45	24.0
19-May-21	11	5.69	0.26	24.0
26-May-21	12	5.68	0.17	24.5
2-Jun-21	13	5.68	0.14	24.5
9-Jun-21	14	5.55	0.67	25.0
16-Jun-21	15	5.60	0.45	24.5
23-Jun-21	16	5.63	0.22	24.5
30-Jun-21	17			
7-Jul-21	18			
14-Jul-21	19			

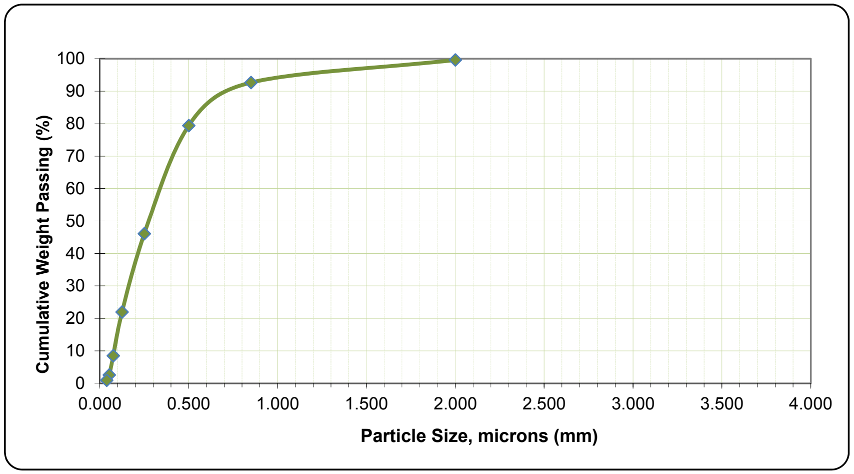
CERTIFICATE OF ANALYSIS ▪ PARTICLE SIZE ANALYSIS RESULTS

Global ARD Testing Services Inc.

PAGE: 10 of 11
GLOBAL PROJECT NO: 2102 (B2)
PROJECT NAME: Dawson Gold Project
PROJECT NO: N/A

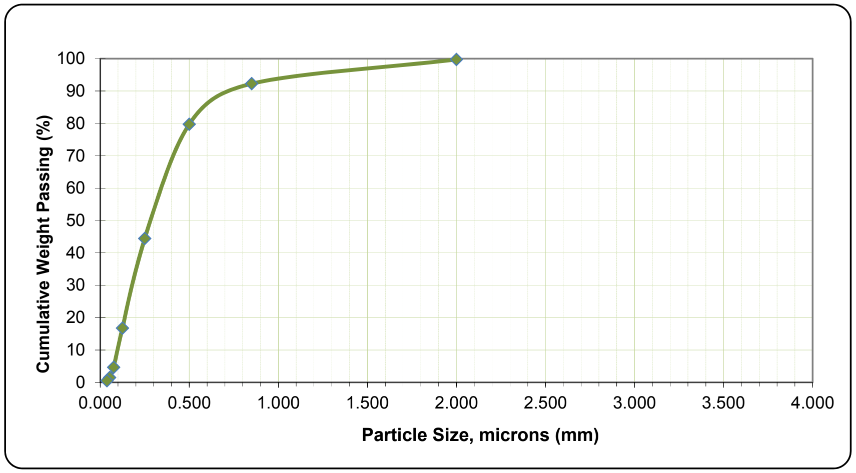
HC-1: Sample ID: BL737-04

Tyler Mesh	U.S Mesh	Opening (mm)	Screen (inches)	Mass (g)	% Retained Interval	% Retained Cumulative	% Passing
9	10	2.000	0.079	0.60	0.4	0.4	99.6
20	20	0.850	0.033	10.40	6.9	7.3	92.7
40	35	0.500	0.0197	19.88	13.3	20.6	79.4
60	60	0.250	0.0098	49.85	33.3	53.9	46.1
115	120	0.125	0.0049	36.15	24.1	78.1	21.9
200	200	0.075	0.0029	20.13	13.4	91.5	8.5
270	270	0.053	0.0021	8.85	5.9	97.4	2.6
400	400	0.038	0.0015	2.46	1.6	99.1	0.9
<400	<400 (Pan)	<0.038	<0.0015	1.38	0.9	100.0	0.0
Wt. of sample used: 150.0 g				**149.7**	100.0		



HC-2: Sample ID: BL737-04

Tyler Mesh	U.S Mesh	Opening (mm)	Screen (inches)	Mass (g)	% Retained Interval	% Retained Cumulative	% Passing
9	10	2.000	0.079	0.40	0.3	0.3	99.7
20	20	0.850	0.033	11.20	7.5	7.7	92.3
40	35	0.500	0.0197	18.75	12.5	20.3	79.7
60	60	0.250	0.0098	52.85	35.3	55.6	44.4
115	120	0.125	0.0049	41.40	27.7	83.2	16.8
200	200	0.075	0.0029	18.10	12.1	95.3	4.7
270	270	0.053	0.0021	4.75	3.2	98.5	1.5
400	400	0.038	0.0015	1.50	1.0	99.5	0.5
<400	<400 (Pan)	<0.038	<0.0015	0.75	0.5	100.0	0.0
Wt. of sample used: 150.0 g				**149.7**	100.0		



CERTIFICATE OF ANALYSIS ▪ HUMIDITY CELL SET-UP DETAILS

Global ARD Testing Services Inc.

PAGE: 11 of 11
GLOBAL PROJECT NO: 2102 (B2)
PROJECT NAME: Dawson Gold Project
PROJECT NO: N/A

HCT ID	Sample Type	Humidity Cell Dimensions (inches)			Dry Wt. of Sample (g)	Particle Size	Other Materials Used (1 Layer)	Column Material	Total Volume of Initial Flushings (Wk-0) (mL)	Weekly Flushing Volume (mL)	Sampling Frequency	Sampling Day	Water Addition to Drain Time (h)	Start-up Date	Proposed Termination Date	Total No. of Weeks Proposed	Operation Procedure
		Inner Diameter	Column Height	Cell Wall Thickness													
HC-1	Tailings	8	5	1/4"	1000.0	As-received Homogenized sample.	400 Nylon Mesh	Clear Cast Acrylic	750	500	Weekly	Tuesday	4	3-Mar-21	2-Mar-22	53 includes Wk-0	Flood Leach
HC-2	Tailings	8	5	1/4"	1000.0	As-received Homogenized sample.	400 Nylon Mesh	Clear Cast Acrylic	750	500	Weekly	Tuesday	4	3-Mar-21	2-Mar-22	53 includes Wk-0	Flood Leach

Method Reference: ASTM D 5744 - 07$^{\epsilon 1}$; Standard Test Method for Laboratory Weathering of Solid Materials Using a Humidity Cell[1], April 2010.

APPENDIX C: Mill Design Figures and Process Flow Sheets

NO.	DESCRIPTION	DATE	BY	ELECTR.	INSTRM.	P.P.	MECH.	CIVIL	SERV.	PROCS.	P.E.M.
A	ISSUED FOR REVIEW										

REVISIONS / ISSUES

NO.	DESCRIPTION	DATE	BY	ELECTR.	INSTRM.	P.P.	MECH.	CIVIL	SERV.	PROCS.	P.E.M.

REVISIONS / ISSUES

NO.	TITLE	DATE	REV.

REFERENCE DRAWINGS

		DATE
DESIGNED BY	HMB	11MAR16
DRAWN BY	JSM	11MAR16
CHECKED BY		
APPOVED BY		
DWG. SCALE	1:100	

BOMENCO INC.
BOLU MINERAL ENGINEERING & CONSULTANT
VANCOUVER, BC

PRELIMINARY SCOPING STUDY
PROPOSED 300t/d FLOTATION PLANT
SITE PLAN

Zephyr Gold USA Ltd.

ZEPHYRGOLD USA LTD
DAWSON GOLD PROJECT, COLORADO, USA

		SHEET NO OF	REV.
CLIENT DWG. NO			
DRAWING NO	15561–3000–GAD–001		B

NO.	DESCRIPTION	DATE	BY
A	ISSUED FOR REVIEW	02MAY2016	JSM

REVISIONS / ISSUES

REFERENCE DRAWINGS

		DATE
DESIGNED BY	HMB	11MAR16
DRAWN BY	JSM	11MAR16
CHECKED BY		
APPOVED BY		
DWG. SCALE	1:100	

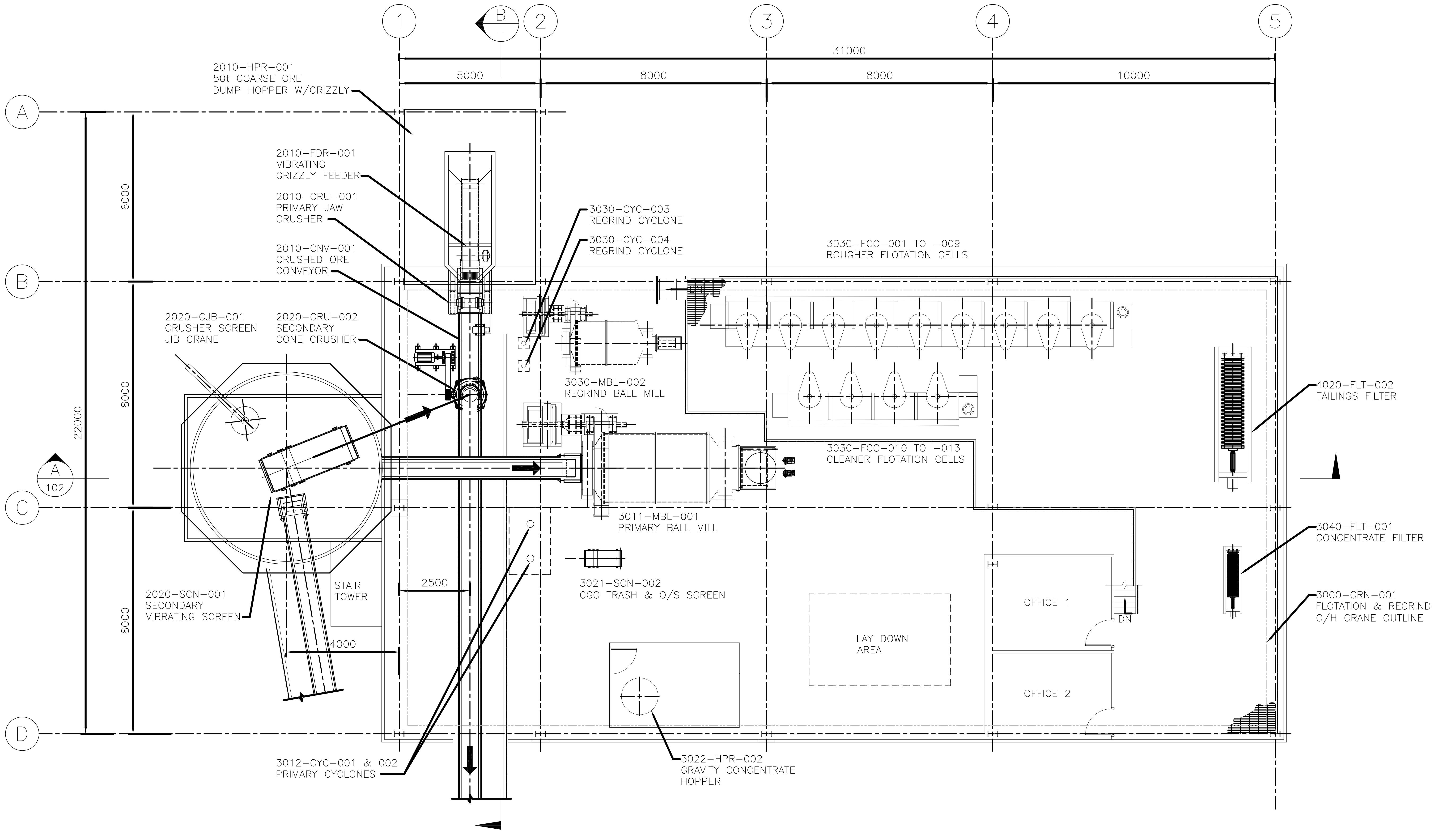
BOMENCO INC.
BOLU MINERAL ENGINEERING & CONSULTANT
VANCOUVER, BC

PRELIMINARY SCOPING STUDY
PROPOSED 300t/d FLOTATION PLANT
GENERAL ARRANGEMENT
PLAN – SHEET 1 OF 2

Zephyr Gold USA Ltd.

ZEPHYRGOLD USA LTD
DAWSON GOLD PROJECT, COLORADO, USA

CLIENT DWG. NO
DRAWING NO 15561–3000–GAD–100
REV. B



UPPER FLOOR PLAN

0 5 10
1:100 SCALE IN METERS

NO.	DESCRIPTION	DATE	BY
A	ISSUED FOR REVIEW	02MAY2016	JSM

REVISIONS / ISSUES

ELECTR. INSTRM. P.P. MECH. CIVIL SERV. PROCS. P.E.M.

NO. DESCRIPTION DATE BY

REVISIONS / ISSUES

NO. TITLE DATE REV.

REFERENCE DRAWINGS

		DATE
DESIGNED BY	HMB	11MAR16
DRAWN BY	JSM	11MAR16
CHECKED BY		
APPOVED BY		
DWG. SCALE	1:100	

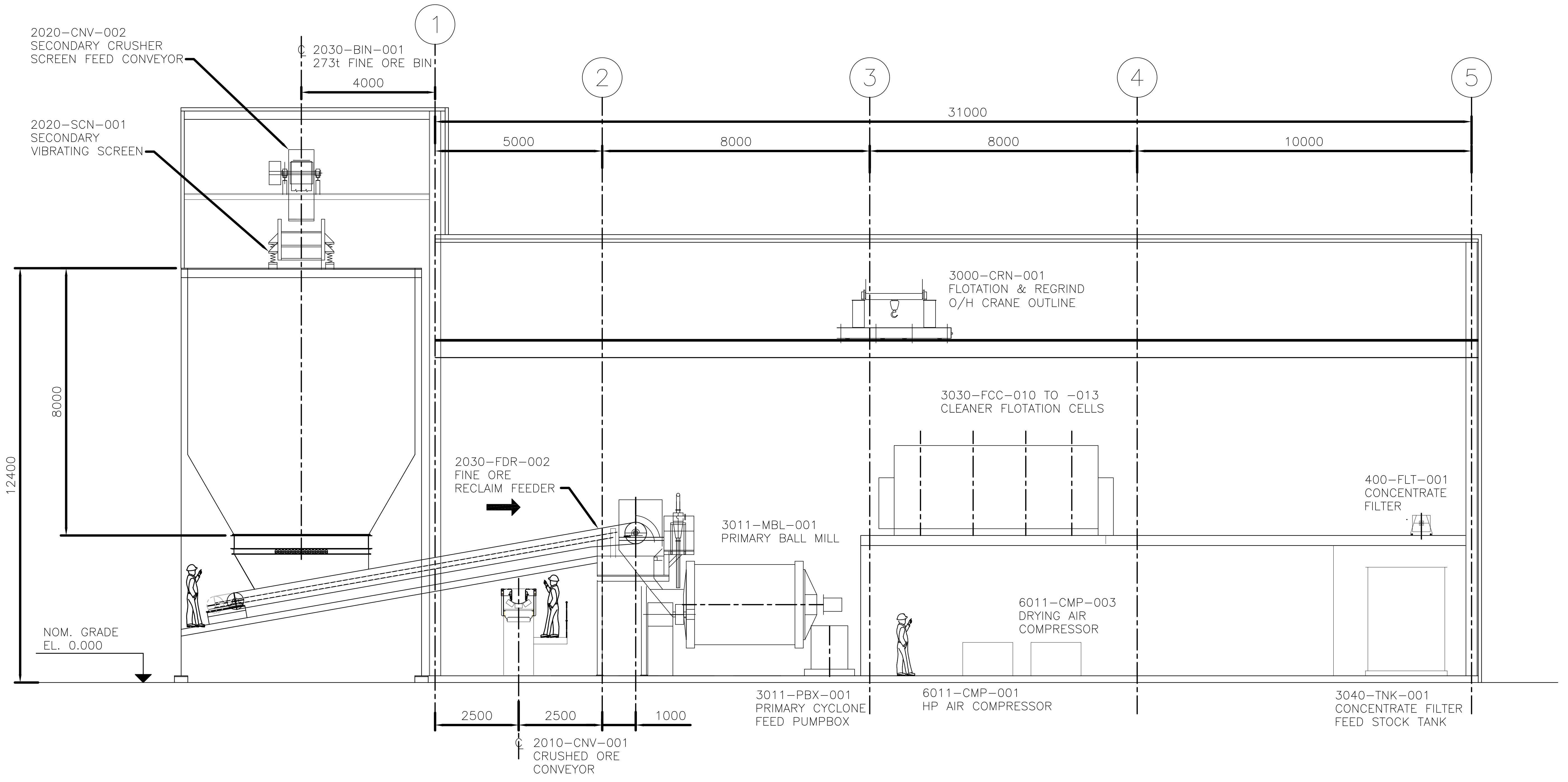
BOMENCO INC.
BOLU MINERAL ENGINEERING & CONSULTANT
VANCOUVER, BC

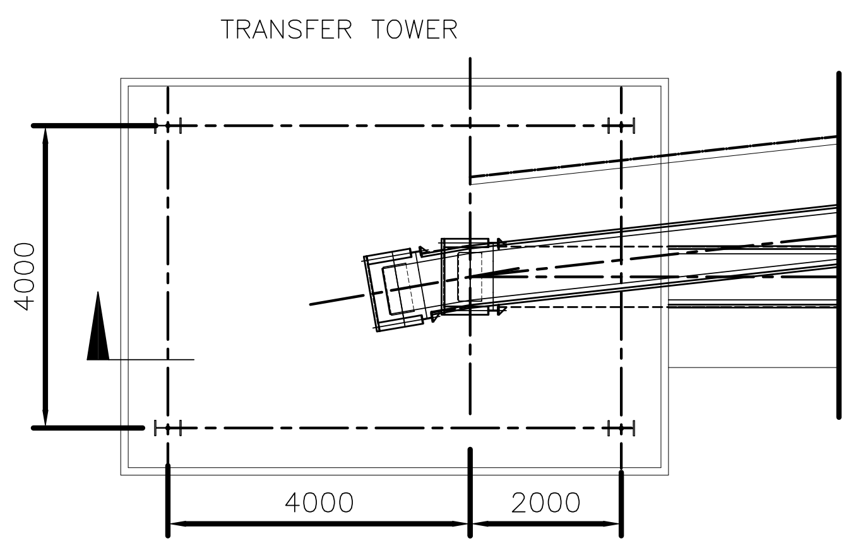
PRELIMINARY SCOPING STUDY
PROPOSED 300t/d FLOTATION PLANT
GENERAL ARRANGEMENT
PLAN – SHEET 2 OF 2

Zephyr Gold USA Ltd.

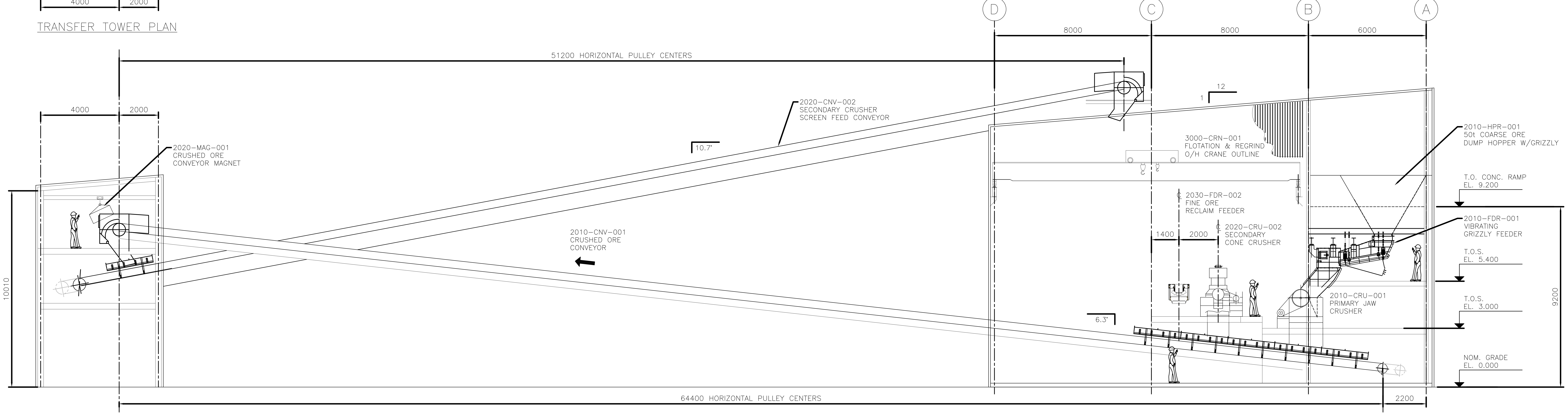
ZEPHYRGOLD USA LTD
DAWSON GOLD PROJECT, COLORADO, USA

CLIENT DWG. NO
DRAWING NO 15561–3000–GAD–101
SHEET NO OF
REV. B





TRANSFER TOWER PLAN



SECTION B
3000–GAD–100

0 5 10
1:100 SCALE IN METERS

NO.	DESCRIPTION	DATE	BY	ELECTR.	INSTRM.	P.P.	MECH.	CIVIL	SERV.	PROCS.	P.E.M.
A	ISSUED FOR REVIEW	02MAY2016	JSM								

REVISIONS / ISSUES

NO.	DESCRIPTION	DATE	BY	ELECTR.	INSTRM.	P.P.	MECH.	CIVIL	SERV.	PROCS.	P.E.M.

REVISIONS / ISSUES

NO.	TITLE	DATE	REV.

REFERENCE DRAWINGS

		DATE
DESIGNED BY	HMB	26APR16
DRAWN BY	JSM	26APR16
CHECKED BY		
APPOVED BY		
DWG. SCALE	1:100	

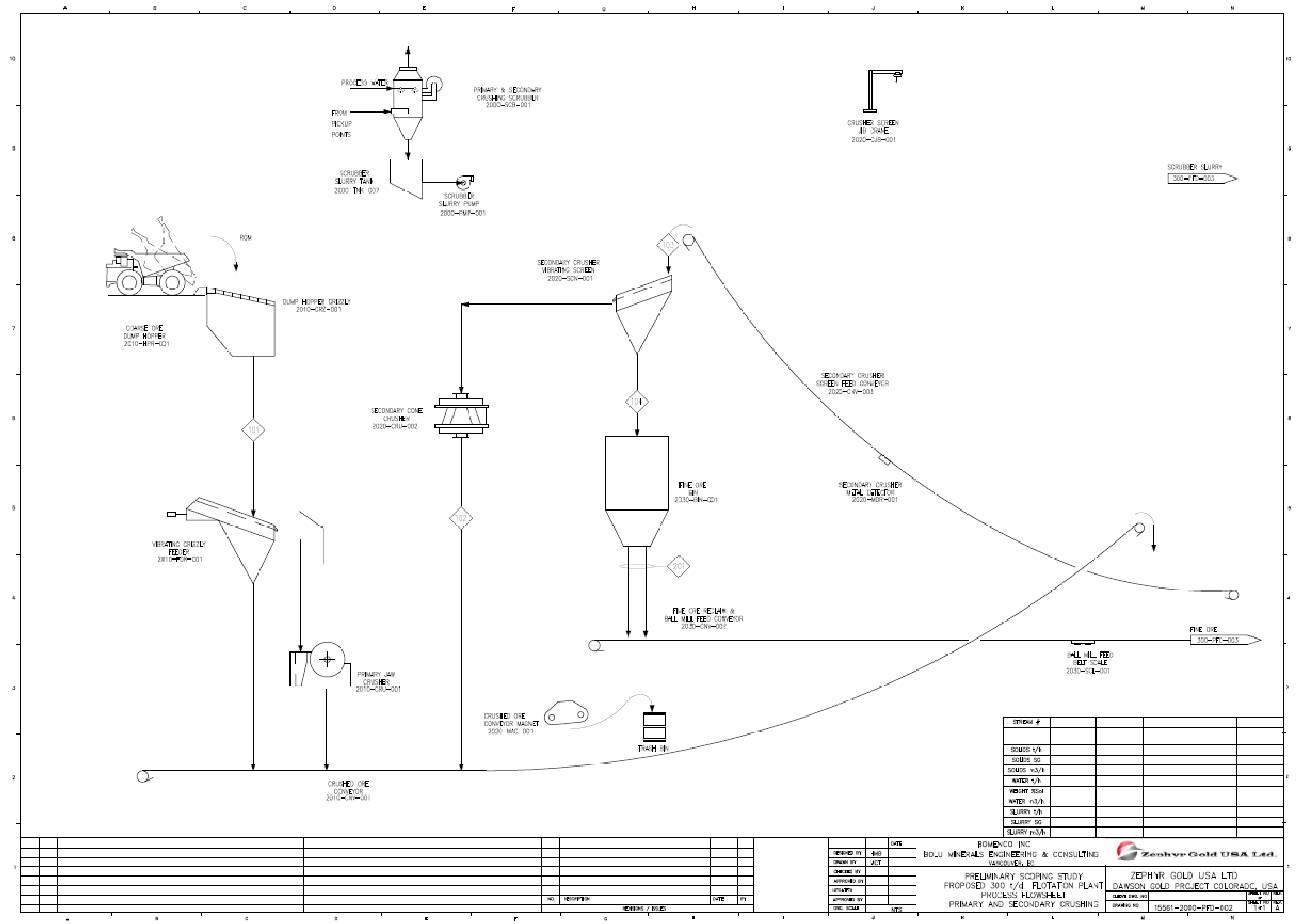
BOMENCO INC.
BOLU MINERAL ENGINEERING & CONSULTANT
VANCOUVER, BC

Zephyr Gold USA Ltd.

PRELIMINARY SCOPING STUDY
PROPOSED 300t/d FLOTATION PLANT
GENERAL ARRANGEMENT
SECTIONS

ZEPHYRGOLD USA LTD
DAWSON GOLD PROJECT, COLORADO, USA

CLIENT DWG. NO		SHEET NO OF	REV.
DRAWING NO	15561–3000–GAD–102	SHEET NO OF	REV. B



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SOLIDS SG					
SOLIDS m3/h					
WATER t/h					
WEIGHT %Sol					
WATER m3/h					
SLURRY t/h					
SLURRY SG					
SLURRY m3/h					

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	REVISIONS / ISSUES		

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DESIGNED BY	HMB	
DRAWN BY	MCT	
CHECKED BY		
APPROVED BY		
UPDATED		
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DWG. SCALE	NTS	

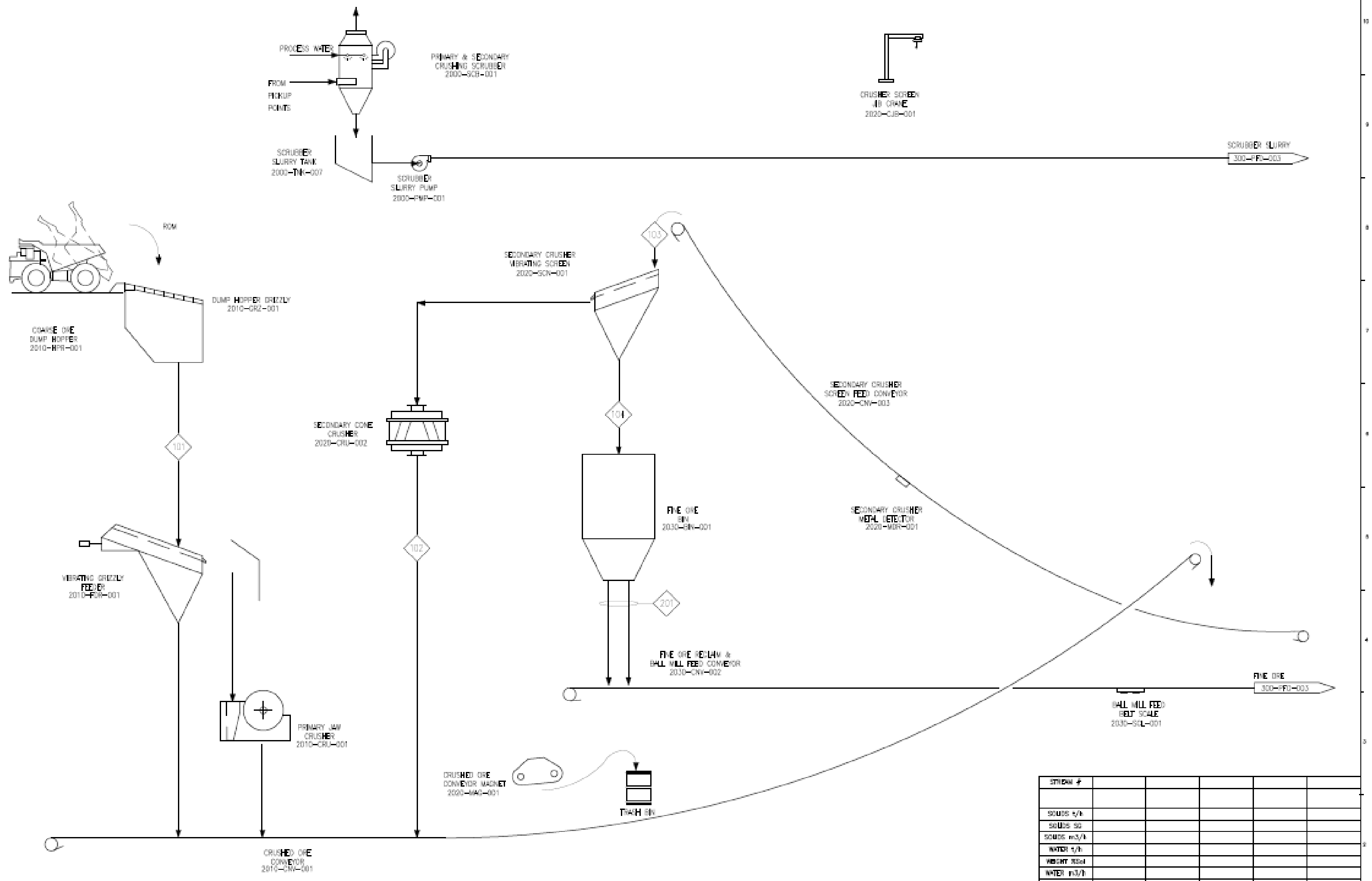
BOMENCO INC
BOLU MINERALS ENGINEERING & CONSULTING
VANCOUVER, BC

Zephyr Gold USA Ltd.

PRELIMINARY SCOPING STUDY
PROPOSED 300 t/d FLOTATION PLANT
PROCESS FLOWSHEET
PRIMARY AND SECONDARY CRUSHING

ZEPHYR GOLD USA LTD
DAWSON GOLD PROJECT COLORADO, USA

CLIENT DWG. NO
DRAWING NO 15561-2000-PFD-002
SHEET NO 1 of 1
REV. A



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SOLIDS SG					
SOLIDS m3/h					
WATER t/h					
WEIGHT %Sol					
WATER m3/h					
SLURRY t/h					
SLURRY SG					
SLURRY m3/h					

NO.	DESCRIPTION	DATE	BY

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DESIGNED BY	HMB	
DRAWN BY	MCT	
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DWG. SCALE		NTS

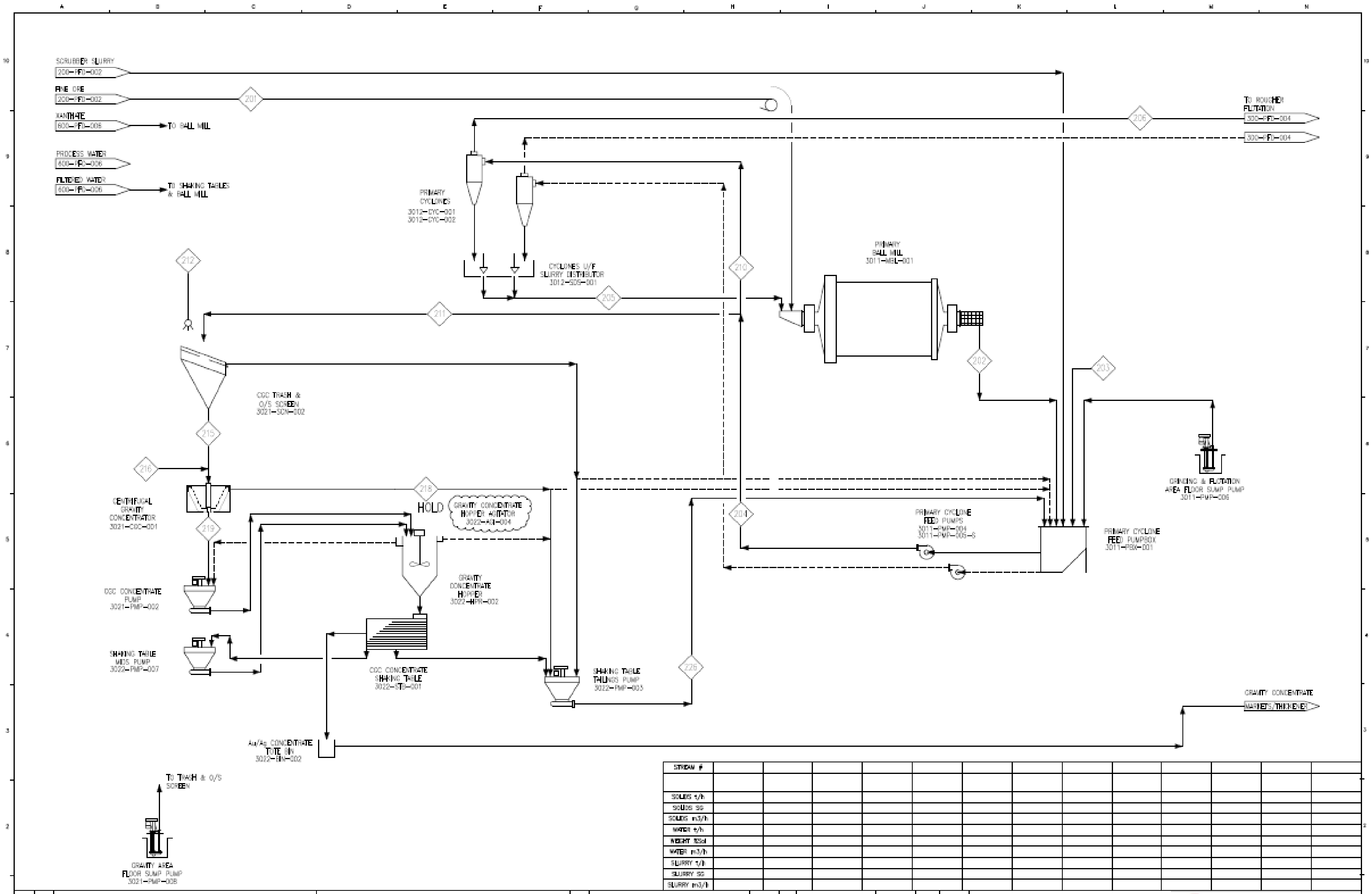
BOMENCO INC
BOLU MINERALS ENGINEERING & CONSULTING
VANCOUVER, BC

Zephyr Gold USA Ltd.

PRELIMINARY SCOPING STUDY
PROPOSED 300 t/d FLOTATION PLANT
PROCESS FLOWSHEET
PRIMARY AND SECONDARY CRUSHING

ZEPHYR GOLD USA LTD
DAWSON GOLD PROJECT COLORADO, USA

CLIENT DWG. NO		SHEET NO	REV.
DRAWING NO	15561-2000-PFD-002	1 of 1	A



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WEIGHT %Sol													
WATER m3/h													
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SLURRY m3/h													

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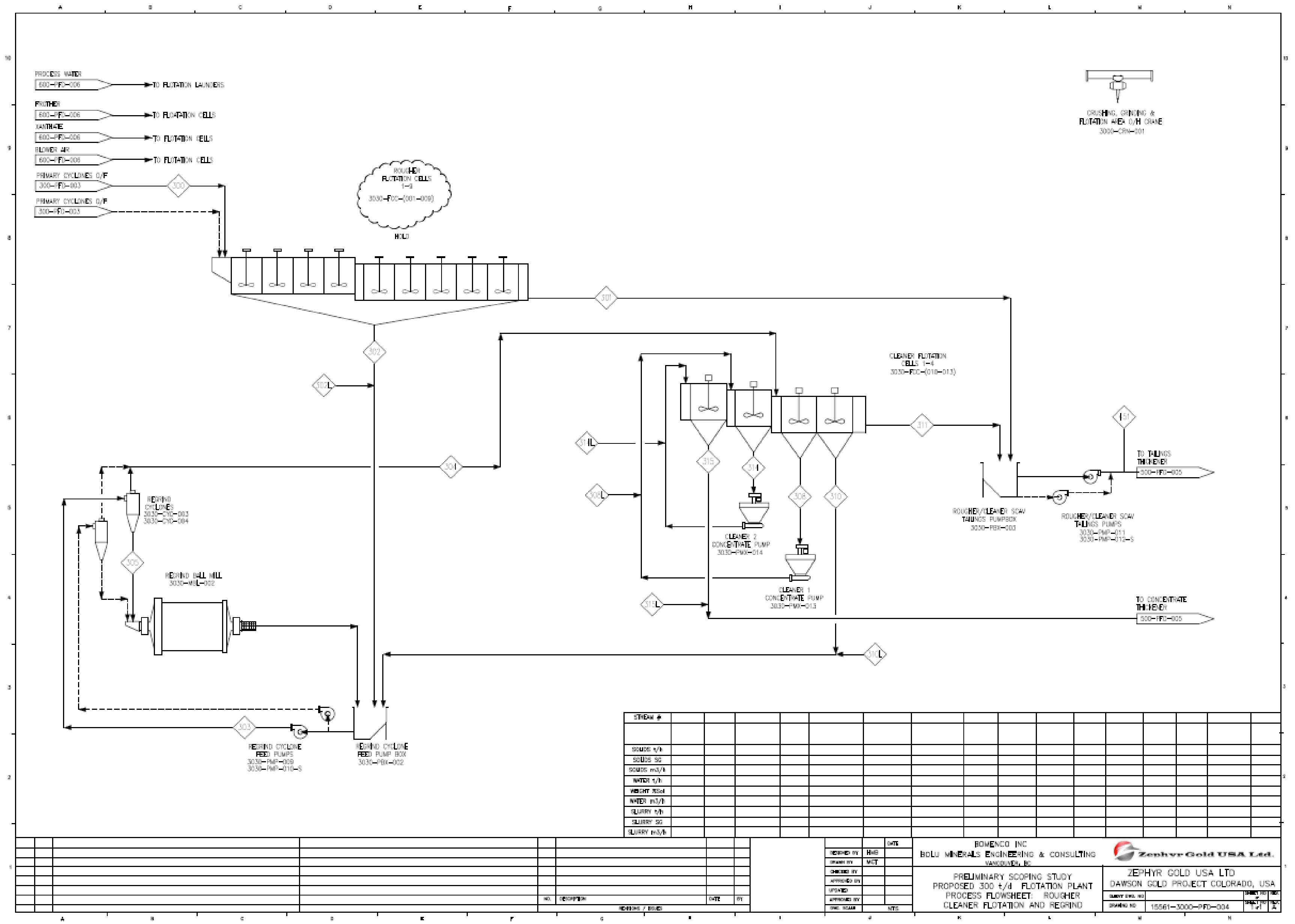
PRELIMINARY SCOPING STUDY
FLOTATION PLANT
PROPOSED 300 t/d PROCESS FLOWSHEET
GRINDING AND GRAVITY SEPARATION

Zephyr Gold USA Ltd.

ZEPHYR GOLD USA LTD
DAWSON GOLD PROJECT COLORADO, USA

CLIENT DWG. NO		SHEET NO of	REV.
DRAWING NO	15561-3000-PFD-003	1 of 1	A



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SOLIDS m3/h																
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WEIGHT %Sol																
WATER m3/h																
SLURRY t/h																
SLURRY SG																
SLURRY m3/h																

NO.	DESCRIPTION	DATE	BY

REVISIONS / ISSUES

		DATE
DESIGNED BY	HMB	
DRAWN BY	MCT	
CHECKED BY		
APPROVED BY		
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APPROVED BY		
DWG. SCALE	NTS	

BOMENCO INC
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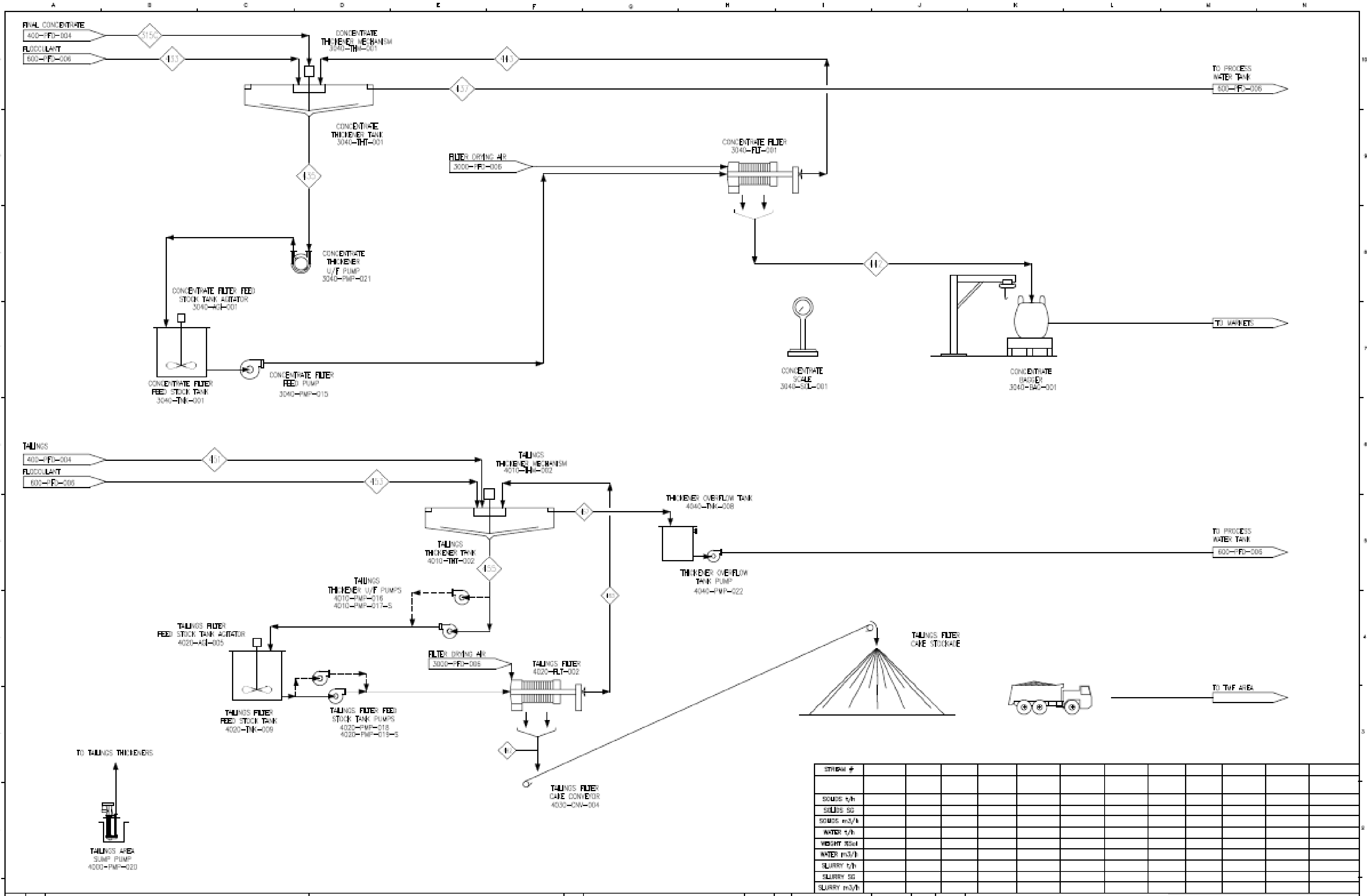
VANCOUVER, BC

Zephyr Gold USA Ltd.

PRELIMINARY SCOPING STUDY
PROPOSED 300 t/d FLOTATION PLANT
PROCESS FLOWSHEET: ROUGHER
CLEANER FLOTATION AND REGRIND

ZEPHYR GOLD USA LTD
DAWSON GOLD PROJECT COLORADO, USA

CLIENT DWG. NO
DRAWING NO 15561–3000–PFD–004
SHEET NO 1 of 1
REV. A



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WATER t/h												
WEIGHT %Sol												
WATER m3/h												
SLURRY t/h												
SLURRY SG												
SLURRY m3/h												

NO.	DESCRIPTION	DATE	BY

REVISIONS / ISSUES

		DATE
DESIGNED BY	HMB	
DRAWN BY	MCT	
CHECKED BY		
APPROVED BY		
UPDATED		
APPROVED BY		
DWG. SCALE		NTS

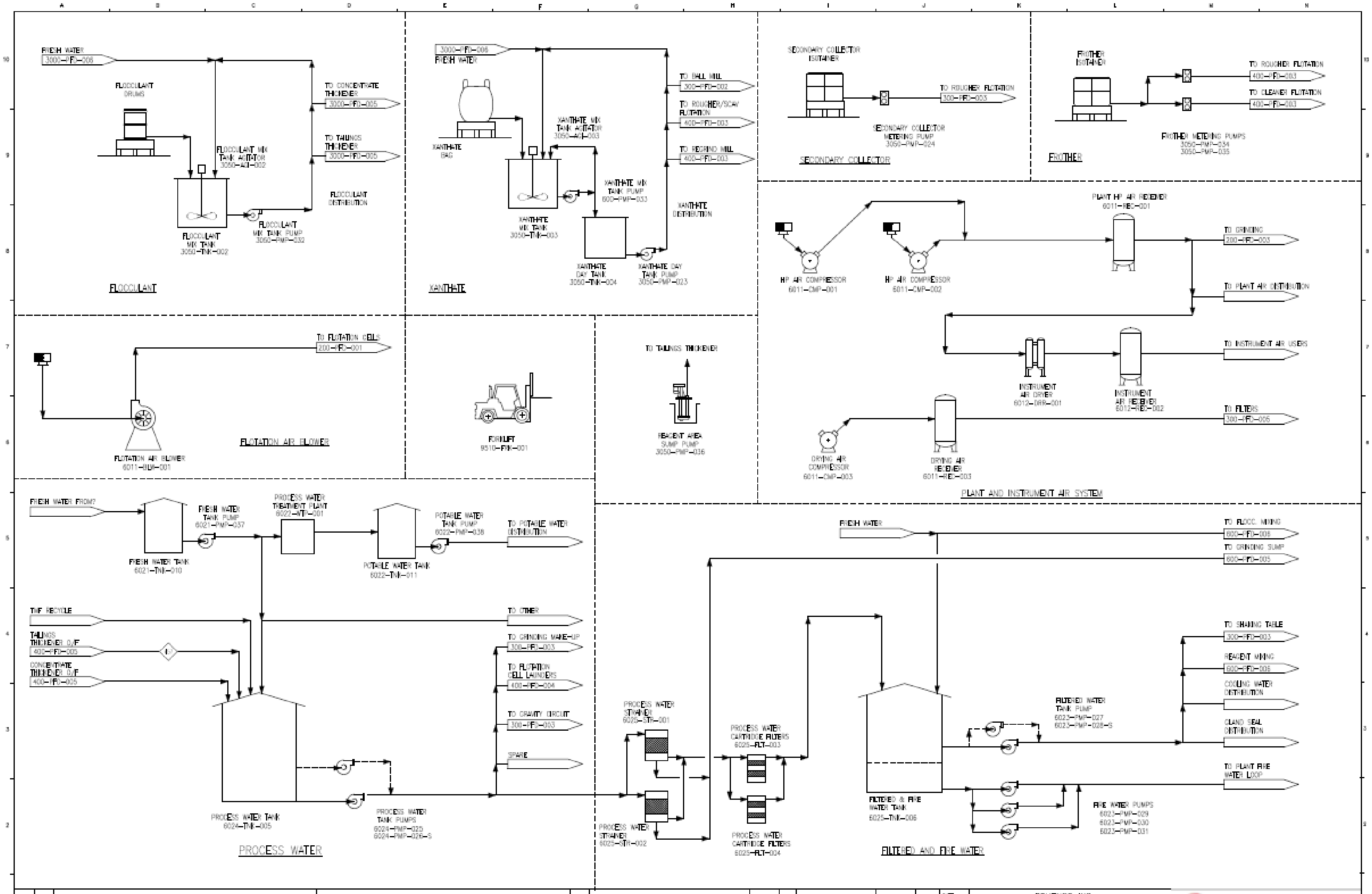
BOMENCO INC
BOLU MINERALS ENGINEERING & CONSULTING
VANCOUVER, BC

Zephyr Gold USA Ltd.

PRELIMINARY SCOPING STUDY
PROPOSED 300 t/d FLOTATION PLANT
PROCESS FLOWSHEET: CONCENTRATE
& TAILINGS DEWATERING

ZEPHYR GOLD USA LTD
DAWSON GOLD PROJECT COLORADO, USA

CLIENT DWG. NO		SHEET NO OF	REV.
DRAWING NO	15561-3000-PFD-005	1 of 1	A



NO.	DESCRIPTION	DATE	BY

REVISIONS / ISSUES

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DESIGNED BY	HMB	
DRAWN BY	MCT	
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BOMENCO INC
BOLU MINERALS ENGINEERING & CONSULTING
VANCOUVER, BC

PRELIMINARY SCOPING STUDY
PROPOSED 300 t/d FLOTATION PLANT
PROCESS FLOWSHEET
REAGENTS & UTILITIES

Zephyr Gold USA Ltd.

ZEPHYR GOLD USA LTD
DAWSON GOLD PROJECT COLORADO, USA

CLIENT DWG. NO		SHEET NO	REV.
DRAWING NO	155611-3000-PFD-006	1 of 1	A

APPENDIX D: Material Safety Data Sheets

Safety Data Sheet
Magnafloc® LT25

1. Identification

Product identifier used on the label

Magnafloc® LT25

Recommended use of the chemical and restriction on use
Recommended use*: flocculation agent

* The “Recommended use” identified for this product is provided solely to comply with a Federal requirement and is not part of the seller's published specification. The terms of this Safety Data Sheet (SDS) do not create or infer any warranty, express or implied, including by incorporation into or reference in the seller's sales agreement.

Details of the supplier of the safety data sheet

Company:
BASF CORPORATION
100 Park Avenue
Florham Park, NJ 07932, USA

Telephone: +1 973 245-6000

Emergency telephone number

CHEMTREC: 1-800-424-9300
BASF HOTLINE: 1-800-832-HELP (4357)

Other means of identification
Chemical family: polyacrylamide, anionic

2. Hazards Identification

According to Regulation 2012 OSHA Hazard Communication Standard; 29 CFR Part 1910.1200

Classification of the product

No need for classification according to GHS criteria for this product.

Label elements

The product does not require a hazard warning label in accordance with GHS criteria.

Hazards not otherwise classified

Very slippery when wet.

Labeling of special preparations (GHS):
This product is not combustible in the form in which it is shipped by the manufacturer, but may form a combustible dust through downstream activities (e.g. grinding, pulverizing) that reduce its particle size.

According to Regulation 1994 OSHA Hazard Communication Standard; 29 CFR Part 1910.1200

Emergency overview

Contact with the eyes or skin may cause mechanical irritation.
Use with local exhaust ventilation.
Avoid dust formation.
Wear protective clothing.
Caution - Slippery when wet!

---

3. Composition / Information on Ingredients

According to Regulation 2012 OSHA Hazard Communication Standard; 29 CFR Part 1910.1200

This product does not contain any components classified as hazardous under the referenced regulation.

---

4. First-Aid Measures

Description of first aid measures

General advice:
Remove contaminated clothing.

If inhaled:
If difficulties occur after dust has been inhaled, remove to fresh air and seek medical attention.

If on skin:
Wash thoroughly with soap and water.

If irritation develops, seek medical attention.

If in eyes:
Wash affected eyes for at least 15 minutes under running water with eyelids held open.

Seek medical attention.

If swallowed:
Rinse mouth and then drink plenty of water. Do not induce vomiting. Immediate medical attention required.

Most important symptoms and effects, both acute and delayed

Symptoms: The most important known symptoms and effects are described in the labelling (see section 2) and/or in section 11., Further important symptoms and effects are so far not known.
Hazards: No hazard is expected under intended use and appropriate handling.

Indication of any immediate medical attention and special treatment needed

Note to physician

Treatment: Treat according to symptoms (decontamination, vital functions), no known specific antidote.

5. Fire-Fighting Measures

Extinguishing media

Suitable extinguishing media:
dry powder, foam

Unsuitable extinguishing media for safety reasons:
water jet

Additional information:
If water is used, restrict pedestrian and vehicular traffic in areas where slip hazard may exist.

Special hazards arising from the substance or mixture

Hazards during fire-fighting:
carbon oxides, nitrogen oxides
The substances/groups of substances mentioned can be released in case of fire. Very slippery when wet.

Advice for fire-fighters

Protective equipment for fire-fighting:
Wear a self-contained breathing apparatus.

Further information:
Dusty conditions may ignite explosively in the presence of an ignition source causing flash fire.

6. Accidental release measures

Further accidental release measures:
Avoid dispersal of dust in the air (i.e., clearing dust surfaces with compressed air). Avoid the formation and build-up of dust - danger of dust explosion. Dust in sufficient concentration can result in an explosive mixture in air. Handle to minimize dusting and eliminate open flame and other sources of ignition. Forms slippery surfaces with water.

Personal precautions, protective equipment and emergency procedures

Use personal protective clothing.

Environmental precautions

Do not discharge into drains/surface waters/groundwater.

Methods and material for containment and cleaning up

Nonsparking tools should be used.

7. Handling and Storage

Precautions for safe handling

Breathing must be protected when large quantities are decanted without local exhaust ventilation. Handle in accordance with good industrial hygiene and safety practice. Forms slippery surfaces with water.

Protection against fire and explosion:
Avoid dust formation. Dust in sufficient concentration can result in an explosive mixture in air. Handle to minimize dusting and eliminate open flame and other sources of ignition. Routine housekeeping should be instituted to ensure that dusts do not accumulate on surfaces. Dry powders can build static electricity charges when subjected to the friction of transfer and mixing operations. Provide adequate precautions, such as electrical grounding and bonding, or inert atmospheres. Refer to NFPA 654, Standard for the Prevention of Fire and Dust Explosions from the Manufacturing, Processing, and Handling of Combustible Particulate Solids (2013 Edition) for safe handling.

Conditions for safe storage, including any incompatibilities

Further information on storage conditions: Store in unopened original containers in a cool and dry place. Avoid wet, damp or humid conditions, temperature extremes and ignition sources.

Storage stability:
Avoid extreme heat.

8. Exposure Controls/Personal Protection

No occupational exposure limits known.

Advice on system design:
It is recommended that all dust control equipment such as local exhaust ventilation and material transport systems involved in handling of this product contain explosion relief vents or an explosion suppression system or an oxygen deficient environment. Ensure that dust-handling systems (such as exhaust ducts, dust collectors, vessels, and processing equipment) are designed in a manner to prevent the escape of dust into the work area (i.e., there is no leakage from the equipment). Use only appropriately classified electrical equipment and powered industrial trucks.

Personal protective equipment

Respiratory protection:
Wear a NIOSH-certified (or equivalent) organic vapour/particulate respirator.

Hand protection:
Chemical resistant protective gloves

Eye protection:
Safety glasses with side-shields.

Body protection:
light protective clothing

General safety and hygiene measures:
Wear protective clothing as necessary to minimize contact. Handle in accordance with good industrial hygiene and safety practice. No eating, drinking, smoking or tobacco use at the place of work.

9. Physical and Chemical Properties

Form:	powder
Odour:	odourless
Odour threshold:	No data available.
Colour:	off-white
pH value:	6 - 8 (10 g/l) The product has not been tested. The statement has been derived from substances/products of a similar structure or composition.
Melting point:	The substance / product decomposes therefore not determined.
Boiling point:	not applicable
Sublimation point:	No data available.
Flash point:	not applicable
Flammability:	not flammable
Lower explosion limit:	No data available.
Upper explosion limit:	No data available.
Autoignition:	No data available.
Vapour pressure:	The product has not been tested.
Relative density:	No data available.
Bulk density:	approx. 750 kg/m3
Vapour density:	No data available.
Partitioning coefficient n-octanol/water (log Pow):	Study scientifically not justified.
Self-ignition temperature:	not self-igniting
Viscosity, dynamic:	not applicable, the product is a solid
% volatiles:	not determined
Solubility in water:	Forms a viscous solution.
Solubility (quantitative):	No data available.
Solubility (qualitative):	No data available.
Evaporation rate:	The product is a non-volatile solid.
Other Information:	If necessary, information on other physical and chemical parameters is indicated in this section.

10. Stability and Reactivity

Reactivity

No hazardous reactions if stored and handled as prescribed/indicated.

Corrosion to metals:
No corrosive effect on metal.

Oxidizing properties:
not fire-propagating

Chemical stability

The product is stable if stored and handled as prescribed/indicated.

Possibility of hazardous reactions

The product is not a dust explosion risk as supplied; however the build-up of fine dust can lead to a risk of dust explosions.
Stable under normal conditions.

No hazardous reactions known.

Conditions to avoid

Avoid extreme temperatures. Avoid humidity.

Incompatible materials

strong acids, strong bases, strong oxidizing agents

Hazardous decomposition products

Decomposition products:
No hazardous decomposition products if stored and handled as prescribed/indicated.

11. Toxicological information

Primary routes of exposure

Routes of entry for solids and liquids are ingestion and inhalation, but may include eye or skin contact. Routes of entry for gases include inhalation and eye contact. Skin contact may be a route of entry for liquefied gases.

Acute Toxicity/Effects

Acute toxicity
Assessment of acute toxicity: No known acute effects.

Oral
Type of value: LD50
Species: rat
Value: > 5,000 mg/kg (OECD Guideline 401)

Irritation / corrosion
Assessment of irritating effects: Not irritating to eyes and skin.

Skin
Species: rabbit
Result: non-irritant
Method: OECD Guideline 404

Eye
Species: rabbit
Result: non-irritant

Sensitization
Assessment of sensitization: Based on the ingredients, there is no suspicion of a skin-sensitizing potential.

Aspiration Hazard
No aspiration hazard expected.

Chronic Toxicity/Effects

Repeated dose toxicity
Assessment of repeated dose toxicity: Based on our experience and the information available, no adverse health effects are expected if handled as recommended with suitable precautions for designated uses. The product has not been tested. The statement has been derived from the properties of the individual components.

Genetic toxicity
Assessment of mutagenicity: Based on the ingredients, there is no suspicion of a mutagenic effect.

Carcinogenicity
Assessment of carcinogenicity: The whole of the information assessable provides no indication of a carcinogenic effect.
None of the components in this product at concentrations greater than 0.1% are listed by IARC; NTP, OSHA or ACGIH as a carcinogen.

Reproductive toxicity
Assessment of reproduction toxicity: Based on the ingredients, there is no suspicion of a toxic effect on reproduction.

Teratogenicity
Assessment of teratogenicity: Based on the ingredients, there is no suspicion of a teratogenic effect.

Other Information
The product has not been tested. The statements on toxicology have been derived from products of a similar structure and composition.

Symptoms of Exposure

The most important known symptoms and effects are described in the labelling (see section 2) and/or in section 11., Further important symptoms and effects are so far not known.

12. Ecological Information

Toxicity

Toxicity to fish
LC50 (96 h) > 100 mg/l, Oncorhynchus mykiss (static)
(under static conditions in the presence of 10 mg/L humic acid)

Aquatic invertebrates
LC50 (48 h) > 100 mg/l, Daphnia magna

Persistence and degradability

Assessment biodegradation and elimination (H2O)
Not readily biodegradable (by OECD criteria).

Bioaccumulative potential

Assessment bioaccumulation potential
Based on its structural properties, the polymer is not biologically available. Accumulation in organisms is not to be expected.

Mobility in soil

Assessment transport between environmental compartments

Information on: Anionic polyacrylamide

Adsorption to solid soil phase is expected.

Additional information

Other ecotoxicological advice:
The product has not been tested. The statements on ecotoxicology have been derived from products of a similar structure and composition.

13. Disposal considerations

Waste disposal of substance:
Must be disposed of or incinerated in accordance with local regulations.

Container disposal:
Dispose of in a licensed facility. Recommend crushing, puncturing or other means to prevent unauthorized use of used containers.

RCRA:
Not a hazardous waste under RCRA (40 CFR 261).

14. Transport Information

Land transport
USDOT

Not classified as a dangerous good under transport regulations

Sea transport
IMDG

Not classified as a dangerous good under transport regulations

Air transport
IATA/ICAO

Not classified as a dangerous good under transport regulations

15. Regulatory Information

VOC content:

not determined

Federal Regulations

Registration status:

Chemical	TSCA, US	released / listed

EPCRA 311/312 (Hazard categories): Not hazardous;

CA Prop. 65:
WARNING: THIS PRODUCT CONTAINS A CHEMICAL(S) KNOWN TO THE STATE OF CALIFORNIA TO CAUSE CANCER AND BIRTH DEFECTS OR OTHER REPRODUCTIVE HARM.

NFPA Hazard codes:

Health : 0	Fire: 1	Reactivity: 0	Special:

HMIS III rating

Health: 0	Flammability: 1	Physical hazard: 0

16. Other Information

SDS Prepared by:
BASF NA Product Regulations
SDS Prepared on: 2015/07/17

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END OF DATA SHEET

Methyl Isobutyl Carbinol

Safety Data Sheet

according to Federal Register / Vol. 77, No. 58 / Monday, March 26, 2012 / Rules and Regulations

Date of issue: 04/06/2018 Revision date: 04/06/2018 Supersedes: 06/01/2015

SECTION 1: Identification

1.1. Identification

Product form : Substance

Trade name : Methyl Isobutyl Carbinol

Chemical name : Methyl Isobutyl Carbinol

CAS-No. : 108-11-2

Product code : HP-040788-FP

Formula : $C_6H_{14}O$

Synonyms : Isobutylmethylmethanol / 2-Methyl-4-pentanol / Pentan-2-ol, 4-methyl- / 4-Pentanol, 2-methyl- / Methyl-2-pentanol, 4- / 4-Methyl-2-pentanol / 4-Methylpentan-2-ol / 1,3-Dimethyl-1-butanol / MIBC / Methylisobutylcarbinol / 4-Methyl-2-amyl alcohol / Methyl isobutyl carbinol / Methyl(2-methylpropyl) carbinol / 4-Methylpent-2-one

1.2. Recommended use and restrictions on use

Use of the substance/mixture : Solvent, organic synthesis, brake fluids

Use of the substance/mixture : Solvent

1.3. Supplier

Monument Chemical
16717 Jacintoport Blvd.
Houston, TX 77015 - USA
T (281) 452-5951 - F (281) 457-1127
sds@monumentchemical.com - www.monumentchemical.com

1.4. Emergency telephone number

Emergency number : 24 HR CHEMTREC: 1-800-424-9300; 24 HR Emergency Assistance: 1-832-376-2026

SECTION 2: Hazard(s) identification

2.1. Classification of the substance or mixture

GHS-US classification

Flammable liquids Category 3	H226	Flammable liquid and vapour
Serious eye damage/eye irritation Category 2A	H319	Causes serious eye irritation
Specific target organ toxicity (single exposure) Category 3	H335	May cause respiratory irritation

Full text of H statements : see section 16

2.2. GHS Label elements, including precautionary statements

GHS-US labeling

Hazard pictograms (GHS-US) :

Signal word (GHS-US) : Warning

Hazard statements (GHS-US) : H226 - Flammable liquid and vapour
H319 - Causes serious eye irritation
H335 - May cause respiratory irritation

Precautionary statements (GHS-US) : P210 - Keep away from heat, hot surfaces, open flames, sparks. - No smoking.
P233 - Keep container tightly closed.
P240 - Ground/Bond container and receiving equipment
P241 - Use explosion-proof electrical, lighting, ventilating equipment
P242 - Use only non-sparking tools.
P243 - Take precautionary measures against static discharge.
P261 - Avoid breathing dust, fume, gas, mist, spray, vapors.
P264 - Wash hands, forearms and face thoroughly after handling.
P271 - Use only outdoors or in a well-ventilated area.
P280 - Wear eye protection, protective clothing, protective gloves.

P303+P361+P353 - If on skin (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower
P304+P340 - If inhaled: Remove person to fresh air and keep comfortable for breathing
P305+P351+P338 - If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
P312 - Call a doctor, a POISON CENTER if you feel unwell
P337+P313 - If eye irritation persists: Get medical advice/attention.
P370+P378 - In case of fire: Use alcohol resistant foam, carbon dioxide (CO2), dry extinguishing powder, Water spray to extinguish.
P403+P233 - Store in a well-ventilated place. Keep container tightly closed.
P403+P235 - Store in a well-ventilated place. Keep cool.
P405 - Store locked up.
P501 - Dispose of contents/container to hazardous or special waste collection point, in accordance with local, regional, national and/or international regulation

2.3. Other hazards which do not result in classification

No additional information available

2.4. Unknown acute toxicity (GHS US)

Not applicable

SECTION 3: Composition/Information on ingredients

3.1. Substances

Substance type : Mono-constituent

Name	Product identifier	%
Methyl Isobutyl Carbinol (Main constituent)	(CAS-No.) 108-11-2	>= 99

Full text of hazard classes and H-statements : see section 16

3.2. Mixtures

Not applicable

SECTION 4: First-aid measures

4.1. Description of first aid measures

First-aid measures general : Call a poison center/doctor/physician if you feel unwell.

First-aid measures after inhalation : Remove person to fresh air and keep comfortable for breathing. Call a poison center/doctor/physician if you feel unwell.

First-aid measures after skin contact : Rinse skin with water/shower. Remove/Take off immediately all contaminated clothing.

First-aid measures after eye contact : Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. If eye irritation persists: Get medical advice/attention.

First-aid measures after ingestion : Call a poison center/doctor/physician if you feel unwell.

4.2. Most important symptoms and effects (acute and delayed)

Symptoms/effects after inhalation : May cause respiratory irritation.

Symptoms/effects after skin contact : Slight irritation. Red skin. Dry skin. Itching.

Symptoms/effects after eye contact : Irritation of the eye tissue. Eye irritation.

Symptoms/effects after ingestion : Vomiting. Abdominal pain. AFTER INGESTION OF HIGH QUANTITIES: Dizziness. Headache. Disturbances of consciousness.

Chronic symptoms : No effects known.

4.3. Immediate medical attention and special treatment, if necessary

Treat symptomatically.

SECTION 5: Fire-fighting measures

5.1. Suitable (and unsuitable) extinguishing media

Suitable extinguishing media : Water spray. Dry powder. Foam. Carbon dioxide.

5.2. Specific hazards arising from the chemical

Fire hazard : Flammable liquid and vapour.

Reactivity : Reacts with (some) acids: (increased) risk of fire/explosion. Reacts violently with (strong) oxidizers: (increased) risk of fire/explosion. Flammable liquid and vapour.

5.3. Special protective equipment and precautions for fire-fighters

Protection during firefighting : Do not attempt to take action without suitable protective equipment. Self-contained breathing apparatus. Complete protective clothing.

SECTION 6: Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

6.1.1. For non-emergency personnel

Protective equipment : Gloves. Protective clothing. Large spills/in enclosed spaces: compressed air apparatus.

Emergency procedures : Ventilate spillage area. No open flames, no sparks, and no smoking. Avoid breathing dust/fume/gas/mist/vapors/spray. Avoid contact with skin and eyes.

6.1.2. For emergency responders

Protective equipment : Do not attempt to take action without suitable protective equipment. For further information refer to section 8: "Exposure controls/personal protection".

6.2. Environmental precautions

Avoid release to the environment.

6.3. Methods and material for containment and cleaning up

For containment : Contain released product, pump into suitable containers. Plug the leak, cut off the supply. Dam up the liquid spill. Provide equipment/receptacles with earthing. Do not use compressed air for pumping over spills. Heating: dilute combustible gas/vapour with water curtain.

Methods for cleaning up : Take up liquid spill into absorbent material. Notify authorities if product enters sewers or public waters.

Other information : Dispose of materials or solid residues at an authorized site.

6.4. Reference to other sections

For further information refer to section 13.

SECTION 7: Handling and storage

7.1. Precautions for safe handling

Precautions for safe handling : Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking. Ground/bond container and receiving equipment. Use only non-sparking tools. Take precautionary measures against static discharge. Flammable vapors may accumulate in the container. Use explosion-proof equipment. Wear personal protective equipment. Use only outdoors or in a well-ventilated area. Avoid breathing dust/fume/gas/mist/vapors/spray. Avoid contact with skin and eyes.

Hygiene measures : Observe normal hygiene standards. Keep container tightly closed. Do not eat, drink or smoke when using this product. Always wash hands after handling the product.

7.2. Conditions for safe storage, including any incompatibilities

Technical measures : Ground/bond container and receiving equipment.

Storage conditions : Store in a well-ventilated place. Keep cool. Keep container tightly closed. Store locked up.

Heat-ignition : KEEP SUBSTANCE AWAY FROM: heat sources. ignition sources.

Information on mixed storage : KEEP SUBSTANCE AWAY FROM: oxidizing agents. (strong) acids. (strong) bases. amines.

Storage area : Ventilation at floor level. Fireproof storeroom. Provide for a tub to collect spills. Provide the tank with earthing. Store at ambient temperature. Meet the legal requirements.

Special rules on packaging : SPECIAL REQUIREMENTS: closing. clean. correctly labelled. meet the legal requirements. Secure fragile packagings in solid containers.

Packaging materials : SUITABLE MATERIAL: steel. stainless steel. carbon steel. aluminium. zinc. polyethylene. glass. tin.

SECTION 8: Exposure controls/personal protection

8.1. Control parameters

Methyl Isobutyl Carbinol (108-11-2)		
ACGIH	Local name	Methyl isobutyl carbinol
ACGIH	ACGIH TWA (ppm)	25 ppm [SKIN]
ACGIH	ACGIH STEL (ppm)	40 ppm
ACGIH	Remark (ACGIH)	URT & eye irr; CNS impair
ACGIH	Regulatory reference	ACGIH 2018
OSHA	OSHA PEL (TWA) (mg/m³)	100 mg/m³
OSHA	OSHA PEL (TWA) (ppm)	25 ppm [SKIN]
OSHA	Limit value category (OSHA)	prevent or reduce skin absorption

Methyl Isobutyl Carbinol (108-11-2)		
OSHA	Regulatory reference (US-OSHA)	OSHA
IDLH	US IDLH (ppm)	400 ppm
NIOSH	NIOSH REL (TWA) (mg/m³)	100 mg/m³
NIOSH	NIOSH REL (TWA) (ppm)	25 ppm [SKIN]
NIOSH	NIOSH REL (STEL) (mg/m³)	165 mg/m³
NIOSH	NIOSH REL (STEL) (ppm)	40 ppm
NIOSH	US-NIOSH chemical category	Potential for dermal absorption

8.2. Appropriate engineering controls

Appropriate engineering controls : Ensure good ventilation of the work station.
Environmental exposure controls : Avoid release to the environment.

8.3. Individual protection measures/Personal protective equipment

Materials for protective clothing:

GIVE EXCELLENT RESISTANCE: butyl rubber. GIVE GOOD RESISTANCE: butyl rubber. PVC. neoprene

Hand protection:

Protective gloves

Eye protection:

Safety glasses

Skin and body protection:

Protective clothing

Respiratory protection:

In case of insufficient ventilation, wear suitable respiratory equipment

SECTION 9: Physical and chemical properties

9.1. Information on basic physical and chemical properties

Physical state : Liquid
Appearance : Clear, colorless liquid.
Color : Colorless
Odor : mild
Odor threshold : No data available
pH : No data available
Melting point : -90 °C
Freezing point : -90 °C ; -130.0 °F
Boiling point : 132 °C ; 269.6 °F
Critical temperature : 291 °C
Flash point : 41 °C ; 105.8 °F closed cup
Relative evaporation rate (butyl acetate=1) : 0.3
Relative evaporation rate (ether=1) : 33
Flammability (solid, gas) : Not applicable.
Vapor pressure : 2.8 mm Hg (at 25 °C)
Vapor pressure at 50 °C : 34 hPa
Relative vapor density at 20 °C : 3.5
Relative density : 0.82
Relative density of saturated gas/air mixture : 1
Specific gravity / density : 807.5 kg/m³ (at 20 °C)
Molecular mass : 102.2 g/mol

Solubility	: Moderately soluble in water. Soluble in ethanol. Soluble in ether. Water: 2 g/100ml (at 25 °C)
Log Pow	: 1.43 (at 25 °C)
Auto-ignition temperature	: 305 °C ; 581 °F
Decomposition temperature	: No data available
Viscosity, kinematic	: 5.08 mm²/s (25 °C)
Viscosity, dynamic	: 4.116 mPa.s (25 °C)
Explosion limits	: 1 - 5.5 vol % 42 - 235 g/m³ LEL: 1 vol % UEL: 5.5 vol %
Explosive properties	: No data available
Oxidizing properties	: No data available

9.2. Other information

Specific conductivity	: 70000 pS/m
Saturation concentration	: 25 g/m³
VOC content	: 100 %
Other properties	: Gas/vapour heavier than air at 20°C. Clear. Slightly volatile. Substance has neutral reaction. May generate electrostatic charges.

SECTION 10: Stability and reactivity

10.1. Reactivity

Reacts with (some) acids: (increased) risk of fire/explosion. Reacts violently with (strong) oxidizers: (increased) risk of fire/explosion. Flammable liquid and vapour.

10.2. Chemical stability

Stable under normal conditions.

10.3. Possibility of hazardous reactions

No dangerous reactions known under normal conditions of use.

10.4. Conditions to avoid

Avoid contact with hot surfaces. Heat. No flames, no sparks. Eliminate all sources of ignition.

10.5. Incompatible materials

No additional information available

10.6. Hazardous decomposition products

Under normal conditions of storage and use, hazardous decomposition products should not be produced.

SECTION 11: Toxicological information

11.1. Information on toxicological effects

Acute toxicity : Not classified

Methyl Isobutyl Carbinol (108-11-2)	
LD50 oral rat	2600 mg/kg
LD50 dermal rabbit	2880 mg/kg
LC50 inhalation rat (mg/l)	> 16000 mg/m³ (Equivalent or similar to OECD 403, 4 h, Rat, Male/female, Experimental value)
LC50 inhalation rat (ppm)	> 4600 ppm (Exposure time: 2 h)
ATE US (oral)	2600 mg/kg body weight
ATE US (dermal)	2880 mg/kg body weight

Skin corrosion/irritation	: Not classified
Serious eye damage/irritation	: Causes serious eye irritation.
Respiratory or skin sensitization	: Not classified
Germ cell mutagenicity	: Not classified
Carcinogenicity	: Not classified
Reproductive toxicity	: Not classified
Specific target organ toxicity – single exposure	: May cause respiratory irritation.

Specific target organ toxicity – repeated exposure : Not classified

Aspiration hazard : Not classified

Symptoms/effects after inhalation : May cause respiratory irritation.
Symptoms/effects after skin contact : Slight irritation. Red skin. Dry skin. Itching.
Symptoms/effects after eye contact : Irritation of the eye tissue. Eye irritation.
Symptoms/effects after ingestion : Vomiting. Abdominal pain. AFTER INGESTION OF HIGH QUANTITIES: Dizziness. Headache. Disturbances of consciousness.
Chronic symptoms : No effects known.

SECTION 12: Ecological information

12.1. Toxicity

Ecology - general : Not classified as dangerous for the environment according to the criteria of Regulation (EC) No 1272/2008.
Ecology - air : Not included in the list of fluorinated greenhouse gases (Regulation (EU) No 517/2014). Not classified as dangerous for the ozone layer (Regulation (EC) No 1005/2009).

Methyl Isobutyl Carbinol (108-11-2)	
LC50 fish 1	360 mg/l 24hr; Goldfish

12.2. Persistence and degradability

Methyl Isobutyl Carbinol (108-11-2)	
Biochemical oxygen demand (BOD)	2.12 g O_2/g substance
Chemical oxygen demand (COD)	2.6 g O_2/g substance
ThOD	2.8 g O_2/g substance
BOD (% of ThOD)	0.76 (Calculated value)

12.3. Bioaccumulative potential

Methyl Isobutyl Carbinol (108-11-2)	
Log Pow	1.43 (at 25 °C)

12.4. Mobility in soil

Methyl Isobutyl Carbinol (108-11-2)	
Surface tension	0.023 N/m
Ecology - soil	No (test)data on mobility of the substance available.

12.5. Other adverse effects

No additional information available

SECTION 13: Disposal considerations

13.1. Disposal methods

Regional legislation (waste) : LWCA (the Netherlands): KGA category 03.
Waste treatment methods : Dispose of contents/container in accordance with licensed collector’s sorting instructions.
Additional information : Flammable vapors may accumulate in the container.

SECTION 14: Transport information

Department of Transportation (DOT)

In accordance with DOT

Transport document description : UN2053 Methyl isobutyl carbinol, 3, III
UN-No.(DOT) : UN2053
Proper Shipping Name (DOT) : Methyl isobutyl carbinol
Class (DOT) : 3 - Class 3 - Flammable and combustible liquid 49 CFR 173.120
Packing group (DOT) : III - Minor Danger

Hazard labels (DOT) : 3 - Flammable liquid

DOT Packaging Non Bulk (49 CFR 173.xxx) : 203

DOT Packaging Bulk (49 CFR 173.xxx) : 242

DOT Special Provisions (49 CFR 172.102) : B1 - If the material has a flash point at or above 38 C (100 F) and below 93 C (200 F), then the bulk packaging requirements of 173.241 of this subchapter are applicable. If the material has a flash point of less than 38 C (100 F), then the bulk packaging requirements of 173.242 of this subchapter are applicable.
IB3 - Authorized IBCs: Metal (31A, 31B and 31N); Rigid plastics (31H1 and 31H2); Composite (31HZ1 and 31HA2, 31HB2, 31HN2, 31HD2 and 31HH2). Additional Requirement: Only liquids with a vapor pressure less than or equal to 110 kPa at 50 C (1.1 bar at 122 F), or 130 kPa at 55 C (1.3 bar at 131 F) are authorized, except for UN2672 (also see Special Provision IP8 in Table 2 for UN2672).
T2 - 1.5 178.274(d)(2) Normal............ 178.275(d)(3)
TP1 - The maximum degree of filling must not exceed the degree of filling determined by the following: Degree of filling = 97 / 1 + a (tr - tf) Where: tr is the maximum mean bulk temperature during transport, and tf is the temperature in degrees celsius of the liquid during filling.

DOT Packaging Exceptions (49 CFR 173.xxx) : 150

DOT Quantity Limitations Passenger aircraft/rail (49 CFR 173.27) : 60 L

DOT Quantity Limitations Cargo aircraft only (49 CFR 175.75) : 220 L

DOT Vessel Stowage Location : A - The material may be stowed ‘‘on deck’’ or ‘‘under deck’’ on a cargo vessel and on a passenger vessel.

Emergency Response Guide (ERG) Number : 129

Other information : No supplementary information available.

Transport by sea

Transport document description (IMDG) : UN 2053 METHYL ISOBUTYL CARBINOL, 3, III (41°C c.c.)

UN-No. (IMDG) : 2053

Proper Shipping Name (IMDG) : METHYL ISOBUTYL CARBINOL

Class (IMDG) : 3 - Flammable liquids

Packing group (IMDG) : III - substances presenting low danger

Limited quantities (IMDG) : 5 L

EmS-No. (1) : F-E

EmS-No. (2) : S-D

Air transport

Transport document description (IATA) : UN 2053 Methyl isobutyl carbinol, 3, III

UN-No. (IATA) : 2053

Proper Shipping Name (IATA) : Methyl isobutyl carbinol

Class (IATA) : 3 - Flammable Liquids

Packing group (IATA) : III - Minor Danger

SECTION 15: Regulatory information

15.1. US Federal regulations

Methyl Isobutyl Carbinol (108-11-2)
Listed on the United States TSCA (Toxic Substances Control Act) inventory

15.2. International regulations

CANADA

Methyl Isobutyl Carbinol (108-11-2)
Listed on the Canadian DSL (Domestic Substances List)

EU-Regulations

Methyl Isobutyl Carbinol (108-11-2)
Listed on the EEC inventory EINECS (European Inventory of Existing Commercial Chemical Substances)

National regulations

Methyl Isobutyl Carbinol (108-11-2)
Listed on the AICS (Australian Inventory of Chemical Substances) Listed on IECSC (Inventory of Existing Chemical Substances Produced or Imported in China) Listed on the Japanese ENCS (Existing & New Chemical Substances) inventory Listed on the Japanese ISHL (Industrial Safety and Health Law) Listed on the Korean ECL (Existing Chemicals List) Listed on NZIoC (New Zealand Inventory of Chemicals) Listed on PICCS (Philippines Inventory of Chemicals and Chemical Substances) Listed on INSQ (Mexican National Inventory of Chemical Substances) Listed on CICR (Turkish Inventory and Control of Chemicals) Listed on the TCSI (Taiwan Chemical Substance Inventory)

15.3. US State regulations

Methyl Isobutyl Carbinol (108-11-2)	
State or local regulations	U.S. - New Jersey - Right to Know Hazardous Substance List U.S. - Pennsylvania - RTK (Right to Know) List

SECTION 16: Other information

Revision date : 04/06/2018

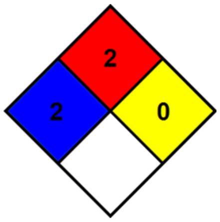
Full text of H-phrases:

H226	Flammable liquid and vapour
H319	Causes serious eye irritation
H335	May cause respiratory irritation

NFPA health hazard : 2 - Materials that, under emergency conditions, can cause temporary incapacitation or residual injury.

NFPA fire hazard : 2 - Materials that must be moderately heated or exposed to relatively high ambient temperatures before ignition can occur.

NFPA reactivity : 0 - Material that in themselves are normally stable, even under fire conditions.



SDS US (GHS HazCom 2012)

MATERIAL SAFETY DATA SHEET

POTASSIUM AMYL XANTHATE, SOLID

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Brenntag Canada Inc.
43 Jutland Rd.
Toronto, ON
M8Z 2G6
(416) 259-8231

Website: http:\\www.brenntag.ca

WHMIS#:	00060600
Index:	HCI0065/09B
Effective Date:	2009 June 17
Date of Revision:	2009 June 17

EMERGENCY TELEPHONE NUMBERS (FOR EMERGENCIES INVOLVING CHEMICAL SPILLS OR RELEASE)

Toronto, ON (416) 226-6117
Montreal, QC (514) 861-1211
Winnipeg, MB (204) 943-8827
Edmonton, AB (780) 424-1754
Calgary, AB (403) 263-8660
Vancouver, BC (604) 685-5036

PRODUCT IDENTIFICATION

Product Name:	Potassium Amyl Xanthate, Solid.
Chemical Name:	Dithiocarbonic Acid, Amyl Ester, Potassium Salt.
Synonyms:	Potassium Amyl Xanthate; KAX 51; Potassium Pentyl Xanthate; Potassium Pentyl Xanthogenate.
Chemical Family:	Salts of carbonic acid dithio esters.
Molecular Formula:	$C_6H_{11}OS_2$. K.
Product Use:	Flotation agent.

WHMIS Classification / Symbol:

B-6: Reactive Flammable Material
D-1B: Toxic (acute effects)
D-2B: Toxic (skin and eye irritant)

READ THE ENTIRE MSDS FOR THE COMPLETE HAZARD EVALUATION OF THIS PRODUCT.

2. COMPOSITION, INFORMATION ON INGREDIENTS (Not Intended As Specifications)

Ingredient	*CAS#*	*ACGIH TLV*	*% Concentration*
Potassium Amyl Xanthate	2720-73-2	---	60 - 100
Potassium Hydroxide	1310-58-3	—	1 - 5
Isoamyl alcohol	123-51-3	100 ppm	1 - 5
Decomposition Product: Carbon disulfide	75-15-0	10 ppm (Skin)	

Skin Notation: Contact with skin, eyes and mucous membranes can contribute to the overall exposure and may invalidate the TLV. Consider measures to prevent absorption by these routes.

3. HAZARDS IDENTIFICATION

EMERGENCY OVERVIEW:	May be fatal if swallowed. Harmful if inhaled. Causes skin and eye irritation. Dust is irritating to respiratory tract. See "Other Health Effects" Section. Heating of solid xanthate or aging or heating of solutions will cause formation of Carbon Bisulfide. Upon exposure of solid xanthates to moisture and/or heat, decomposition results and spontaneous combustion can occur. Contact of solid xanthate with moist air has resulted in ignition. (4) Emits a flammable gas upon contact with water or water vapour. Can decompose at high temperatures forming toxic gases. Powdered material may form explosive dust-air mixtures. Contents may develop pressure on prolonged exposure to heat.

POTENTIAL HEALTH EFFECTS

Inhalation:	Excessive contact with powder may cause drying of mucous membranes of nose and throat due to absorption of moisture and oils. Product may cause severe irritation of the nose, throat and respiratory tract. Repeated and/or prolonged exposures may cause productive cough, running nose, bronchopneumonia, pulmonary oedema (fluid build-up in lungs), and reduction of pulmonary function. Irritation of mucous membranes and respiratory tract is possible following exposure to the decomposition product. (3) See "Other Health Effects" Section.
Skin Contact:	Brief contact with the dust causes irritation. Greater exposure causes severe burns. In the presence of moisture (perspiration, humidity, tears), the dust dissolves to form a corrosive solution which may cause burns. (3) Potassium Amyl Xanthate may cause symptoms of skin irritation such as reddening, swelling, rash, scaling, or blistering. May cause defatting, drying and cracking of the skin.
Skin Absorption:	May be absorbed through intact skin. See Section 11, "Other Studies Relevant to Material".
Eye Contact:	This product may cause irritation, redness and possible damage due to abrasiveness. Brief contact with the dust causes irritation. Greater exposure causes severe burns. In the presence of moisture (perspiration, humidity, tears), the dust dissolves to form a corrosive solution which may cause burns. (3) Irritation of the eyes is possible following exposure to the decomposition product. (3)
Ingestion:	Ingestion is not a likely route of exposure. This product causes irritation, a burning sensation of the mouth and throat and abdominal pain.
Other Health Effects:	Effects (irritancy) on the skin and eyes may be delayed, and damage may occur without the sensation or onset of pain. Strict adherence to first aid measures following any exposure is essential. May cause cardiovascular effects, liver damage, peripheral nervous system (PNS) effects or central nervous system (CNS) depression. CNS depression is characterized by headache, dizziness, drowsiness, nausea, vomiting and incoordination. Severe overexposures may lead to coma and possible death due to respiratory failure. Peripheral Neuropathy is a progressive disorder of the nervous system characterized by sensory and motor abnormalities, muscle spasms, weakness and pain in the arms and legs, numbness and tingling of the fingers and toes and paralysis. Liver damage is characterized by the loss of appetite, jaundice (yellowish skin colour), and occasional pain in the upper left-hand side of the abdomen. Potassium Amyl Xanthate: Symptoms of potassium poisoning may occur. These include slow heartbeat, accelerated breathing, muscle weakness and, in severe cases, paralysis. Vapours of the decomposition products of Xanthates (Carbon Bisulphide) can cause severe disturbances of mood and behaviour, including excitation, anger and violent dreams. High concentrations of vapours can cause death. (4) Carbon Bisulphide: Contact with moisture in the body by inhalation may yield sodium hydroxide (corrosive) and 2-mercaptobenzothiazole, an irritant. (4) Contact with acids will liberate carbon disulphide. (3) Exposure to carbon disulphide (500 to 1000 ppm) may cause severe mood and personality disturbances, including excitability, confusion, irritability, uncontrollable anger, bizarre dreams, insomnia, psychosis and suicide. Exposure to carbon disulphide at 4800 ppm for thirty minutes results in coma and may be fatal. Carbon disulphide is readily absorbed through intact skin. Chronic exposure to carbon disulphide produces central and peripheral nervous system, cardiovascular, gastrointestinal, kidney, endocrine and eye disorders. (4) Potassium Hydroxide: Exposure to very low doses, even for a short period of time, has produced extensive damage to the esophagus, stomach and intestine extending into surrounding tissues, as well as hyperexcitability followed by apathy and weakness. In some cases, death has resulted from hemorrhage, adhesions or perforation. Following esophageal damage, strictures have frequently developed in surviving animals. (4)

4. FIRST AID MEASURES

FIRST AID PROCEDURES

Inhalation:	Move victim to fresh air. Give artificial respiration ONLY if breathing has stopped. Give cardiopulmonary resuscitation (CPR) if there is no breathing AND no pulse. Obtain medical advice IMMEDIATELY.
Skin Contact:	Prompt removal of the material from the skin is essential. Remove all contaminated clothing and immediately wash the exposed areas with copious amounts of soap and water for a minimum of 30 minutes or up to 60 minutes for critical body areas. Immerse the exposed part immediately in ice water to relieve pain and to prevent swelling and blistering. Place cold packs, ice or wet cloths on the burned area if immersion is not possible. Cover the exposed part with a clean, preferably sterile, lint-free dressing. Obtain medical attention IMMEDIATELY and monitor breathing and treat for shock for severe exposure.
Eye Contact:	Immediately flush eyes with running water for a minimum of 20 minutes. Hold eyelids open during flushing. If irritation persists, repeat flushing. Obtain medical attention IMMEDIATELY.

Ingestion:	Do not attempt to give anything by mouth to an unconscious person. If victim is alert and not convulsing, rinse mouth out and give 1/2 to 1 glass of water to dilute material. IMMEDIATELY contact local Poison Control Centre. Vomiting should only be induced under the direction of a physician or a poison control centre. If spontaneous vomiting occurs, have victim lean forward with head down to avoid breathing in of vomitus, rinse mouth and administer more water. IMMEDIATELY transport victim to an emergency facility.
Note to Physicians:	Treat symptomatically. Medical conditions that may be aggravated by exposure to this product include neurological and cardiovascular disorders, diseases of the skin, eyes or respiratory tract, preexisting liver and kidney disorders.

5. FIRE-FIGHTING MEASURES

		Flammability Limits in Air (%):	
Flashpoint (°C)	***AutoIgnition Temperature (°C)***	***LEL***	***UEL***
-30. (Carbon Disulphide)	90.1 (Carbon Disulphide)	1.25. (Carbon Disulphide)	50. (Carbon Disulphide)

Flammability Class (WHMIS):	B-6: Reactive Flammable Material
Hazardous Combustion Products:	Thermal decomposition products are toxic and may include Carbon Disulphide, Potassium sulphide, carbonyl sulphide, Amyl Alcohols, oxides of carbon, sulphur, potassium and irritating gases.
Unusual Fire or Explosion Hazards:	This product may be capable of forming flammable dust clouds in air. Avoid accumulation and dispersion of dust to reduce explosion potential. Spilled material may cause floors and contact surfaces to become slippery. Heating of solid xanthate or aging or heating of solutions will cause formation of Carbon Bisulfide. Upon exposure of solid xanthates to moisture and/or heat, decomposition results and spontaneous combustion can occur. Contact of solid xanthate with moist air has resulted in ignition. (4) Vapours from this product are heavier than air, and may "travel" to a source of ignition (eg. pilot lights, heaters, electric motors) some distance away, and then "flash back" to the point of product discharge causing an explosion and fire. Enforce NO SMOKING rules.
Sensitivity to Mechanical Impact:	Not expected to be sensitive to mechanical impact.
Rate of Burning:	Not available.
Explosive Power:	Not available.
Sensitivity to Static Discharge:	If product has come into contact with moisture and Carbon Bisulphide gas has evolved, then Carbon Bisulphide is expected to be sensitive to static discharge if vapours are present between the lower and upper explosive limits. (3) High voltage static electricity build-up is possible when significant quantities of dust are present.
EXTINGUISHING MEDIA	
Fire Extinguishing Media:	Use carbon dioxide or dry chemical media for small fires. If only water is available, use it in the form of a fog. Cool containers with flooding quantities of water until well after the fire is out. Exposure to heat and moisture may cause the decomposition of xanthates to release flammable, explosive and poisonous Carbon Bisulphide vapours. (3)
FIRE FIGHTING INSTRUCTIONS	
Instructions to the Fire Fighters:	Use water spray to cool fire-exposed containers or structures. Use water spray to disperse vapours; re-ignition is possible. Clean up immediately to eliminate slipping hazard. Do not allow to enter sewers or watercourses. Avoid accumulation and dispersion of dust to reduce explosion potential.
Fire Fighting Protective Equipment:	Use self-contained breathing apparatus and protective clothing.

6. ACCIDENTAL RELEASE MEASURES

Information in this section is for responding to spills, leaks or releases in order to prevent or minimize the adverse effects on persons, property and the environment. There may be specific reporting requirements associated with spills, leaks or releases, which change from region to region.

Containment and Clean-Up Procedures: In all cases of leak or spill contact vendor at Emergency Number shown on the front page of this MSDS. Avoid accumulation and dispersion of dust to reduce explosion potential. Wear respirator, protective clothing and gloves. Spilled material may cause floors and contact surfaces to become slippery. Any recovered product can be used for the usual purpose, depending on the extent and kind of contamination. Where a package (drum or bag) is damaged and / or leaking, repair it, or place it into an over-pack drum immediately so as to avoid or minimize material loss and contamination of surrounding environment. Replace damaged containers immediately to avoid loss of material and contamination of surrounding atmosphere. Avoid dry sweeping. Do not use compressed air to clean surfaces. Vacuuming or wet sweeping is preferred. Return all material possible to container for proper disposal. Do not flush with water as aqueous solutions or powders that become wet render surfaces extremely slippery. Eliminate all sources of ignition. Collect product for recovery or disposal. For release to land, or storm water runoff, contain discharge by constructing dykes or applying inert absorbent; for release to water, utilize damming and/or water diversion to minimize the spread of contamination. Ventilate enclosed spaces. Notify applicable government authority if release is reportable or could adversely affect the environment.

7. HANDLING AND STORAGE

HANDLING

Handling Practices: Avoid accumulation and dispersion of dust to reduce explosion potential. Ground and bond equipment and containers to prevent a static charge buildup. Use spark-resistant tools. Use normal "good" industrial hygiene and housekeeping practices. Clean up immediately to eliminate slipping hazard. Enforce NO SMOKING rules in area of use.

Ventilation Requirements: See Section 8, "Engineering Controls".

Other Precautions: Use only with adequate ventilation and avoid breathing dusts (aerosols, vapours or mists). Avoid contact with eyes, skin or clothing. Wash thoroughly with soap and water after handling. Wash contaminated clothing thoroughly before re-use. Do not use cutting or welding torches on empty drums that contained this material/product. Absorption via contact with skin, eyes and mucous membranes can contribute to the overall exposure. Consider measures to prevent absorption by these routes.

STORAGE

Storage Temperature (°C): See below.

Ventilation Requirements: Ventilation should be explosion proof.

Storage Requirements: Store solid Xanthates under cool, dark, dry conditions. Liquid products must be kept cool and used as quickly as possible. (3) Store in a cool, well-ventilated area. Keep away from heat, sparks and flames. Keep containers closed. Do not expose sealed containers to temperatures above 40° C. Avoid moisture contamination. Prolonged storage may result in lumping or caking.

Special Materials to be Used for Packaging or Containers: Materials of construction for storing the product include: carbon steel. Copper and its alloys should not be used in equipment for storage, handling or transportation. Attacks some types of rubber, plastics and coatings. Confirm suitability of any material before using.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

Recommendations listed in this section indicate the type of equipment, which will provide protection against overexposure to this product. Conditions of use, adequacy of engineering or other control measures, and actual exposures will dictate the need for specific protective devices at your workplace.

ENGINEERING CONTROLS

Engineering Controls: Local exhaust ventilation required. Ventilation should be explosion proof. Make up air should be supplied to balance air that is removed by local or general exhaust ventilation. Avoid accumulation and dispersion of dust to reduce explosion potential. Ventilate low lying areas such as sumps or pits where dense dust may collect. Enforce NO SMOKING rules.

PERSONAL PROTECTIVE EQUIPMENT (PPE)

Eye Protection: Use chemical safety goggles when there is potential for eye contact. Use full face-shield and chemical safety goggles when there is potential for contact.

Skin Protection: Gloves and protective clothing made from neoprene, PVC, polyethylene, rubber or plastic should be impervious under conditions of use. Attacks some types of rubber, plastics and coatings. Prior to use, user should confirm impermeability. Discard contaminated gloves.

Respiratory Protection: No specific guidelines available. A NIOSH/MSHA-approved air-purifying respirator equipped with dust, mist, fume cartridges for concentrations up to 2 mg/m³ Potassium Hydroxide. An air-supplied respirator if concentrations are higher or unknown.

Other Personal Protective Equipment:	Avoid accumulation and dispersion of dust to reduce explosion potential. Wear an impermeable apron and boots. Locate safety shower and eyewash station close to chemical handling area. Take all precautions to avoid personal contact. Clothing and footwear that is fire retardant and dissipates static electrical charges should be worn when handling flammable materials. Natural fibers (cotton, wool, leather and linen) should be selected in favour of synthetic materials (rayon, nylon and polyester). Skin Notation: Contact with skin, eyes and mucous membranes can contribute to the overall exposure and may invalidate the TLV. Consider measures to prevent absorption by these routes.

EXPOSURE GUIDELINES

SUBSTANCE	***ACGIH TLV (STEL)***	***OSHA PEL (TWA)***	***OSHA PEL (STEL)***	***NIOSH REL (TWA)***	***NIOSH REL (STEL)***
Potassium Hydroxide	2 mg/m³ (Ceiling)	---	---	---	2 mg/m³ (Ceiling)
Isoamyl alcohol	125 ppm	100 ppm	---	100 ppm	125 ppm
Decomposition Product: Carbon disulfide	—	20 ppm (Skin)	30 ppm (Skin)	1 ppm (Skin)	3 ppm (Skin)

9. PHYSICAL AND CHEMICAL PROPERTIES (Not intended as Specifications)

Physical State:	Solid.
Appearance:	Yellow to yellow-green pellets.
Odour:	Strong, disagreeable sulphur odour.
Odour Threshold (ppm):	0.02 - 0.21(Carbon Disulphide)
Boiling Range (°C):	Not available.
Melting/Freezing Point (°C):	255 - 280 (decomposes). (3)
Vapour Pressure (mm Hg at 20° C):	Not applicable.
Vapour Density (Air = 1.0):	Not applicable.
Relative Density (g/cc):	0.7. (4)
Bulk Density:	Not applicable.
Viscosity:	Not applicable.
Evaporation Rate (Butyl Acetate = 1.0):	Not applicable.
Solubility:	Soluble in water. Hygroscopic (readily absorbs water).
% Volatile by Volume:	< 20. (3)
pH:	10.5 (10 % solution). (3)
Coefficient of Water/Oil Distribution:	Not available.
Volatile Organic Compounds (VOC):	Not applicable.
Flashpoint (°C):	-30. (Carbon Disulphide)

10. STABILITY AND REACTIVITY

CHEMICAL STABILITY

Under Normal Conditions:	Unstable. Solid Xanthates are stable when kept cool and dry. Exposure to heat causes decomposition. Acids and oxidizing agents accelerate aging. In solution, Xanthates will decompose slowly even at room temperature. (3)
Under Fire Conditions:	Flammable. This product may be capable of forming flammable dust clouds in air.
Hazardous Polymerization:	Will not occur.
Conditions to Avoid:	High temperatures, sparks, open flames and all other sources of ignition. Avoid accumulation and dispersion of dust to reduce explosion potential. Exposure to heat and moisture may cause the decomposition of xanthates to release flammable, explosive and poisonous Carbon Bisulphide vapours. (3)
Materials to Avoid:	Strong oxidizers. Lewis or mineral acids. Metal Salts. Copper and its alloys.. Contact with acids will liberate Carbon Bisulphide. Avoid moisture contamination. Contact with water or moisture will liberate Carbon Bisulphide. Mixtures or reactions of alcohols with the following materials may cause explosions: barium perchlorate, chlorine, hypochlorous acid, ethylene oxide, hexamethylene diisocyanate and other isocyanates, nitrogen tetroxide, permonosulfuric acid and tri-isobutyl aluminum. (4) Attacks some types of rubber, plastics and coatings.

Decomposition or Combustion Products:	Thermal decomposition products are toxic and may include Carbon Bisulphide, Potassium sulphide, carbonyl sulphide, Amyl Alcohols, oxides of carbon, sulphur, potassium and irritating gases.

11. TOXICOLOGICAL INFORMATION

TOXICOLOGICAL DATA:

SUBSTANCE	***LD50 (Oral, Rat)***	***LD50 (Dermal, Rabbit)***	***LC50 (Inhalation, Rat, 4h)***
Potassium Amyl Xanthate	1 000 mg/kg (3)	---	---
Potassium Hydroxide	214 - 365 mg/kg (1,3)	1 260 mg/kg (3)	---
Isoamyl alcohol	1 300 mg/kg (1)	3 216 mg/kg (1)	---
Decomposition Product: Carbon disulfide	1 200 mg/kg (1)	---	12 500 mg/m3 (1)

Carcinogenicity Data:	The ingredient(s) of this product is (are) not classed as carcinogenic by ACGIH, IARC, OSHA or NTP.
Reproductive Data:	This product: No adverse reproductive effects are anticipated.
Mutagenicity Data:	No adverse mutagenic effects are anticipated.
Teratogenicity Data:	No adverse teratogenic effects are anticipated.
Respiratory / Skin Sensitization Data:	None known.
Synergistic Materials:	Alcohols may interact synergistically with chlorinated solvents (example - carbon tetrachloride, chloroform, bromotrichloromethane), dithiocarbamates (example - disulfiram), dimethylnitrosamine and thioacetamide. (4) Carbon Bisulphide: The toxic effects of Carbon Bisulphide, particularly on the nervous system, can be intensified by consumption of alcohol, alcoholism, treatment with disulfiram (Antibuse), and exposure to Hydrogen Sulphide. (4) In animal studies the toxicity of Carbon Bisulphide was intensified by chemicals such as resperine and amphetamine which act on the nervous system. (4)
Other Studies Relevant to Material:	None known.

12. ECOLOGICAL INFORMATION

Ecotoxicity:	Not available. May be harmful to aquatic life.
Environmental Fate:	Not available. Product has an unaesthetic appearance and can be a nuisance. Can be dangerous if allowed to enter drinking water intakes. Do not contaminate domestic or irrigation water supplies, lakes, streams, ponds, or rivers.

13. DISPOSAL CONSIDERATIONS

Deactivating Chemicals:	Not available.
Waste Disposal Methods:	This information applies to the material as manufactured. Reevaluation of the product may be required by the user at the time of disposal since the product uses, transformations, mixtures and processes may influence waste classification. Dispose of waste material at an approved (hazardous) waste treatment/disposal facility in accordance with applicable local, provincial and federal regulations. Do not dispose of waste with normal garbage, or to sewer systems.
Safe Handling of Residues:	See "Waste Disposal Methods".
Disposal of Packaging:	Empty containers retain product residue and can be dangerous. Treat package in the same manner as the product.

14. TRANSPORTATION INFORMATION

CANADIAN TDG ACT SHIPPING DESCRIPTION:

XANTHATES, Class 4.2, UN3342, PG III.

Label(s): Substances Liable To Spontaneous Combustion. Placard: Substances Liable To Spontaneous Combustion.

ERAP Index: -----. Exemptions: None known.

US DOT CLASSIFICATION (49CFR 172.101, 172.102):

XANTHATES, Class 4.2, UN3342, PG III.

Label(s): Spontaneously Combustible. Placard: Spontaneously Combustible.

CERCLA-RQ: Not available. Exemptions: None known.

15. REGULATORY INFORMATION

CANADA

CEPA - NSNR:	All constituents of this product are included on the DSL.
CEPA - NPRI:	Not included.

Controlled Products Regulations Classification (WHMIS):

B-6: Reactive Flammable Material
D-1B: Toxic (acute effects)
D-2B: Toxic (skin and eye irritant)

USA

Environmental Protection Act:	All constituents of this product are included on the TSCA inventory.
OSHA HCS (29CFR 1910.1200):	Flammable Solid. Toxic. Skin and Eye Irritant.

NFPA: 3 Health, 4 Fire, 0 Reactivity (6)
HMIS: Health, Fire, Reactivity (Not available.)

INTERNATIONAL

Not available.

16. OTHER INFORMATION

REFERENCES

1. RTECS-Registry of Toxic Effects of Chemical Substances, Canadian Centre for Occupational Health and Safety RTECS database.
2. Clayton, G.D. and Clayton, F.E., Eds., Patty's Industrial Hygiene and Toxicology, 3rd ed., Vol. IIA,B,C, John Wiley and Sons, New York, 1981.
3. Supplier's Material Safety Data Sheet(s).
4. CHEMINFO, through "CCINFOdisc", Canadian Centre for Occupational Health and Safety, Hamilton, Ontario, Canada.
5. Guide to Occupational Exposure Values, 2007, American Conference of Governmental Industrial Hygienists, Cincinnati, 2007.
6. Regulatory Affairs Group, Brenntag Canada Inc.
7. The British Columbia Drug and Poison Information Centre, Poison Managements Manual, Canadian Pharmaceutical Association, Ottawa, 1981.

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APPENDIX E: AMEC Foster Wheeler Filtered Tailings Storage Facility Design Report

PRE-FEASIBILITY STUDY REPORT

DAWSON FILTERED TAILINGS STORAGE FACILITY

Fremont County, Colorado

Prepared for:

Zephyr Gold USA, Ltd.
Pacific Registered Agents
P.O. Box 5040
Salem, OR 97304-0040

Prepared by:

Amec Foster Wheeler
Environment & Infrastructure, Inc.
2000 S. Colorado Blvd., Ste. 2-1000
Denver, CO 80222
(303) 935-6505

November 2016

Project No. 74201633

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1.0 EXECUTIVE SUMMARY

Zephyr Gold USA Ltd (Zephyr) is in the early stages of advancing their proposed Dawson Gold mining project located in Fremont County, Colorado, approximately 6 miles southwest of Cañon City in south-central Colorado. The Dawson project is comprised of three mineralized areas designated as the Windy Gulch segment, the Dawson segment and the Windy Point segment. The ore bodies will be processed using gravity separation and flotation at an approximate throughput of 300 tons per day (tpd). Amec Foster Wheeler Environment & Infrastructure, Inc. (Amec Foster Wheeler) was commissioned by Zephyr to provide pre-feasibility level design for the proposed tailings storage facility at the Dawson Gold Project.

Filtered, or “dry stack”, tailings were selected as the preferred tailings management technology early in the project for two primary reasons: (i) the proposed tailings location in the valley immediately north of the proposed process plant presented an unattractive tailings storage to embankment fill ratio for conventional slurry tailings; and (ii) the proposed tailings location likely would not provide enough storage capacity for conventional slurry tailings to meet the life of mine (LOM) plan.

The Dawson Filtered Tailings Storage Facility (FTSF) has been designed to store up to approximately 1.0 million short tons (Mt) of tailings over an approximate 10 year period, based on a mill throughput of 300 tpd. Tailings will be hauled by truck from the filter plant to the FTSF site where they will be spread in thin lifts and compacted. Two tailings placement zones with different compaction requirements are included in the design to provide physical stability of the dry stack and operational flexibility for periods of wet weather or upset conditions at the filter plant. The tailings will be stacked at an overall slope of 3H:1V with intermediate benches to control erosion and runoff. A two-foot thick, non-mineralized sand and rock layer will be progressively placed on the downstream slope of the FTSF during operations for erosion protection. This layer will form a portion of the closure cover.

Perimeter diversion channels will be constructed around the FTSF to capture clean water (i.e., non-contact) and route it around the FTSF, thereby preventing clean water run-on to the FTSF. An underdrainage system will be constructed to capture seepage from the filtered tailings stack as well as any potential shallow groundwater or seepage from the FTSF foundation. The seepage, as well as runoff from the dry stack, will be directed to a geomembrane-lined contact water pond downstream of the FTSF. Contact water collected in the pond will be recycled back to the process plant, evaporated or treated (if necessary to achieve water quality standards) and released.

For closure, a vegetative cover system will be constructed over FTSF. A closure channel will be constructed around the perimeter of the ultimate tailings facility to capture surface water runoff and prevent surface water runoff flow onto the reclaimed tailings facility. The final surface of the FTSF will be graded to promote runoff from direct precipitation to the closure channel. Seepage from the FTSF is expected to be negligible, however seepage will be monitored and treated if necessary to meet water quality standards of the State of Colorado. Once demonstrated to no longer be necessary for water quality monitoring, the seepage pond will be decommissioned, re-graded to original topography and re-vegetated.

Capital and operating cost estimates were developed for the FTSF to a level of accuracy of +/- 35%. The capital and operating cost estimates are presented in **Table 1** and **Table 2**, respectively. Note that estimation of capital costs for the tailings filter plant are not included in the capital cost estimate.

Table 1: Summary of Capital Costs

Description	Year 0 Cost (US$)	Year 1-3 Cost (US$)	Year 3-5 Cost (US$)	Year 5-10 Cost (US$)
1.0 MOBILIZATION/DEMOBILIZATION	$ 30,118	$ 8,533	$ 9,043	$ 10,448
2.0 SITE PREPARATION	$ 42,955	$ 35,263	$ 29,124	$ 38,674
3.0 HAUL/ACCESS ROAD TO FTSF	$ 19,731	$ -	$ -	$ -
4.0 STARTER BUTTRESSES	$ 20,908	$ -	$ -	$ -
5.0 UNDERDRAINS	$ 56,718	$ 24,761	$ 11,004	$ 5,925
6.0 CONTACT WATER POND	$ 120,820	$ -	$ -	$ -
7.0 SURFACE WATER CHANNELS	$ 194,766	$ 61,881	$ 89,059	$ 104,663
8.0 MONITORING / INSTRUMENTATION	$ 17,500	$ 5,000	$ -	$ -
9.0 CONTINGENCY TAILINGS STORAGE IMPOUNDMENT	$ 13,940	$ -	$ -	$ -
TOTAL CONSTRUCTION COST	**$ 517,457**	**$ 135,439**	**$ 138,229**	**$ 159,709**
10.0 CONTINGENCY (20%)	$ 103,491	$ 27,088	$ 27,646	$ 31,942
TOTAL CONSTRUCTION COST + CONTINGENCY	**$ 620,948**	**$ 162,526**	**$ 165,875**	**$ 191,651**
11.0 INDIRECT COSTS (10%)	**$ 51,746**	**$ 13,544**	**$ 13,823**	**$ 15,971**
TOTAL	**$ 672,694**	**$ 176,070**	**$ 179,698**	**$ 207,622**

Table 2: Summary of Operating Costs

Description	Annual Cost (US$)
1.0 ANNUAL EARTHWORKS (ROADS, TAILINGS & EROSION PROTECTION LAYER PLACEMENT)	**$ 223,875**
2.0 ANNUAL MONITORING	**$ 58,960**
TOTAL ANNUAL OPERATING COSTS	**$ 282,835**
3.0 CONTINGENCY (20%)	**$ 56,567**
TOTAL ANNUAL OPERATING COST + CONTINGENCY	**$ 339,402**
COST PER TON (NOT INCLUDING TAILINGS FILTRATION)	$ 3.10

The most significant uncertainties with respect to the pre-feasibility FTSF design relate to the feasibility of tailings filtration to the required moisture contents and the geochemical characterization of the different ore types. The feasibility of tailings filtration to the optimum moisture content (approximately) has not been proven for the Windy Gulch or Dawson tailings. Consequently, the tailings filter plant sizing, capital cost, cycle times, operating costs, etc. are uncertain. Bench-scale pressure filtration testwork on the different ore types will be needed for the next study phase.

Geochemical characterization of the Dawson or Windy Point tailings has not been undertaken. A synthetic sample of Windy Gulch tailings were shown to be “non-PAG” or “uncertain” potential for acid generation, depending on the evaluation method. Additional testwork will be needed to characterize the geochemistry of the tailings.

2.0 INTRODUCTION

Zephyr Gold USA Ltd (Zephyr) is in the early stages of advancing their proposed Dawson Gold mining project located in Fremont County, Colorado, approximately 6 miles southwest of Cañon City. Amec Foster Wheeler Environment & Infrastructure, Inc. (Amec Foster Wheeler) was commissioned by Zephyr to provide pre-feasibility level design for the proposed Dawson Filtered Tailings Storage Facility (Dawson FTSF) at the Dawson Gold Project.

2.1 Background

Zephyr is proposing a gold mining operation for the Dawson property in Fremont County, Colorado. The Dawson Property comprises a group of patented and unpatented mining claims totaling approximately 1,000 acres in size. The gold mineralization on the property is hosted in several segments of which the Dawson Segment and Windy Gulch Segment currently contain the majority of the gold resources identified to date. The Dawson Segment and Windy Gulch Segment gold deposits are part of an intrusion-related shear zone. The mineralization is hosted by a sequence of amphibolite-grade Proterozoic felsic gneisses, and occurs in steeply dipping, east-west trending multiple horizons up to 50 feet thick that can be traced across the property for a distance of 1.6 miles.

The Windy Gulch Segment will be a small open cut planned to be mined by contractor using conventional truck and shovel methods for approximately the first year of operations. Mining will then transition to the underground Dawson Segment. The preliminary underground mine design is sublevel longhole stoping (MineTech, 2015). A portal and decline access is anticipated to be located near the process plant site.

Ore will be processed using gravity separation and flotation at an average milling rate of 300 short tons per day (tpd). No cyanide leaching is included in the process flowsheet. The total life-of-mine (LOM) is approximately 5 years, though there is potential to extend the LOM based on future exploration.

Amec Foster Wheeler was commissioned by Zephyr in June 2016 to prepare a pre-feasibility study for a new tailings storage facility at the Dawson site. The proposed tailings site is located within a small valley just north of the proposed portal and process plant site. This location was selected by Zephyr based on its proximity to the portal and process plant; its relatively small upstream tributary watershed; and favorable storage capacity relative to other nearby sites.

Early in the project, Amec Foster Wheeler developed a conceptual design for a conventional slurry tailings storage facility with construction of a tailings dam. This conceptual design indicated an unfavorable tailings storage to embankment fill ratio (~1.2), which is not an economically attractive tailings management strategy. Furthermore, the conceptual study indicated that the proposed TSF site likely would not provide enough storage capacity for conventional slurry tailings to meet LOM plan.

Filtered tailings were subsequently selected as the preferred tailings management technology for the Dawson Project to achieve the LOM tailings storage at the proposed tailings storage site, while significantly reducing the earthworks materials necessary to construct a tailings dam. Filtered tailings provide several additional benefits when compared to slurry tailings, including:

- Reduced TSF footprint;
- Recycled water to the process circuit, reducing needs for make-up water;
- Increased recovery of process solutions at the plant;
- Significantly reduced risks relating to stability of the tailings facility;
- Significantly reduced seepage rates from the tailings facility; and
- Opportunity for progressive reclamation of the tailings facility during operations.

This report presents a pre-feasibility level study developed by Amec Foster Wheeler for the proposed Dawson FTSF.

2.2 Filtered Tailings Concept

The tailings continuum based on moisture content is presented in **Figure 1**, which has been adopted from Davies and Rice (2004) and Davies (2011). Filtered tailings or "dry cake" form the lowest moisture content of tailings on the continuum. As filtered tailings are non-pumpable, they must be transported by truck haulage or conveyors.

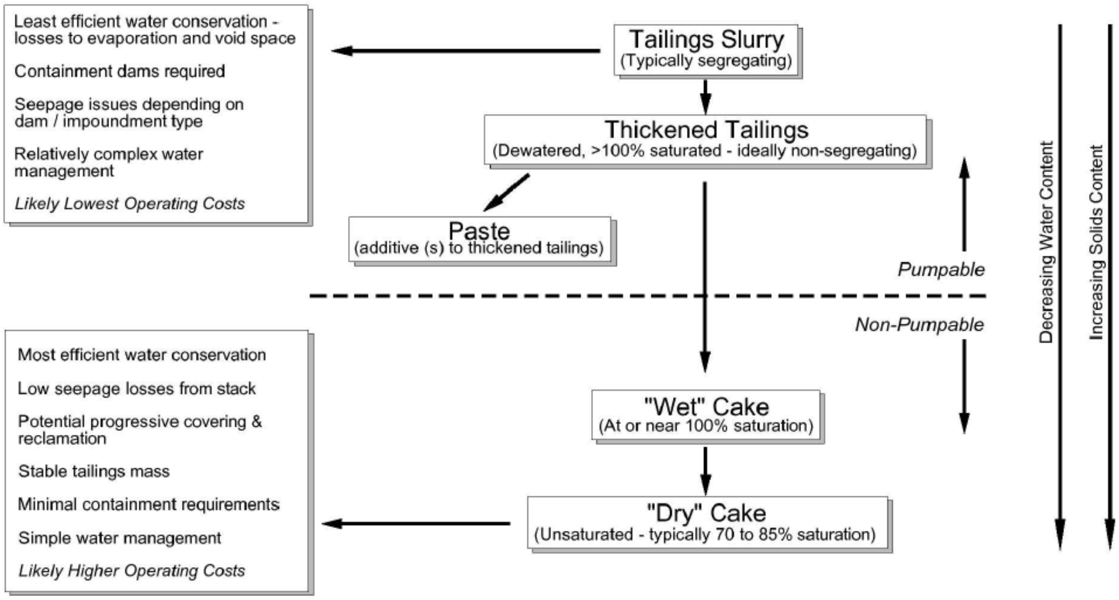


Figure 1: Tailings Continuum (Davies, 2011)

Tailings at the Dawson project will be dewatered by the filtering process to their approximate optimum moisture content according to the standard Proctor. The tailings filtration process is yet to be defined, however, based on preliminary bench scale vacuum belt filtration testing, it appears that pressure plate filtration may be a more effective dewatering method. It is essential that the feasibility of the dewatering the tailings to a moisture content at or near the standard Proctor optimum moisture content be evaluated with filtration testwork. Filtration testing of the tailings was outside this scope of services.

The dewatered tailings are transported to the tailing storage facility by either truck haulage or conveyor. Trafficability on the tailings is an issue for either case. Heavy truck traffic is typically limited to roads that are developed and maintained over the dry stack. Additional compaction and road surfacing material is often necessary along roads and conveyors crossing the dry stack. At Dawson, truck haulage is most likely more practical and versatile method for tailings haulage due to the small mill throughput.

Tailings will be dumped and spread into thin lifts (typically 12 inches or less), and compacted in an unsaturated condition. Filtered tailings compacted and maintained at target moisture contents exhibit limited seepage due to the very low effective hydraulic conductivity of the compacted tailings as well as the limited potential for infiltration of surface water or air due to the high air-entry tension of the unsaturated filtered tailings. When filtered tailings are properly compacted in an unsaturated state and proper surface water management controls are implemented, filtered tailings stacks results in very low infiltration (Lupo and Hall, 2010).

The design of the FTSF includes an underdrain system constructed in the drainage bottoms to collect seepage from the tailings and potential groundwater seeps to maintain a dewatered foundation for the facility. Water collected in the underdrain system will be routed to a lined pond downstream of the facility. Collected seepage will be monitored for water quality, and either evaporated, recycled to the process circuit, or treated and released in accordance with State environmental requirements.

Water management is an important consideration for filtered tailings facilities, both for contact and non-contact water. Non-contact water runoff onto the dry stack must be eliminated. At Dawson, construction of perimeter diversion channels every two years or so will be required to intercept and divert surface water from the tributary basins southwest of the FTSF. Contact water, such as runoff of direct precipitation onto the tailings surface or water from the foundation underdrain, is collected in a lined pond downstream of the facility.

2.3 Scope of Work

Amec Foster Wheeler's scope of work for the pre-feasibility study of the proposed Dawson Filtered Tailings Storage Facility (FTSF) is outlined in Amec Foster Wheeler's proposal titled, "Proposal for Dawson Gold Project Pre-feasibility Design and Engineering for the New Tailings Storage Facility", dated 17 July 2015. Specific tasks performed by Amec Foster Wheeler as part of the FTSF design include the following:

- Preparation and issuance of project design criteria;
- Geotechnical investigation at the proposed FTSF including test pits and laboratory testing;
- Geochemical characterization of a prepared tailings sample;
- Pre-feasibility level design of the FSTS including the following engineering analyses:
  - Site specific seismic hazard assessment;
  - Unsaturated seepage modeling for various phases of the FTSF;
  - Stability evaluation of the FTSF;
  - Design of facility underdrainage system and contact water management pond;
  - Hydrologic study and hydraulic design of stormwater management features; and
  - Development of stage-storage capacity curve;

- Preparation of pre-feasibility level design drawings of the FTSF;
- Preparation of Technical Specifications;
- Preparation of construction quality control and construction quality assurance (CQC/CQA) Plan;
- Development of a bill of quantities and cost estimate to +/- 35%;
- Preparation of a pre-feasibility design report for the FTSF;
- Preparation of an environmental monitoring plan for pre-production, operations and closure;
- Preparation of conceptual closure plan for the FTSF; and
- Preparation of an Operations, Maintenance and Surveillance (OMS) Manual for the Dawson FTSF, including requirements for geotechnical and environmental monitoring. The OMS Manual for the proposed FTSF will be included under separate cover.

The scope of work is limited to the items presented above. For additional clarity, the following tasks are outside this scope of work:

- Design and sizing of the tailings filter plant;
- Tailings filtration testwork; and
- Hydrogeological characterization of the site is being carried by others.

3.0 SITE DESCRIPTION

3.1 Existing Conditions

The Dawson Project is located in the foothills of the northern Wet Mountains. Topography at the site is moderately rugged and sloping with slopes typically ranging from 5 to 50%. Access to the site is provided by a gravel surfaced road off of County Road 3 (Temple Canyon Road).

As shown on **Drawing 100**, the proposed site for the Dawson FTSF is located in a valley immediately north of the proposed process plant. The drainage appears to only convey intermittent flows resulting from runoff from storm events and snowmelt. Vegetation at the site primarily consists of piñon pine and juniper with some sagebrush, grasses and cacti.

Exploration, prospecting and small-scale mining have periodically taken place in the area of the Dawson project since the late 1800's. The mining history of the area is described by the Technical Reports for the property (MineTech, 2015). Past mining activities at the site are evident by access roads for exploration, small adits and prospect pits.

3.2 Climate

The Dawson project site is located in the high desert of south-central Colorado at elevations ranging from approximately 6,500 to 7,000 feet. The climate is semi-arid and on average receives approximately 12-inches of annual precipitation. **Table 3** summarizes statistics of local precipitation based on approximately 67 years of precipitation data (1950-2016) from the Cañon City Weather Station, located approximately 10 miles from the site. The average annual pan evaporation at the site was estimated to be 75 inches. As local evaporation data were unavailable, this estimate was based on evaporation data from regional weather stations of similar elevation and climate. Average minimum monthly temperatures range from approximately 21ºF in January to approximately 60ºF in July and August, while average maximum monthly temperatures range from approximately 50ºF in December and January to approximately 89ºF in July.

Table 3: Monthly Precipitation Statistics

Month	Mean (in.)	Median (in.)	Minimum (in.)	Maximum (in.)
January	0.49	0.40	0.01	3.50
February	0.50	0.38	0.01	2.12
March	0.94	0.87	0.04	2.67
April	1.51	0.93	0.10	6.83
May	1.58	1.28	0.05	6.57
June	1.16	1.06	0.03	4.65
July	1.92	1.86	0.19	5.99
August	1.95	1.88	0.17	4.83
September	1.11	0.94	0.04	5.34
October	0.87	0.70	0.03	3.89
November	0.64	0.54	0.02	2.31
December	0.51	0.42	0.03	1.65
Total	11.98	11.54	0.31	22.63

3.3 Short-Duration Storm Precipitation

Precipitation depths for 24-hour storms with recurrence intervals of 2, 5, 10, 25, 50, 100 and 1,000 years were obtained from the National Oceanic and Atmospheric Administration precipitation data frequency server (NOAA, 2013) and are summarized in **Table 4**.

Table 4: Projected 24-Hour Storm Totals

Storm Event	Precipitation (inches)
2-year	1.82
5-year	2.27
10-year	2.72
25-year	3.43
50-year	4.05
100-year	4.74
1,000-year	7.56

3.4 Geologic Setting

The Dawson project site is located in the northern Wet Mountains in the Southern Rocky Mountain Physiographic Province and is characterized by Proterozoic volcanic and sedimentary units. The Reconnaissance Geologic Map of the Royal Gorge Quadrangle (Taylor et al., 1975) essentially maps the entire footprint of the proposed Dawson FTSF as Cretaceous Dakota Sandstone and Purgatoire Formation. The Dakota Sandstone is described as a yellowish-brown fine-grained sandstone containing some shale of the Dry Creek Member in the upper middle portion of the section. The Purgatoire Formation consists of shale and sandstones of the Glencairn Shale Member and Lytle Sandstone Member. The formation is reported to have a total thickness of approximately 300 feet. **Drawing 110** presents a geologic map of the Dawson FTSF area digitized from the geologic map prepared by Taylor et al. (1975).

3.5 Groundwater

Two monitoring wells were installed at the project site in 2014. One well is located downstream of the proposed FTSF ("Dawson North", well permit #295712) and the other well is located approximately 1,000 feet south ("Dawson South", well permit #295711). Depths to groundwater has been monitored quarterly by Zephyr since October 2014. The depth to groundwater in the Dawson North monitoring well was reported to be 190 feet at the time of installation (September 2014) and has varied from 168 to 176 in quarterly readings taken between October 2014 and October 2015. **Table 5** presents a summary of the monitoring well installation and groundwater depth readings.

Table 5: Summary of Monitoring Wells

Well ID	UTM Coordinates		Total Depth (ft)	Screened Interval (ft)	Screened Interval Geology	Depth to Groundwater (ft)					
	Easting	Northing				Sep-14	Oct-14	Jan-15	Apr-15	Jul-15	Oct-15
Dawson North	474128	4249407	220	180-200	Sandstone	190	176	173	172	173	168
Dawson South	474083	4249087	140	100-120	Granite	105	45	55	55	27	29

3.6 Seismicity

As part of the Dawson FTSF pre-feasibility study, Amec Foster Wheeler conducted a site-specific seismic hazard study using both deterministic and probabilistic analyses. The probabilistic seismic hazard analysis estimated the following peak ground accelerations (PGA) associated with various return periods:

- 0.04 g for an approximate return period of 500 years;
- 0.11 g for an approximate return period of 2,500 years; and
- 0.17 g for an approximate return period of 5,000 years.

The PGA for the Maximum Credible Earthquake (MCE) is estimated to be 0.11 g based on the 84th percentile deterministic spectra for the larges earthquake on the closest Quaternary fault. The site-specific seismic hazard study is presented in **Appendix B**.

4.0 DESIGN CRITERIA

This section summarizes the design criteria and design basis to support the pre-feasibility design of the proposed Dawson FTSF. Design criteria for the project are included as **Appendix A**.

4.1 Design Criteria

The design criteria for the Dawson FTSF were based primarily on the Mineral Rules and Regulations for Hard Rock, Metal, and Designated Mining Operations as set forth by the Colorado Office of Mined Land Reclamation based on records of the Division of Reclamation, Mining and Safety (DRMS, 2015a). The major design criteria for the Dawson FTSF are summarized as follows:

Production:

- Tailings production will be 300 short tons per day;
- LOM tailings production will be 500,000 tons, with potential for expansion to 1,000,000 tons. The pre-feasibility design has been developed for expansion to 1,000,000 tons, though the configuration is presented for 500,000 tons as well;

Tailings Properties:

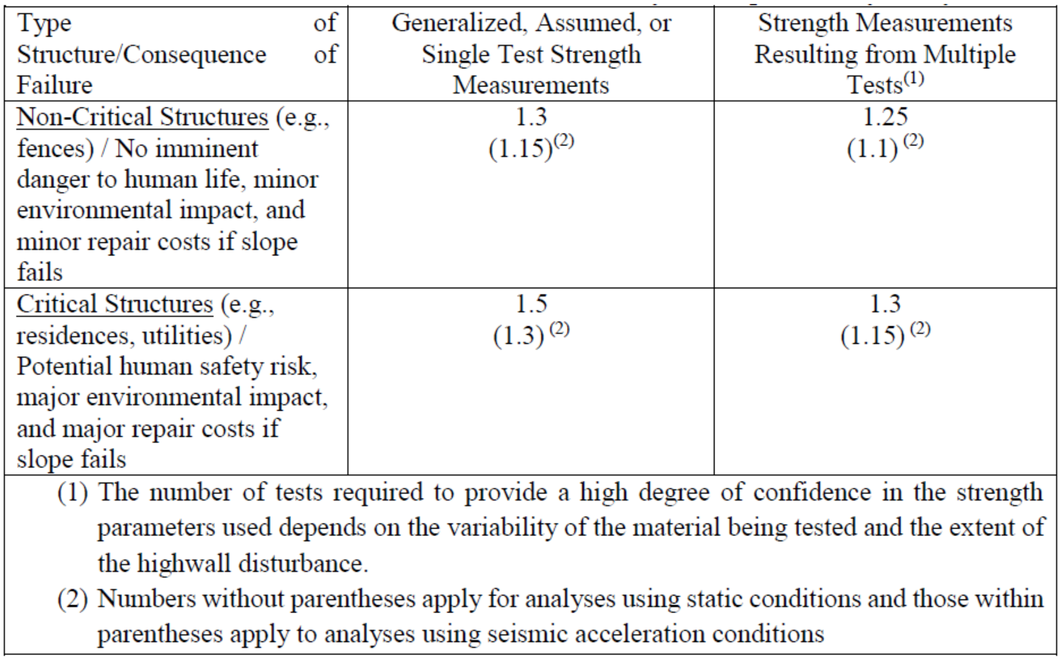
- Tailings are assumed to be dewatered and maintained at approximately the standard Proctor optimum moisture content in order to achieve the compaction requirements;
- Tailings maximum dry density is approximately 111 pounds per cubic foot (pcf) with an optimum moisture content of 15.9% according to the standard Proctor (ASTM D698).
- Percent passing 75 µm particle size is approximately 60% from laboratory testing of a synthetic tailings sample from the Windy Gulch deposit;
- Tailings specific gravity is approximately 2.51 (based on tailings settling test report by Bomenco dated 8 March 2016); and

Seismic and Stability Requirements:

Criteria for minimum factors of safety for slope stability analyses were adopted as detailed below based on **Table 6** (DRMS, 2015b).

- Minimum static factor of safety is 1.5;
- Minimum pseudo-static factor of safety is 1.3

Table 6: Recommended Minimum Factors of Safety for Slope Stability Analyses (DRMS, 2015b)



Type of Structure/Consequence of Failure	Generalized, Assumed, or Single Test Strength Measurements	Strength Measurements Resulting from Multiple Tests(1)
Non-Critical Structures (e.g., fences) / No imminent danger to human life, minor environmental impact, and minor repair costs if slope fails	1.3 (1.15)(2)	1.25 (1.1) (2)
Critical Structures (e.g., residences, utilities) / Potential human safety risk, major environmental impact, and major repair costs if slope fails	1.5 (1.3) (2)	1.3 (1.15) (2)

(1) The number of tests required to provide a high degree of confidence in the strength parameters used depends on the variability of the material being tested and the extent of the highwall disturbance.

(2) Numbers without parentheses apply for analyses using static conditions and those within parentheses apply to analyses using seismic acceleration conditions

- Design Peak Ground Acceleration (PGA):
  - Maximum Credible Earthquake (MCE) = 0.11 g
  - 2% chance of exceedance in 50 years (~1/2,500 year) = 0.11 g
- Design seismic (pseudo-static) coefficient = 0.055 (50% of PGA, Hynes-Griffin and Franklin (1984)).

Surface Water and Stormwater Design:

- Temporary channels (during operations) are designed for 10-year, 24-hour peak discharge; and
- Permanent channels (for closure) designed for 100-year, 24-hour peak discharge.

Seepage and Contact Water Management:

- Seepage and contact water from the FTSF will be collected by an underdrain system and channels and routed to a lined contact water pond located downstream of the facility. Contact water will be either evaporated, recycled to the process plant or treated (as required to meet water quality standards) and released.

Monitoring and Instrumentation:

- Groundwater monitoring wells shall be installed upstream and downstream of the FTSF to monitor water quality (DRMS, 2015a);
- Monitoring of settlement and deformation of the FTSF will be via survey monuments to be installed on the completed slopes;
- Integrity of the tailings stack shall be periodically assessed with Cone Penetration Testing (CPTu) program; and

- Visual surveillance of the FTSF will be conducted during operations in accordance with the Operations, Maintenance and Surveillance (OMS) manual.

4.2 Design Basis

The overall objectives for design of the proposed Dawson FTSF include achieving tailings storage capacity for at least five years, with potential for expansion for 10 years of tailings storage, while minimizing overall construction costs and complying with environmental regulations of the State of Colorado. Filtered tailings were selected for the Dawson FTSF primarily due to a poor dam fill : tailings storage capacity ratio at the tailings site for conventional slurry tailings. Because of the compacted density of filtered tailings, the facility footprint is reduced allowing the selected tailings site west of the process plant to provide tailings storage for at least 10 years at a mill throughput of 300 tpd. Additionally, properly operated filtered tailings facilities are inherently lower risk facilities compared to slurry tailings facilities with respect to stability, consequences of dam failure, management of seepage and contact water.

It is essential to point out that the design of the dry stack is based on achieving certain levels of compaction of the tailings which will only be feasible if the tailings can be effectively dewatered to approximately the standard Proctor optimum moisture content. Tailings characteristics vary greatly and tailings filtration characteristics are based on ore mineralogy, grain-size distribution and plasticity, and chemical processes used for metals extraction. Only limited and preliminary vacuum filtration has been conducted (by others) on a sample of synthetic tailings. The preliminary results suggested that vacuum filtration may not be effective to dewater the tailings to the optimum moisture content. Filtration testwork, including pressure filtration methods, should be carried out on tailings samples both from Windy Gulch and the Dawson segment (as well as other ore types, if applicable) as soon as practical to characterize the feasibility of tailings dewatering and size the tailings filter plant.

Additionally, the design of the Dawson FTSF was based on the following criteria, assumptions and constraints:

- The proposed location for the filtered tailings storage facility is in the valley immediately north of the proposed process plant site based on its proximity to the plant and favorable configuration to achieve the criteria for tailings storage capacity;
- Tailings transport is anticipated to be by truck haulage from the filter plant to the FTSF. Considering the proposed throughput of 300 short tons per day (tpd), tailings transport by overland conveyor and stacking systems are likely less attractive from an economic and operational standpoint;
- Availability of non-mineralized (non-PAG) waste rock for construction of the starter buttresses and fine waste rock for the erosion protection layer on the downstream slope of the dry stack. The erosion protection layer is placed during operations;
- Two zones of tailings placement are provided to achieve physical stability of the facility while also providing operational flexibility of tailings during times of heavy precipitation or upset filter plant conditions;

5.0 GEOTECHNICAL EXPLORATION PROGRAM

A pre-feasibility level geotechnical exploration program was performed at the proposed FTSF site to provide an initial characterization of the geological and geotechnical characteristics of the proposed FTSF foundation. The program consisted of a site reconnaissance and excavation of three test pits in August 2016. The subsurface conditions are briefly discussed below and test pit logs are presented in **Appendix C.1**. Locations of test pits referenced in the following sections are presented on **Drawing 110**.

5.1 Site Reconnaissance

The proposed FTSF is located within a valley dissected by an east-west trending drainage. This reports to a larger drainage on the eastern edge of the site that eventually drains into the Arkansas River to the north of the site. The area of the proposed Dawson FTSF is moderately to heavily vegetated with trees, native grasses, small shrubs, and cacti.

Dakota sandstone outcrops dominate the south facing slopes of the valley at the northern portion of the proposed Dawson FTSF footprint, whereas alluvial/colluvial deposits overlie bedrock on the north facing slopes of the valley. Bedrock outcrops are present along parts of the drainage bottom. The sandstone outcrops were slightly weathered, medium strong to strong and slightly fractured. Some of the bedrock outcrops at the southern portion of the site reacted to hydrochloric acid (HCl) indicating calcareous cementation, however reaction to HCl was not prevalent for bedrock throughout the site.

5.2 Subsurface Conditions

Three test pits, designated TP-01, -02 and -03, were excavated within and in the vicinity of the proposed FTSF footprint. As shown on **Drawing 110**, TP-01 and TP-03 were located on the south slopes of the valley, and TP-02 was located on the north slope of the valley near the drainage bottom. The test pits were excavated by Lippis Excavating of Cañon City using a rubber wheeled backhoe.

Subsurface conditions encountered in the test pits consisted of approximately 5 to 24 inches of topsoil overlying dry to moist, moderately dense clayey sand with gravel to sandy clay with some gravel and cobbles. All test pits were excavated to depths of 9 to 10 feet (maximum reach of the backhoe) and no groundwater was observed in any of the excavations. Backhoe refusal was met at a depth of 9 feet in TP-02 on bedrock. Bedrock was not encountered in TP-01 or TP-03. The pits were logged by an Amec Foster Wheeler engineer and bulk soil samples were collected from the test pits for laboratory testing. The test pits were all backfilled with the spoil material and compacted with the backhoe bucket.

5.3 Laboratory Testing

Selected samples from the test pit program were tested by Advanced Terra Testing (ATT) of Lakewood, Colorado. A total of four bulk samples were tested: one from TP-01 (depth of 9 feet), two from TP-02 (depths of 5 and 9 feet), and one from TP-03 (composite sample). The laboratory testing consisted of moisture content, sieve analysis, Atterberg limits, and standard Proctor compaction. The samples from TP-01 and TP-03 were classified as clayey sand (SC) and the samples from TP-02 were classified as lean sandy clay (CL) according to the Unified Soil Classification System (USCS). One standard Proctor test was performed on the composite sample from TP-

03, which showed a maximum dry density of 128.4 lb/ft³ and an optimum moisture content of 8.9%. The lab testing results are presented in **Appendix C.2**.

6.0 TAILINGS CHARACTERIZATION

For this study, one composite synthetic tailings sample was generated from 60 core samples obtained from exploration drilling of the Windy Gulch deposit. Geotechnical classification testwork and geochemical characterization were conducted on the tailings sample. The results of this testwork are presented in the following sections. As no tailings sample was available from the Dawson Segment, the properties of the Windy Gulch tailings sample were assumed for the design of the FTSF. Future studies should evaluate the properties of tailings from the Dawson Segment.

6.1 Geotechnical Characterization

Geotechnical classification testing conducted on the synthetic tailings sample included the following:

- Particle size distribution (ASTM C117 and C136)
- Atterberg limits (ASTM D4318)
- Standard Proctor (ASTM D698)

The Windy Gulch tailings were found to be non-plastic and have 60% by weight passing the #200 sieve (75µm). The standard Proctor yielded a maximum dry density of 1,780 kg/m^3 (~111 pcf) at an optimum moisture content of 15.9%. Results of the geotechnical testing on the tailings sample are presented in **Appendix D**.

6.2 Geochemical Characterization

Geochemical testing was performed by Maxxam Analytics, Inc. of Burnaby, BC on a sample of composite synthetic tailings generated from 60 samples of core material obtained from the Windy Gulch Segment. Testing included static testing to characterize the mineralogy and acid generation potential and accelerated weathering tests to characterize the metals leaching potential. The results of the geochemical testing of the tailings sample is detailed in a technical memorandum presented in **Appendix E**. The geochemical testing methodology and results are summarized below.

6.2.1 Mineralogy and Acid-Generation Potential

Static tests of the composite tailings to characterize its acid-generation potential included the following:

1) Mineralogy using x-ray diffraction (XRD) with a Rietveld correction;
2) Whole rock major oxides by x-ray fluorescence;
3) Whole rock total metals after 4-acid digestion;
4) Paste pH;
5) Acid base accounting (Modified Sobek ABA package);
6) Sulfur speciation; and
7) Single-addition net acid generation (NAG) testing.

Items 4-7 involved testing of three split samples from the composite to demonstrate the variability, or lack thereof, within the composite sample and provide information to assess the potential for acid generation of the tailings.

Minerals detected by XRD include quartz (67.5%), and numerous aluminosilicates, including feldspars (potassium and plagioclase = 6.1%) and mafic aluminosilicates (21.4%), as well as magnetite (0.2%) and goethite (4.8%). No carbonates or sulfides were detected by XRD.

Results from the ABA testing of the synthetic mine tailings from the Windy Gulch Segment are mixed with respect to the potential for the material to be acid-generating. The sulfur speciation data show that there is very little sulfur (0.1 weight percent) remaining in the tailings, and of that, only 0.01 weight percent is sulfide-sulfur. In addition to the low concentrations of total and pyritic sulfur in the tailings, the neutralization potential ratio (NPR) and NAG pH results indicate the material is classified as non-potentially acid generating (non-PAG); however, the net neutralization potential (NNP) results show the tailings to be “uncertain”. The acid neutralization potential (NP) for all splits greatly exceeded the acid generation potential (AP), however NP was not due to the presence of calcite as there was no “fizz rating”, therefore, the NP must be derived from iron oxides, reactive aluminosilicate, or silicate minerals.

6.2.2 Metals Leaching Characterization

The leachability of constituents from the tailings was tested using the Synthetic Precipitation Leaching Procedure (SPLP) and the Meteoric Water Mobility Procedure (MWMP). These procedures were performed on a subsample of the three splits of the composite tailings sample.

The concentrations of most constituents in the leachates from both the SPLP and MWMP were well below standards for domestic drinking water and agriculture published by CDPHE Water Quality Control Commission (WQCC). However, the leachate concentrations of four constituents (cobalt, copper, manganese, and selenium) were very near to, or exceeded, the water quality standards. The concentrations of cobalt in the leachates for both the scaled SPLP and MWMP results were slightly greater than the agricultural standard of 0.05 mg/L. The concentrations of copper, manganese and selenium in the leachates were approximately an order of magnitude greater than the domestic water supply and/or the agricultural water quality standards. These data indicate that there is potential that meteoric water infiltrating through the tailings could mobilize the constituents at levels that could negatively impact waters of the State. In addition to the four metals in the leachate that exceeded a water quality standard, the pH of the leachate from both the SPLP and MWMP were below pH 6 and in two MWMP samples were below pH 5. While the paste pH and NAG pH values were very close to or above pH 6, the lower pH in the SPLP and MWMP leachates suggest that there is some potential for the tailings to be slightly acidic, at least initially before the oxides, and/or aluminosilicates/silicates provide buffering due to their weathering.

7.0 FTSF DESIGN COMPONENTS

The Dawson FTSF has been designed to store up to approximately 1.0 million short tons (Mt) of filtered tailings over an approximate 10 year period, based on a mill throughput of 300 tpd. The location of the FTSF is proposed to be in a small valley immediately north of the proposed process plant site. The location and general layout of the FTSF, proposed process plant and related facilities are presented on **Drawing 100**.

Tailings will be hauled by truck from the filter plant to the tailings facility where they will be spread in thin lifts and compacted. Two tailings placement zones with different compaction requirements are included in the design to provide physical stability of the dry stack and operational flexibility for periods of wet weather or upset conditions at the filter plant. A Shell Placement Zone, designated "Zone 1", will be placed in the downstream shell of the FTSF to provide physical stability to the dry stack. A General Placement Zone, designated "Zone 2" will be placed upstream of Zone 1 and will provide operational flexibility for tailings placement during periods of wet weather or upset filter plant conditions. The tailings will be stacked at an overall slope of 3H:1V with intermediate benches to control erosion and runoff. A schematic of the intermediate bench concept is presented in ***Figure 2***. An erosion protection layer will be progressively placed on the downstream slope of the FTSF during operations for erosion protection.

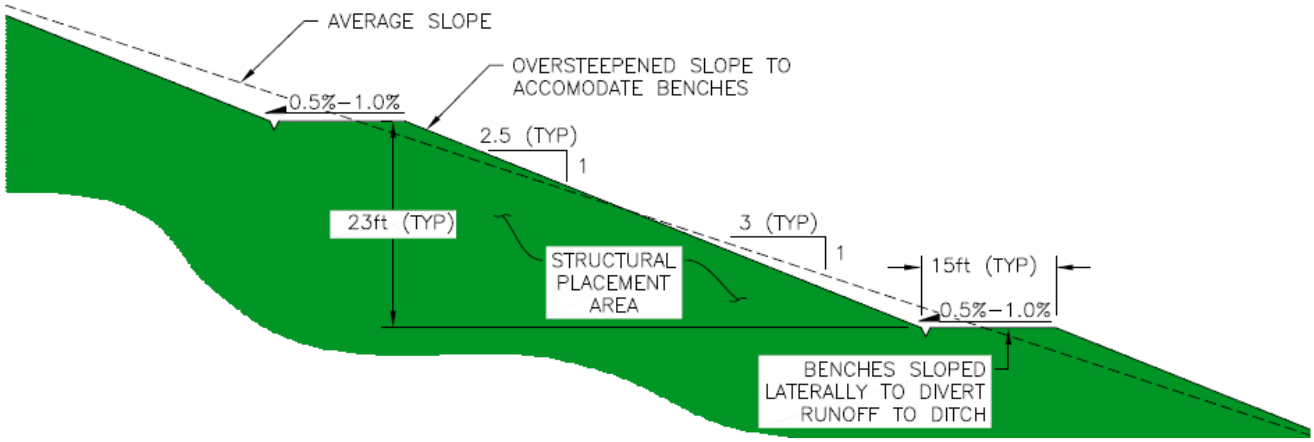


Figure 2: Schematic of Intermediate Benches on Downstream FTSF Slope

Additionally, a contingency tailings impoundment will be located near the process plant for temporary storage during times when the tailings filter plant is off-line for maintenance or operational problems. The contingency tailings impoundment will be lined and will provide approximately 24-hours of tailings capacity.

No liner system is included in the FTSF design based on the low seepage rates observed from compacted filtered tailings stacks and the relatively benign geochemistry of the tailings. However, an underdrainage system will be constructed to capture any seepage from the filtered tailings stack as well as any potential shallow groundwater or seepage. The seepage will be directed to a lined contact water pond downstream of the FTSF. Contact water collected in the pond will be recycled back to the process plant, evaporated or treated (if necessary to achieve water quality standards) and released.

Perimeter diversion channels will be constructed around the FTSF to capture stormwater runoff (i.e., non-contact) and route it around the FTSF, thereby preventing clean water run-on to the FTSF. The following sections describe key components of the FTSF design in greater detail.

7.1 Underdrain System

A network of underdrains will be constructed within the drainage bottoms of the FTSF footprint. The purpose of the underdrains is to capture and collect seepage due to consolidation of the tailings and provide foundation drainage to the tailings facility. Water collected by the underdrains will be routed to a lined contact water pond located downstream of the FTSF. Water collected in the contact water pond will be either evaporated, recycled to the process plant or treated (as necessary to meet water quality requirements) and released. The contact water pond is further described in Section 7.6.

The underdrains will consist a 4-inch diameter perforated corrugated polyethylene pipe surrounded by free-draining underdrain material. The underdrain material shall be filter compatible with the filtered tailings to prevent migration of fines into the underdrains. Due to shallow and outcropping bedrock in the drainage bottom, the underdrains will be constructed above the prepared ground surface (instead of in an excavated trench). The underdrains have been sized to convey the estimated seepage from the tailings with a factor of safety of 100, to account for uncertainties of the estimated seepage rates and potential for foundation seepage. The underdrain layout and details are presented on **Drawing 120**.

The underdrain system shall be progressively constructed and extended upgradient in the natural drainages throughout operations as the filtered tailings stack expands. The upgradient end of the underdrains shall be capped and protected from contamination with sediment, equipment damage or other degradation throughout operations.

7.2 Starter Buttress

A starter buttress will be constructed within the valley bottom at the toe of the FTSF to provide lateral confinement of tailings at the operations start-up. The starter buttress will be constructed with rockfill and will also provide stability, drainage and erosion protection to the toe of the filtered tailings stack. The starter buttress has been designed with 2H:1V slopes with a vertical height of 15 feet.

Due to the configuration of Zones 1 and 2 (discussed in Section 7.3), tailings placement will need to be focused within Zone 1 – Shell Placement Area at project start-up until the Zone 1 tailings reach an elevation to allow placement of tailings within Zone 2 – General Placement Area. To allow placement of tailings within Zone 2 during the initial months of operations, a Zone 2 Starter Buttress has been included in the design to provide confinement of Zone 2 tailings at start-up until the Zone 1 tailings rise to the elevation of the Zone 2 tailings. The concept of the starter buttresses and tailings placement zones is illustrated in **Figure 3**. **Drawing 125** presents the plan and sections of the starter buttresses.

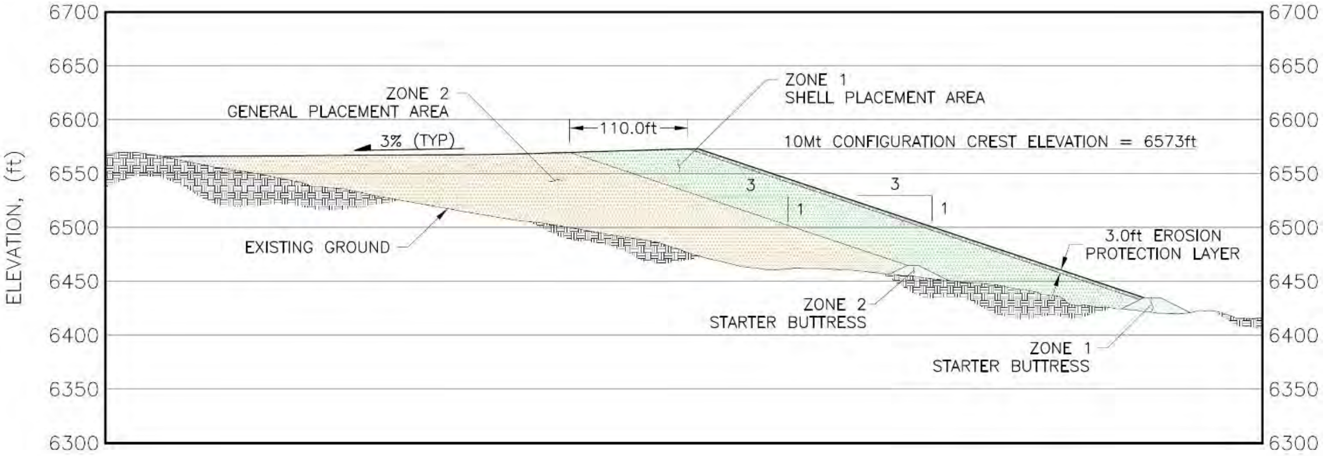


Figure 3: Schematic of Tailings Placement Zones

The starter buttresses will be constructed with rockfill sourced from non-PAG waste rock sourced from the Windy Gulch pit or an approved on-site quarry. Rockfill shall have a fines content (percent passing 0.075 mm) less than 15% and is composed of inert, hard and durable rock with a minimum uniaxial compressive strength of 40 MPa and no more than 45% loss during the Los Angeles Abrasion test. Rockfill shall have a maximum particle size equal to 2/3 of the approved lift thickness. Rockfill may be placed according to a method specification technique with placement in controlled engineered lifts with compaction by construction traffic (i.e., loaded haul trucks) and smooth-drum vibratory compactors. The specifics of the method specification, including the lift thickness, size and number of passes of compaction equipment will be confirmed by construction of test fill(s) by the earthworks contractor at the commencement of construction. The test fill(s) shall be conducted in general accordance with the U.S. Army Corps of Engineers Engineer Manual for Test Quarries and Test Fills (USACE, 1994) and the ASTM Rockfill placement and compaction guidelines (ASTM, 1993).

7.3 Tailings Placement Areas

Tailings will be produced from gravity separation and flotation circuits, and are assumed to be thickened prior to feeding to the tailings filter plant. The filtered tailings are assumed to be dewatered to a moisture content at or near the optimum moisture content according to the standard Proctor test (ASTM D698). One standard Proctor conducted on a composite synthetic tailings sample from cores obtained from the Windy Gulch deposit yielded an optimum moisture content of approximately 16%. To achieve specified compaction within the designated tailings zones, the tailings moisture content shall be within 2% of the optimum moisture content.

The FTSF design considers two zones for tailings placement: (i) Shell Placement Area (Zone 1), and (ii) General Placement Area (Zone 2). The Zone 1 – Shell Placement Area tailings form a minimum 110-foot wide zone (measured horizontally) at the downstream, or exterior shell, of the tailings dry stack. Zone 1 tailings will be compacted in maximum 12 inch-thick loose lifts to at least 95% of the maximum dry density as determined by the standard Proctor test (ASTM D698).

The Zone 2 – General Placement Area tailings are located in the interior of the FTSF, between the compacted tailings Zone 1 and the natural ground. Zone 2 tailings will be compacted using the same methodologies as Zone 1, however less stringent dry densities are acceptable in the General Placement Area. Zone 2 tailings shall be compacted in maximum 12 inch-thick loose lifts to at least 90% of the maximum dry density as determined by the standard Proctor. The Zone 2 General Placement Area is designed to provide operational flexibility for tailings placement during wet weather or upset plant conditions. Weather permitting, it is advisable to still compact Zone 2 tailings to similar densities as Zone 1 tailings to provide suitable conditions for equipment traffic and optimize the storage capacity of the FTSF. The two placement zones are presented in **Figure 3** and on **Drawings 130 and 131**.

The tailings compaction specifications will be assessed by a trial compaction program conducted at start-up of operations. The purpose of the program will be to determine the most efficient means of compacting the tailings (number of passes, lift thickness, vibration benefits, etc.) to achieve the densities required by the design. In other words, based upon experience, the aim is to establish a method specification versus a strict performance specification. The compacted dry density of the tailings during the trial compaction program shall be verified by either the nuclear density gauge testing or sand cone density testing. The merit of static versus vibratory compaction will be evaluated during the trial compaction and during ongoing operations. The adopted method specification will also be used for the General Placement Area. Based on similar project experience a minimum 10-ton static drum weight smooth drum vibratory compactor will be necessary for the tailings compaction.

The tailings surface in both zones shall be compacted immediately upon placement with a smooth drum vibratory roller and graded to promote runoff of precipitation off the FTSF to the designated contact water ditches. The two tailings zones should be maintained at the same elevation during operations to the extent possible for management of contact water runoff.

7.4 Erosion Protection Layer

An erosion protection layer will be progressively placed on the slope of the FTSF for protection against water and wind erosion. The erosion protection layer is a key design component as the filtered tailings are highly erodible. Since the erosion protection layer will be progressively placed on the tailings slope during operations it will become part of the reclamation cover.

The erosion protection layer will be constructed from inert, non-PAG fine waste rock. A preliminary grain-size distribution of the erosion protection layer is presented in **Table 7**. The erosion protection layer will be a minimum of 2 feet-thick as measured perpendicular to the slope. The filtered tailings surface abutting the erosion protection layer shall be prepared by wetting and compacting immediately prior to placement of the erosion protection material.

Table 7: Preliminary Grain-Size Distribution for Erosion Protection Layer

Sieve Size	Percent Passing
6-inch	100
3-inch	70 - 100
1.5 inch	50 – 90
3/4-inch	40 – 80
No. 4 (4.75 mm)	30 - 50
No. 200 (0.075 mm)	0 – 10

7.5 Surface Water Diversion Channels

Surface water runoff shall not be allowed to run-on to the FTSF to the extent practical. Stormwater runoff that has not come into contact with tailings (“non-contact” water) will be captured by perimeter diversion channels and routed around the south margin of the FTSF to discharge to the natural drainage east of the FTSF. The non-contact diversion channels have been designed to intercept runoff water from the contributing watersheds tributary to the FTSF and direct the clean non-contact water around the FTSF. The FTSF perimeter stormwater channels will be relocated as the tailings dry stack footprint increases (approximately every two years).

The diversion channels have been designed to pass the 10-year, 24-hour precipitation event during operation of the FTSF. For closure, the diversion channel has been sized to pass the 100-year, 24-hour storm event. Further discussion of the closure channel is presented in Section 11.0. The non-contact water diversion channel alignments are presented on **Drawings 130 and 131** and details are presented on **Drawing 145**. Calculations for the channel sizing are presented in **Appendix I**.

The hydrologic analyses were conducted using a HEC-HMS hydrologic model to estimate flow volumes and peak flows throughout the site using a SCS Type II precipitation distribution. The total catchment area tributary to the FTSF was divided into six sub-basins (see **Appendix I**). Due to the small size of the basins, the Rational Method was also used to size the channels. The higher flow rate of the two methods was used for sizing the diversion channels.

Bentley FlowMaster V8i (Select Series 1) hydraulic modeling software, was utilized to size the diversion channels to effectively transport the discharge from the respective precipitation events. The non-contact water diversion channels were designed with a trapezoidal section and one foot of freeboard according to the design criteria.

Channels were designed to limit the Froude number to less than 0.8. Riprap sizing was based on the Federal Highway Administration’s HEC-15 methodology (FHWA, 2005). For some steeper sections of the channels, gabion drop structures are necessary for energy dissipation. These details are shown on **Drawing 145**.

Sediment control during operations will be the responsibility of the operator or contractor hired by Zephyr. The contractor shall incorporate Best Management Practices (BMPs) and construct all necessary temporary erosion prevention and control facilities in order to comply with applicable regulations.

7.6 Contact Water Pond

The contact water pond will be constructed in the valley downstream of the FTSF as shown on **Drawing 140**. The pond will contain water collected by the FTSF underdrain system as well as contact water runoff from the FTSF. Contact water collected in the pond will either be evaporated, recycled to the process plant or treated (as required to meet water quality standards) and released. A pumping and piping system will be included to provide the capability to recycle the contact water to the process plant.

The contact water pond will be constructed with a combination of cut and compacted fill, with slopes not exceeding 2.5H:1V. The pond will be lined with 60 mil HDPE geomembrane to prevent infiltration of water to the natural ground. A 12-inch thick geomembrane cushion layer will placed and compacted to prepare a subgrade surface that is acceptable for geomembrane installation. Geomembrane will be anchored in a perimeter anchor trench.

Some form of ballast will be necessary to protect the geomembrane from wind uplift during periods when the pond does not contain water. Examples of ballast include tires, cloth or plastic tubes filled with pea gravel or grout, sandbags.

The pond has been designed to contain approximately 32,000 cubic feet of water with five feet of freeboard. This storage capacity will easily store estimated seepage from the FTSF. Estimated contact water runoff from the 10-year, 24-hour storm event should also be contained by the pond, assuming the reclaim pumping system is operational. An emergency spillway will be included in the contact water pond to protect against overtopping failure of the pond should the storage capacity of the pond be exceeded.

The contact water pond as sized in this study would be classified as a non-jurisdictional size dam by the Colorado Division of Water Resources as its capacity is less than 100 acre-feet and the dam height is less than 10 vertical feet as measured from the lowest point of the natural ground surface to the spillway crest (CDWR, 2007).

7.7 Haul Roads

A haul road along the south side of the FTSF will be constructed to access the tailings placement areas. A conceptual alignment of a haul road from the process plant to the FTSF is shown on **Drawing 100**.

Since the tailings stack will be constantly rising in elevation throughout operations, switchback benches will likely need to be created in the face of the shell to provide an access route for haul trucks to the downstream slope of the FTSF. For construction of these access benches, the shell face may be over-steepened up to 2.5H:1V, so long as the overall average slope is maintained at 3H:1V. Each bench shall not exceed 50 feet in height, so as to break up long-continuous faces that are more susceptible to erosion.

8.0 CONSTRUCTION AND OPERATIONS

The following sections discuss earthworks activities and materials for construction of components of the FTSF.

8.1 Foundation Clearing and Preparation

Foundation preparation will consist of clearing and grubbing of significant vegetation within the FTSF footprint area and stripping and stockpiling of topsoil for use in reclamation of disturbed areas. Foundation clearing and preparation is further described in the Technical Specifications Section 02200.

Stripped and grubbed vegetation shall be removed from the designated areas and disposed of in stockpiles or other approved methods designated by Zephyr. Acceptable growth media (topsoil) shall be removed from the designated areas and stockpiled for later use to establish vegetation on the closure cover of the FTSF and other disturbed areas. For the purposes of quantity estimation, the topsoil layer has been assumed to be an average 12-inches thick over 70% of the FTSF footprint. This roughly corresponds to the southern side of the drainage bottom (the northern side is predominately bedrock). One potential location for a topsoil stockpile has been identified east of the FTSF as shown on **Drawing 100**.

8.2 Management of Off-Specification Tailings

Tailings delivered to the FTSF may occasionally be out of moisture content specification due to upset plant operations or unfavorable weather conditions. The zoned FTSF design allows for some flexibility of tailings placement. Tailings may be placed in the General Placement Area of the FTSF (Zone 2) to a minimum of 90% of standard Proctor density, if the 95% standard Proctor density required in the FTSF Shell Placement Area (Zone 1) cannot be met. The following procedures may be considered for management of off-specification tailings, should Zone 2 be unavailable or should the Contractor/Operator be unable to achieve compaction requirements for either zone:

- A lined contingency tailings storage impoundment shall be constructed near the process plant to provide approximately 24-hours of slurry tailings storage for times when the filter plant is not functioning;
- If tailings are too wet of the optimum moisture content, the tailings may be spread out, and disked with an agriculture-type tractor to dry;
- Blend wet tailings with drier, native granular soils from the FTSF footprint or vicinity to improve compaction characteristics;
- If the weather is unfavorable for drying, tailings may be stockpiled until the weather is amenable for drying. A contingency area for temporary tailings management (stockpiling and drying) should be included adjacent to the filter plant;
- If tailings are too dry of the optimum moisture content to achieve specified compaction, add water to the tailings as appropriate to improve compaction characteristics; and
- As a last resort to management of off-specification tailings, tailings production may be temporarily suspended until conditions allow for placement.

It is very important to note that trafficability for haul trucks will need to be maintained across both tailings zones. Traficability for truck traffic across filtered tailings is often a challenge and compactive effort required for roads on the dry stack to assure adequate trafficability is often greater than required to achieve the geotechnical requirements.

8.3 Management of Contact Water

The active tailings crest surface shall be immediately compacted and smooth-rolled to minimize infiltration and sloped to drain to perimeter contact water ditches on the south and west side of the FTSF and away from the slope of the Shell Placement Area and erosion protection layer. Precipitation coming into direct contact with the active tailings platform will be directed west and south to temporary perimeter ditches. The contact water ditches shall be graded to drain around the FTSF and to the contact water pond located downstream of the FTSF as shown on **Drawings 130 and 131**. The contact water ditches are temporary and will require construction of new ditches as the tailings dry stack elevation rises (approximately every year). Components of contact water management include:

- Compaction and smooth-rolling of active and inactive tailings platform. The tailings surface shall be graded to a minimum 3% slope towards the perimeter contact water ditches on the south and west sides of the FTSF.
- Temporary contact water ditches will be located along the perimeter of the FTSF, roughly at the contact between the tailings platform and the native ground surface. The temporary ditches will route contact water around the southern margin of the FTSF and to the contact water pond. Tailings placed along the contact with native ground along the west and south side of the FTSF will require excavation/grading to achieve positive drainage for the contact water ditches.
- Erosion protection and energy dissipation structures as required for contact water ditches on steep slopes.
- A contact water pond will be located in the valley downstream of the FTSF for containment, sedimentation and environmental monitoring of contact water. Water collected in the pond will either be evaporated, recycled to the process plant, or treated (if necessary to achieve water quality standards) and released. The pond has a design capacity of 32,000 ft^3. The contact water pond will be lined with HDPE geomembrane and will include an emergency spillway to protect against overtopping should the maximum pond capacity be reached.

8.4 Dust Management

Control of fugitive dust generation from filtered tailings facilities is an important component of operations. Dust generation can be kept to an acceptable level with good operating practices. The following measures will help to control dust generation:

- Tailings compacted in a timely manner will significantly help limit dust generation;
- Spray the tailings surface with water as needed during dry periods;
- Progressive slope reclamation during operations by placement of the Erosion Protection Layer greatly reduces the exposed tailings area susceptible to fugitive dusting. Placement of the erosion protection layer should not be allowed to lag behind the tailings placement, but placed concurrently to the working FTSF crest elevation;

- Restrict traffic on the FTSF to transport, placement and compaction equipment. Limit the use of this equipment to active placement areas only;
- The use of binders, wetting agents or other approved dust suppressants on haul roads or areas of inactive tailings placement can further be employed to effectively manage fugitive dusting.

8.5 Earthworks Materials

The materials used in construction of the described project components are referenced here and throughout this design report. The following sections provide descriptions for each earthwork material of the pre-feasibility FTSF design. See construction specification Section 02200 for material descriptions and placement requirements for earthworks materials (**Appendix F**).

8.5.1 Rockfill

Rockfill will be used for construction of the FTSF starter buttress for the Shell Placement Area, as well as the General Placement Area, if necessary. The rockfill is anticipated to be sourced from inert, non-PAG developmental rock sourced from the Windy Gulch pit or an approved on-site quarry. Rockfill shall consist of hard, durable, strong rock materials with a maximum particle size equal to 67% of the approved lift thickness, with maximum 15% fines (particles passing the #200 sieve). The rockfill will be placed by a method specification (specifying compactor type and size, lift thickness, moisture conditioning, and number of compactor passes). The method specification shall be developed by construction of a test fill.

8.5.2 Structural Fill

Structural fill will be used for construction of embankments of the contact water pond and other minor ancillary fills for construction of diversion channels or haul roads as needed. Structural fill shall consist of inorganic earthfill materials sourced from local alluvial/colluvial soil deposits and shall have a maximum particle size of 3-inches. Structural fill shall be placed in maximum 12-inch thick loose lifts and compacted to at least 95% of the standard Proctor maximum dry density.

8.5.3 Underdrain Material

Underdrain material will consist of free-draining sand to be used in construction of the underdrains as shown on **Drawing 120**. The underdrain material is anticipated to be imported to the site, although processing material on site is also acceptable so long as it meets the specifications. Underdrain material shall be free-draining and durable. The gradation requirements of the underdrain material are presented in **Table 8**.

Table 8: Underdrain Material Gradation Requirements

Sieve Size	Percent Passing
¾ inch	95 - 100
No. 4 (4.75 mm)	70 – 100
No. 10 (2.00 mm)	50 – 80
No. 40 (0.425 mm)	10 – 50
No. 200 (0.075 mm)	0 – 5

8.5.4 Geomembrane Cushion Material

Geomembrane cushion material will be placed as a 12-inch layer at the contact water pond to provide a surface adequate for installation of the HDPE geomembrane.

The geomembrane cushion material is anticipated to consist of native alluvial/colluvial soils screened/processed to achieve a maximum particle size of ¾-inch in order to protect against puncture of the overlying geomembrane. The geomembrane cushion material surface shall be placed and prepared to provide an adequate surface for installation of the geomembrane that is smooth and free of debris, grade stakes, large or protruding rocks, roots, branches or other deleterious material.

8.5.5 Anchor Trench Fill

Anchor trench fill material will be used to backfill the geomembrane anchor trench at the contact water pond. Anchor trench fill shall have a maximum particle size of 2-inches. The anchor trench shall be backfilled and compacted as by an approved method specification. Trench backfill material shall generally be placed in 12-inch thick loose lifts and compacted by wheel rolling with light, rubber-tired or other light compaction equipment.

8.5.6 Erosion Protection Layer

An erosion protection layer will be progressively placed on the exterior slopes of the FTSF for protection against water and wind erosion. The erosion protection layer shall consist of non-mineralized (non-PAG) sand and rock and will be used progressively placed on the downstream slope of the FTSF for erosion protection. It is anticipated that the material will be sourced from fine, non-mineralized mine waste rock, on-site quarries or imported to the site. The erosion protection layer will be placed by dozers in a single lift working in an upslope direction.

8.5.7 Riprap

Riprap is proposed for use as erosion protection of the steep sections of the stormwater diversion channels and contact water management ditches, as presented on the drawings. Riprap shall be composed of dense, angular, reasonably well-graded, sound fragments resistant to abrasion. Material shall be free of cracks, seams, clay, organic material and other defects that would hasten degradation by water and/or frost action. Riprap material may be sourced from suitable non-mineralized waste rock, on-site quarries or imported from off-site. The riprap sizing is presented on the design drawings.

Placement of riprap shall begin at the toe of the slope and proceed up the slope. The stones may be placed by dumping and may be spread with an excavator or other suitable equipment as long as the underlying material is not displaced. Stones shall be placed so as to provide a minimum of voids. Smaller stones shall be uniformly distributed throughout the mass. Sufficient hand work shall be done to produce a neat and uniform surface, true to the lines, grades, and sections indicated.

9.0 ENGINEERING ANALYSES

9.1 Tailings Filling Curve

Tailings stacking curves were developed for the Dawson FTSF to estimate the rate of rise of the tailings dry stack and to development a relationship between the tailings crest elevation, tailings in-place tonnage and time. The FTSF stage-capacity curve was developed based on the project design criteria presented in **Appendix A**. Specifically, the following assumptions and design criteria were applied:

- ► In-place tailings dry density = 105 pcf for Zone 1 – Shell Placement Area and 100 pcf for Zone 2 – General Placement Area; and
- ► Tailings delivered to the FTSF = 300 tpd.

The tailings stacking curves presented in **Figure 4** were developed based on these assumptions. Based on the criteria and assumptions adopted for development of the tailings stacking curves, the Dawson FTSF can provide tailings storage capacity of up to 1.0 Mt over a period of approximately 10 years, with potential for expansion.

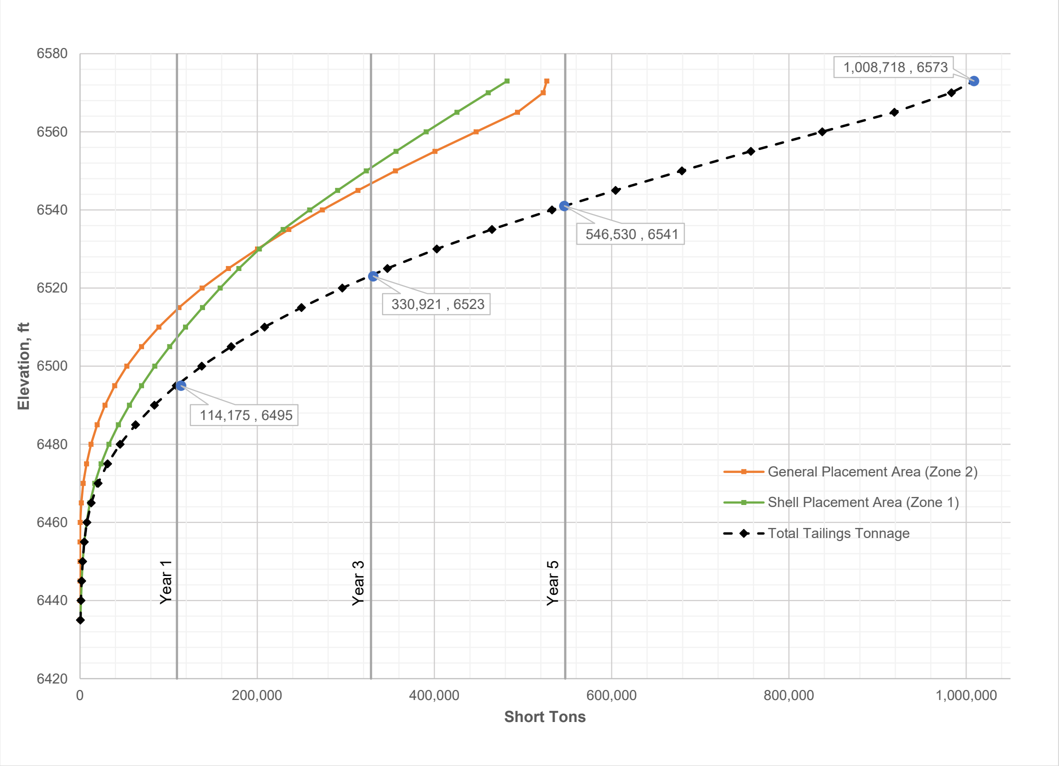


Figure 4: Tailings Stacking Curves for the Dawson FTSF

9.2 Seepage Analyses

In order to size the Dawson filtered TSF underdrains and collection pond, seepage analyses were performed.

9.2.1 Analysis Method

For the pre-feasibility stage of this project, one dimensional (1D) models of the various stages of the Dawson project were created using the finite element software VADOSE/W (GEO-SLOPE, 2014). The software program links the stress state of the moisture in the ground to the demands of the climate to compute how water moves through the soil-atmosphere interface. Inputs for the seepage model were developed based on information obtained from the tailings testwork, nearby climate data stations, and Amec Foster Wheeler's experience with similar projects.

Four separate VADOSE/W models were developed to represent each presented stage of the project: end of years 1, 3, 5, and the ultimate configuration. For each model, a steady-state initial condition was defined as the parent analysis and a transient analysis was defined for the duration listed in **Table 9**.

Table 9: VADOSE/W Model Setup

	VADOSE/W Models			
	End of Year 1	End of Year 3	End of Year 5	Ultimate Configuration (9.2 years)
Initial Condition Starting Time (day)	0	365	1,095	1,825
Transient Analysis Duration (days)	365	730	730	1,538
Last Time Step (day)	365	1,095	1,825	3,363

9.2.2 Model Geometry

The 1D column model was comprised of two materials: native ground (rock/alluvium material) and filtered tailings. For each stage of the project, a separate model was developed to reflect the average height of tailings at the end of the respective stage, as summarized in **Table 10** and illustrated in **Figure 5**.

Table 10: Average Depth of Filtered Tailings by Project Stage

Stage	Average Height of Filtered Tailings (ft)
End of Year 1	13
End of Year 3	24
End of Year 5	28
Ultimate Configuration	38

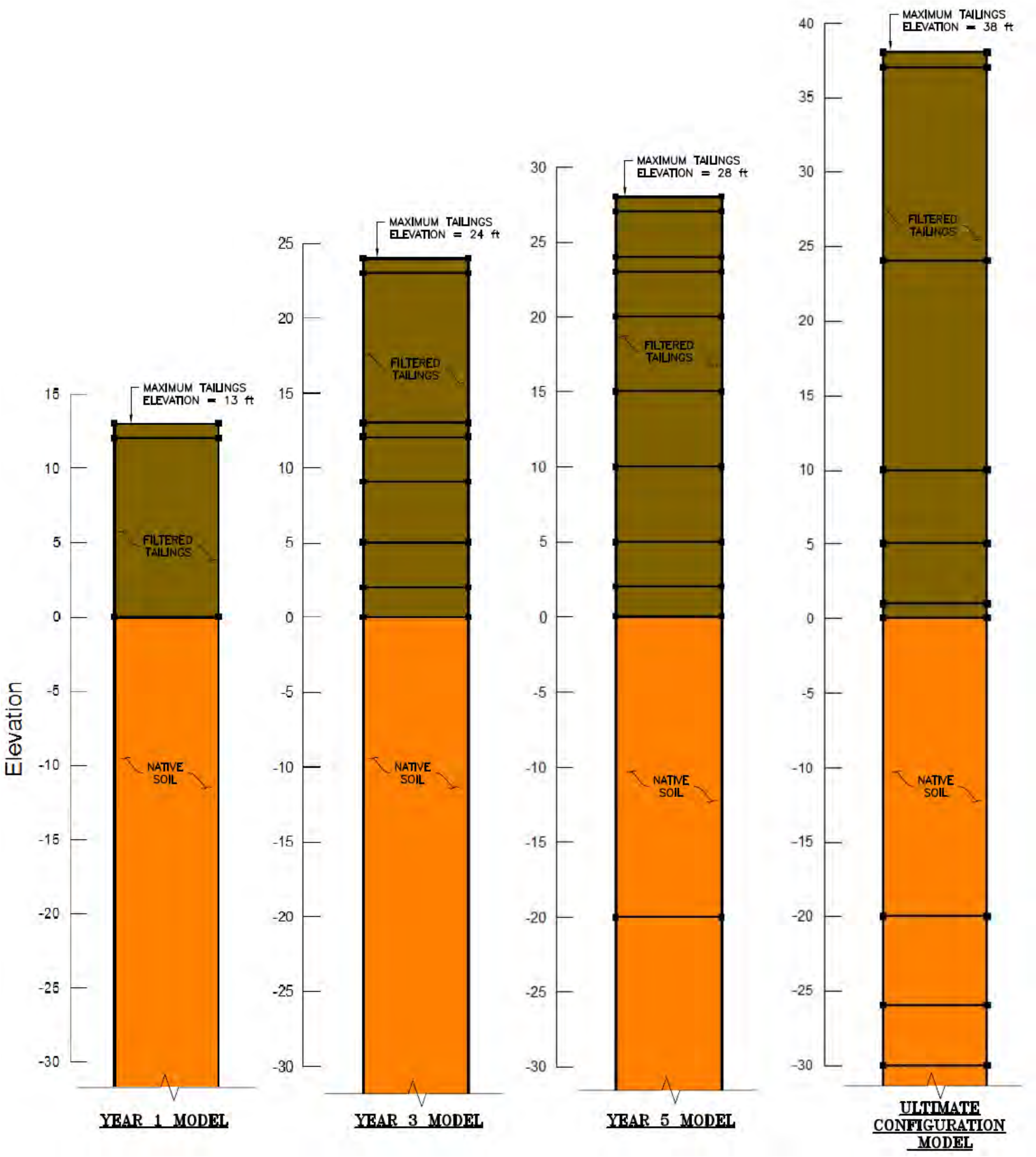


Figure 5: Seepage Models Schematic

The depth of the native material was modeled as 200 feet.

9.2.3 Material Properties

The rate of flow of water through a porous medium is controlled by availability of water for infiltration (climate), the soil water characteristic curve (SWCC), the hydraulic conductivity (saturated and unsaturated), and the initial soil water content within the material (initial condition).

Soil Water Characteristic Curve

The soil water characteristic curve (SWCC) for the filtered tailings and the native soil (rock/alluvium) material was estimated using an available function in the VADOSE/W software. The function is based on the saturated water content (which is equal to the material porosity) and a similar sample material. SWCC estimation parameters for the Dawson filtered tailings and native soil are presented in **Table 11**.

Table 11: SWCC Estimation Parameters

	Tailings	Native Soil
Estimation Method (Material)	Sample Function (Silt)	Sample Function (Silty Sand)
Saturated Water Content (ft^3/ft^3)	0.36	0.45

Hydraulic Conductivity

The saturated hydraulic conductivity is assumed at this stage of the design. Values were estimated to be $1x10^{-6}$ cm/s and $1x10^{-4}$ cm/s for the tailings and native soil material, respectively. The unsaturated hydraulic conductivity is estimated for both materials using the Fredlund & Xing (Fredlund et al., 1994) estimation method provided in the VADOSE/W program. Inputs for this estimation method include the SWCC for the material and the saturated hydraulic conductivity.

Initial Conditions

Known geotechnical parameters (moisture content and dry density) were used to define the initial volumetric water content in the tailings. According to design criteria revision B (presented in **Appendix A**) the tailings are specified to exit the filter plant at a moisture content within 2% of the optimum (16%); therefore, a moisture content of 16% was used in the analysis. A dry density of 100 lb/ft^3 was used based on the minimum placement specification for the Zone 2 tailings. Using equation 1, the initial volumetric water content of the tailings was calculated to be 25.6%

$$Volumetric\ water\ content\ (\theta) = \frac{w \cdot \gamma_d}{\gamma_w} \qquad (1)$$

Where: w = moisture content

γ_d = dry density (lb/ft^3)

γ_w = density of water, equal to 62.4 lb/ft^3

Based on the initial volumetric content and the SWCC developed as described previously, an initial matric suction—or negative pore-water pressure—can be determined for the tailings. Based on equation 2, this was applied as a pressure head boundary condition for the initial condition in the Year 1 model and the “new” tailings in the Year 3, 5, and Ultimate models. Boundary conditions are discussed further below.

$$Pressure\ head\ (h) = \frac{u}{\gamma_w} \tag{2}$$

Where: u = pore-water pressure
γ_w = density of water, equal to 62.4 lb/ft³

9.2.4 Boundary Conditions

The boundary conditions are the driving force behind any finite element based analysis. The one-dimensional models were assigned two types of boundary conditions: a climate boundary condition to simulate meteoric condition and hydraulic boundary conditions to specify pressure heads at particular locations in the model.

Climate Boundary Conditions

The climate data set is comprised of environmental factors including air temperature, relative humidity, wind speed, precipitation, and evaporation. The climate data is applied to the exposed surface of the tailings as a boundary condition. The following site-specific climate data was used to develop the data set:

- Temperature and precipitation data was collected from the National Oceanic and Atmospheric Administration (NOAA) Cañon City weather station;
- Relative humidity information was obtained for nearby Colorado Springs;
- Wind speed data was taken from project experience in Colorado Springs, CO; and
- Evaporation data was developed as the statistical average of evaporation data from other regional weather stations of similar elevation and climate (due to lack of site specific evaporation data).

Hydraulic Boundary Conditions

For all models, a zero pressure hydraulic boundary was defined at 170 feet below native soil boundary to represent the groundwater elevation, based on groundwater levels observed in the Dawson North Monitoring Well (location presented on **Drawing 100**).

For the Year 1 model, the tailings initial condition was defined based on the initial volumetric water content of the tailings as described in Section 9.2.3. For each subsequent model, however, the "initial" condition of the tailings was defined to match, as closely as possible, the last time step of the previous project stage's model. For example, the "End of Year 3" model begins at time step 365 and lasts for 730 days—or 2 years—to reach the end of year 3. The initial condition for this model must represent the condition of tailings at the final time step (day 365) in the "End of Year 1" model. This was achieved by obtaining a pore-pressure vs. elevation graph for the entire 1D column at day 365. Curve-defining points of this plot were obtained and converted to pressure heads, which were then used to define the "initial" condition of the tailings and native soil for the Year 3 model. This process was repeated for the Year 5 and Ultimate seepage models.

9.2.5 Seepage Analysis Results

The primary purpose of the seepage analyses was to obtain the amount of flow that would report to the underdrain system and subsequently the contact water pond. Using a flux section defined at the interface of the filtered tailings material and the native soil, VADOSE/W has the ability to compute a cumulative volume that flows across the section. Based on the number of time steps and the footprint of the entire FTSF, an average seepage flow is determined for each modeled configuration, as presented in **Table 12**.

Table 12: Seepage Analyses Results

	Year 1	Year 3	Year 5	Ultimate Configuration
Cumulative Flux for 1D Model (ft^3)	1.68	3.59	4.76	6.28
Total FTSF 2D Footprint Area (ft^2)	140,638	270,002	381,416	525,247
Total Flux for FTSF footprint area (ft^3)	33,691	138,287	259,548	470,974
Average Flow (gpm)	0.5	0.7	0.7	0.7

To design an effective underdrain system that satisfies the ultimate configuration, the maximum average flow rate of 0.7 gpm was considered. As discussed in Section 7.1, the underdrains will be constructed with a 4-inch diameter perforated corrugated polyethylene pipe resulting in a factor of safety of 100 in regards to conveying seepage flow to account for uncertainties of the estimated seepage rates and potential for foundation seepage.

9.3 Stability Evaluations

Slope stability analyses were conducted in support of the pre-feasibility level design of the Dawson FTSF. The stability of the proposed FTSF was evaluated under both static and seismic loading conditions. The stability evaluations are discussed in the sections below and presented in **Appendix H**.

9.3.1 Analysis Methods

The stability analyses were conducted using *SLIDE* (Version 6), a commercially available computer program (Rocscience, 2010) which enables the user to conduct limit equilibrium slope stability calculations by a variety of methods.

For the failure mechanisms considered in the analyses, slope stability was evaluated using limit equilibrium methods based on Spencer’s method of analysis (Spencer, 1967). Spencer’s method is a method of slices (consideration of potential failure masses as rigid bodies divided into adjacent regions or "slices," separated by vertical boundary planes) that satisfies both moment and force equilibrium. It is based on the principle of limit equilibrium (i.e., the method calculates the shear strengths that would be required to just maintain equilibrium along the selected failure plane, and then determines a safety factor by dividing the available shear strength by the driving shear stress). Consequently, safety factors calculated by Spencer’s, or by any other limit equilibrium method, indicate the percentage by which the available shear strength exceeds, or falls short of, that required to maintain equilibrium. Therefore, safety factors in excess of 1.0 indicate stability and those less than 1.0 indicate instability, while the greater the mathematical difference between a safety factor and 1.0, the larger the margin of safety (for safety factors in excess of 1.0), or the more extreme the likelihood of failure (for safety factors less than 1.0). For the embankment design, the design criteria requires for a minimum factor of safety of 1.5 under static loading conditions.

Pseudo-static-based analyses are commonly used to apply equivalent seismic loading on earthfill structures. In an actual seismic event, the peak acceleration would be sustained for only a fraction of a second. Actual seismic time histories are characterized by multiple-frequency attenuating motions. The accelerations produced by seismic events rapidly reverse motion and generally tend to build to a peak acceleration that quickly decays to lesser accelerations. Consequently, the duration that a mass is actually subjected to a unidirectional, peak seismic acceleration is finite, rather than infinite. The pseudo-static analyses conservatively models seismic events as constant acceleration and direction (i.e., an infinitely long pulse). Therefore, it is customary for geotechnical engineers to take only a fraction of the predicted peak maximum acceleration when modeling seismic events using pseudo-static analyses (Hynes-Griffin and Franklin, 1984). The pseudo-static analysis incorporated pseudo-static coefficient of 0.055, in accordance with the design criteria. The project design criteria requires a minimum factor of safety of 1.3 under seismic loading conditions.

9.3.2 Model Development

The ultimate 1Mt FTSF was analyzed for stability considering static and pseudo-static loading conditions. The section considered for stability was taken perpendicular to the main slope of the FTSF and through both starter buttresses, as shown in **Figure 6**. This section represents the maximum section of the FTSF and therefore is considered to represent the most critical section for stability.

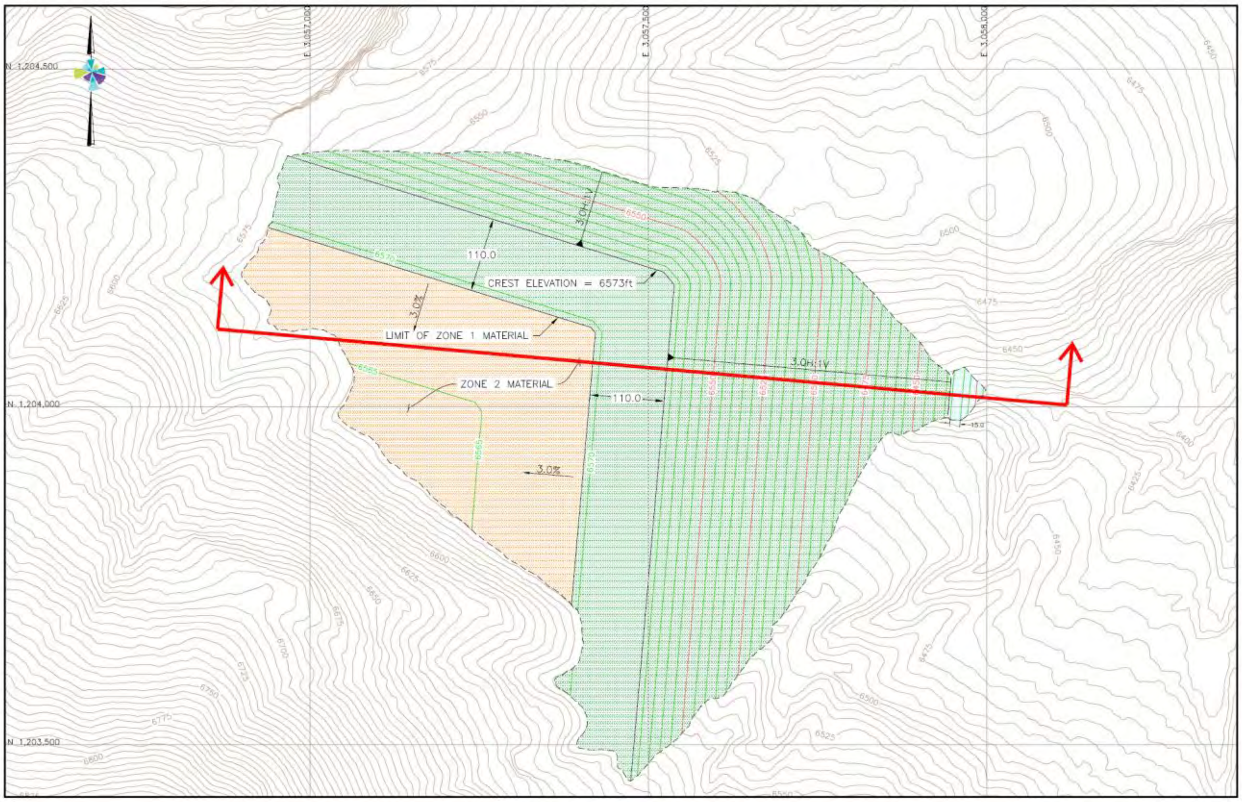


Figure 6: Cross-Section Location

The foundation conditions for the stability model considered a 10 foot-thick zone of native soils overlying bedrock. The model included two placement zones of filtered tailings, as previously discussed in Section 7.3, as starter buttresses constructed of rockfill material. The typical stability section is shown in **Figure 7**.

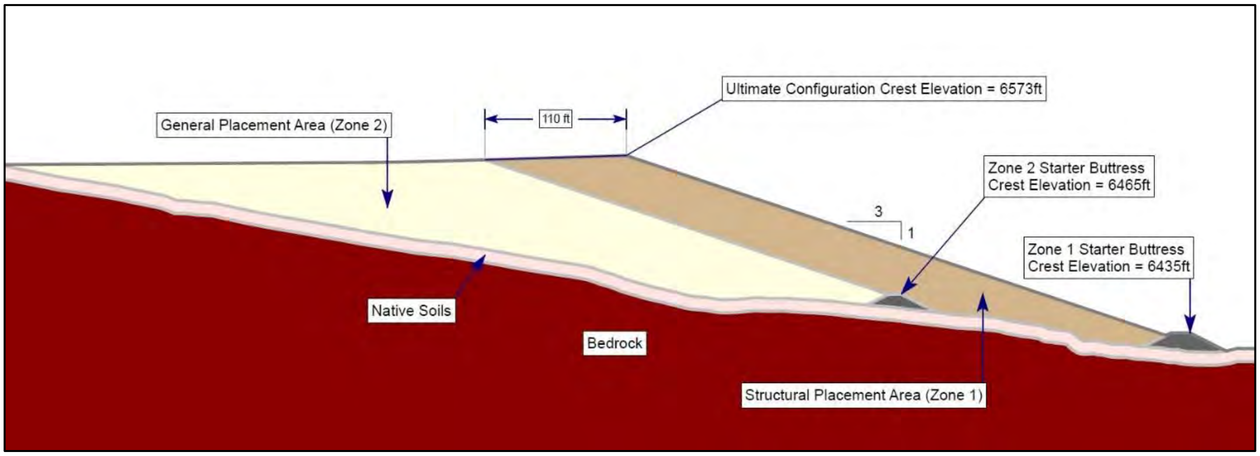


Figure 7: Typical Cross-Section

9.3.3 Material Parameters

The stability analysis cross section includes the following materials: Bedrock, Native Soils, Filtered Tailings (Zone 1: Shell Placement and Zone 2: General Placement), and Rockfill. The unit weight of the structural and general placement areas were derived from Proctor tests and based on the design criteria stating that the shell and general placement areas must be 95% and 90% of the standard Proctor maximum dry density, respectively. All materials, except for the zone of general placement filtered tailings (Zone 2), were assigned effective strength (i.e., drained) properties. The general placement tailings were conservatively assigned an undrained shear strength ratio (Su/σ'_v) of 0.35. The properties used in the analyses are summarized in **Table 13**.

Table 13: Summary of Material Properties for Stability Analyses

Material	Moist Unit Weight	Effective Strength		Undrained Shear Strength Ratio
		Cohesion	Phi	
	(lb/ft³)	(psf)	(degrees)	(Su/σ_v')
Bedrock	125	0	40	--
Native Soils	115	0	28	--
Filtered Tailings (Zone 1)	105	0	32	--
Filtered Tailings (Zone 2)	100	--	--	0.35
Rockfill	122	0	32	--

9.3.4 Stability Evaluation Results

In accordance with the design criteria, slope stability was evaluated for the Dawson FTSF considering static and seismic loading conditions. Both circular and non-circular failure surfaces were analyzed to determine the critical failure surface. Results of the slope stability analyses for the cross sections under consideration are presented in **Appendix H** and the most critical factors of safety are summarized in **Table 14**.

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Table 14: Results of Stability Evaluation

	Stability Analysis Factor of Safety	
	Circular Failure Surface	Non-Circular Failure Surface
Ultimate Configuration, Static	1.63	1.59
Ultimate Configuration, Pseudo-static	1.38	1.35

As summarized in **Table 14**, the FTSF meets or exceeds the prescriptive factor or safety values for the static loading conditions described above. Furthermore, the embankment is stable under seismic loading conditions as evidenced by pseudo-static factors of safety greater than 1.3.

9.3.5 Liquefaction Susceptibility

Liquefaction is a phenomenon where loose, saturated, cohesionless soils lose significant strength and stiffness as a result of a triggering mechanism such as a strong earthquake ground motions. The strong ground motions tend to increase pore water pressure in the loose saturated soils very fast without any time for drainage. When the effective stress due to the increase in pore water pressure becomes essentially zero, liquefaction of the soils takes place due to loss of shear strength.

The Dawson tailings will be compacted to an unsaturated state of 95% of the standard Proctor maximum dry density in the perimeter shell. Such densely compacted tailings will dilate, or increase in volume, when sheared, essentially resulting in a decrease in pore water pressures, therefore tailings in the perimeter shell are not considered to be susceptible to liquefaction.

10.0 MONITORING AND INSPECTIONS

The Mineral Rules and Regulation of the Colorado Mined Land Reclamation Board regulate the permitting, operational and reclamation requirements for all non-coal mining operations in Colorado. According to Section 34-32-112 of the Mined Land Reclamation Act, hard rock mining operations disturbing more than 10 acres and mining more than 70,000 tons per year (like the proposed Dawson mine) will require one of the following 112 permits:

- A 112 Regular Permit is for operations disturbing of more than 10 acres and extracting more than 70,000 tons of material per year that is not toxic or acid-producing.
- Mining operations considered to be of higher environmental risk than 112 Regular Permits (mining of materials that are toxic, acid-producing and/or include toxic chemicals in on-site processing) are labeled as "Designated Mining Operations" and require some form of a 112d permit based on the area of disturbance and amount of material mined annually:
  - 112d-1: Disturbance of less than 50 acres and extraction of less than 1.0 million tons per year;
  - 112d-2: Disturbance of less than 100 acres and extraction of less than 5.0 million tons per year; or
  - 112d-3: Designated Mining Operations not meeting the criteria of 112d-1 or 112d-2.

The type of permit required for the Dawson mine will therefore depend on if the mined material is deemed to be toxic or acid-producing. As discussed in Section 6.2, the geochemical testing conducted on a composite synthetic sample of tailings indicates that the tailings are "non-PAG" or "uncertain" based on the criteria adopted. Additional geochemical characterization (e.g., kinetic testing) may be required to define the acid generation potential of the tailings and waste rock at Dawson.

Mines determined to classify as Designated Mining Operations must submit an Environmental Protection Plan as specified in Subsection 6.4.21 of the Mineral Rules and Regulations (DRMS, 2015a). The following sections present the salient requirements for environmental monitoring required by the Environmental Protection Plan. Further discussion of the environmental and geotechnical monitoring and inspections is presented in the Operations, Maintenance and Surveillance (OMS) manual for the Dawson FTSF.

10.1 Groundwater Monitoring

As described in Section 3.5, Zephyr has installed two monitoring wells at the project site, one of which is installed within the Dakota Formation downstream of the proposed FTSF location. Zephyr initiated a groundwater monitoring program in October 2014 and has been monitoring water quality quarterly since that time. For baseline characterization, the Mineral Rules and Regulations require quarterly monitoring of groundwater quality for a minimum of five successive quarters.

As part of the Environmental Protection Plan, the hydrogeology of the area where surface or groundwater may be impacted by mining operations will need to be characterized. The point of compliance for groundwater monitoring is specified by DRMS (2015a) as "the hydrologically down-gradient limit of the area below the facility or activity potentially impacting groundwater quality". The existing Dawson North Monitoring Well (shown on **Drawing 100**) will likely qualify as the point of compliance, though this should be confirmed by the hydrogeological study of the site (outside the scope of this study). The Dawson North Monitoring Well is screened within the Dakota Formation at a depth of 180 to 200 feet. Installation of a second monitoring well screened within the alluvial material (logged to a depth of 36 feet) is recommended. Additionally, installation of a groundwater monitoring well is recommended upgradient of the FTSF to characterize and monitor groundwater quality upgradient of the facility. Recommended locations for installation of new upgradient and downgradient groundwater monitoring wells are presented on **Drawing 160**. These locations should be verified based on results from the hydrogeological study of the site.

Groundwater should be sampled and tested on a quarterly basis during construction and operations. Quarterly groundwater monitoring shall continue for a minimum period of 8 quarters post-closure. The required monitoring frequency and period after two years will be as negotiated with the regulatory agencies and will depend on further characterization of site specific conditions of the tailings, geology and groundwater.

A list of typical water quality monitoring parameters is presented in **Table 15**. The groundwater samples will be tested by qualified third-party laboratories and should meet standards specified by 5 CCR 1002-41 (CDPHE Water Quality Control Commission Regulation No. 41) for human health, domestic water supply and agricultural standards. The more stringent limit should be adopted as the criteria for the water quality standard.

Table 15: Typical Groundwater and Surface Water Monitoring Parameters

Field Parameters	
Sample Location, Time and Conditions	
Flow or Water Level	
Temperature	
Specific Conductance	
pH	
Dissolved Oxygen	
General Parameters	
Total Dissolved Solids	
Acidity	Hardness
Alkalinity	Suspended Solids
Ammonia	Turbidity
Major Anions	
Bicarbonate	Fluoride
Carbonate	Nitrate
Chloride	Sulfate
Major Cations	
Calcium	Iron
Magnesium	Lead
Potassium	Manganese
Sodium	Mercury
Arsenic	Nickel
Cadmium	Selenium
Chromium	Silver
Copper	Zinc

10.2 Underdrain and Contact Water Pond Monitoring

A weir or flume should be installed to monitor flowrates discharging from the FTSF underdrain system to the contact water pond. During operations, seepage the flow rate and pH should be monitored and documented weekly.

During operations contact water captured in the lined contact water pond will be recycled to the process plant. During this time, the water quality in the pond should be tested at least quarterly to provide a baseline characterization. Quarterly water monitoring at the contact water pond shall continue for a minimum period of 8 quarters post-closure. The required monitoring frequency and period after two years will be as negotiated with the regulatory agencies and will depend on further characterization of site specific conditions of the tailings, projected water quality and seepage rates.

A list of typical water quality monitoring parameters is presented in **Table 15**. The contact water pond samples will be tested by a qualified third-party laboratory and should meet standards specified by 5 CCR 1002-41 (CDPHE Water Quality Control Commission Regulation No. 41) for human health, domestic water supply and agricultural standards. The more stringent limit should be adopted as the criteria for the water quality standard. If the water does not meet water quality standards, it will require treatment prior to release to the environment.

10.3 Weather Monitoring

On-site monitoring of precipitation, temperature, pan evaporation and wind speed and direction is recommended and may be required. Site specific weather data will be needed to calibrate the FTSF water balance and seepage modeling and will aid in closure planning.

10.4 Geotechnical Monitoring

Only minimal geotechnical instrumentation is required to assess the geotechnical integrity of the FTSF during operations. The performance of the FTSF will be assessed through:

- Daily inspections by operations personnel;
- Installation of standpipe piezometers in the filtered tailings;
- Periodic cone penetration testing (CPTu) programs;
- Annual facility safety inspections by a qualified geotechnical engineer (usually the design engineer); and
- Facility safety reviews carried out every three years by a qualified third-party engineer.

These activities are described in the following sections and further detailed in the FTSF Operations, Maintenance and Inspection (OMS) Manual.

10.4.1 Daily Inspections

Daily visual inspections shall be carried out by operations personnel to monitor the physical performance of the FTSF. Operations personnel will look for any unusual physical conditions with particular attention to:

- Ponding of water on FTSF;
- Evidence of deformation or sloughing on the FTSF face;
- Evidence of excessive erosion of the tailings placement area or face; and
- Condition of water management channels and features.

Detailed inspections should be carried out during or immediately following heavy rainfall or seismic events. The detailed inspections are carried out by a qualified Operations Supervisor(s) who is experienced in discerning potential or developing problems through visual inspection. Detailed inspections should include, but not be limited to, the following observations, where applicable:

- Evidence of excessive ponding (lack of drainage)
- Evidence of slope sloughing;
- Evidence of slope erosion on the FTSF crest and / or slopes;
- Evidence of surface cracking, movement, settlement;
- Subsidence or sinkholes in the tailings deposits;
- Condition of perimeter channels and underdrains; and
- Other unusual conditions.

A qualified geotechnical engineer should be contacted and/or called in to examine the FTSF in cases where an unusual condition or damage is evident, and/or the Operations Supervisor(s) has a concern. All notes and salient photographs from special inspections made as a result of a potentially damaging event, such as a flood or significant earthquake, should be recorded and included with the daily inspection sheet.

10.4.2 Standpipe Piezometers

Standpipe piezometers should be installed within the filtered tailings to monitor if a phreatic surface develops within the FTSF. The piezometers should be installed following one year of tailings placement and only within the tailings (i.e., the piezometers shall not extend into the underdrain or native foundation). Suggested locations for the piezometers are shown on **Drawing 160**.

10.4.3 CPTu Program

Periodic larger scale integrity testing of the FTSF will be carried out to confirm overall integrity during operations and for closure planning purposes, as well as to assess the stress level effects on material density (e.g. the increase in tailings density due to self-weight consolidation). The most effective tool for carrying out this large scale testing is the cone penetration test (CPTu). The CPTu is economical service offered by a number of specialty contractors.

In the modern CPTu, a 60° apex and typically 35.7 mm diameter (10 cm^2 area) cone tip, attached to the end of a series of rods of the same or lesser diameter as the cone, is pushed into the ground at a constant rate (standard is 2 cm/sec or approximately one meter per minute) and continuous measurements are made of the resistance to penetration of the cone and the surface sleeve, which has a 150 cm^2 surface area and is located just behind the cone tip. Pore pressure response during pushing, and dissipation of any positive (or negative) dynamic pressure (i.e. pore pressure induced due to the penetration of the cone into the soils) at selected depth intervals, are also measured.

The CPTu programs shall be developed and evaluated by the Design engineer or Engineer of Record. A CPTu program should be conducted every three years, starting at the end of one year of operations.

10.4.4 Facility Safety Inspection and Reviews

A qualified Geotechnical Engineer will conduct formal annual Facility Safety Inspections (FSI) of the FTSF. The inspection will include a review of all compaction and daily inspection data. A report will be completed upon completion of the inspection and will be submitted to the owner and, as required, the appropriate agencies.

Every third year, a thorough Facility Safety Review (FSR) should be completed. During the FSR, design criteria and all operating surveillance information are evaluated. A formal risk assessment is completed with key mine management staff, and is used to provide the basis for any changes to practices as the project proceeds through operations towards an optimal closure condition. The main intent of the FSR is to confirm the status of the potential asset liability associated with the FTSF.

11.0 CONCEPTUAL CLOSURE CONSIDERATIONS

Developing an effective closure concept for a tailings storage facility is an iterative process that should commence as early as possible in the project development and continue throughout the life of the facility. The concepts for the closure of the Dawson FTSF discussed in this report were developed with the understanding that additional information and subsequent operational experience may identify more efficient and effective methods of attaining a successful and acceptable outcome.

The closure objectives for the FTSF include long-term physical and chemical stability; limiting erosion potential; diversion of stormwater runoff around the FTSF in permanent channels; and construction of an engineered cover over the FTSF. To meet these objectives, the conceptual closure of the FTSF includes the following components:

- The FTSF will be placed at an overall maximum slope of 3H:1V and will be reclaimed with an erosion protection layer concurrent with operations. The final cover of the FTSF slope may also be initiated during operations. Other disturbed areas will be regraded to maximum 3H:1V slopes to the extent possible, with all disturbed slopes not exceeding 2H:1V, unless evaluated and approved by a geotechnical engineer;
- Construction of an engineered cover system over the entire FTSF consisting of (from bottom to top):
  - 24-inch thick erosion protection layer (progressively placed on slopes during operations);
  - 6-inch thick sand and gravel layer;
  - 6-inch thick growth media layer to support establishment of vegetation; and
  - Seeding with native grasses.
- Crowning the final FTSF surface at 3% grade to promote positive drainage of runoff off the facility to perimeter closure channels;
- Construction of permanent perimeter closure channels around the FTSF to route runoff from the tributary watershed of the FTSF and runoff from direct precipitation on the FTSF around the facility and to the natural drainage downstream of the FTSF; and
- Although seepage from the FTSF is expected to be negligible, seepage will be monitored and treated if necessary to meet water quality standards of the State of Colorado. Once demonstrated to no longer be necessary for water quality monitoring, the seepage pond will be decommissioned, re-graded to original topography and re-vegetated.

A vegetative soil cover with erosion protection is proposed due to the semi-arid conditions and modest rainfall at the site, the low hydraulic conductivity of compacted filtered tailings, and the apparent lack of acid generating potential of the tailings. Additional measures to provide a low-hydraulic conductivity layer, capillary break or oxygen barrier are not believed to be warranted for this site based on currently available information. If desired, consideration may be given to progressively placing the final cover system on the final slopes of the FTSF during operations.

The FTSF will be crowned with a three percent slope to shed direct precipitation off of the FTSF to the perimeter closure channels. The perimeter closure channels have been designed to pass the 100-year, 24-hour storm event. The closure channel will be lined with riprap, with gabion drop structures constructed in steep sections as needed for energy dissipation.

The Contact Water Pond will be maintained for a period during post-closure to allow for water quality monitoring. Once demonstrate that the water quality is not adversely impacted by the FTSF, the Contact Water Pond will be breached, the liner system will be removed from site and disposed of, and the area will be regraded to mimic pre-existing conditions.

The conceptual closure plan of the FTSF is presented on **Drawing 170** and details are presented on **Drawing 175**.

12.0 PRE-FEASIBILITY COST ESTIMATE

Capital and operating cost estimates were developed for the filtered tailings storage facility. In accordance with the scope of work, the cost estimate has been developed to an accuracy of +/- 35%. Capital and sustaining capital cost estimates for the FTSF construction include the following elements:

- Site preparation;
- Haul road to FTSF;
- Starter buttresses for Zones 1 and 2;
- Underdrains;
- Contact water pond;
- Surface water diversion channels;
- Erosion protection structures for the diversion channels and contact water ditches; and
- Monitoring well installation.

Estimation of the capital costs for the tailings filter plant were outside the scope of this work.

Estimates of operating costs for the FTSF include the following:

- Filtered tailings placement;
- Placement of the erosion protection layer;
- Stormwater management and erosion/sediment control; and
- Monitoring activities.

Material take-offs (MTOs) were estimated based on the pre-feasibility FTSF design drawings presented in this report. Unit costs were estimated based on vendor quotes, Colorado Department of Transportation (CDOT) construction cost databases, the Nevada Standardized Reclamation Cost Estimator (SRCE, 2016), estimated equipment and cost rates, and costs from other projects. The following sections discuss the cost development and detailed cost tables showing quantities and unit rates are presented in **Appendix J**.

12.1 Capital and Sustaining Capital Costs

Table 16 presents a summary of the capital costs for the FTSF and discussion of the major items is presented in the following sections.

Table 16: Summary of Capital and Sustaining Capital Costs

Description	Year 0 Cost (US$)	Year 1-3 Cost (US$)	Year 3-5 Cost (US$)	Year 5-10 Cost (US$)
1.0 MOBILIZATION/DEMOBILIZATION	$ 30,118	$ 8,533	$ 9,043	$ 10,448
2.0 SITE PREPARATION	$ 42,955	$ 35,263	$ 29,124	$ 38,674
3.0 HAUL/ACCESS ROAD TO FTSF	$ 19,731	$ -	$ -	$ -
4.0 STARTER BUTTRESSES	$ 20,908	$ -	$ -	$ -
5.0 UNDERDRAINS	$ 56,718	$ 24,761	$ 11,004	$ 5,925
6.0 CONTACT WATER POND	$ 120,820	$ -	$ -	$ -
7.0 SURFACE WATER CHANNELS	$ 194,766	$ 61,881	$ 89,059	$ 104,663
8.0 MONITORING / INSTRUMENTATION	$ 17,500	$ 5,000	$ -	$ -
9.0 CONTINGENCY TAILINGS STORAGE IMPOUNDMENT	$ 13,940	$ -	$ -	$ -
TOTAL CONSTRUCTION COST	**$ 517,457**	**$ 135,439**	**$ 138,229**	**$ 159,709**
10.0 CONTINGENCY (20%)	$ 103,491	$ 27,088	$ 27,646	$ 31,942
TOTAL CONSTRUCTION COST + CONTINGENCY	**$ 620,948**	**$ 162,526**	**$ 165,875**	**$ 191,651**
11.0 INDIRECT COSTS (10%)	**$ 51,746**	**$ 13,544**	**$ 13,823**	**$ 15,971**
TOTAL	**$ 672,694**	**$ 176,070**	**$ 179,698**	**$ 207,622**

12.1.1 Contractor Mobilization / Demobilization

Costs for contractor mobilization and demobilization were based on a percentage of the direct construction costs based on experience with other projects. Mobilization costs for the earthworks contractor were estimated to be 5% of the earthworks costs and demobilization costs were estimated to be 2% of the earthworks. Mobilization/demobilization costs for the geosynthetics installer were estimated to be 10% of the geomembrane supply and installation costs.

12.1.2 Site Preparation

Site preparation cost include clearing and grubbing, topsoil removal and hauling to stockpile, and management of stormwater, erosion and sediment control during construction. Unit rates for clearing and grubbing costs were estimated based on average cost data for clearing and grubbing presented by the CDOT cost data books for 2012 through 2016.

Topsoil removal quantities were based on 12-inches average topsoil thickness over 70% of the FTSF footprint, as approximately 30% of the FTSF footprint has bedrock outcrops. Topsoil removal on the north side of the drainage was neglected due to extensive bedrock outcrops. Topsoil was assumed to be excavated using dozers and excavators and hauled approximately 1,500 feet to the stockpile location(s).

Management of stormwater, erosion and sediment control was estimated at 1.0% of the direct construction cost. This cost includes typical structures and activities such as silt fencing, temporary ditch and sediment detention ponds, and erosion control blankets and wattles.

12.1.3 Haul Road to FTSF

Capital costs include construction of a haul road from the process plant to the FTSF. The haul road is approximately 1,600 feet long and 30 feet wide. The alignment of the haul road is shown on **Drawing 100**. Costs associated with the haul road construction include excavation and structural fill placement (based on a roughly balanced cut to fill ratio) and placement of a wearing course.

12.1.4 Starter Buttresses

The starter buttresses for tailings zones 1 and 2 are assumed to be constructed with non-mineralized developmental waste rock from the Windy Gulch pit. Unit costs for starter buttress construction include foundation preparation/excavation and hauling the rockfill from Windy Gulch to the FTSF as well as spreading and compacting the fill. A one-way haul distance of 9,000 feet was used for the haulage costs. Costs for mining the rockfill material were not been included in the cost estimate.

12.1.5 Underdrains

Foundation underdrain material was assumed to have to be imported to site. A quote was provided by Fremont Paving and Redi-Mix to produce and deliver material to site at a unit rate of $24/ton. Unit rate for loading underdrain material from a stockpile, hauling and placement were estimated based on anticipated equipment and haul distances. Costs for underdrain pipe were estimated based on similar projects.

12.1.6 Contact Water Pond

Capital costs associated with the contact water pond include:

- Clearing and grubbing;
- Topsoil removal and stockpiling;
- Structural fill excavation and placement for construction of the pond basin and embankment; and
- Liner system construction, including subgrade preparation, 60 mil HDPE geomembrane installation and anchor trench excavation and backfilling.

Unit costs for clearing and grubbing and topsoil removal and stockpiling were estimated as described previously. Structural fill for embankment construction is assumed to be sourced from native alluvial/colluvial soils. Unit costs for structural fill excavation and placement are based on short haul distances (within 300 feet). Geomembrane supply and installation costs are benchmarked to recent liner installation projects and factored based on project scale. Geosynthetic material quantities were increased 10% to account for overlap and waste.

12.1.7 Surface Water Diversion Channels

Capital costs associated with the construction of the surface water diversion channels include:

- Clearing and grubbing;
- Topsoil removal and stockpiling;
- Structural fill excavation and placement for construction of the pond basin and embankment; and
- Riprap channel lining as well as erosion control structures (gabions) for steeper slopes (both for the diversion channels and the contact water ditches).

Unit costs for clearing and grubbing and topsoil removal and stockpiling were estimated as described previously. The channels are assumed to be constructed with a roughly balanced cut and fill, with excavated soils used as structural fill. Unit rates for riprap and gabions were estimated based on project experience and the CDOT cost database.

The diversion channels will need to be relocated as the filtered tailings stack expands. Sustaining capital cost development assumes construction of new diversion channels for years 2, 3 and 7.

12.1.8 Monitoring Well Installation

Monitoring wells considered for the cost estimate include:

- Three monitoring wells installed in the surficial alluvial aquifer (one upgradient and two downgradient of the FTSF);
- Two monitoring wells installed in the Dakota formation aquifer (one upgradient and one downgradient of the FTSF); and
- Two standpipe piezometers installed within the filtered tailings following the first year of operations.

Costs for the alluvial monitoring wells and standpipe piezometers were based on driller quotes, and costs for the monitoring wells installed in the Dakota formation were based on actual costs for the two monitoring wells installed at site in 2014.

12.1.9 Contingency and Indirect Costs

For this pre-feasibility level design, a contingency of 20% has been applied to the cost estimate. Indirect costs for engineering design, construction management and construction quality assurance (CQA) were estimated as 10% of the construction cost due to the relatively low capital cost for the FTSF.

12.2 Operating Costs

Table 17 presents a summary of the capital costs for the FTSF and discussion of the major items is presented in the following sections.

Table 17: Summary of FTSF Operating Costs

Description	Annual Cost (US$)
1.0 ANNUAL EARTHWORKS (ROADS, TAILINGS & EROSION PROTECTION LAYER PLACEMENT)	**$ 223,875**
2.0 ANNUAL MONITORING	**$ 58,960**
TOTAL ANNUAL OPERATING COSTS	**$ 282,835**
3.0 CONTINGENCY (20%)	**$ 56,567**
TOTAL ANNUAL OPERATING COST + CONTINGENCY	**$ 339,402**
COST PER TON (NOT INCLUDING TAILINGS FILTRATION)	$ 3.10

12.2.1 Filtered Tailings Placement

Costs for filtered tailings placement include hauling by truck from the filter plant to the FTSF, spreading and compaction. Unit costs were estimated using the material handling module of SRCE (2016), considering an average haul distance of 800 feet from the filter plant.

12.2.2 Annual Road Construction and Maintenance

Budget has been included for annual construction and maintenance of haul/access roads to and within the FTSF for tailings haul truck delivery.

12.2.3 Erosion Protection Layer

The erosion protection layer will be progressively placed on finished slopes of the FTSF during operations and therefore has been included as an operational cost. The erosion protection layer is assumed to be sourced from non-mineralized fine waste rock. Estimated costs for the erosion protection layer include crushing and/or screening, truck haulage from a stockpile at the process plant to the FTSF and placement. Unit costs were estimated using the material handling module of SRCE (2016), considering an average haul distance of 800 feet from the process plant. Costs do not include mining costs or transport/stockpiling at the process plant.

12.2.4 Monitoring Costs

Annual monitoring costs for sampling, laboratory testing and reporting of groundwater and surface water and facility safety inspections and reporting were estimated based on project experience. Costs for cone penetration testing (CPTu) were estimated based on unit rates provided by a prominent CTPu contractor. CPTu programs were assumed to be conducted every three years.

13.0 RISKS AND OPPORTUNITIES

The following risks and opportunities relating to the FTSF have been identified during the course of the pre-feasibility study.

13.1 Risks

- ► The feasibility of tailings filtration to the optimum moisture content (approximately) has not been proven for the Windy Gulch or Dawson tailings. Consequently, the tailings filter plant sizing, capital cost, cycle times, operating costs, etc. are uncertain. Bench-scale pressure filtration testwork is recommended in the next study phase.
- ► Geochemical characterization of the Dawson and Windy Point tailings has not been undertaken. A synthetic sample of Windy Gulch tailings were shown to be "non-PAG" or "uncertain" potential for acid generation, depending on the evaluation method. Additional testwork will be needed to characterize the geochemistry of the tailings.
- ► Trafficability on filtered tailings is a common challenge. This issue may be addressed with construction of access roadways using coarse material such as fine waste rock.

13.2 Opportunities

- ► Should surface disposal of waste rock be needed, consideration may be given to co-disposal or co-mingling of the filtered tailings and waste rock at the FTSF. Co-disposal is typically defined as mixing different waste streams (tailings and waste rock in this case) together prior to transport to the disposal site, whereas mixing for co-mingling takes place at the disposal site following transport. Although material handling is more challenging for co-disposal, benefits may include:
    - ▪ Significant reduction of potential acid generation of waste rock due to significant reduction of water and oxygen exposure;
    - ▪ Enhanced trafficability of the tailings surface;
    - ▪ Reduced waste footprint required for closure by combining tailings and waste rock disposal in one site; and
    - ▪ Improved dust control.

14.0 LIMITATIONS

This report has been prepared in accordance with generally accepted engineering practices for use by Zephyr for pre-feasibility design purposes. Conditions may exist which were undetectable given the limited nature of the enquiry Amec Foster Wheeler was retained to undertake with respect to the site. Accordingly, additional studies and actions may be required. It is recognized that the passage of time affects the information and assessment provided in this Document. Amec Foster Wheeler's assessment is based upon information that existed at the time of the production of the Document. Any assessments made in this Document are based on the conditions indicated from published sources. No warranty is offered, either express or implied, that confirms that the actual conditions will conform exactly to the assessments contained in this Document. Where data supplied by the client or other external sources have been used, it has been assumed that the information is correct unless otherwise stated. No responsibility is accepted by Amec Foster Wheeler for incomplete or inaccurate data supplied by others. If conditions appear to be different from those described herein, notification should be given so that a re-evaluation of the recommendations can be made.

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15.0 REFERENCES

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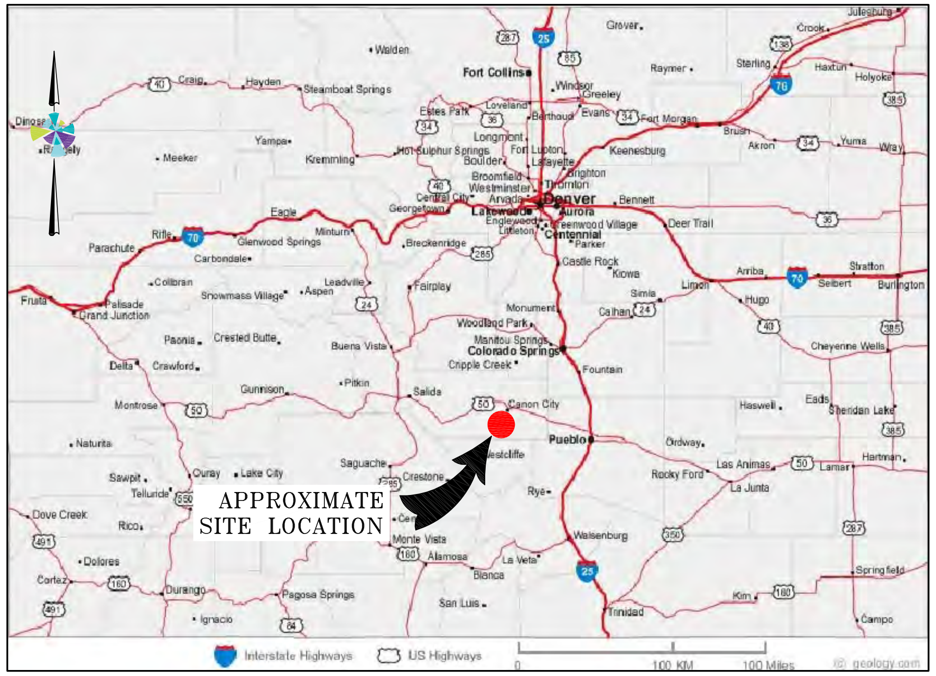
DRAWINGS

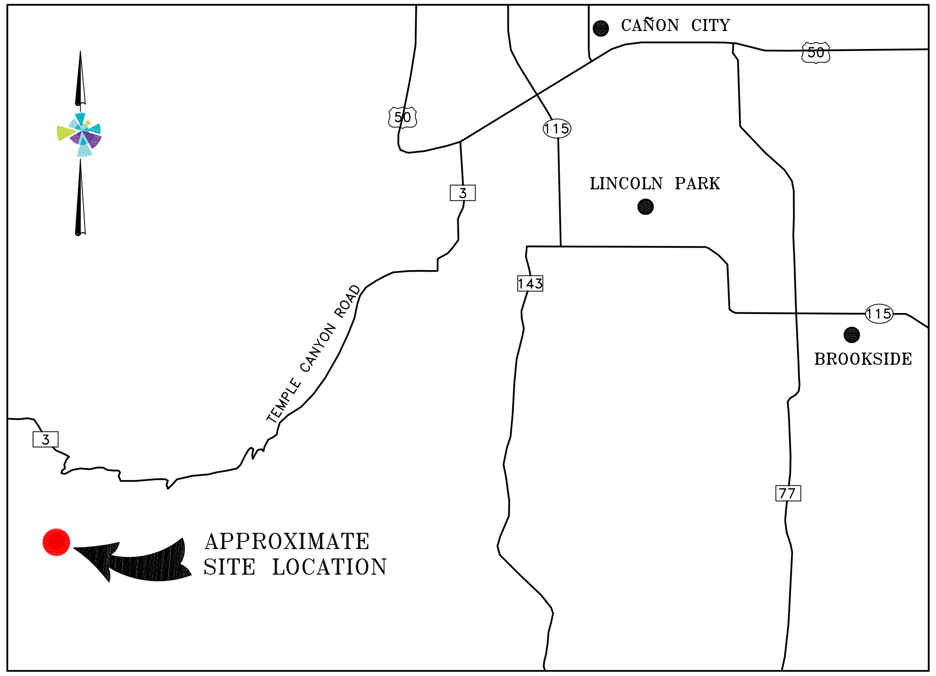
DAWSON FILTERED TAILINGS STORAGE FACILITY
PRE-FEASIBILITY STUDY
FREMONT COUNTY, COLORADO



LOCATION MAP
NTS

ISSUED
NOVEMBER 18, 2016

INDEX OF DRAWINGS



VICINITY MAP
NTS

PREPARED FOR:

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Zephyr Minerals Ltd

PREPARED BY:

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LEGEND:

100	EXISTING GROUND SURFACE CONTOUR EL, FEET (REF. 1)
100	PROPOSED GROUND SURFACE CONTOUR EL, FEET
⌖	EXISTING MONITORING WELL
▭	PROPOSED DAWSON FILTERED TAILINGS STORAGE FACILITY
▭	TOPSOIL STOCKPILE LOCATION

REFERENCES:
1. ORTHOPHOTO AND TOPOGRAPHIC CONTOURS CAPTURED FROM LIDAR SURVEY COMPLETED BY EAGLE MAPPING IN APRIL 2016.
2. COLORADO STATE PLANE COORDINATES
DATUM: NAD 83 – ZONE: COLLORADO CENTRAL

REV	DATE	DESCRIPTION	ENGR / CADD

CLIENT
ZEPHYR GOLD USA LTD.

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DRN BY HV
DSN BY SC
CHK BY BB
APR BY BB

PROJECT
DAWSON FILTERED TAILINGS STORAGE FACILITY

TITLE
GENERAL ARRANGEMENT

ISSUED DATE
11/18/2016

PROJECT No.
74201633

DRAWING No.
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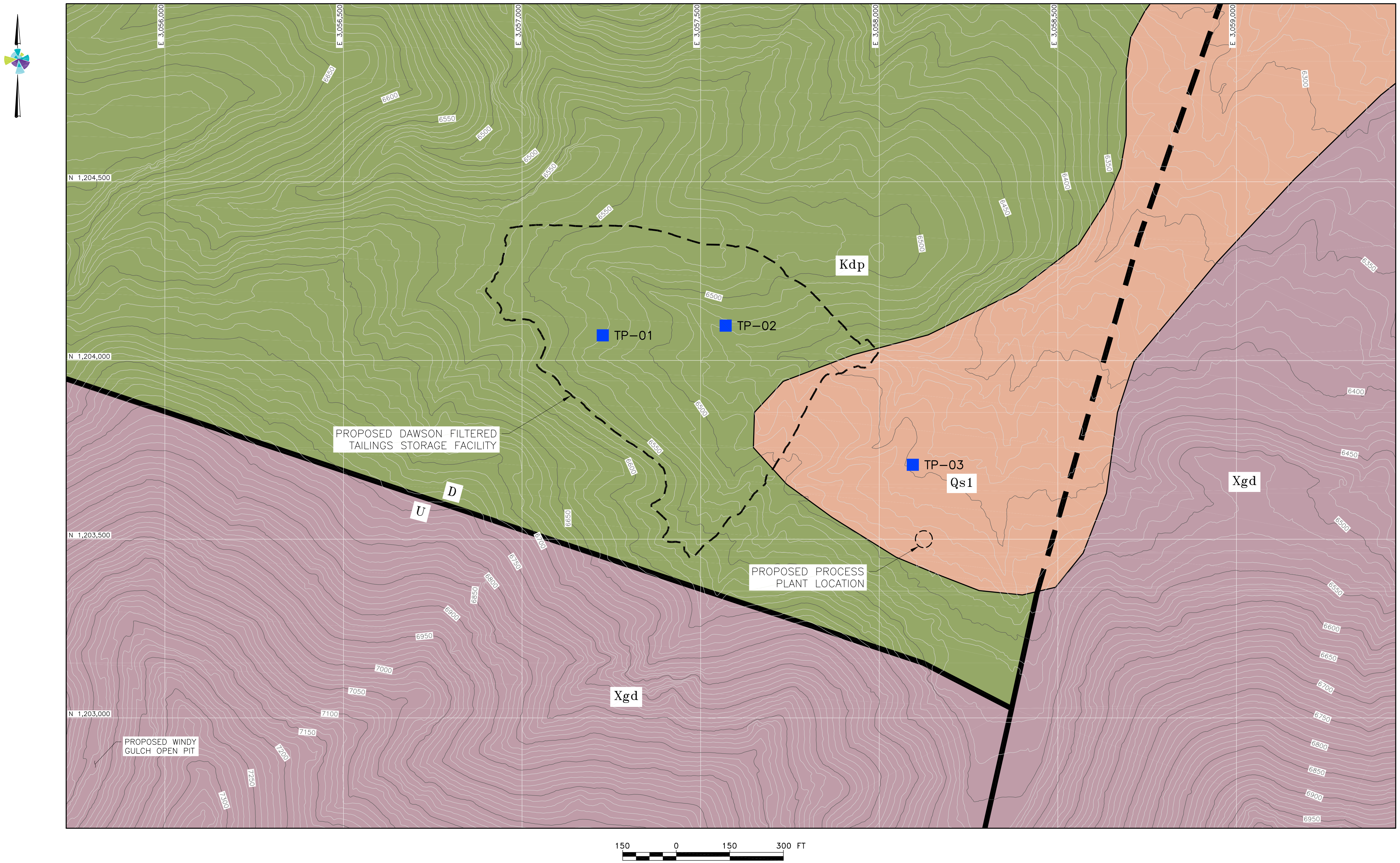

LEGEND:

100	EXISTING GROUND SURFACE CONTOUR EL, FEET (REF. 1)
– – – – –	PROPOSED DAWSON FILTERED TAILINGS STORAGE FACILITY
D ▬ U	FAULT, DASHED WHERE APPROXIMATELY LOCATED OR INFERRED. U = UPTHRONE SIDE D = DOWNTHRONE SIDE
TP–03 🟦	TEST PITS

DESCRIPTION OF MAP UNITS

Qs1	Qs1 – SLOCUM ALLUVIUM (PLEISTOCENE – SANGAMON INTERGLACIATION OR ILLINOIAN GLACIATION) – Moderate reddish brown poorly sorted moderately compacted stratified gravel containing layers of clay, silt, sand and clay balls derived from shaly bedrock. Near mountains, gravel contains abundant boulders. Stones are weathered and coated by calcium carbonate. Upper part contains a very strong calcareous Brown soil. Source of gravel. About 20 feet (6 m) thick. Terrace formed about 160 feet (48 m) above Arkansas River.
Kdp	Kdp – DAKOTA SANDSTONE AND PURGATOIRE FORMATION (LOWER CRETACEOUS) Total thickness about 300 feet (92 m) Dakota Sandstone–Yellowish brown crossbedded fine–grained sandstone containing some shale (Dry Creek Canyon Member) in the upper middle part.100 feet (30.5m) thick Purgatoire Formation – Glencairn Shale Member at top contains olive brown thin bedded sandstone, gray and black shale, and clay; thickness 80 feet (24.5m); underlain by the Lytle Sandstone Member which contains white fine to coarse grained sandstone, variegated clay and pebbly beds thickness 120 feet (36.5m)
Xgd	Xgd – GRANODIORITE (PRECAMBRIAN X1) – Gray, light gray to pinkish gray massive to foliated medium to coarse–grained granodiorite and lesser amounts of quartz monzonite and quartz diorite. Correlates with Boulder Creek Granodiorite. Forms plutons whose margins are well foliated and arc generally concordant or subconcordant to structure of enclosing gneisses. Interiors of plutons are less well foliated or are massive. Chiefly made up of oligoclase–ande–sine, microcline, hornblende and (or) biotite, and quartz.

NOTES:

1. GEOLOGIC MAP DIGITIZED FROM RECONNAISSANCE GEOLOGIC MAP OF THE ROYAL GORGE QUADRANGLE, FREMONT AND CUSTER COUNTIES, COLORADO, 1975

TEST PIT LOCATIONS

Point #	Elevation	Latitude	Longitude	Description
1	6530.18	N38° 23' 36.55"	W105° 18' 01.23"	TP–01
2	6474.89	N38° 23' 36.81"	W105° 17' 56.91"	TP–02
3	6447.75	N38° 23' 32.95"	W105° 17' 50.34"	TP–03

REFERENCES:
1. ORTHOPHOTO AND TOPOGRAPHIC CONTOURS CAPTURED FROM LIDAR SURVEY COMPLETED BY EAGLE MAPPING IN APRIL 2016.
2. COLORADO STATE PLANE COORDINATES
DATUM: NAD 83 – ZONE: COLLORADO CENTRAL

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REV	DATE	DESCRIPTION	ENGR / CADD

CLIENT
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CHK BY BB
APR BY BB

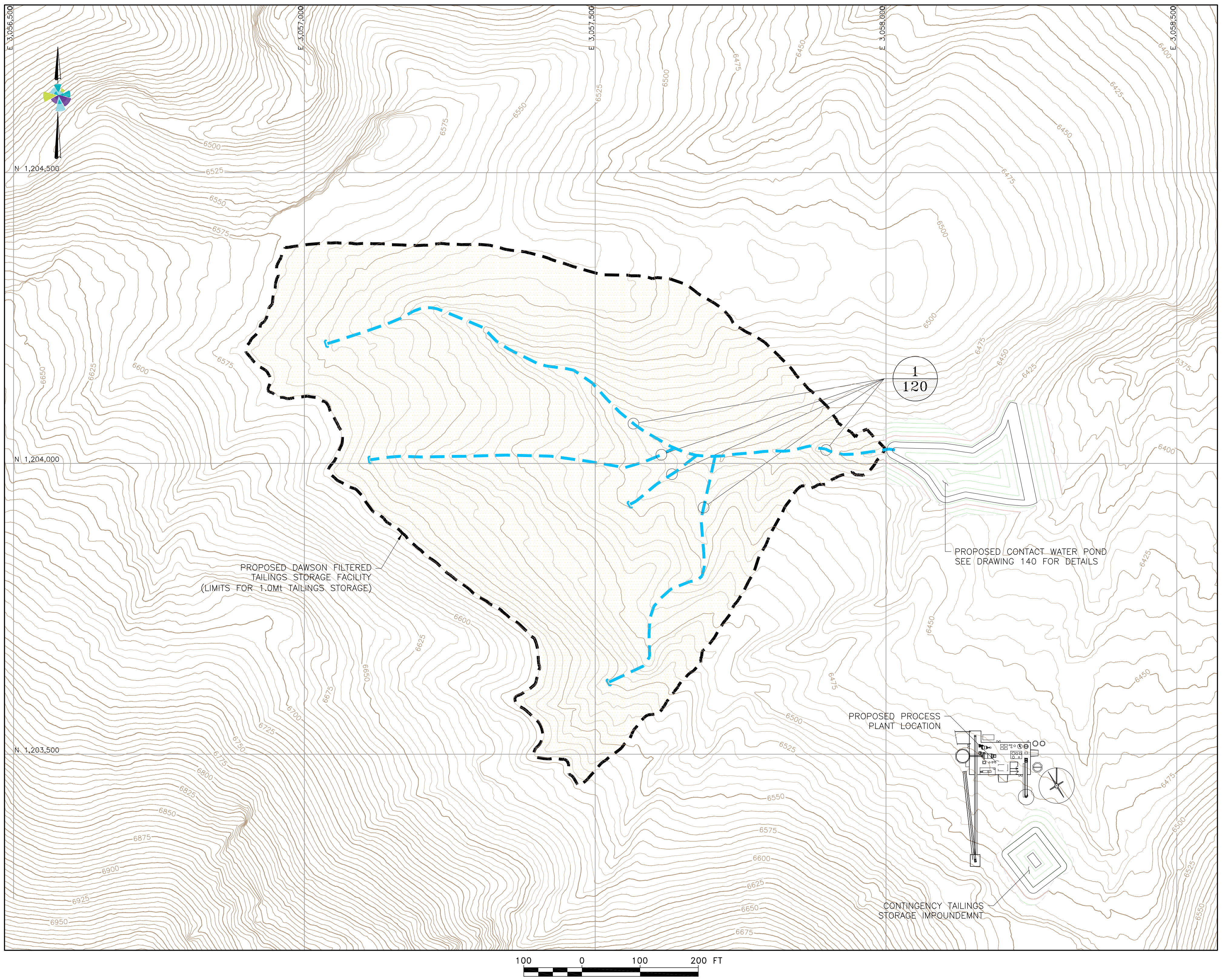
PROJECT
DAWSON FILTERED TAILINGS STORAGE FACILITY

TITLE
GEOLOGIC MAP AND LOCATIONS OF GEOTECHNICAL EXPLORATIONS

ISSUED DATE
11/18/2016

PROJECT No.
74201633

DRAWING No. 110
REV 0



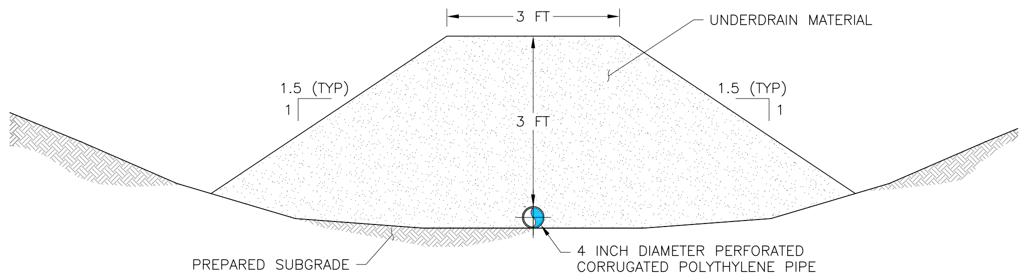
LEGEND:

100 EXISTING GROUND SURFACE CONTOUR EL, FEET

100 PROPOSED GROUND SURFACE CONTOUR EL, FEET

UNDERDRAIN

PROPOSED DAWSON FILTERED TAILINGS STORAGE FACILITY



1
120 UNDERDRAIN DETAIL
NTS

REFERENCES:
1. ORTHOPHOTO AND TOPOGRAPHIC CONTOURS CAPTURED FROM LIDAR SURVEY COMPLETED BY EAGLE MAPPING IN APRIL 2016.
2. COLORADO STATE PLANE COORDINATES
DATUM: NAD 83 – ZONE: COLLORADO CENTRAL

REV	DATE	DESCRIPTION	ENGR CADD

CLIENT
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CHK BY BB
APR BY BB

PROJECT
DAWSON FILTERED TAILINGS STORAGE FACILITY

TITLE
FOUNDATION UNDERDRAIN LAYOUT AND DETAILS

ISSUED DATE
11/18/2016

PROJECT No.
74201633

DRAWING No. 120
REV 0

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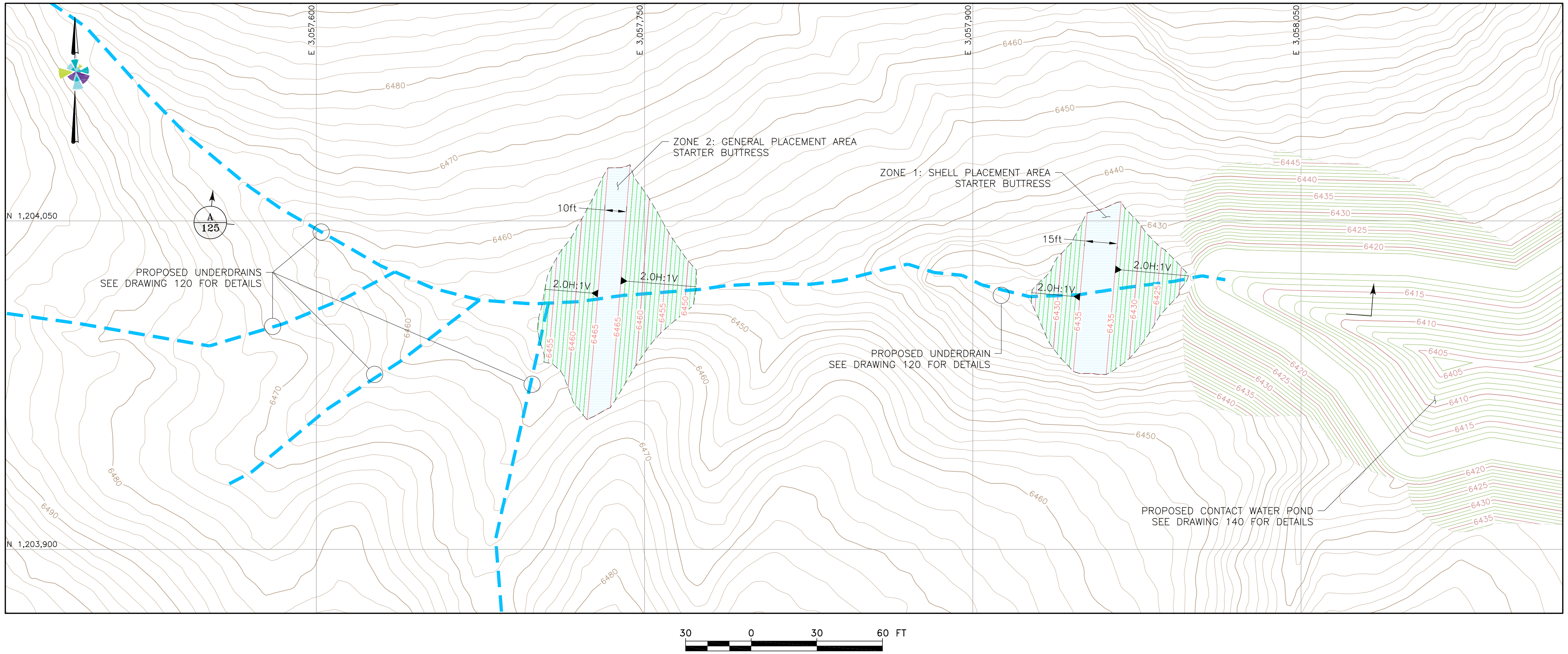


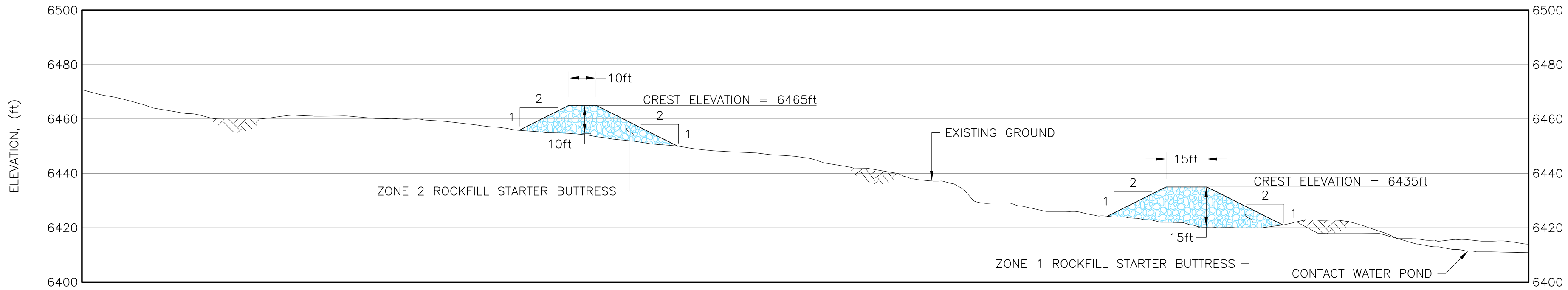
LEGEND:

100 EXISTING GROUND SURFACE CONTOUR EL, FEET
100 PROPOSED GROUND SURFACE CONTOUR EL, FEET
100 SECONDARY PROPOSED GROUND SURFACE CONTOUR EL, FEET
UNDERDRAIN
▭ STARTER BUTTRESS

DAWSON FTSF STARTER BUTTRESS VOLUMES		
BUTTRESS	CREST ELEVATION	BUTTRESS ROCKFILL (cu. yds)
ZONE 1	6,435	772
ZONE 2	6,465	1,109

NOTE:

1. STARTER BUTTRESSES TO BE CONSTRUCTED WITH INERT (NON–PAG) ROCKFILL SOURCED FROM MINE DEVELOPMENT ROCK OR ON–SITE QUARRY. ROCKFILL SHALL BE PLACED BY METHOD SPECIFICATION AND MEET REQUIREMENTS PRESENTED IN TECHNICAL SPECIFICATION SECTION 02200.



A
125
FTSF STARTER BUTTRESSES
30 0 30 60 FT

REFERENCES:
1. TOPOGRAPHIC CONTOURS CAPTURED FROM LIDAR SURVEY COMPLETED BY EAGLE MAPPING IN APRIL 2016.
2. COLORADO STATE PLANE COORDINATES
DATUM: NAD 83 – ZONE: COLLORADO CENTRAL

REV	DATE	DESCRIPTION	ENGR / CADD

CLIENT
ZEPHYR GOLD USA LTD.

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PROJECT
DAWSON FILTERED TAILINGS STORAGE FACILITY

TITLE
FTSF STARTER BUTTRESSES PLAN AND SECTION

ISSUED DATE
11/18/2016

PROJECT No.
74201633

DRAWING No. 125
REV 0

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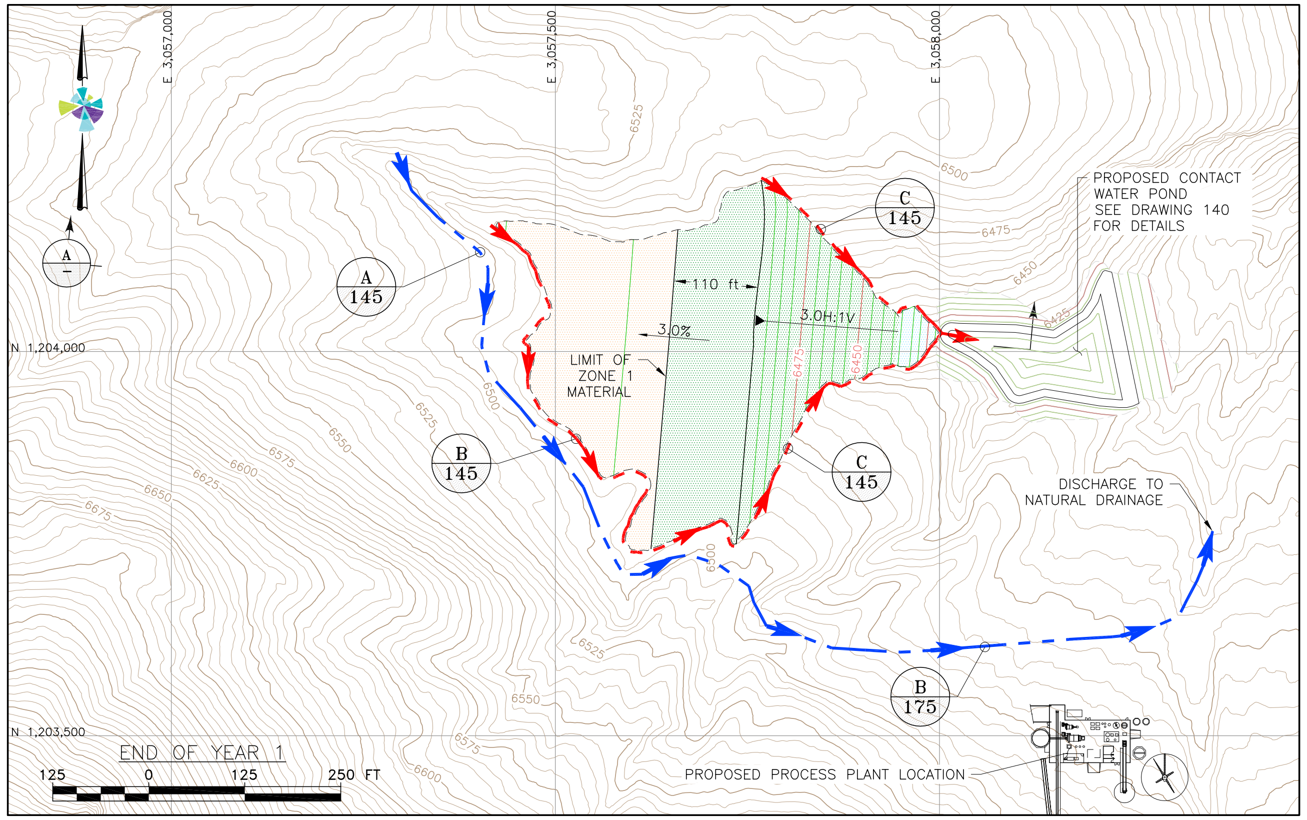
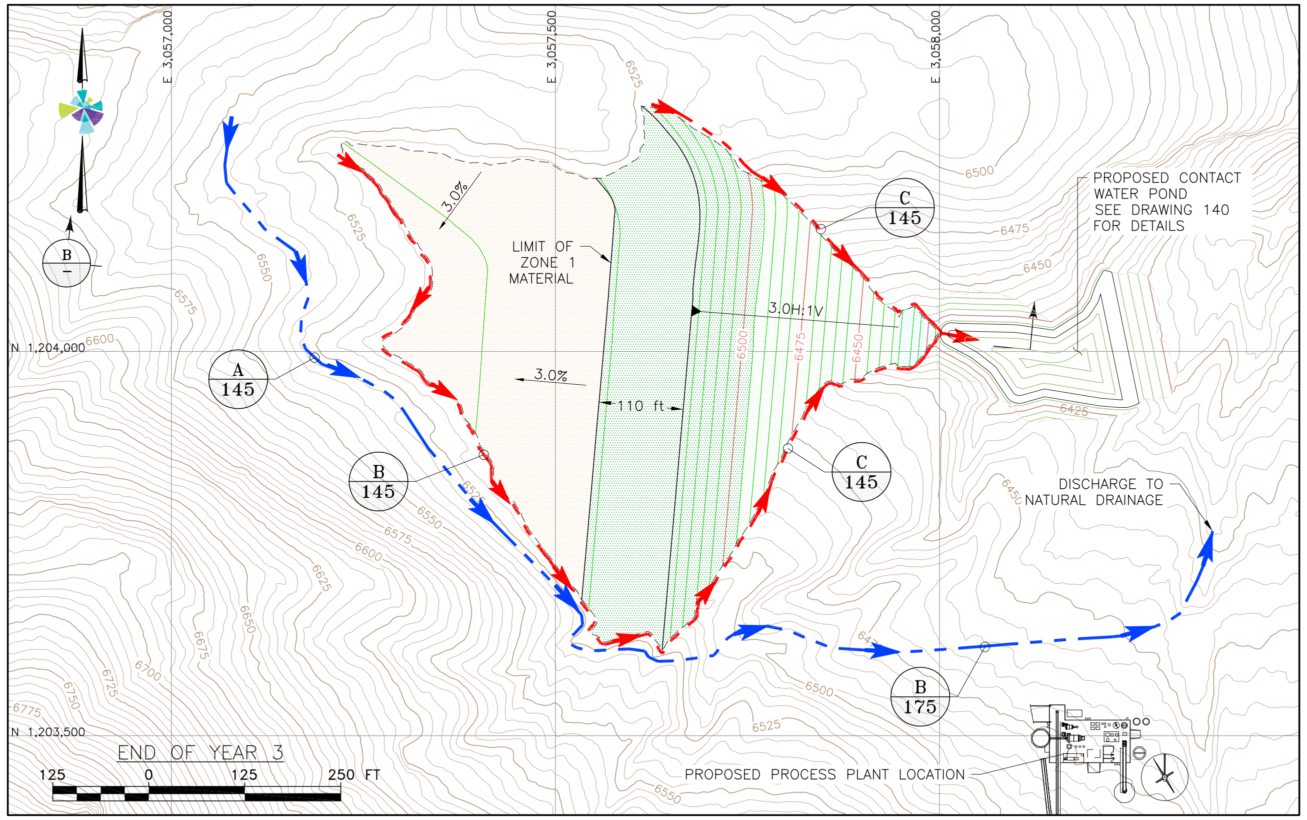


END OF YEAR 1



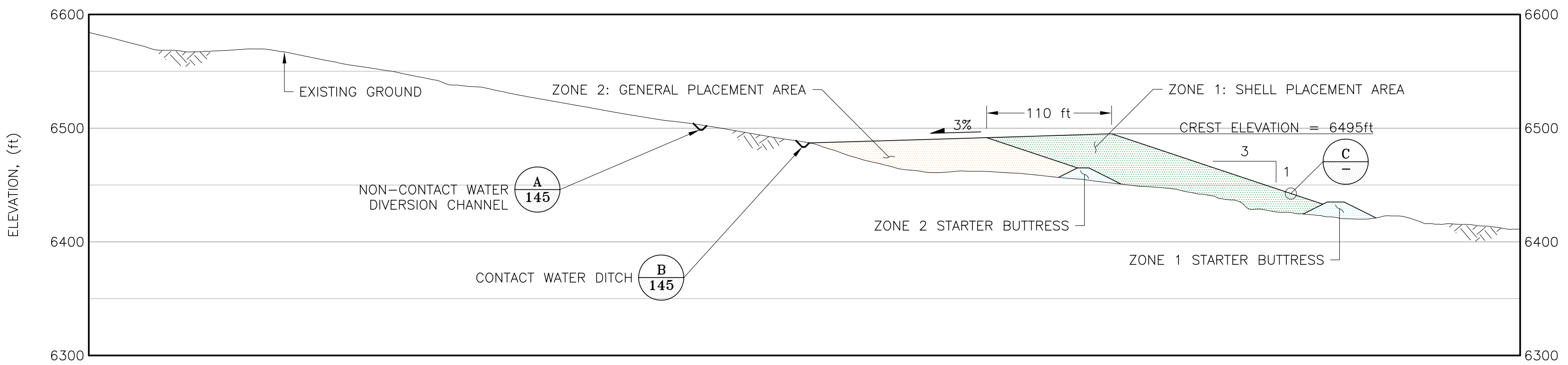
END OF YEAR 3

LEGEND:

- 100 EXISTING GROUND SURFACE CONTOUR EL, FEET (REF. 1)
- 100 PROPOSED GROUND SURFACE CONTOUR EL, FEET
- 100 SECONDARY PROPOSED GROUND SURFACE CONTOUR EL, FEET
- 🟩 ZONE 1 FILTERED TAILINGS MATERIAL (SHELL PLACEMENT AREA)
- ☐ ZONE 2 FILTERED TAILINGS MATERIAL (GENERAL PLACEMENT AREA)
- ☐ STARTER BUTTRESS
- ☐ PREVIOUSLY PLACED ZONE 1 FILTERED TAILINGS MATERIAL
- ☐ PREVIOUSLY PLACED ZONE 2 FILTERED TAILINGS MATERIAL
- ➔ NON-CONTACT WATER DIVERSION CHANNEL (OPERATIONS)
- ➔ CONTACT WATER DITCH

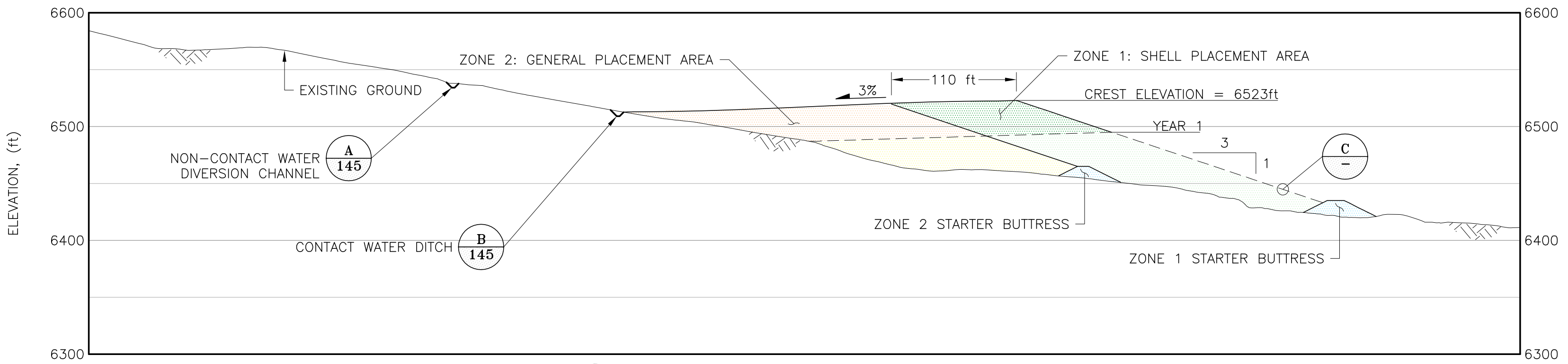
NOTES:

1. SCHEMATIC ONLY. DRY STACK FACE TO BE DEVELOPED WITH BENCHES TO LIMIT EROSION POTENTIAL.
2. ZONE 1 TAILINGS TO BE PLACED IN 12in.-THICK LIFTS TO MINIMUM 95% STANDARD PROCTOR MAXIMUM DRY DENSITY. ZONE 2 TAILINGS TO BE PLACED IN 12in.-THICK LIFTS TO MINIMUM 90% STANDARD PROCTOR MAXIMUM DRY DENSITY.
3. SURFACE OF FTSF TO BE SMOOTH ROLLED AND GRADED TO PROMOTE RUNOFF AND PREVENT PONDING WATER ON TAILINGS SURFACE.



A – END OF YEAR 1

80 0 80 160 FT

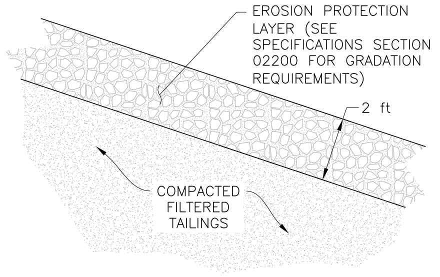


B – END OF YEAR 3

80 0 80 160 FT

DAWSON FTSF VOLUMES				
YEAR	CREST ELEVATION	ZONE 1[1] (CUMULATIVE TONS)	ZONE 2[2] (CUMULATIVE TONS)	TOTAL TONS
1	6,495	67,888	46,287	114,175
3	6,523	163,476	167,445	330,921

1. ZONE 1 (SHELL PLACEMENT AREA) DRY DENSITY IS ASSUMED TO BE 105 lb/ft³.
2. ZONE 2 (GENERAL PLACEMENT AREA) DRY DENSITY IS ASSUMED TO BE 100 lb/ft³.



C – EROSION PROTECTION LAYER DETAIL

REFERENCES:
1. ORTHOPHOTO AND TOPOGRAPHIC CONTOURS CAPTURED FROM LIDAR SURVEY COMPLETED BY EAGLE MAPPING IN APRIL 2016.
2. COLORADO STATE PLANE COORDINATES DATUM: NAD 83 – ZONE: COLORADO CENTRAL

REV	DATE	DESCRIPTION	ENGR CADD

CLIENT
ZEPHYR GOLD USA LTD.

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PROJECT
DAWSON FILTERED TAILINGS STORAGE FACILITY

ISSUED DATE
11/18/2016

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CHK BY BB
APR BY BB

TITLE
FTSF PLANS AND SECTIONS – YEARS 1 AND 3

PROJECT No.
74201633

DRAWING No. 130
REV 0

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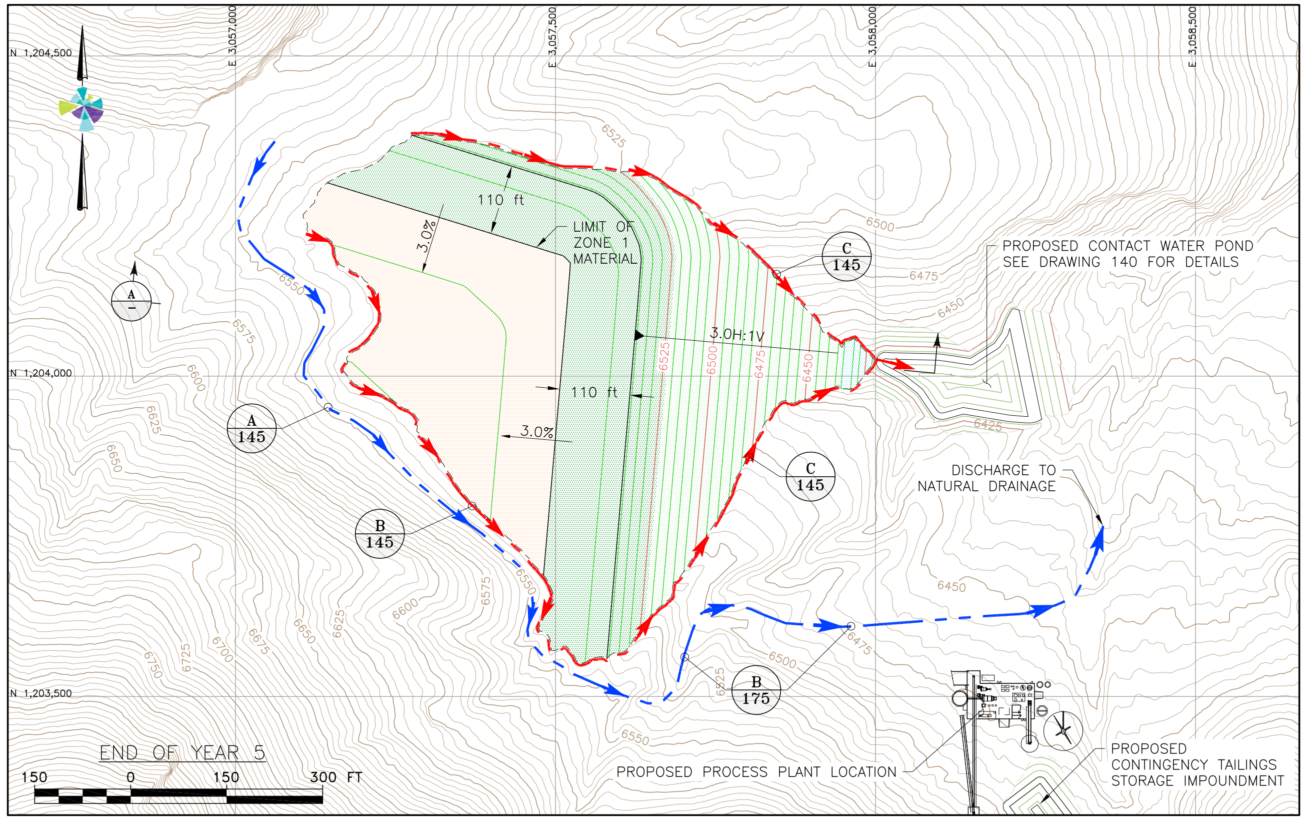
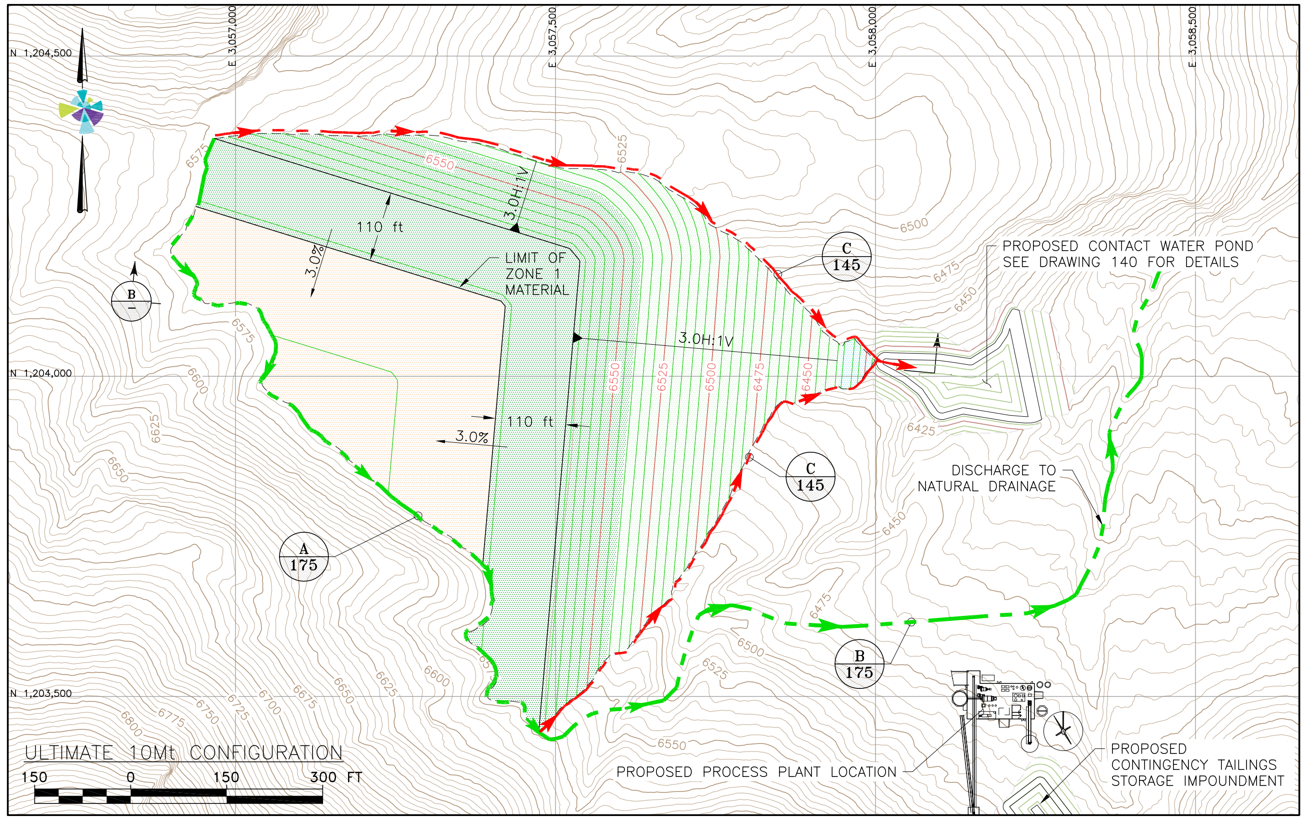




LEGEND:

100 EXISTING GROUND SURFACE CONTOUR EL, FEET (REF. 1)

100 PROPOSED GROUND SURFACE CONTOUR EL, FEET

100 SECONDARY PROPOSED GROUND SURFACE CONTOUR EL, FEET

▨ ZONE 1 FILTERED TAILINGS MATERIAL (SHELL PLACEMENT AREA)

▨ ZONE 2 FILTERED TAILINGS MATERIAL (GENERAL PLACEMENT AREA)

▨ STARTER BUTTRESS

▨ PREVIOUSLY PLACED ZONE 1 FILTERED TAILINGS MATERIAL

▨ PREVIOUSLY PLACED ZONE 2 FILTERED TAILINGS MATERIAL

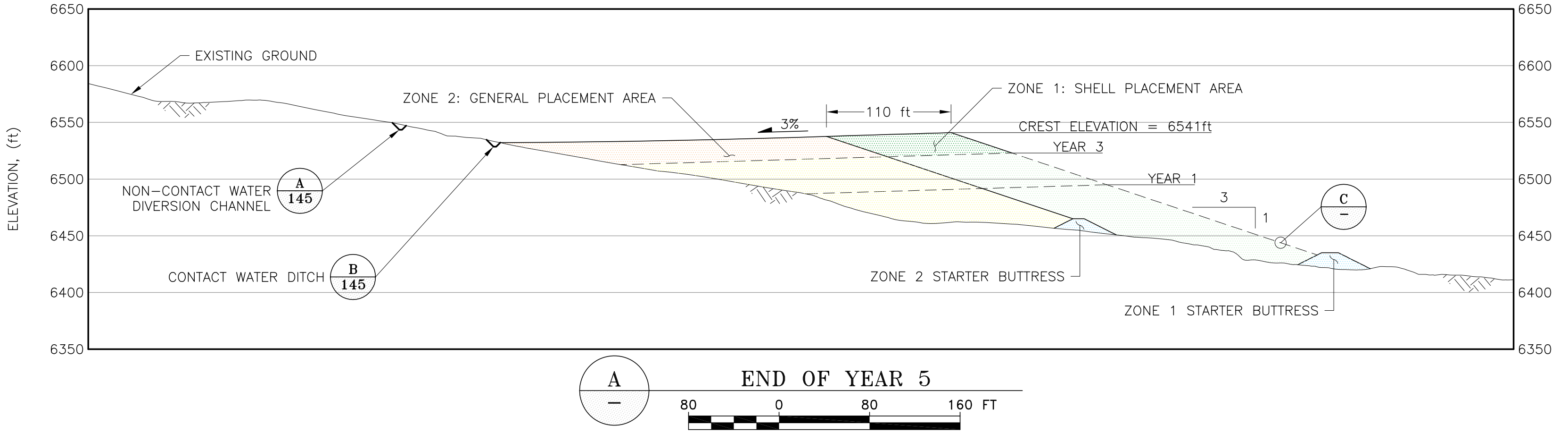
NON-CONTACT WATER DIVERSION CHANNEL (OPERATION)

CONTACT WATER DITCH

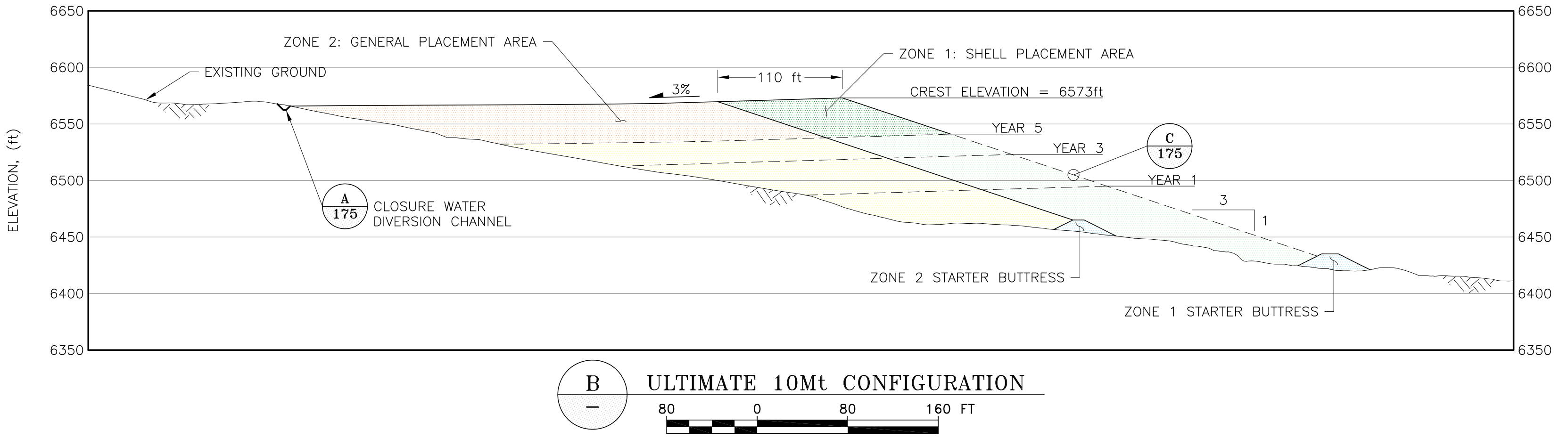
CLOSURE CHANNEL

NOTES:

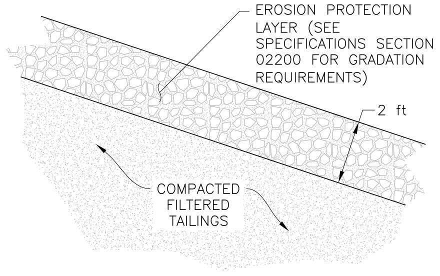
1. SCHEMATIC ONLY. DRY STACK FACE TO BE DEVELOPED WITH BENCHES TO LIMIT EROSION POTENTIAL.
2. ZONE 1 TAILINGS TO BE PLACED IN 12in.–THICK LIFTS TO MINIMUM 95% STANDARD PROCTOR MAXIMUM DRY DENSITY. ZONE 2 TAILINGS TO BE PLACED IN 12in.–THICK LIFTS TO MINIMUM 90% STANDARD PROCTOR MAXIMUM DRY DENSITY.
3. SURFACE OF FTSF TO BE SMOOTH ROLLED AND GRADED TO PROMOTE RUNOFF AND PREVENT PONDING WATER ON TAILINGS SURFACE.



A – END OF YEAR 5



B – ULTIMATE 10Mt CONFIGURATION



C – EROSION PROTECTION LAYER DETAIL

DAWSON FTSF VOLUMES				
YEAR	CREST ELEVATION	ZONE 1[1] (CUMULATIVE TONS)	ZONE 2[2] (CUMULATIVE TONS)	TOTAL TONS
5	6,541	256,453	290,077	546,530
ULTIMATE	6,573	481,996	526,722	1,008,718

1. ZONE 1 (SHELL PLACEMENT AREA) DRY DENSITY IS ASSUMED TO BE 105 lb/ft^3.
2. ZONE 2 (GENERAL PLACEMENT AREA) DRY DENSITY IS ASSUMED TO BE 100 lb/ft^3.

REFERENCES:
1. ORTHOPHOTO AND TOPOGRAPHIC CONTOURS CAPTURED FROM LIDAR SURVEY COMPLETED BY EAGLE MAPPING IN APRIL 2016.
2. COLORADO STATE PLANE COORDINATES DATUM: NAD 83 – ZONE: COLORADO CENTRAL

REV	DATE	DESCRIPTION	ENGR CADD

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PROJECT
DAWSON FILTERED TAILINGS STORAGE FACILITY

TITLE
FTSF PLANS AND SECTIONS – YEAR 5 AND ULTIMATE

ISSUED DATE
11/18/2016

PROJECT No.
74201633

DRAWING No.
131

REV
0

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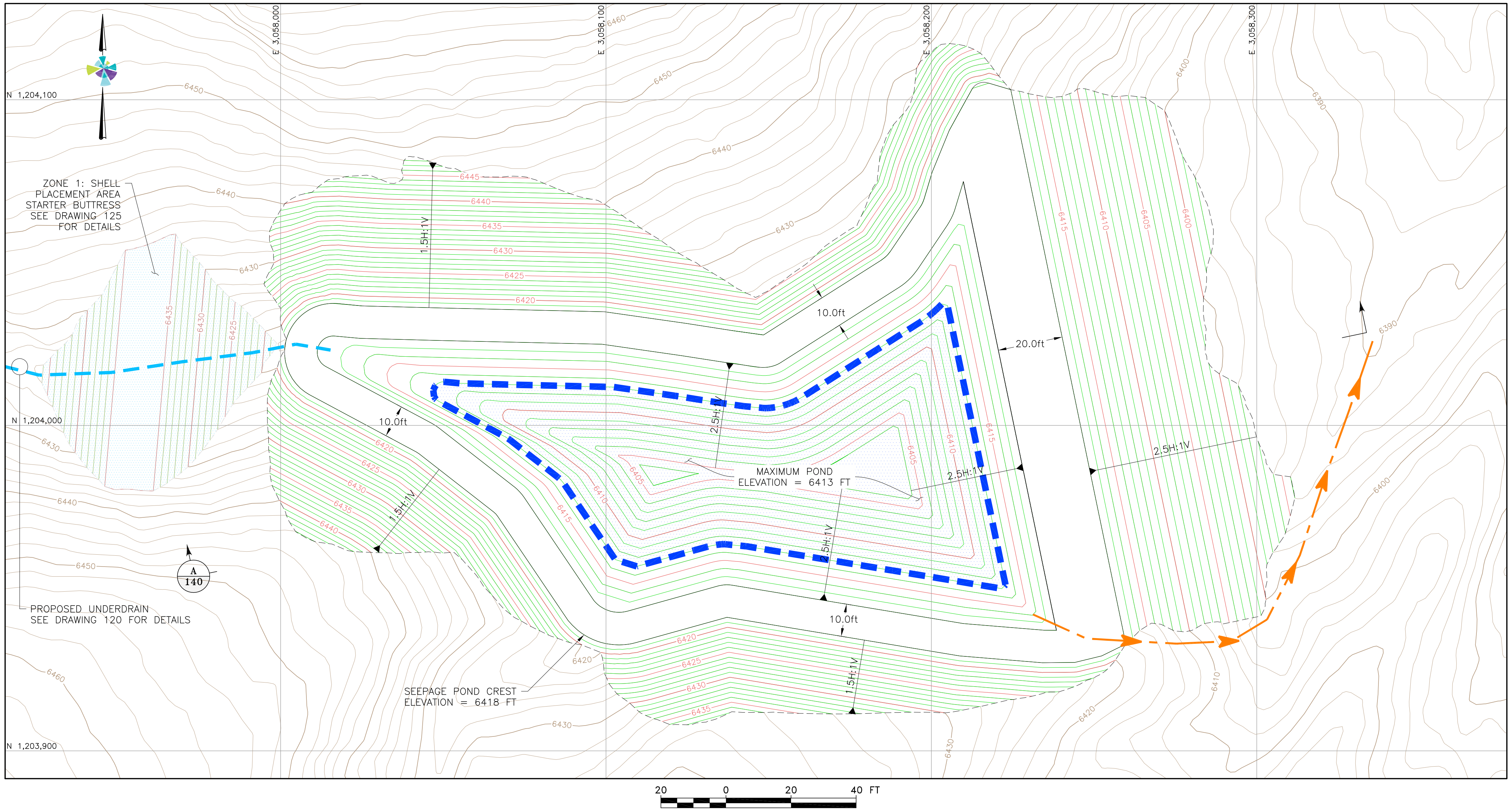


LEGEND:

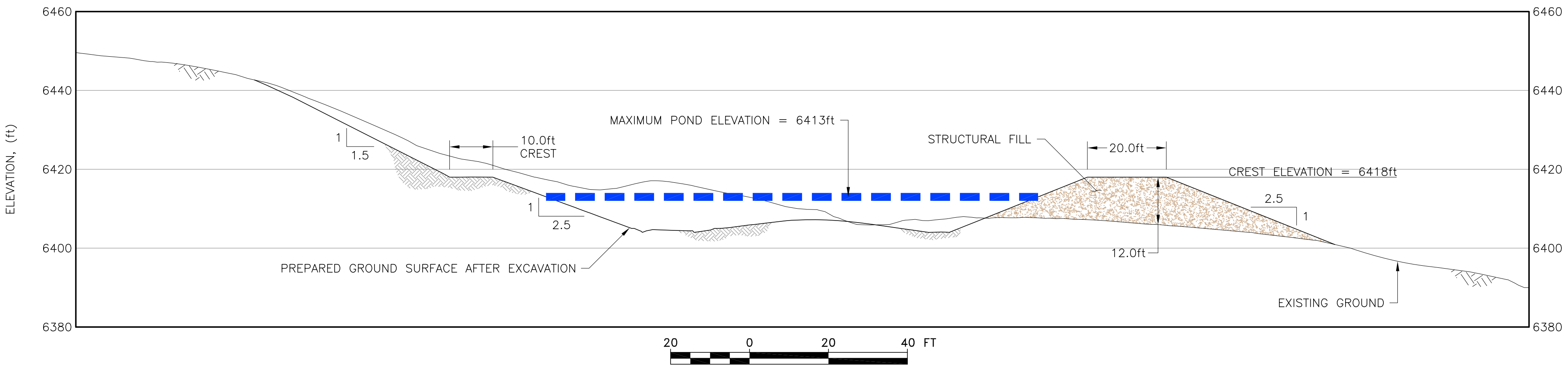
- EXISTING GROUND SURFACE CONTOUR EL, FEET (REF. 1)
- PROPOSED GROUND SURFACE CONTOUR EL, FEET
- SECONDARY PROPOSED GROUND SURFACE CONTOUR EL, FEET
- UNDERDRAIN
- STARTER BUTTRESS
- SPILLWAY CHANNEL (CONCEPTUAL)

NOTE:

1. PUMPS (DESIGNED BY OTHERS) WILL BE USED TO PUMP WATER OUT OF THE CONTACT WATER POND AND RECYCLE IT BACK TO THE PROCESS PLANT.

DAWSON FTSF
CONTACT WATER POND VOLUMES

CUT (cu. yds)	FILL (cu. yds)	NET CUT (cu. yds)	POND CAPACITY (cu. yds)
4,483	3,513	970	1,185



REFERENCES:
1. ORTHOPHOTO AND TOPOGRAPHIC CONTOURS CAPTURED FROM LIDAR SURVEY COMPLETED BY EAGLE MAPPING IN APRIL 2016.
2. COLORADO STATE PLANE COORDINATES
DATUM: NAD 83 – ZONE: COLLORADO CENTRAL

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PROJECT
DAWSON FILTERED TAILINGS STORAGE FACILITY

TITLE
CONTACT WATER POND – PLAN AND CROSS SECTION

ISSUED DATE
11/18/2016

PROJECT No.
74201633

DRAWING No.
140

REV
0

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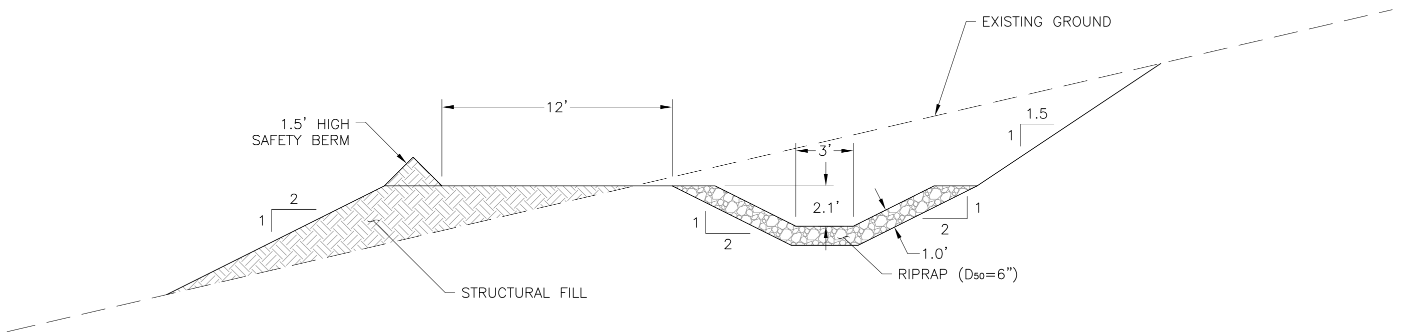
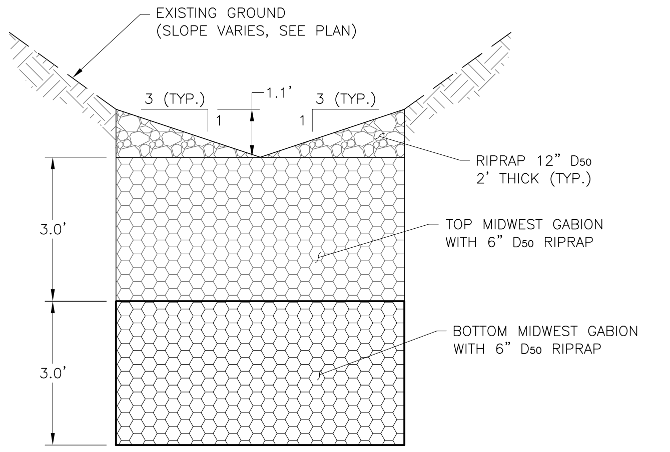


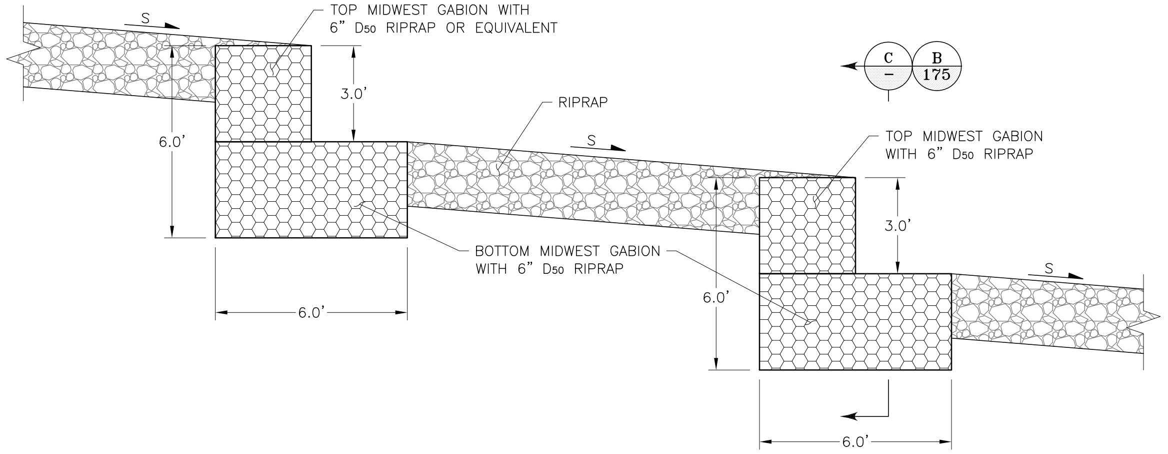
A 130 A 131 NON–CONTACT WATER DIVERSION CHANNEL (DURING OPERATIONS)

NTS



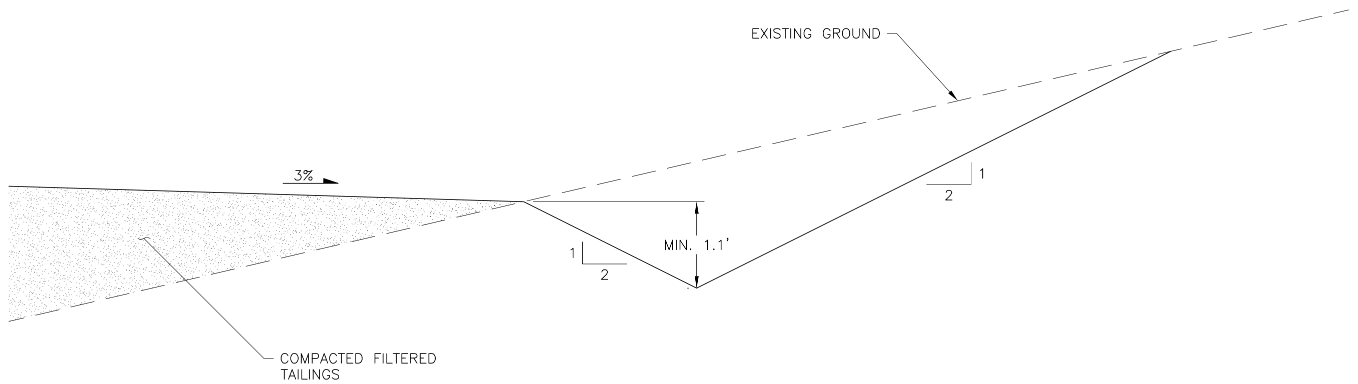
C 130 C 131 TYPICAL CONTACT WATER DITCH WITH GABION DROP STRUCTURES (STEEP SLOPES)

NTS



TYPICAL PROFILE GABION DROP STRUCTURES

NTS



B 130 B 131 TYPICAL CONTACT WATER DITCH (2% LONGITUDINAL SLOPES)

NTS

NOTES:

1. THE NON–CONTACT WATER DIVERSION CHANNEL LOCATED ON STEEP SLOPES OUTSIDE THE ULTIMATE FOOTPRINT WILL FORM THE DOWNSTREAM SEGMENT OF THE CLOSURE CHANNEL AND HAS BEEN DESIGNED FOR CLOSURE CONDITION.

REV	DATE	DESCRIPTION	ENGR CADD

CLIENT
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PROJECT
DAWSON FILTERED TAILINGS STORAGE FACILITY

TITLE
SURFACE WATER MANAGEMENT DETAILS

ISSUED DATE
11/18/2016

PROJECT No.
74201633

DRAWING No. 145
REV 0

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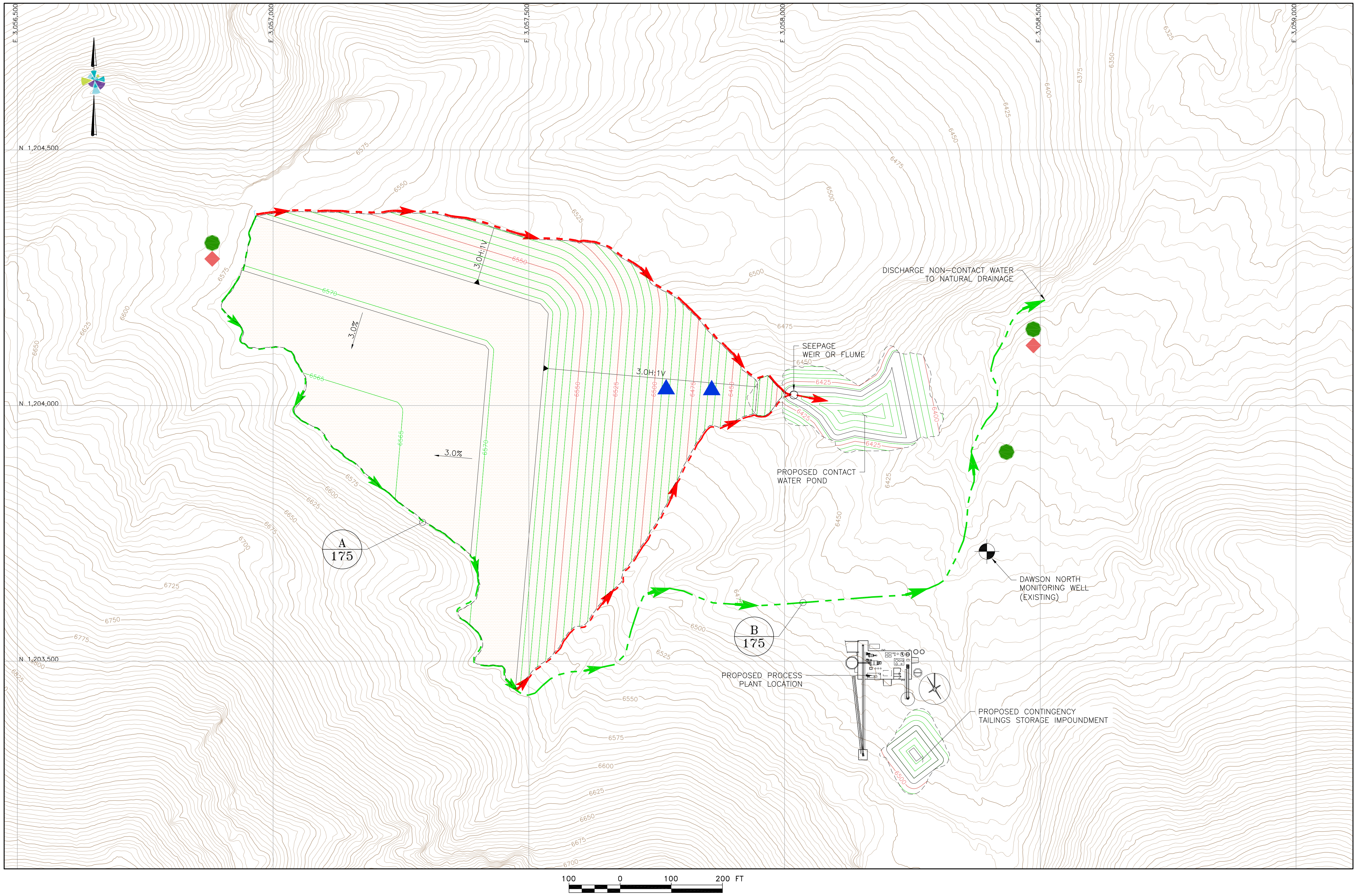

LEGEND:

- 100 EXISTING GROUND SURFACE CONTOUR EL, FEET (REF. 1)
- 100 PROPOSED GROUND SURFACE CONTOUR EL, FEET
- CLOSURE CHANNEL
- CONTACT WATER DITCH
- EXISTING MONITORING WELL (SCREENED IN DAKOTA FORMATION)
- ● PROPOSED MONITORING WELL (SCREENED IN ALLUVIAL AQUIFER)
- ◆ PROPOSED MONITORING WELL (SCREEN IN DAKOTA FORMATION AQUIFER)
- ▲ STANDPIPE PIEZOMETER (INSTALLED ONLY IN TAILING)

NOTES:

1. GROUNDWATER MONITORING WELLS TO BE INSTALLED PRIOR TO OPERATIONS.

REFERENCES:

1. ORTHOPHOTO AND TOPOGRAPHIC CONTOURS CAPTURED FROM LIDAR SURVEY COMPLETED BY EAGLE MAPPING IN APRIL 2016.
2. COLORADO STATE PLANE COORDINATES
DATUM: NAD 83 – ZONE: COLLORADO CENTRAL

REV	DATE	DESCRIPTION	ENGR / CADD

CLIENT
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DSN BY SC
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APR BY BB

PROJECT
DAWSON FILTERED TAILINGS STORAGE FACILITY

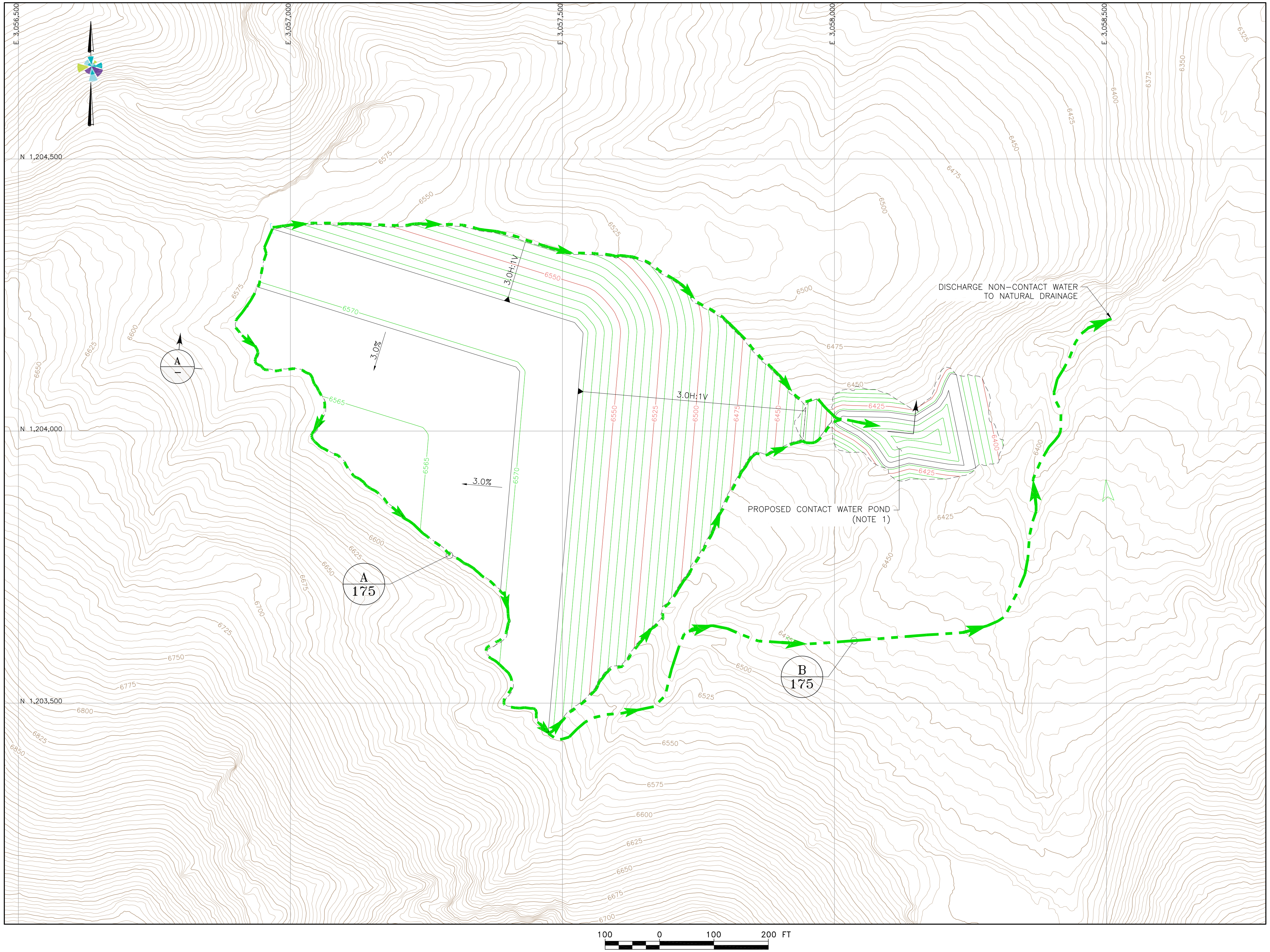
TITLE
INSTRUMENTATION PLAN

ISSUED DATE
11/18/2016

PROJECT No.
74201633

DRAWING No. 160
REV 0

S:\Projects\1633 zephyr minerals dawson tsf\9.0 cadd\9.1 sheet sets\PR-INSTRUMENTATION PLAN.dwg-10/20/2016 1:26 PM

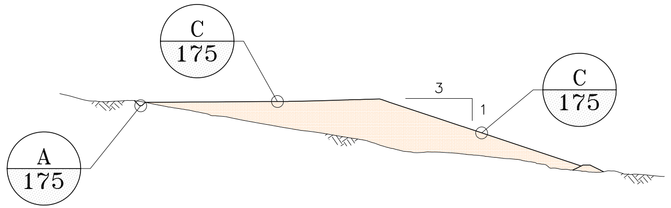


LEGEND:

100	EXISTING GROUND SURFACE CONTOUR EL, FEET (REF. 1)
100	PROPOSED GROUND SURFACE CONTOUR EL, FEET
➞	CLOSURE CHANNEL

NOTE:

1. CONTACT WATER POND WILL BE BREACHED AND REGRADED TO APPROXIMATE ORIGINAL GROUND CONDITIONS ONCE SEEPAGE FLOWS ARE DEMONSTRATED TO MEET WATER QUALITY STANDARDS.



A – TYPICAL CROSS-SECTION
NTS

REFERENCES:
1. ORTHOPHOTO AND TOPOGRAPHIC CONTOURS CAPTURED FROM LIDAR SURVEY COMPLETED BY EAGLE MAPPING IN APRIL 2016.
2. COLORADO STATE PLANE COORDINATES DATUM: NAD 83 – ZONE: COLLORADO CENTRAL

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REV	DATE	DESCRIPTION	ENGR / CADD

CLIENT
ZEPHYR GOLD USA LTD.

DISCLAIMER

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PRE-FEASIBILITY

DRN BY HV
DSN BY SC
CHK BY BB
APR BY BB

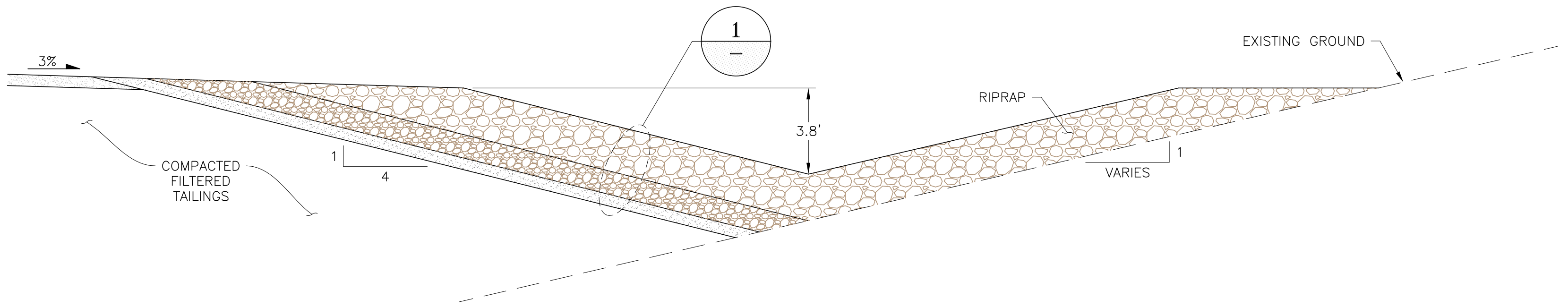
PROJECT
DAWSON FILTERED TAILINGS STORAGE FACILITY

TITLE
CONCEPTUAL CLOSURE PLAN

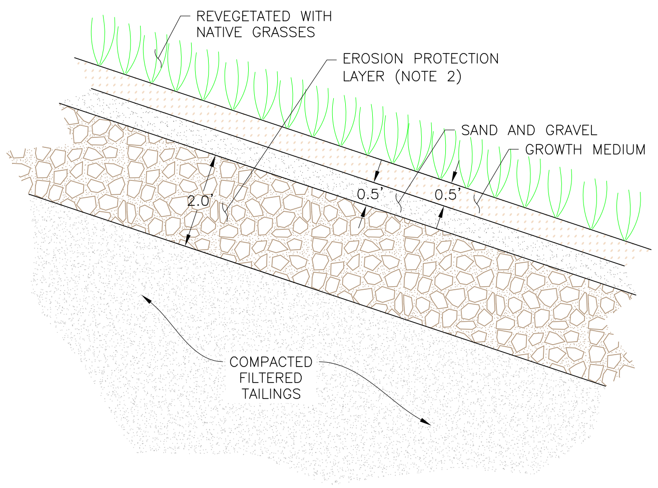
ISSUED DATE
11/18/2016

PROJECT No.
74201633

DRAWING No. 170
REV 0



A
170
CLOSURE CHANNEL – PERIMETER OF FTSF
NTS



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C
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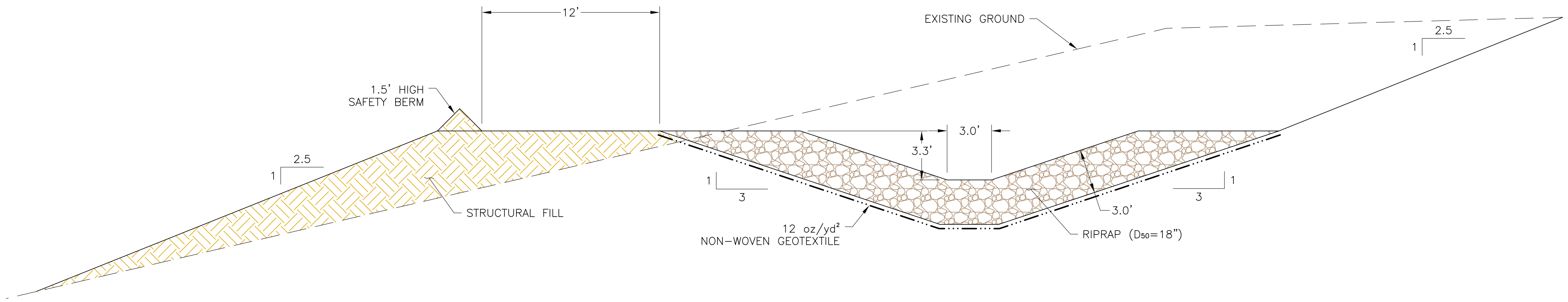
CONCEPTUAL CLOSURE COVER SYSTEM



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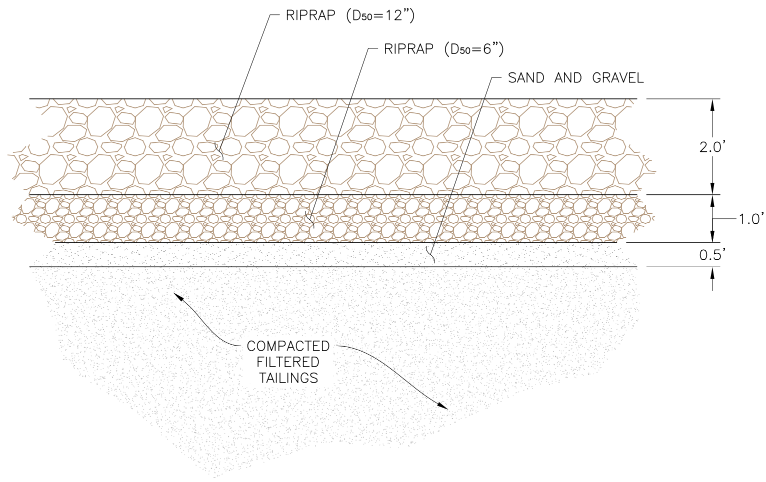
B
131
B
170
CLOSURE WATER DIVERSION CHANNEL – DOWNSTREAM OF FTSF (NOTE 1)
NTS



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LINING DETAIL – CLOSURE CHANNEL

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NOTES:

1. INCLUDE GABION DROP STRUCTURES ACCORDING TO THE PROFILE ON DRAWING 145.
2. SEE SPECIFICATIONS SECTION 02200 FOR EROSION PROTECTION LAYER GRADATION.

REV	DATE	DESCRIPTION	ENGR CADD

CLIENT
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DRN BY HV
DSN BY SC
CHK BY BB
APR BY BB

TITLE
CONCEPTUAL CLOSURE PLAN DETAILS

PROJECT No.
74201633

DRAWING No.
175

REV
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APPENDIX F: AMEC Foster Wheeler Operation Monitoring and Surveillance Manual

OPERATIONS, MONITORING & SURVEILLANCE (OMS) MANUAL

DAWSON FILTERED TAILINGS STORAGE FACILITY (FTSF)

PRE-FEASIBILITY STUDY

Fremont County, Colorado

Prepared for:

Zephyr Minerals Ltd

Zephyr Gold USA, Ltd.
Pacific Registered Agents
P.O. Box 5040
Salem, OR 97304-0040

Prepared by:

Amec Foster Wheeler
Environment & Infrastructure, Inc.
2000 S. Colorado Blvd., Ste. 2-1000
Denver, CO 80222
(303) 935-6505

October 2016

Project No. 7420163300

This manual was prepared exclusively for Zephyr Gold USA Ltd (Zephyr) by Amec Foster Wheeler Environment & Infrastructure, Inc. (Amec Foster Wheeler). The quality of information, conclusions and estimates contained herein is consistent with the level of effort involved in Amec Foster Wheeler's services and based on: i) information available at the time of preparation; ii) data supplied by outside sources; and iii) the assumptions, conditions and qualifications set forth in this report. This report is intended to be used by Zephyr only, subject to the terms and conditions of its contract with Amec Foster Wheeler. Any other use of, or reliance on, this report by any third party is at that party's sole risk.

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1.0 INTRODUCTION

This Operation, Maintenance and Surveillance Manual (OMS Manual) has been prepared to serve as a guiding document for the operation of the proposed Filtered Tailings Storage Facility (FTSF) at the Dawson Gold Project in Colorado, USA. The objectives of this document are to define and describe:

- Roles and responsibilities of personnel assigned to the Dawson FTSF;
- Key components of the FTSF;
- Geotechnical monitoring and inspection of the FTSF;
- Environmental monitoring of the FTSF; and
- Best practices required for operation and maintenance of the FTSF to ensure that the facility functions in accordance with its design, and meets regulatory and corporate policy obligations.

This OMS Manual is based on the pre-feasibility level design of the FTSF. This Manual must be reviewed and updated based on the evolution of future studies and design of the facility. During operations, the document should be reviewed and updated by the owner on an annual basis. Any changes in operations should be incorporated during the annual review.

1.1 Filtered Tailings Storage Facility Overview

The Dawson FTSF has been designed to store up to approximately 1.0 million short tons (Mt) of filtered tailings over an approximate 10 year period, based on a mill throughput of 300 tpd. The location of the FTSF is proposed to be in a small valley immediately north of the proposed process plant site. The location and general layout of the FTSF, proposed process plant and related facilities are presented in **Figure 1**.

Tailings will be hauled by truck from the filter plant to the tailings facility where they will be spread in thin lifts and compacted. Two tailings placement zones with different compaction requirements are included in the design to provide physical stability of the dry stack and operational flexibility for periods of wet weather or upset conditions at the filter plant. A Shell Placement Zone, designated “Zone 1”, will be placed in the downstream shell of the FTSF to provide physical stability to the dry stack. A General Placement Zone, designated “Zone 2” will be placed upstream of Zone 1 and will provide operational flexibility for tailings placement during periods of wet weather or upset filter plant conditions. The tailings will be stacked at an overall slope of 3H:1V with intermediate benches to control erosion and runoff. An erosion protection layer will be progressively placed on the downstream slope of the FTSF during operations for erosion protection.

An underdrainage system will be constructed to capture seepage from the filtered tailings stack as well as any potential shallow groundwater or seepage. The seepage will be directed to a lined contact water pond downstream of the FTSF. Contact water collected in the pond will be recycled back to the process plant, evaporated or treated (if necessary to achieve water quality standards) and released.

Perimeter diversion channels will be constructed around the FTSF to capture clean water (i.e., non-contact) and route it around the FTSF, thereby preventing clean water run-on to the FTSF. Additional detail of the facility design is provided by Amec Foster Wheeler (2016).

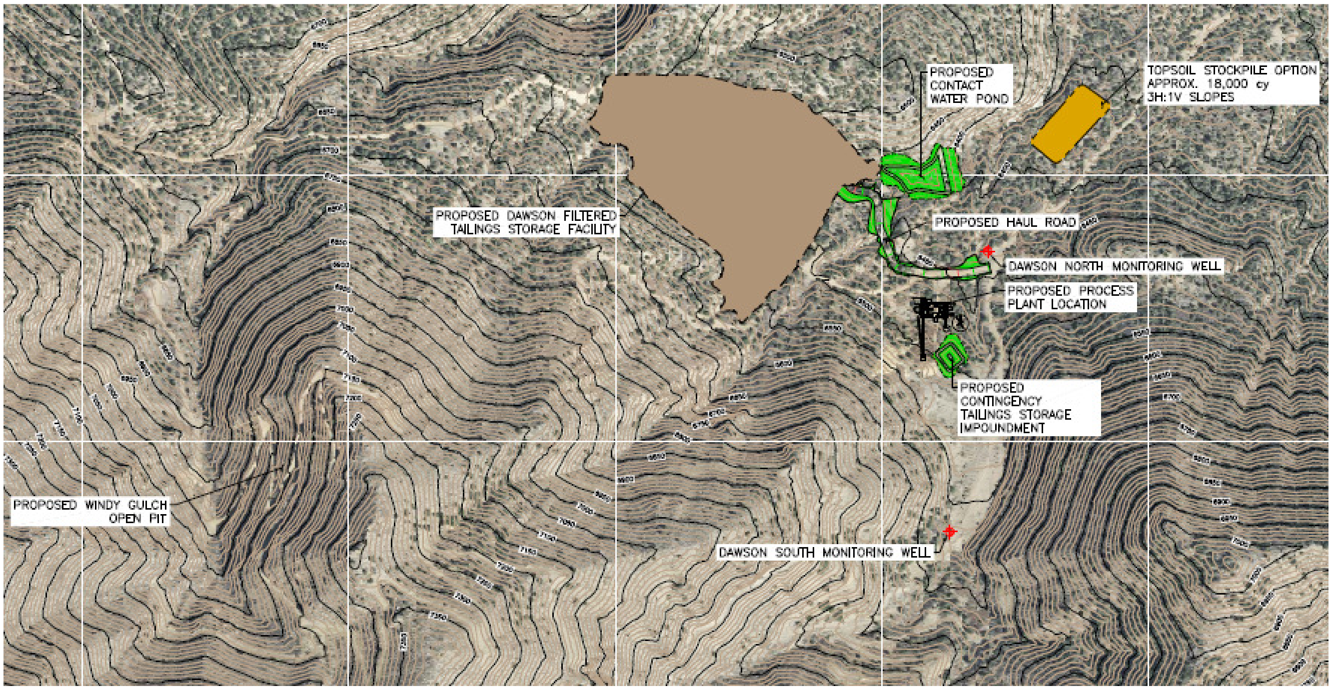


Figure 1. General Site Arrangement

1.2 Design Reference

This OMS Manual is based on the pre-feasibility design of the Dawson FTSF outlined in the following report:

- “Pre-Feasibility Study Report, Dawson Gold Filtered Tailings Storage Facility, Fremont County, Colorado”, prepared by Amec Foster Wheeler (2016).

2.0 ROLES AND RESPONSIBILITIES

2.1 Organizational Structure

A generalized management structure for the proposed Dawson Filtered Tailings Storage Facility is summarized in **Figure 2.** This management structure should be revised and completed at start-up of operations and reviewed each year during updating the OMS Manual.

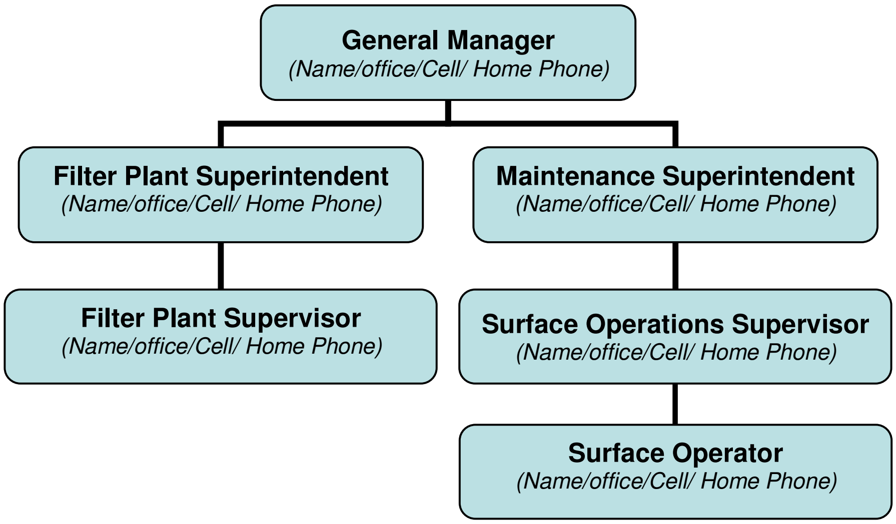


Figure 2: Dawson Gold FTSF Organizational Chart

2.2 Designated Responsibilities

Roles and responsibilities of each of the tailings and water management operations team are briefly outlined below:

- The General Manager is responsible for achieving the project key objectives including all operational aspects of the tailings and water facilities.
- The Tailings Filter Plant Personnel are responsible for operations of the tailings filter plant, ensuring that tailings are dewatered to a moisture content amenable for compaction and managing the filtered tailings stockpile at the filtered tailings plant.
- The Maintenance Superintendent is responsible for overseeing maintenance of the tailings surface, haul roads, contact and non-contact water management channels, and contact water pond.
- The Surface Operations Personnel are responsible for day-to-day management of operations of the FTSF, including ensuring that tailings placement, construction, and contact and non-contact water management practices follow this Manual. The Surface Operations personnel will perform routine daily and monthly inspections of the facility, and will consult with the tailings filter plant team on a regular basis. The Surface Operations Supervisor will review and approve procedural documents, and coordinate the review, editing, control, and distribution of the procedures outlined in this Manual.

3.0 DAWSON FTSF OPERATIONAL PRACTICES

This section outlines the operational aspects of the FTSF, and details best practices for operating procedures necessary to satisfy the objectives of the tailings management plan.

3.1 General

The following operational criteria are generally applicable for start-up and the first year or so of operation of the FTSF. Operational criteria, including method specifications for tailings compaction, will be re-established in the first year as outlined from those herein. This manual should be updated accordingly at the end of the first year or so to reflect actual conditions at the FTSF, and define operational parameters for the remaining operational life of the facility.

In general tailings placement and compaction must begin at the toe or lowest part of the containment area and progress up gradient. During periods of favorable weather, tailings will be placed and compacted in the downstream portion of the stack, forming the engineered shell. This area is termed “Zone 1”, or the Shell Placement Area. The General Placement Area, or “Zone 2” is located upstream of the Structural Placement Area. Zone 2 will be used year-round, but exclusively during periods of wet weather or upset plant conditions that could potentially affect the placement and compaction of these materials. The same compactive effort and procedures will be used in the Zone 1 - Shell Placement Area and the Zone 2 - General Placement Area. This compaction will aid in general trafficability and other operational considerations.

The first 2 months of tailings placement (approximately) will require that material be placed in Zone 1 behind the starter buttress, until the tailings stack reaches an elevation that allows placement in Zone 2. Alternatively, a Zone 2 starter buttress has been included in the design to allow for placement of Zone 2 tailings during operations start-up. Nonetheless, operations shall make an effort to raise the Zone 1 tailings area to the elevation of Zone 2 tailings as quickly as practical at start-up and maintain both zones at roughly the same elevation thereafter.

The generally arid climate of the project site should allow tailings placement to achieve compaction requirements of the Shell Placement Area throughout the year. The General Placement Area will provide operational flexibility during periods of wet weather and upset plant conditions.

The following sections describe operational parameters for the following components of the FTSF:

- Foundation Clearing and Preparation;
- Underdrain System;
- Starter Buttress;
- Shell Placement Area (Zone 1);
- General Placement Area (Zone 2);
- Erosion Protection Layer;
- Management of Contact Water;
- Contact Water Pond;
- Surface Water Diversion Channels
- Quality Control;

- Erosion Control; and
- Dust Control.

3.2 Foundation Clearing and Preparation

Foundation preparation will consist of clearing and grubbing of significant vegetation within the FTSF footprint area and stripping and stockpiling of topsoil for use in reclamation of disturbed areas. Foundation clearing and preparation is further described in the Technical Specifications Section 02200.

Stripped and grubbed vegetation shall be removed from the designated areas and disposed of in stockpiles or other approved methods designated by Zephyr. Acceptable growth media (topsoil) shall be removed from the designated areas and stockpiled for later use to establish vegetation on the closure cover of the FTSF and other disturbed areas.

3.3 Underdrain System

A network of underdrains will be constructed within the drainage bottoms of the FTSF footprint to capture and collect seepage due to consolidation of the tailings and provide foundation drainage to the tailings facility. Water collected by the underdrains will be routed to a lined contact water pond located downstream of the FTSF. The underdrains will consist of free-draining gravel wrapped in non-woven geotextile and covered with a layer of filter material to prevent migration of filtered tailings into the underdrains.

The underdrain system shall be progressively constructed and extended upgradient in the natural drainages throughout operations as the filtered tailings stack expands. The upgradient end of the underdrains shall be protected from contamination with sediment, equipment damage or other degradation.

3.4 Starter Buttress

A rockfill starter buttress will be constructed within the valley bottom at the toe of the FTSF to provide lateral confinement of tailings at the operations start-up, as well as stability, drainage and erosion protection to the toe of the filtered tailings stack. The starter buttress has been designed with 2H:1V slopes with a vertical height of 15 feet.

Due to the configuration of tailings placement Zones 1 and 2 (discussed in subsequent sections), tailings placement will need to be focused within Zone 1 – Shell Placement Area at project start-up until the Zone 1 tailings reach an elevation to allow placement of tailings within Zone 2 – General Placement Area. To allow placement of tailings within Zone 2 during the initial months of operations, a Zone 2 Starter Buttress has been included in the design to provide confinement of Zone 2 tailings at start-up until the Zone 1 tailings rise to the elevation of the Zone 2 tailings. The concept of the starter buttresses and tailings placement zones is illustrated in **Figure 3**.

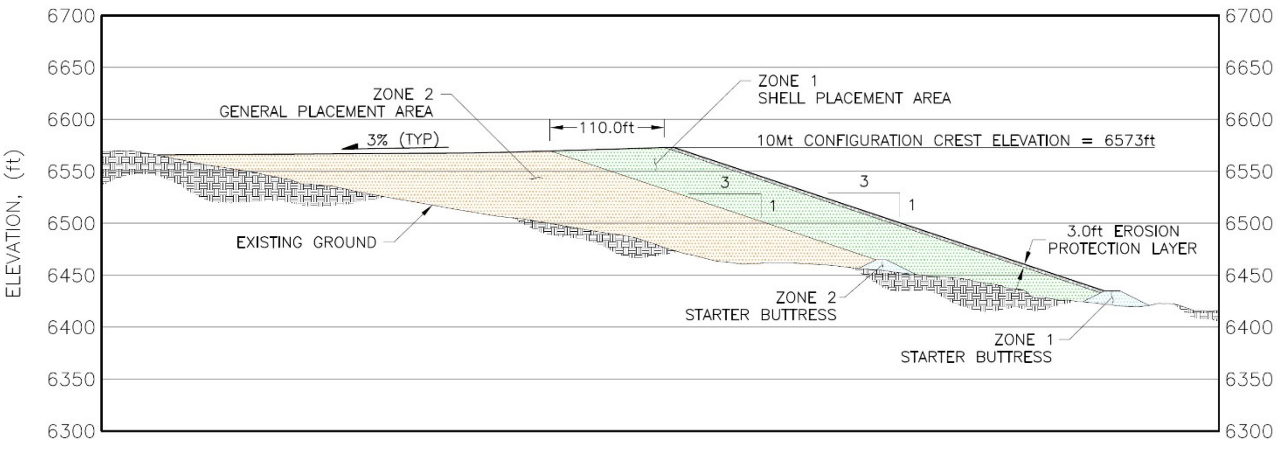


Figure 3: Schematic of Tailings Placement Zones

The starter buttresses will be constructed with rockfill sourced from inert, non-PAG waste rock sourced from the Windy Gulch pit or an approved on-site quarry. The rockfill shall be placed by a method specification developed by construction of a test fill. Technical Specification Section 02200 provide material requirements and placement methods for the rockfill.

3.5 Shell Placement Area (Zone 1)

Tailings shall exit the filter plant at or near the optimum moisture content as determined by the standard Proctor (ASTM D698). The Zone 1 – Shell Placement Area is a 110-foot wide zone of tailings at the exterior shell of the FTSF. Zone 1 tailings will be placed in horizontal lifts not exceeding 12-inches thickness and will be compacted to at least 95% of the maximum dry density according to the standard Proctor test (ASTM D698). The tailings surface shall be compacted with a smooth drum vibratory roller and graded to promote drainage to the south and west to the perimeter contact water ditches. Water must not be allowed to pond on the top of the tailings surface.

A haul road along the south side of the FTSF will be constructed to access the tailings placement areas. Since the tailings stack will be constantly rising in elevation throughout operations, switchback benches will likely need to be created in the face of the shell to provide an access route for haul trucks. For construction of these access benches, the shell face may be over-steepened up to 2.5H:1V, so long as the overall average slope is maintained at 3H:1V. Each bench shall not exceed 50 feet in height, so as to break up long-continuous faces that are more susceptible to erosion and provide.

The benches will be sloped laterally away from the center of the tailings dry stack to ensure that runoff water is directed towards the perimeter ditches and not onto the downstream slope of the FTSF.

3.6 General Placement Area (Zone 2)

The Zone 2 – General Placement Area tailings are located in the interior of the FTSF, between the compacted tailings Zone 1 and the natural ground. Zone 2 tailings will be compacted using the same methodologies as Zone 1, however less stringent dry densities are acceptable in the General Placement Area. Zone 2 tailings shall be compacted in maximum 12 inch-thick loose lifts to at least 90% of the maximum dry density as determined by the standard Proctor. The Zone 2 General Placement Area is designed to provide operational flexibility for tailings placement during wet weather or upset plant conditions. Weather permitting, it is advisable to still compact Zone

2 tailings to similar densities as Zone 1 tailings to provide suitable conditions for equipment traffic and optimize the storage capacity of the FTSF. As for the Zone 1 tailings, the Zone 2 tailings surface shall be compacted with a smooth drum vibratory roller and graded to promote drainage to the south and west to the perimeter contact water ditches. Water must not be allowed to pond on the top of the tailings surface.

The General Placement Area will be available to be used year-round, but will be used exclusively during time when rain or snow affect the placement and compaction of the tailings. Access to the General Placement Area will be from the same haul road access to the Shell Placement Area. Temporary haul roads may be constructed as necessary to provide other access points to the General Placement Area. Culverts shall be constructed and maintained where the haul road crosses surface water diversion channels and contact water ditches.

To improve trafficability for haul roads on the tailings surface, non-PAG waste rock can be used as road base within the FTSF as needed.

3.7 Erosion Protection Layer

An erosion protection layer will be progressively placed on the exterior slopes of the FTSF for protection against water and wind erosion. The erosion protection layer is a key design component as the filtered tailings are highly erodible. Since the erosion protection layer will be progressively placed on the tailings slope during operations it will become part of the reclamation cover.

The erosion protection layer will be constructed from processed colluvial soils sourced from the FTSF footprint or from inert, non-PAG waste rock. The erosion protection layer will be a minimum of 2 feet-thick as measured perpendicular to the slope. The material shall be placed by dozers in a single lift working in an upslope direction. The filtered tailings surface abutting the erosion protection layer shall be prepared by wetting and compacting immediately prior to placement of the erosion protection material.

The erosion protection layer shall be placed and maintained at the working crest of the Shell Placement Area throughout operations. It is important that the erosion protection layer placement not lag behind tailings placement as the exposed tailings face is highly susceptible to erosion.

3.8 Management of Contact Water

The active tailings crest surface shall be immediately compacted and smooth-rolled to minimize infiltration and sloped to drain to perimeter contact water ditches on the south and west side of the FTSF and away from the slope of the Shell Placement Area and erosion protection layer. Precipitation coming into direct contact with the active tailings platform will be directed west and south to temporary perimeter ditches. The contact water ditches shall be graded to drain around the FTSF and to the contact water pond located downstream of the FTSF as shown on Figure 1. The contact water ditches are temporary and will require construction of new ditches as the tailings dry stack elevation rises (approximately every year). Components of contact water management include:

- Compaction and smooth-rolling of active and inactive tailings platform. The tailings surface shall be graded to a minimum 3% slope towards the perimeter contact water ditches on the south and west sides of the FTSF.
- Temporary contact water ditches will be located along the perimeter of the FTSF, roughly at the contact between the tailings platform and the native ground surface. The temporary ditches will route contact water to the south around the FTSF and to the contact water pond. Tailings placed along the contact with

native ground along the west and south side of the FTSF will require excavation/grading to achieve positive drainage for the contact water ditches.

- Erosion protection and energy dissipation structures (such as gabion drop structures) for contact water ditches on steep slopes to contact water pond.
- A contact water pond will be located in the valley downstream of the FTSF for containment, sedimentation and environmental monitoring of contact water. Water collected in the pond will either be evaporated, recycled to the process plant, or treated (if necessary to achieve water quality standards) and released.

3.9 Contact Water Pond

The contact water pond will be constructed in the valley downstream of the FTSF as shown on Figure 1. The pond will contain water collected by the FTSF underdrain system as well as contact water runoff from the FTSF. Contact water collected in the pond will either be evaporated, recycled to the process plant or treated (as required to meet water quality standards) and released. A pumping and piping system will be included to provide the capability to recycle the contact water to the process plant. The contact water pond will be constructed with a combination of cut and compacted fill and will be lined with 60 mil HDPE geomembrane.

3.10 Surface Water Diversion Channels

Surface water runoff shall not be allowed to run-on to the FTSF to the extent practical. Stormwater runoff that has not come into contact with tailings (“non-contact” water) will be captured by perimeter diversion channels and routed around the FTSF to discharge to the natural drainages north and east of the FTSF. The non-contact diversion channels have been designed to intercept runoff water from the contributing watershed tributary to the FTSF and direct the clean non-contact water around the FTSF. The FTSF perimeter stormwater channels will be relocated as the FTSF size increases (approximately every two or three years).

3.11 Quality Control

3.11.1 Trial Compaction Program

The compaction of the tailings in both the Shell Placement Area and the General Placement Area will be important for trafficability, erosion resistance, limiting seepage, as well as overall stability of the (particularly in the Shell Placement Area).

The minimum tailings compaction specifications (95% of the standard Proctor Maximum Dry Density (MDD) for Zone 1 and 90% MDD for Zone 2) will be assessed by a trial compaction program conducted at start-up of operations. The purpose of the program will be to determine the most efficient means of compacting the tailings (number of passes, lift thickness, vibration benefits, etc.) to achieve the densities required by the design. In other words, based upon experience, the aim is to establish a method specification versus a strict performance specification. The compacted dry density of the tailings during the trial compaction program shall be verified by either the nuclear density gauge testing or sand cone density testing. The merit of static versus vibratory compaction will be evaluated during the trial compaction and during ongoing operations. The adopted method specification will also be used for the General Placement Area.

3.11.2 Tailings Placement Monitoring

During normal operations of the FTSF, after completion of the trial compaction program, compaction assessment will be carried out on a regular basis. Compaction tests consist of evaluating grab samples be used to optimize the method specification. In-situ placed and compacted material will be sampled and taken to the on-site laboratory for moisture content evaluation. The moisture content will allow calibration to periodic standard Proctor tests to indicate the degree of achieved compaction. The moisture contents should be obtained twice per week and the Proctor Tests carried out once every two weeks during start-up of operations.

In addition to the method specification and compaction assessment testing, periodic larger scale integrity testing of the FTSF will be carried out. This test work will be used to confirm overall integrity for closure planning purposes and to assess the stress level effects on material density (e.g. the increase in tailings density due to self-weight consolidation). The most effective tool for carrying out this large scale testing is the cone penetration test (CPTu). CPTs should be conducted every three years, starting at the end of one year of operations. **Table 1** provides the suggested monitoring program for tailings placement at the FTSF.

Table 1: Monitoring of Tailings Placement

Test Description	ASTM Method	Sample Method	Frequency	Target Range
Method Specification	N/A	Defined during placement tests and modified, as required, as project proceeds	Maintain daily operating logs	Follow specified placement plan
Standard Proctor	D698	Grab	Every two weeks*	-
Moisture Content	D2216	In-situ	Twice a week*	Within 2% of optimum moisture content for Zone 1
In-situ Density	D6938	In-situ	Twice a week*	Zone 1: 95% MDD Zone 2: 90% MDD
Particle Size Distribution	D422	Grab	1 per 5,000 yd^3	-
Atterberg Limits	D4318	Grab	1 per 5,000 yd^3	-
Consolidated Undrained Triaxial Tests	D4767	Grab	Once at week 4	Shear strength parameters $c'=0$, $\phi'>32^o$
Piezocone penetration tests (CPTu)	D5778	Per ASTM procedure. Push from drill rig.	Every three years starting at end of first year of operations	To be defined during initial CPTu program. Generally, material to be shown to be dilatant
Weather Documentation	N/A	Daily weather station readout	Daily	Daily precipitation, minimum and maximum temperatures

*Frequency is for start-up period of FTSF (approximately 12 weeks). Based on material variability, frequency may be modified following operations start-up.
MDD = Maximum dry density according to ASTM D698

Until the trial compaction program is carried out during initial stages of shell placement, tailings shall be placed in maximum 12-inch loose lifts and compacted with approximately eight passes of a 10-ton smooth drum roller.

3.11.3 Record Keeping

Record keeping is an important tool for tracking overall performance of the FTSF. The following is a summary of the records which personnel should keep on site:

- Shift/Daily records. These will include location of material placement, load counts/volume totals, weather data (including visual weather conditions, amount of precipitation and temperature), and results of overall visual inspection of facility (described further in Section 6.1).
- Survey Records. Surveys should be carried out quarterly in the Shell Placement and General Placement Areas.
- Annual as-built surveys of the Shell Placement Area.
- Records required for permitting purposes.

The mine should modify this to best suit the conditions yet all essential information needs to be captured regardless of format.

3.12 Operation During Cold and Snowy Weather Conditions

Operation in cold weather conditions means that some additional work will be required to keep tailings placement on schedule and efficient. Work should include the following:

- Haul roads will need to be cleared and sanded, as required, to prevent traffic from slipping.
- Windrows of tailings have to be dozed down and spread within 1 hour during freezing conditions. If left to freeze the tailings may not be able to spread readily or frozen material may be incorporated in the fill (which should be avoided, especially in the Shell Placement Area).
- The placement area on the FTSF will also need to be cleared of snow and ice, as necessary. Small amounts of snow and ice may be mixed with tailings in the General Placement Area, however, all reasonable attempts should be made to clear snow and ice in order to minimize the amount that ends up buried in the stack.
- Snow should be piled within the General Placement Area but away from the construction area. Snow piles may need to be moved periodically to accommodate construction. It is important that these snow piles be kept in the FTSF area as the snow removal process would likely entrain tailings if moved out of the FTSF area.
- Snow should not be pushed into perimeter clean water channels since tailings entrained in the snow would end up in the channels and be transported to natural drainages, requiring clean-up work. Snow in the perimeter channels could also hamper their performance.

3.13 Operation During Wet Conditions

During rainy periods, the tailings may become difficult to compact if water is allowed to infiltrate and permeate them. Placement in rain is possible if the following actions are taken:

- Keep tailings placement area as limited as possible.
- Prior to placement of tailings in this small area, the saturated and softened surface should be scraped off. If the last lift was properly compacted and sealed, then the amount of softened material at the surface should be minimal.

- When the tailings are hauled and dumped to this area, they must be spread and immediately compacted. If the tailings cannot be compacted immediately, then they should not be spread at all, but left in a pile. If the tailings remain in a pile, the rain will generally only penetrate the outer shell of the pile, and the moisture content of the remainder will be maintained near optimum.
- Once tailings placement in the area is complete, the tailings surface should be smooth, free of water traps, and graded to allow water to run off the surface towards the contact water ditches.

If the amount of rainfall begins to reach extreme levels (more than 0.5 inches in 24 hours), placement of tailings in the Shell Placement Area must be suspended.

3.14 Erosion Control

Surface runoff on to and from the FTSF has the potential to cause tailings erosion if the runoff is not controlled. Since filtered tailings erosion translates into a sediment load to contact water ditches and the contact water pond, the following specific measures will be utilized water management structures will be used to control surface runoff:

- FTSF geometry. Benches on the FTSF face will be sloped laterally such that water sheds towards the sides of the FTSF where it can be collected in perimeter ditches. The benches themselves will reduce the amount of runoff on the slopes.
- Erosion protection layer. Progressive placement of the erosion protection layer on the face of the Structural Placement Area to minimize the exposed tailings area.
- Tailings compaction. The Shell Placement Area (Zone 1) will be compacted to minimum 95% of the standard Proctor maximum dry density as described in earlier sections. The General Placement Area (Zone 2) will be provided similar compactive effort but with flexibility to accept tailings wet of optimum moisture content.
- Management of runoff collection/routing areas. The perimeter channels and contact water ditches will have sedimentation traps and silt fencing for erosion control.

3.15 Dust Control

Dust control will be an important component of operating the FTSF. Tailings are prone to creating dust, especially when they have dried and desiccated. The following measures will aid in controlling dust generation:

- Timely compaction of the tailings will significantly control dust.
- Spray the tailings surface with water as needed during dry periods.
- Progressive placement of Erosion Protection Layer on the face of the Shell Placement Area to limit the exposed area of tailings.
- Restrict traffic on the FTSF to only transport, placement and compaction equipment and limit the use of this equipment to active placement area(s) only.
- Moisture from rainfall should assist in keeping the surface moisture content within the required range but prolonged periods of warm weather with low humidity may make it necessary to build silt fences around non-active placement areas.

4.0 MAINTENANCE

Maintenance for the FTSF is expected to be relatively routine. Maintenance will generally be performed on an as needed basis as determined from the various regular and annual inspections. Maintenance includes, but is not limited to the items outlined in **Table 2**.

Table 2: General FTSF Maintenance Requirements

Item	Maintenance Required
Haul Roads	• In winter, haul roads may need to be cleared and sanded periodically or sheeted with rock, as required, to provide suitable trafficability. • Re-grade as necessary to prevent potholes and rough surfaces.
Underdrains	• Maintain temporary berms and channels to prevent ingress of water or sediment into the upgradient ends of underdrains during operations. • Clean sediment accumulation at upgradient extent of underdrains during operations.
Perimeter Stormwater Diversion Channels and Contact Water Ditches	• Clean sediment and debris from channels and ditches. • Regrade as necessary to maintain positive drainage. • Maintain silt fences, erosion protection and energy dissipation structures.
Contact Water Pond	• Clean sediment and debris accumulation as necessary. • Repair damages to geomembrane when occurring.
Tailings Surface	• Maintain grades and compaction of the tailings surface to promote runoff of direct precipitation and prevent ponded water on the tailings stack. • Grade rutting due to traffic on the tailings surface as necessary.

Maintenance carried out should be documented on a daily activity log.

5.0 MONITORING PROGRAM

Monitoring of the FTSF operation includes the assessment of structural integrity and environmental compliance of the FTSF and associated structures. Personnel working at the FTSF should be aware of noteworthy aspects of the daily inspection detailed in Section 6.0 in order to assess any warning factors or malfunctions in the performance of the facility.

5.1 Environmental Monitoring

A monitoring program shall be followed to ensure acceptable performance of the FTSF. The following parameters, which can be directly measured and are associated with a potential mechanism of unsatisfactory performance, should be identified:

- Groundwater quality from environmental monitoring wells upgradient and downgradient of the FTSF;
- Seepage quantities (i.e., measured flow from the underdrain system);

Results from the monitoring program are to be presented to the General Manager for review on a monthly basis, or more frequently (if required). If variations from the design values are noted, the Design Engineer for the FTSF must be notified immediately.

Monitoring activities shall include groundwater sampling of environmental monitoring wells to be installed upgradient and downgradient of the facility and monitoring of seepage flow rates from the FTSF underdrain system.

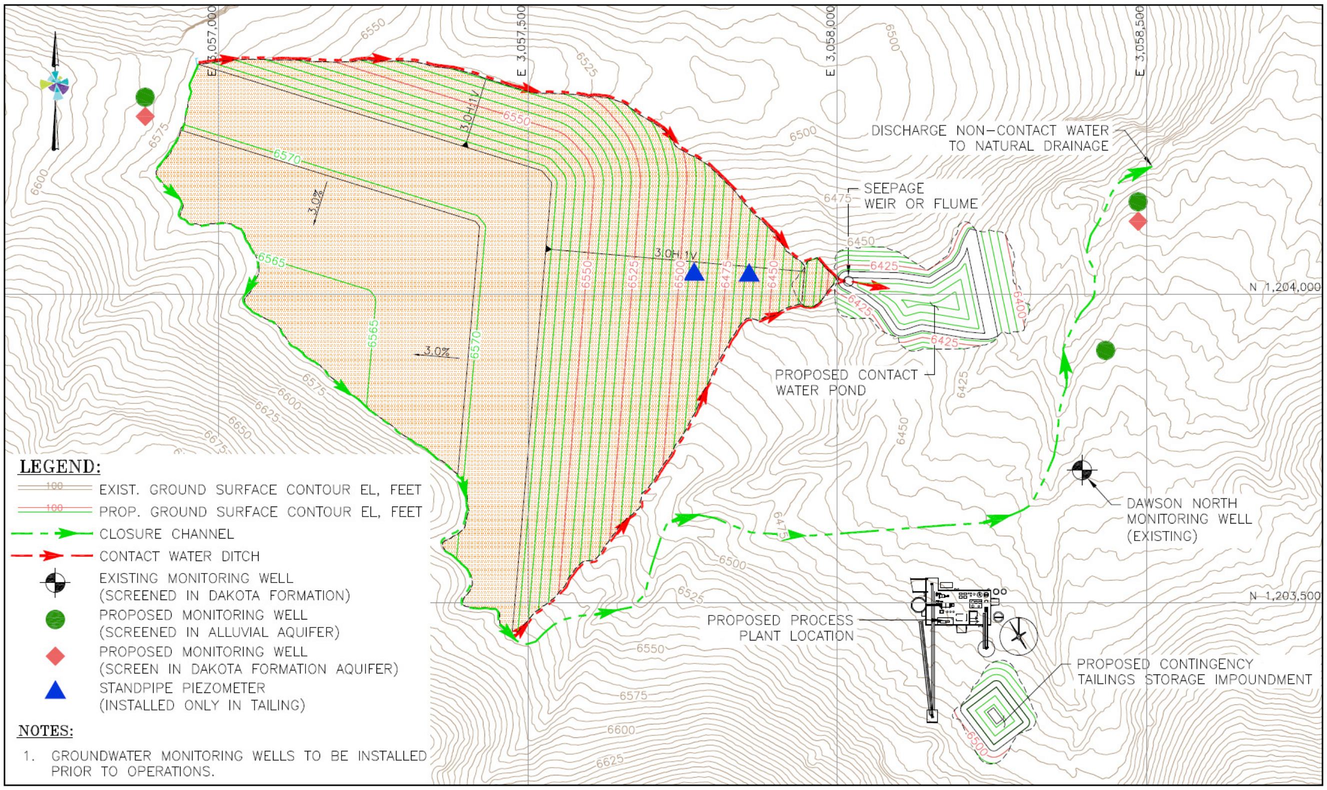


Figure 4: Proposed Locations of Monitoring Instrumentation at the FTSF

5.1.1 Groundwater Monitoring Wells

Groundwater monitoring shall be conducted at monitoring wells installed upgradient and downgradient of the FTSF. Groundwater sampling and testing shall commence at least 5 consecutive quarters prior to operations of the FTSF to establish a baseline of water quality. Groundwater monitoring shall continue on a quarterly basis during operations and for at least 8 quarters post-closure (and possibly longer depending the permit requirements, tailings geochemistry, water quality and site-specific hydrogeology).

A list of typical water quality monitoring parameters is presented in **Table 3**. The groundwater samples will be tested by qualified third-party laboratories and should meet standards specified by 5 CCR 1002-41 (CDPHE Water Quality Control Commission Regulation No. 41) for human health, domestic water supply and agricultural standards. The more stringent limit should be adopted as the criteria for the water quality standard.

Table 3: Typical Groundwater and Surface Water Monitoring Parameters

Field Parameters	
Sample Location, Time and Conditions	
Flow or Water Level	
Temperature	
Specific Conductance	
pH	
Dissolved Oxygen	
General Parameters	
Total Dissolved Solids	
Acidity	Hardness
Alkalinity	Suspended Solids
Ammonia	Turbidity
Major Anions	
Bicarbonate	Fluoride
Carbonate	Nitrate
Chloride	Sulfate
Major Cations	
Calcium	Iron
Magnesium	Lead
Potassium	Manganese
Sodium	Mercury
Arsenic	Nickel
Cadmium	Selenium
Chromium	Silver
Copper	Zinc

5.1.2 Underdrain and Contact Water Pond Monitoring

The seepage flow rate collected by the underdrain system should be measured (via weir or flume) and recorded weekly along with the pH of the contact water. The data should be provided to a suitably qualified engineer to gauge performance against the flowrates estimated in the design. Once seepage flows have stabilized, any marked changes in the seepage flow rates should be noted (e.g., an increase in flow rate of more than 25%). In the event that the flow rate increases significantly the Design Engineer should be contacted immediately.

During operations contact water captured in the lined contact water pond will be recycled to the process plant. During this time, the water quality in the pond should be tested at least quarterly to provide a baseline characterization. Quarterly water monitoring at the contact water pond shall continue for a minimum period of 8 quarters post-closure. The required monitoring frequency and period after two years will be as negotiated with the regulatory agencies and will depend on further characterization of site specific conditions of the permit requirements, tailings, projected water quality and seepage rates. Typical monitoring parameters for water from the contact water pond are presented in **Table 3**.

5.1.3 Standpipe Piezometers

Standpipe piezometers should be installed within the filtered tailings to monitor if a phreatic surface develops within the FTSF. The piezometers should be installed following one year of tailings placement and only within the tailings (i.e., the piezometers shall not extend into the underdrain or native foundation). Suggested locations for the piezometers are shown in **Figure 4**.

5.1.4 CPTu Program

Periodic larger scale integrity testing of the FTSF will be carried out to confirm overall integrity during operations and for closure planning purposes, as well as to assess the stress level effects on material density (e.g. the increase in tailings density due to self-weight consolidation). The most effective tool for carrying out this large scale testing is the cone penetration test (CPTu). CPTu programs shall be developed and evaluated by an experienced geotechnical engineer. A CPTu program should be conducted every three years, starting at the end of one year of operations.

6.0 FILTERED TSF SURVEILLANCE PROGRAM

6.1 Inspections

6.1.1 General

The physical characteristics of the FTSF will be most effectively monitored/evaluated by regular visual inspections by operating personnel and periodic inspections by an engineer. **Table 4** presents the details of the visual inspection plan for the FTSF.

Table 4: Monitoring of FTSF Physical Conditions

Item	Personnel	Scope	Frequency	Deliverable
Daily Inspections*	Operational personnel	Visual assessment	Daily*	Daily Record as part of the activity log (number of trucks, etc.)
Detailed Inspections*	Operations Supervisor(s)	Thorough visual assessment	Following heavy rainfall events or seismic activity	Daily Record plus notes and salient photographs
Facility Safety Inspection (FSI)	Qualified Engineer	Thorough visual assessment and review of all placement records	Annually**	Facility Safety Inspection Report (comparable to Dam Safety Inspection).
Facility Safety Review (FSR)	Qualified Engineer	Per FSI plus review of design basis and compliance of as-built with closure plan. Formal risk assessment.	Every Three Years (staring at Year Three)	Facility Safety Review Report (comparable to Dam Safety Review).

* When FTSF operating
**Except during years when Facility Safety Review is carried out

6.1.2 Daily Inspections

For the daily inspections, operations personnel will look for any unusual physical conditions with particular attention to:

- Any ponding of water on FTSF;
- Evidence of deformation or sloughing on the FTSF face;
- Evidence of excessive erosion of the tailings placement area or face; and
- Condition of water management channels and features.

6.1.3 Detailed Inspections

Detailed inspections are carried out during or immediately following heavy rainfall or seismic events. The detailed inspections are carried out by a qualified Operations Supervisor(s) who is experienced in discerning potential or developing problems through visual inspection.

Detailed inspections should include, but not be limited to, the following observations, where applicable:

- Evidence of excessive ponding (lack of drainage)
- Evidence of slope sloughing;
- Evidence of slope erosion on the FTSF crest and / or slopes;
- Evidence of surface cracking, movement, settlement;
- Subsidence or sinkholes in the tailings deposits;
- Condition of perimeter channels and underdrains; and
- Other unusual conditions.

A qualified geotechnical engineer should be contacted and/or called in to examine the FTSF in cases where an unusual condition or damage is evident, and/or the Operations Supervisor(s) has a concern. All notes and salient photographs from special inspections made as a result of a potentially damaging event, such as a flood or significant earthquake, should be recorded and included with the daily inspection sheet.

6.1.4 Facility Safety Inspection and Reviews

A qualified Geotechnical Engineer will conduct formal annual Facility Safety Inspection (FSI) of the FTSF. The inspection will include a review of all compaction and daily inspection data. A report will be completed upon completion of the inspection and will be submitted to the owner and, as required, the appropriate agencies.

Every third year, a thorough Facility Safety Review (FSR) should be completed. During the FSR, design criteria and all operating surveillance information are evaluated. A formal risk assessment is completed with key mine management staff, and is used to provide the basis for any changes to practices as the project proceeds through operations towards an optimal closure condition. The main intent of the FSR is to confirm the status of the potential asset liability associated with the FTSF.

6.2 Previous Facility Safety Inspections

A summary of previous facility safety inspections will be maintained using a simple log per that shown in **Table 5**.

Table 5: Summary of Previous Facility Safety Inspections

Report	Author	Date

7.0 REVIEW AND REVISIONS TO OMS MANUAL

The intention of this OMS Manual is to provide the Operator with the minimum criteria to operate the FTSF safely. This Manual should be viewed as a dynamic manual where changes and updates are provided on a regular basis as newer, safer, more efficient and more economic methods are developed. Therefore, it is recommended that this Manual be reviewed as part of the comprehensive annual (or more frequent) inspections and the need for updates be identified during this process.

Updates to the OMS Manual should be initiated by Zephyr. Once the required changes have been made, Zephyr shall distribute replacement pages for all copies of the Manual as per the distribution list. **Table 6** provides a sample log that should be used to track all changes to the OMS Manual.

Table 6: Modifications to OMS Manual

Rev. No.	Rev. Pages	Date	Description	Reason for Modification	Author(s)

8.0 REFERENCES

Amec Foster Wheeler, 2016. “Pre-feasibility Study Report Dawson Filtered Tailings Storage Facility, Fremont County, Colorado”, report prepared for Zephyr Gold USA, Ltd.

Mining Association of Canada (MAC), 2011. “Developing an Operation, Maintenance and Surveillance Manual for Tailings and Water Management Facilities”.

APPPENDIX G: Wildlife Information

COLORADO PARKS & WILDLIFE

7405 HWY 50 • Salida, Colorado 81201
719-530-5500 • 719-530-5554
wildlife.state.co.us • parks.state.co.us

January 14, 2013

Ms. Angela M. Bellantoni
Environmental Alternatives Inc.
1107 Main Street
Canon City, CO 81212

Re: Colorado Parks & Wildlife Review and Comments - Dawson Gold Project – Fremont County

Dear Ms. Bellantoni,

Colorado Parks and Wildlife (CPW) would like to thank you for the opportunity to review the Dawson Gold Project.

CPW respectfully submits our comments and recommendations based on our review of this project. As always, CPW encourages, through thoughtful design and careful development, any actions that avoid or minimize impacts to wildlife. We believe our recommendations offer the greatest opportunity for avoiding development impacts where we believe they may be high and difficult to remedy.

As described within Sections 14 and 15 of T19S R71W, the project does overlap with multiple known Townsend's big-eared bat winter hibernation sites. Townsend's big-eared bats are a state species of concern as well as a BLM sensitive species. There are six mines that have been gated to protect Townsend's big-eared bats within the proposed project vicinity. Please see attached map titled "Dawson Bats/Inactive Mine Project Gated Bat Sites" for specific Townsend's big-eared bat winter hibernation roost locations. Disturbance that causes hibernating bats to arouse, or wake up, during the hibernation time period can cause bats to burn vital fat reserves, which can lead to the starvation of the bat prior to the end of the winter season. Surface disturbance can transmit to underground locations from both direct and indirect means. The transfer of sound through the rock to the roost site may be at high levels, if surface activity is close to roost sites. Additionally, if such activity is very close, the surface disturbance may cause the collapse of internal passages. . .
CPW offers these recommendations for minimizing impacts to special concern species:

1. Provide a ¼ mile buffer around all Townsend's big-eared bat winter roost sites in order to avoid disturbance to hibernating bats.
   Or
2. Avoid disturbance to hibernating Townsend's big-eared bats by restricting activities from November 1st through April 1st.

Mule deer winter range is mapped within Section 9 and bighorn sheep production areas are mapped within Section 16, directly northwest and west; respectively, of the project site.

Transitory wildlife, such as raptor nesting sites, is highly probable within the project area and CPW recommends a pre-construction survey of the area to identify and avoid disturbances to protected nest sites.

Grape Creek flows along the west boundary of the project site and CPW recommends proper methods of erosion control be utilized throughout the property as applicable; including waterbars, sediment barriers and mulch applications using erosion control fabric, fiber, or mats.

Plant cover includes Pinon–Juniper tree stands with an understory composed of small shrubs and bunch grasses. Soil reports for the project site indicate a mix of gravel/sandy loam to boulder outcrops, all which create significant challenges for establishing permanent ground cover during final reclamation.

CPW recommends a reclamation schedule with appropriate performance standards that include a self-sustaining, locally appropriate plant community on the site, with a density sufficient to control erosion and non-native plant invasion and diversity sufficient to allow for normal plant community development. A post-reclamation monitoring plan is necessary to assure achievement of the agreed upon performance standards.

CPW further offers these recommendations for final reclamation:

1. Non-essential roads and other areas where earth has been moved will be restored to approximate, as close as possible, the original contour of the land.

2. Once sites have been re-contoured and compacted, any topsoil removed from the site will be redistributed over the entire disturbed area from which it is salvaged. Replaced topsoil will be left in a roughened condition to discourage erosion. Additional erosion control and soil stabilization may be required on steeper slopes, in areas of erodible soils, and in areas adjacent to or within drainage.

3. Scarify, till, or harrow the seedbed to a depth of 3 to 4 inches to enhance re-vegetation. Those sites where this method is not practical (e.g., steep slopes, rocky areas, etc.) will be dozer-tracked perpendicular to the slope or otherwise left with adequate roughness following topsoil placement to provide micro sites for seed germination, and reduce soil movement.

4. The basic seed mixtures and seeding rates should be based on NRCS recommendations with final approval from the affected landowner.

5. Erosion control methods will be utilized as needed to prevent movement across the landscape and ingress into Grape Creek. Site specific applications of mulch will be applied on erodible soils to control erosion. In areas with slopes in excess of 40 percent, erosion control fabric, fiber, or mats will be used to control erosion. These materials will be anchored immediately after placement.

These are general guidelines and may be revised based on seasonal climatic conditions, on-site conditions, and concurrence with regulatory agencies.

Once again CPW appreciates Environmental Alternatives Inc. request for our recommendations on the Dawson Gold Project. If the initial phase determines minerals in sufficient quantity to move the project forward to a surface mining development, CPW would greatly appreciate the opportunity to provide additional comments and recommendations.

If you have any questions regarding this letter, please contact Canon City South District Wildlife Manager, Zach Holder, at (719) 269-0656.

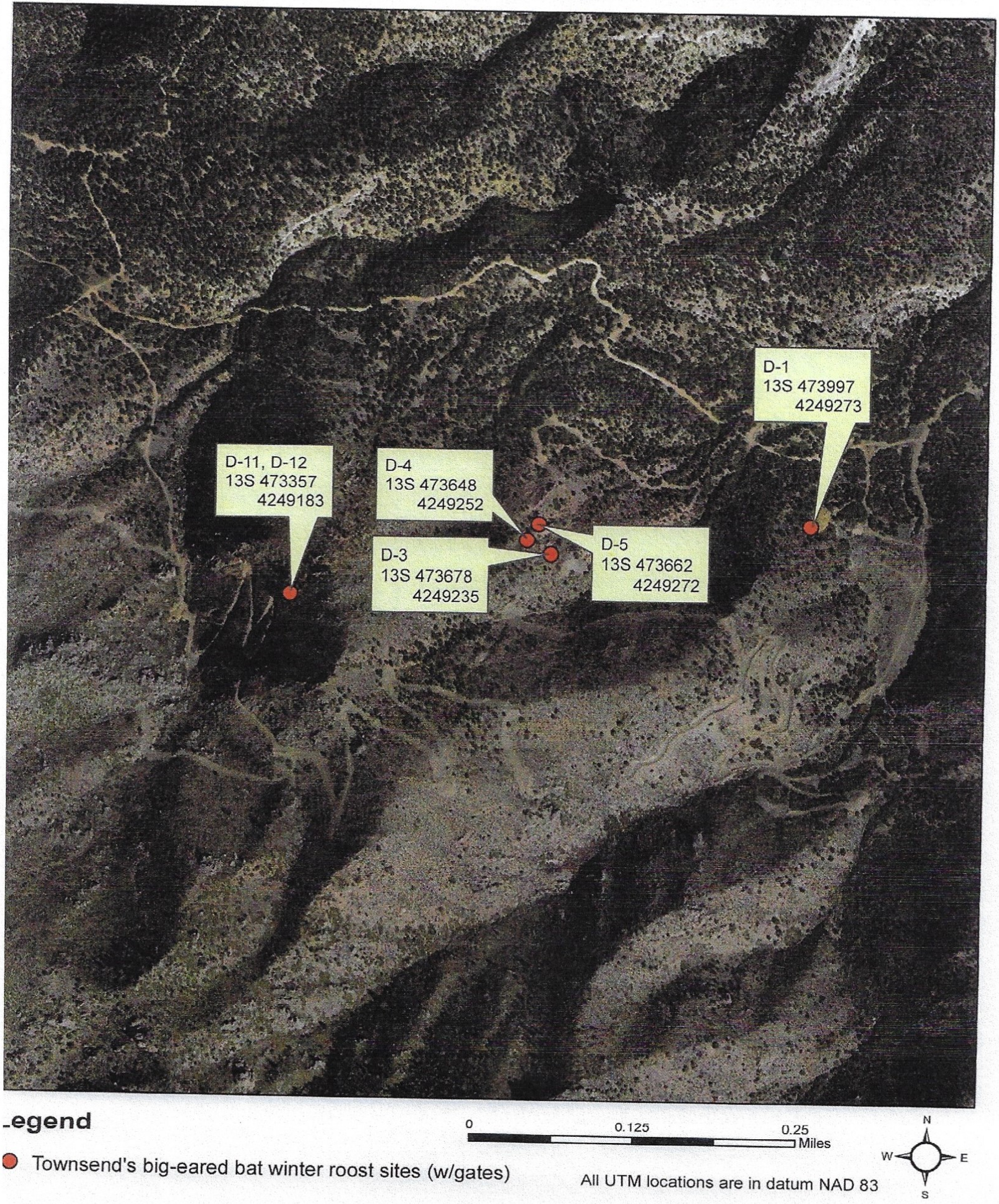
Sincerely,

Jim Aragon

Jim Aragon
Area Wildlife Manager

Cc: Dan Prenzlow, SE Region Manager
Zach Holder, Canon City South DWM
Raquel Wertsbaugh, Conservation Biologist
Jamin Grigg, Terrestrial Biologist
Greg Policky, Aquatic Biologist
Al Trujillo, Energy Liaison

Dawson Bats/Inactive Mine Program Gated Bat Sites



From:	Wertsbaugh - DNR, Raquel [raquel.wertsbaugh@state.co.us]
Sent:	Friday, January 25, 2013 10:22 AM
To:	eai@bresnan.net
Cc:	Jim Aragon - DNR; Al Trujillo - DNR; Zach Holder - DNR
Subject:	Bat survey at Dawson Mines 11 & 12

Hi Angela,
We completed the bat surveys at Dawson adits D-11 and D-12 yesterday and found no bats or bat sign. Since there are no bats using D-11 and D-12 this winter, I am comfortable with the proposed drilling in the vicinity of the mines as we discussed on the phone earlier this week. If you have any questions regarding the surveys please let me know.

Thanks,
Raquel

Raquel Wertsbaugh
Wildlife Conservation Biologist
Colorado Parks and Wildlife
7405 U.S. Hwy 50 Salida, CO 81201
office: 719-530-5526| cell: 719-207-1202
email: raquel.wertsbaugh@state.co.us

Colorado State University
Knowledge to Go Places

November 8, 2012

Angela Bellantoni
Environmental Alternatives Inc.
1107 Main Street
Canon City, CO 81212

Dear Angela:

The Colorado Natural Heritage Program (CNHP) is in receipt of your request for information regarding the Dawson Gold Mine site of interest three miles west of Cañon City, Colorado on County Road 3. In response, I have searched our Biodiversity Tracking and Conservation System (BIOTICS) for natural heritage elements (occurrences of significant natural communities and rare, threatened or endangered plants and animals) documented from the vicinity of the area specified in your request, specifically within a two-mile radius of the parcel legal description provided to CNHP by Environmental Alternatives Inc. for the purposes of this request.

The enclosed report describes natural heritage resources known from this area and gives location (by Township, Range, and Section), precision information, and the date of last observation of the element at that location. This report includes elements known to occur within the specified project site, as well as elements known from similar landscapes near the site. Please note that "precision" reflects the resolution of original data. For example, an herbarium record from "4 miles east of Colorado Springs" provides much less spatial information than a topographic map showing the exact location of the occurrence. "Precision" codes of Seconds, Minutes, and General are defined in the footer of the enclosed report.

The report also outlines the status of known elements. We have included status according to Natural Heritage Program methodology and legal status under state and federal statutes. Natural Heritage ranks are standardized across the Heritage Program network, and are assigned for global and state levels of rarity. They range from "1" for critically imperiled or extremely rare elements, to "5" for those that are demonstrably secure.

You may notice that some occurrences do not have sections listed. Those species have been designated as "sensitive" due to their rarity and threats by human activity. Peregrine falcons, for example, are susceptible to human breeders removing falcon eggs from their nests. For these species, CNHP does not normally provide location information beyond township and range. Please contact us should you require more detailed information for sensitive occurrences.

There are multiple CNHP designated Potential Conservation Areas (PCAs) and one Network of Conservation Areas (NCA) located within the vicinity of your project area (see enclosed shapefiles and PDF site reports). In order to successfully protect populations or occurrences, it is necessary to delineate conservation areas. These conservation areas focus on capturing the ecological processes that are necessary to support the continued existence of a particular element of natural heritage significance. Conservation areas may include a single occurrence of a rare element or a suite of rare elements or significant features.

The goal of the process is to identify a land area that can provide the habitat and ecological processes upon which a particular element or suite of elements depends for their continued existence. The best available knowledge of each species' life history is used in conjunction with information about topographic, geomorphic, and hydrologic features, vegetative cover, as well as current and potential land uses. The proposed boundary does not automatically exclude all activity. It is hypothesized that some activities will cause degradation to the element or the process on which they depend, while others will not. Consideration of specific activities or land use changes proposed within or adjacent to the preliminary conservation planning boundary should be carefully considered and evaluated for their consequences to the element on which the conservation unit is based.

The Colorado Division of Wildlife has legal authority over wildlife in the state. CDOW would therefore be responsible for the evaluation of and final decisions regarding any potential effects a proposed project may have on wildlife. If you would like more specific information regarding these or other vertebrate species in the vicinity of the area of interest, please contact the Colorado Division of Wildlife.

The information contained herein represents the results of a search of Colorado Natural Heritage Program's (CNHP) Biodiversity Tracking and Conservation System (BIOTICS), and can be used as notice to anticipate possible impacts or identify areas of interest. Care should be taken in interpreting these data. Sensitive species and natural community records are currently known from within the actual proposed project, and additional, but undocumented, elements may also exist (see enclosed species PDF report). We also searched our watch-listed species observation database (for non-fully tracked species) and found NO additional records. Please note that the absence of data for a particular area, species, or habitat does not necessarily mean that these natural heritage resources do not occur on or adjacent to the project site, rather that our files do not currently contain information to document their presence. CNHP information should not replace field studies necessary for more localized planning efforts, especially if impacts to wildlife habitat are possible.

Although every attempt is made to provide the most current and precise information possible, please be aware that some of our sources provide a higher level of accuracy than others, and some interpretation may be required. CNHP's data system is constantly updated and revised. Please contact CNHP for an update or assistance with interpretation of this natural heritage information.

The data contained in the report is the product and property of the Colorado Natural Heritage Program (CNHP), a sponsored program at Colorado State University (CSU). The data contained herein are provided on an as is, as available basis without warranties of any kind, expressed or implied, including (but not limited to) warranties of merchantability, fitness for a particular purpose, and non-infringement. CNHP, CSU and the state of Colorado further expressly disclaim any warranty that the data are error free or current as of the date supplied.

Sincerely,

Michael Menefee

Michael Menefee
Environmental Review Coordinator

Natural Heritage Program
COLORADO

Network of Conservation Areas (NCA) Report

Name Arkansas Valley Barrens **Site Code** S.USCOHP*27035

IDENTIFIERS

Site ID 2466 **Site Class** NCA

Site Alias None

Site Relations Shares similar species and ecological processes with Beaver Park (S.USCOHP*1659), Canon City (S.USCOHP*8045), Fourmile Creek-Fremont County (S.USCOFO*105), Garden Park Fossil (S.USWRO1*147), Grape Creek Water Gap (S.USCOHP*26796), Rare Plants of the Chalk Barrens (S.USCOHP8*3283), Ritchie Gulch Upland (S.USCOHP*178) and Rock Creek Hill (S.USCOHP*23972). In addition, contains Boggs Creek (S.USCOHP*157), Brush Hollow Reservoir (S.USCOHP*25792), Chandler Creek (S.USCOHP*25895), Eight Mile Marsh (S.USCOHP*7858), Goodpasture (S.USCOHP*23997) and Turkey Creek (S.USCOHP*23944). Overlaps Beaver Creek at Sugar Loaf (S.USCOHP*4575), Curley Peak (S.USCOHP*1656), Felch Creek (S.USCOHP*25794), Phantom Canyon of Eightmile Creek (S.USCOHP(1755) and South Fourmile Creek (S.USCOHP*1651).

LOCATORS

Nation United States **Latitude** 381925N

State Colorado **Longitude** 1045707W

Quad Code	**Quad Name**
38105-E3	Rice Mountain
38105-D3	Royal Gorge
38105-C2	Rockvale
38104-E6	Buttes
38104-C7	Swallows
38104-B6	Southwest Pueblo
38104-D6	Steele Hollow
38104-A7	Muldoon Hill
38104-E8	Mount Pittsburg
38104-B8	Owl Canyon
38105-E2	Cooper Mountain
38104-C6	Northwest Pueblo
38104-E7	Timber Mountain
38104-C8	Hobson
38104-D5	Pinon
38104-A8	Beulah
38105-B2	Hardscrabble Mountain
38105-D1	Florence
38104-D8	Pierce Gulch
38105-D2	Canon City
38104-B5	Southeast Pueblo
38104-B7	Beulah NE
38105-B1	Wetmore
38104-C5	Northeast Pueblo
38104-A6	Verde School
38105-C1	Florence SE
38105-E1	Phantom Canyon
38104-D7	Stone City

County

Pueblo (CO)
El Paso (CO)
Custer (CO)
Fremont (CO)

Watershed Code	**Watershed Name**
11020003	Fountain

Network of Conservation Areas (NCA) Report

Name Arkansas Valley Barrens **Site Code** S.USCOHP*27035

11020002	Upper Arkansas
11020001	Arkansas Headwaters

Site Directions

Arkansas Valley in the vicinity of Canon City and Pueblo.

SITE DESCRIPTION

Minimum Elevation	4,640.00	**Feet**	1,414.27	**Meters**
Maximum Elevation	8,800.00	**Feet**	2,682.24	**Meters**

Site Description

This is a hot spot for botanical biodiversity in the Middle Arkansas Valley.

Key Environmental Factors

No Data

Climate Description

No Data

Land Use History

No Data

Cultural Features

No Data

SITE DESIGN

Site Map P - Partial **Mapped Date** 02/27/2008

Designer Panjabi, S.S.

Boundary Justification

Boundary is based on ecoregion boundary along the west edge of the site, and Fountain Creek along the east edge. Includes a concentration of globally rare plant species.

Primary Area 621,007.13 **Acres** 251,313.67 **Hectares**

OTHER/PROTECTION/MANAGEMENT RANKS

Other Values Rank No Data

Other Values Comments

No Data

Protection Urgency Rank P2: Threat/Opportunity within 5 Years

Protection Urgency Comments

The vast majority of this site is private land with no protection in place.

Management Urgency Rank M2: Essential within 5 Years to Prevent Loss

Management Urgency Comments

This is one of the most rapidly developing areas of Colorado.

LAND MANAGEMENT ISSUES

Land Use Comments

No Data

Natural Hazard Comments

No Data

Exotics Comments

No Data

Offsite

No Data

Information Needs

No Data

Network of Conservation Areas (NCA) Report

Name Arkansas Valley Barrens **Site Code** S.USCOHP*27035

Management Needs

No Data

Managed Area Relations

No Data

Protection Comments

No Data

ASSOCIATED POTENTIAL CONSERVATION AREAS (PCA)

PCA Site ID	PCA Site Name	PCA Biological Diversity Significance
482	Rare Plants of the Chalk Barrens	B1: Outstanding Biodiversity Significance
1615	Fourmile Creek-Fremont County	B2: Very High Biodiversity Significance
1530	Ritchie Gulch Upland	B2: Very High Biodiversity Significance
1239	Canon City Hogback	B2: Very High Biodiversity Significance
157	Garden Park Fossil	B2: Very High Biodiversity Significance
2427	Grape Creek Water Gap	B3: High Biodiversity Significance
446	Beaver Park	B4: Moderate Biodiversity Significance
87	Rock Creek Hill	B4: Moderate Biodiversity Significance

REFERENCES

Reference ID	Full Citation
-	No Data

ADDITIONAL TOPICS

Additional Topics

No Data

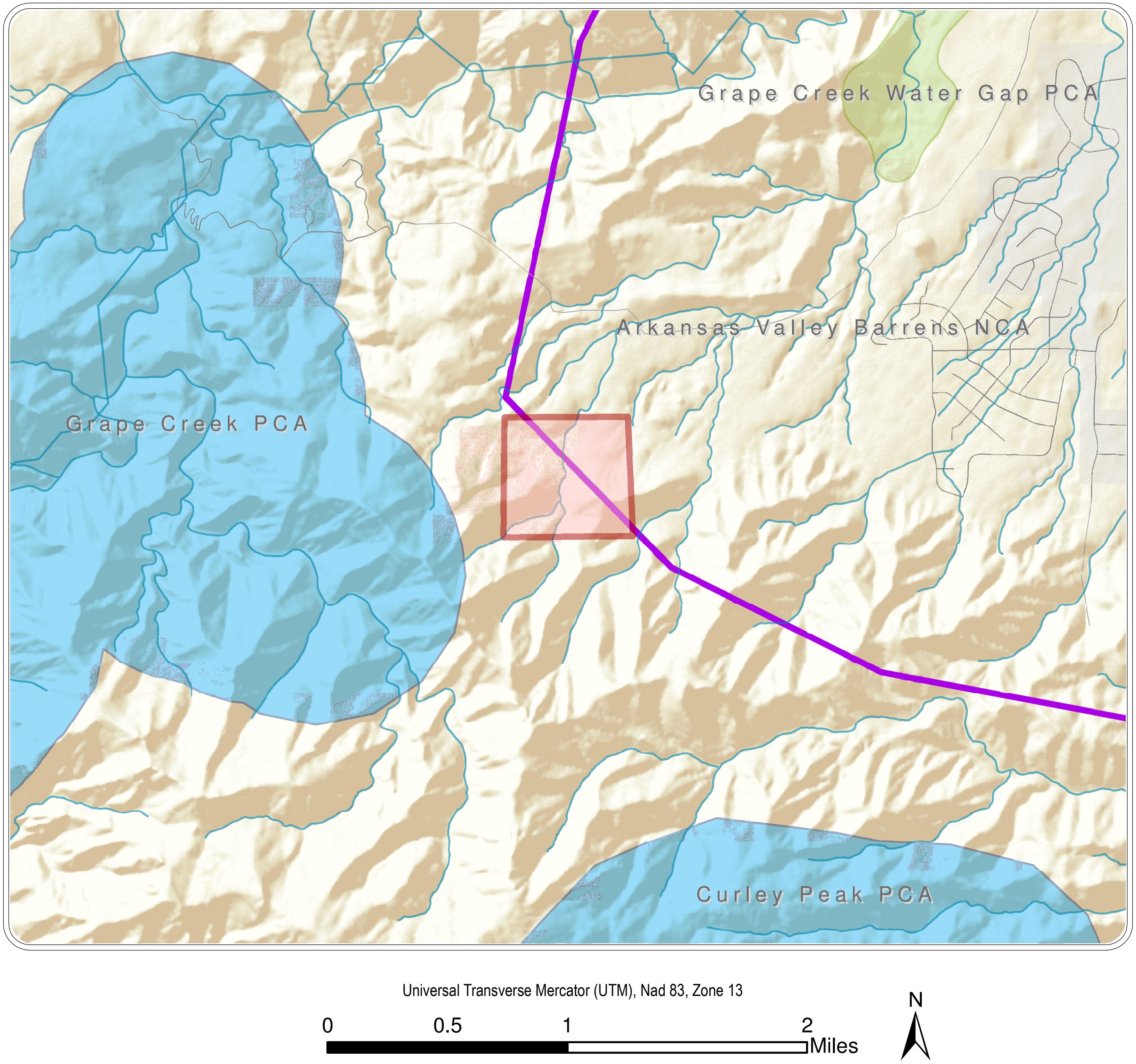
VERSION

Lead Responsibility CNHP-Botany Team

Version Date 02/27/2008

Version Author Panjabi, S.S.

CNHP Potential Conservation Areas (PCAs) and Network of Conservation Areas (NCAs) in the vicinity of the Dawson Gold Mine Area of Interest



Colorado Natural Heritage Program
Colorado State University
1475 Campus Delivery
Fort Collins, CO 80523-1475

Map Created
13 November 2012
CNHP Environmental Review mdm

The absence of data for a particular area or habitat does not necessarily mean that the species does not occur on or adjacent to the project site, rather that our files do not currently contain information to document their presence.

Although every attempt is made to provide the most current and precise information possible, please be aware that some of our sources provide a higher level of accuracy than others, and some interpretation may be required. CNHP's BIOTICS data system is constantly updated and revised. Please contact CNHP for an update or assistance with interpretation of this natural heritage information.

Data are not appropriate for site level planning or evaluation.

Legend

🟥 General Area of Interest

Potential Conservation Areas

🟪 B1: Outstanding Biodiversity Significance
🟦 B2: Very High Biodiversity Significance
🟩 B3: High Biodiversity Significance
🟨 B4: Moderate Biodiversity Significance
🟫 B5: General Biodiversity Interest
▢ Network of Conservation Areas

Level 2 Potential Conservation Area (PCA) Report

Name Grape Creek **Site Code** S.USCOHP*8060

IDENTIFIERS

Site ID 465 **Site Class** PCA

Site Alias Grape Creek at Bear Gulch

Network of Conservation Areas (NCA)

NCA Site ID	NCA Site Code	NCA Site Name
-		No Data

Site Relations No Data

LOCATORS

Nation United States **Latitude** 382011N

State Colorado **Longitude** 1052013W

Quad Code	Quad Name
38105-C3	Curley Peak
38105-D3	Royal Gorge

County

Fremont (CO)
Custer (CO)

Watershed Code	Watershed Name
11020001	Arkansas Headwaters
11020002	Upper Arkansas

SITE DESCRIPTION

Minimum Elevation	5,700.00	**Feet**	1,737.36	**Meters**
Maximum Elevation	8,045.00	**Feet**	2,452.12	**Meters**

Site Description

Grape Creek is a long, perennial drainage that winds through rugged, granitic, lower montane hills west of the north end of the Wet Mountains. The steep canyon slopes above the stream are sparsely covered with rocky pinon - juniper woodland (*Pinus edulis - Juniperus* spp.) with mountain mahogany (*Cercocarpus montanus*) and Gambel oak (*Quercus gambelii*) groves. There are small prospect mines in the hills of the stream valley. This perennial stream is recovering from intensive land use in the past (grazing, railroad corridor). It previously washed out annually during high energy spring flooding once water flow resumed after being much reduced in winter by Deweese Reservoir upstream. This repeatedly stripped all vegetation out of the riparian corridor until recent years when the streambank vegetation has held. Intensive land use has been curbed and the riparian vegetation is recovering. Currently, the predominant vegetation within the corridor is the graminoid-dominated streambanks that have been gradually expanding. The entire reach is dotted with Rocky Mountain juniper (*Juniperus scopulorum*) and one seed juniper (*Juniperus monosperma*) individuals interspersed with groves of narrowleaf cottonwood (*Populus angustifolia*) and/or plains cottonwood (*Populus deltoides*). There are some groves of mature cottonwoods where the ground has significant woody debris as well as areas of regenerating cottonwoods that likely will replace the junipers as canopy dominants in the future. Shrubs are sparse along the reach, but show signs of establishment and regeneration in many places. Coyote willow (*Salix exigua*) is the most common, although peachleaf willow (*Salix amygdaloides*) saplings are also present. The herbaceous cover is lush along the banks. Dominant graminoids include pasture grasses like quackgrass (*Elymus repens*) and Kentucky bluegrass (*Poa pratensis*), although native Nebraska sedge (*Carex nebrascensis*), common spikerush (*Eleocharis palustris*), and scouring rush horsetail (*Equisetum hyemale*) are common and abundant. There are scattered forbs throughout, including wild mint (*Mentha arvensis*), water horehound (*Lycopus americana*), and others. Vines such as riverbank grape (*Vitis riparia*) and clematis (*Clematis ligusticifolia*) crawl up and cover rock outcrops and juniper and cottonwood trees in several areas. Tributaries of Grape Creek are moderate to high gradient sandy washes with ephemeral to intermittent flow. Tree canopies, where present, are mixed evergreen-deciduous woodlands, often with sporadic cover.

Key Environmental Factors

Lower montane elevation; moderate gradient; perennial flow.

Climate Description

No Data

Level 2 Potential Conservation Area (PCA) Report

Name Grape Creek **Site Code** S.USCOHP*8060

Land Use History

A railroad was built through Grape Creek canyon in the late 1800's. It was abandoned and dismantled after repeated flooding washed out the tracks. Small mines dot the canyonsides in some areas.

Cultural Features

No Data

SITE DESIGN

Site Map Y - Yes **Mapped Date** 01/13/2006

Designer Neid, S.L.

Boundary Justification

The boundary is drawn as a 1 km buffer of the riparian corridor, which roughly approximates the adjacent ridgelines surrounding Grape Creek for immediate watershed protection.

Primary Area 13,093.83 **Acres** 5,298.90 **Hectares**

SITE SIGNIFICANCE

Biodiversity Significance Rank B2: Very High Biodiversity Significance

Biodiversity Significance Comments

This site encompasses an excellent (A-ranked) and a good (B-ranked) occurrence of a globally imperiled (G2G3/S2S3) riparian natural community, narrowleaf cottonwood - Rocky Mountain juniper (*Populus angustifolia - Juniperus scopulorum*) woodland. Additionally, there is a good (B-ranked) occurrence of the globally vulnerable (G3/S2) narrowleaf cottonwood - Douglas-fir (*Populus angustifolia - Pseudotsuga menziesii*) woodland and a good to fair (BC-ranked) occurrence of the apparently globally secure but state imperiled (G4/S2) Rocky Mountain juniper / Red-osier dogwood (*Juniperus scopulorum / Cornus sericea*) woodland. Several fair (C-ranked) occurrences of a globally imperiled (G2/S2) plant, Arkansas Canyon stickleaf (*Nuttallia densa*), have also been documented.

Other Values Rank No Data

Other Values Comments

No Data

LAND MANAGMENT ISSUES

Land Use Comments

No Data

Natural Hazard Comments

No Data

Exotics Comments

No Data

Offsite

Hydrological processes originating outside of the planning boundary, including water quality, quantity, timing and flow must be managed to maintain site viability.

Information Needs

No Data

ASSOCIATED ELEMENTS OF BIODIVERSITY

Element State ID	State Scientific Name	State Common Name	Global Rank	State Rank	Driving Site Rank
24657	*Juniperus scopulorum / Cornus sericea* Woodland	Riparian Woodland	G4	S2	No
24692	*Populus angustifolia - Pseudotsuga menziesii* Woodland	Montane Riparian Forest	G3	S2	No
16858	*Nuttallia densa*	Arkansas Canyon stickleaf	G2	S2	No
16858	*Nuttallia densa*	Arkansas Canyon stickleaf	G2	S2	No
24963	*Populus angustifolia - Juniperus scopulorum* Woodland	Montane Riparian Forest	G2G3	S2S3	Yes
16858	*Nuttallia densa*	Arkansas Canyon stickleaf	G2	S2	No
24963	*Populus angustifolia - Juniperus scopulorum* Woodland	Montane Riparian Forest	G2G3	S2S3	Yes

Level 2 Potential Conservation Area (PCA) Report

Name Grape Creek **Site Code** S.USCOHP*8060

REFERENCES

Reference ID	Full Citation
159580	Kittel, G., R. Rondeau and A. McMullen. 1996. A classification of the riparian vegetation of the Lower South Platte and parts of the Upper Arkansas River basins, Colorado. Unpublished CNHP Report for CO DNR and US EPA, Region VIII. 243 p.
193618	Neid, S.L. 2006. Final Report: Survey of Critical Wetlands and Riparian Areas in Fremont County, Colorado. Colorado Natural Heritage Program, Fort Collins, CO.
169032	Rondeau, R. and A. McMullen. 1995. Colorado Natural Heritage Program Riparian Field Survey of the Arkansas River Basin.

ADDITIONAL TOPICS

Additional Topics

Original site design by Kittel, G.M. 1997-04-02.

VERSION

Version Date 01/13/2006

Version Author Neid, S.L.

Level 2 Potential Conservation Area (PCA) Report

Name Curley Peak **Site Code** S.USCOHP*1656

IDENTIFIERS

Site ID 1030 **Site Class** PCA

Site Alias None

Network of Conservation Areas (NCA)

NCA Site ID	NCA Site Code	NCA Site Name
-		No Data

Site Relations Overlaps Chandler Creek (S.USCOHP*25895) and Arkansas Valley Barrens (S.USCOHP*27035). Contains East Bear Gulch (S.USCOHP*26392) and shares a small portion of its sourthern boundary with Lion Canyon (S.USCOHP*25894).

LOCATORS

Nation United States **Latitude** 381953N

State Colorado **Longitude** 1051547W

Quad Code	Quad Name
38105-C3	Curley Peak
38105-C2	Rockvale

County

Fremont (CO)

Watershed Code	Watershed Name
11020001	Arkansas Headwaters
11020002	Upper Arkansas

SITE DESCRIPTION

Minimum Elevation	6,050.00	**Feet**	1,844.04	**Meters**
Maximum Elevation	9,635.00	**Feet**	2,936.75	**Meters**

Site Description

The area is a montane park surrounded by pine (*Pinus* spp.), quaking aspen (*Populus tremuloides*), Douglas-fir (*Pseudotsuga menziesii*), and spruce (*Picea* spp.) forest.

Key Environmental Factors

No Data

Climate Description

No Data

Land Use History

No Data

Cultural Features

No Data

SITE DESIGN

Site Map Y - Yes **Mapped Date** 03/03/1999

Designer Spackman, S.C.

Boundary Justification

Boundary is drawn to protect the occurrences from direct impacts such as trampling or other surface disturbances. The boundary encompasses an area that should provide suitable habitat where additional individuals can become established over time. Although the boundary was not developed for these species, there are historical records of *Notiosorex crawfordi* and *Callophrys mossii schryeri*.

Primary Area 10,441.96 **Acres** 4,225.73 **Hectares**

SITE SIGNIFICANCE

Biodiversity Significance Rank B2: Very High Biodiversity Significance

Biodiversity Significance Comments

This rank is based on an excellent (A-ranked) and a good (B-ranked) occurrence of a globally imperiled (G2/S2) plant species, Degener beardtongue (*Penstemon degeneri*). There are also extant and historical occurrences of Degener beardtongue and an extant occurrence of the globally vulnerable (G3/S3) Fendler cloak-fern (*Argyrochosma fendleri*).

Level 2 Potential Conservation Area (PCA) Report

Name Curley Peak **Site Code** S.USCOHP*1656

Other Values Rank No Data

Other Values Comments

No Data

LAND MANAGMENT ISSUES

Land Use Comments

No Data

Natural Hazard Comments

No Data

Exotics Comments

No Data

Offsite

No Data

Information Needs

No Data

ASSOCIATED ELEMENTS OF BIODIVERSITY

Element State ID	State Scientific Name	State Common Name	Global Rank	State Rank	Driving Site Rank
21773	*Penstemon degeneri*	Degener beardtongue	G2	S2	Yes
21773	*Penstemon degeneri*	Degener beardtongue	G2	S2	No
21773	*Penstemon degeneri*	Degener beardtongue	G2	S2	Yes
21773	*Penstemon degeneri*	Degener beardtongue	G2	S2	No
24246	*Argyrochosma fendleri*	Fendler cloak-fern	G3	S3	No

REFERENCES

Reference ID	Full Citation
-	No Data

ADDITIONAL TOPICS

Additional Topics

No Data

VERSION

Version Date 03/03/1999

Version Author Spackman, S.C.

Level 2 Potential Conservation Area (PCA) Report

Name Grape Creek Water Gap **Site Code** S.USCOHP*26796

IDENTIFIERS

Site ID 2427 **Site Class** PCA

Site Alias None

Network of Conservation Areas (NCA)

NCA Site ID	NCA Site Code	NCA Site Name
2466	S.USCOHP*27035	Arkansas Valley Barrens

Site Relations Contained in Arkansas Valley Barrens (S.USCOHP*27035).

LOCATORS

Nation United States **Latitude** 382512N

State Colorado **Longitude** 1051601W

Quad Code	Quad Name
38105-D3	Royal Gorge

County

Fremont (CO)

Watershed Code	Watershed Name
11020002	Upper Arkansas
11020001	Arkansas Headwaters

SITE DESCRIPTION

Minimum Elevation	5,385.00	**Feet**	1,641.35	**Meters**
Maximum Elevation	6,045.00	**Feet**	1,842.52	**Meters**

Site Description

This site is characterized by a series of hogbacks on the edge of a large expanse of rugged, lower montane, granitic hills. There are two low hogbacks of Niobrara shale on the east side of the area and a tall, sharp hogback of Fountain Formation (sandstone with limestone inclusions) on the west side that is immediately above Grape Creek, a perennial tributary of the Arkansas River. Rock outcrops and unvegetated granite slabs are common on the slopes of the taller western hogback, which is cut by a drainage flowing into Grape Creek. Just to the north above the water gap, there is old clay mining activity and infrastructure. Sparse pinon - juniper (*Pinus edulis - Juniperus monosperma*) woodland occupies the rocky slopes of the hogbacks. The lower Niobrara hogbacks also have mountain mahogany (*Cercocarpus montanus*), Bigelow sage (*Artemisia bigelovii*), and frankenia (*Frankenia jamesii*) shrubs plus sparse, mostly low-growing herbs, such as ricegrass (*Oryzopsis hymenoides*), New Mexico feathergrass (*Hesperostipa neomexicana*), spearleaf buckwheat (*Erigonum fendleriana*), three awn (*Aristida purpurea*), James' prairie clover (*Dalea jamesii*), stemless daisy (*Hymenoxys acaulis*), blue grama (*Bouteloua gracilis*), and hairy woolygrass (*Erioneuron pilosum*). The taller Fountain Formation hogback has shrubs like California brickellbush (*Brickellia californica*) and hoptree (*Ptelea trifoliata*) with diverse graminoids like little bluestem (*Schizachyrium scoparium*), sideoats grama (*Bouteloua curtipendula*), hairy grama (*Bouteloua hirsuta*), bush muhly (*Muhlenbergia porteri*), California oatgrass (*Danthonia californicus*), common wolfstail (*Lycurus phleoides*), and poverty threeawn (*Aristida divaricata*) plus large hedgehog cactus (*Echinocereus triglochidiatus*), dwarf Indian mallow (*Abutilon parvulum*), chickenthief (*Mentzelia oligosperma*), and narrowleaf four o'clock (*Oxybaphus linearis*). The intervening valleys are occupied by gypsiferous grasslands. The gypsiferous grasslands are unique in character, having selenium influence and a different species composition. Graminoids are unique and include burrograss (*Scleropogon brevifolius*), ear muhly (*Muhlenbergia arenacea*), vine mesquite (*Panicum obtusum*), and Texas dropseed (*Sporobolus texanus*) in addition to more common blue grama (*Bouteloua gracilis*), green needlegrass (*Stipa viridula*), bottlebrush grass (*Elymus elymoides*), and sand dropseed (*Sporobolus cryptandrus*). Prince's plume (*Stanleya pinnata*), a selenium indicator, is abundant in some locations.

Key Environmental Factors

No Data

Climate Description

No Data

Land Use History

Past clay mining activity

Level 2 Potential Conservation Area (PCA) Report

Name Grape Creek Water Gap **Site Code** S.USCOHP*26796

Cultural Features

No Data

SITE DESIGN

Site Map P - Partial **Mapped Date** 03/06/2007

Designer Neid, S.L.

Boundary Justification

This boundary includes known occurrences of rare plants as well as some adjacent suitable natural habitat.

Primary Area 315.60 **Acres** 127.72 **Hectares**

SITE SIGNIFICANCE

Biodiversity Significance Rank B3: High Biodiversity Significance

Biodiversity Significance Comments

The site supports an excellent (A-ranked) occurrence of the globally vulnerable (G3/S3) Rocky Mountain bladderpod (*Lesquerella calcicola*) and a good (B-ranked) occurrence of the state rare (G5/S2) Wright's cliff-brake (*Pellaea wrightiana*).

Other Values Rank No Data

Other Values Comments

No Data

LAND MANAGMENT ISSUES

Land Use Comments

No Data

Natural Hazard Comments

No Data

Exotics Comments

Exotic species present include Russian thistle (*Salsola australis*), kochia (*Kochia scoparia*), and limited tamarisk (*Tamarix ramosissimum*). The tamarisk occurs in the drainage above the water gap.

Offsite

No Data

Information Needs

No Data

ASSOCIATED ELEMENTS OF BIODIVERSITY

Element State ID	State Scientific Name	State Common Name	Global Rank	State Rank	Driving Site Rank
19618	*Pellaea wrightiana*	Wright's cliff-brake	G5	S2	No
21031	*Lesquerella calcicola*	Rocky Mountain bladderpod	G3	S3	Yes

REFERENCES

Reference ID	Full Citation
194663	Neid, S.L. 2007. Final Report: Rare Plant Survey of Select Bureau of Land Management Lands in the Arkansas River Canyon, Chaffee and Fremont Counties, Colorado. Colorado Natural Heritage Program, Fort Collins, CO.

ADDITIONAL TOPICS

Additional Topics

No Data

VERSION

Version Date 03/06/2007

Version Author Neid, S.L.

Locations and Status of Rare and/or Imperiled Species and Natural Communities known from or likely to occur within a two-mile radius of the Dawson Gold Mine Project Site of Interest

Report generated: 8 November 2012

EO_ID	major group	scientific name	common name	Prec	last obs	Town/ Range	Sec	TRS Note	grank	srank	eo-rank	ESA	fed stat	st stat
462	Insects	*Amblyscirtes simius*	Simius Roadside Skipper	G	1962-06-04	018S071W	26		G4	S3	H	-		
7,159	Insects	*Callophrys mossii schryveri*	Moss's Elfin	G	1973-05-19	020S070W	08		G4T3	S2S3	H	-		
2,048	Mammals	*Thomomys bottae rubidus*	Botta's Pocket Gopher Subsp	G	9999-99-99	018S070W	32		G5T1	S1	H	-		SC
13,062	Natural Communities	*Populus angustifolia - Juniperus scopulorum Woodland*	Montane Riparian Forest	S	2005-08-15	019S071W 019S071W 019S071W	15 16 22		G2G3	S2S3	A	-		
4,634	Vascular Plants	*Astragalus brandegeei*	Brandegee milkvetch	G	1873-06-26	018S070W	28		G3G4	S1S2	H	-		
4,003	Vascular Plants	*Lesquerella calcicola*	Rocky Mountain bladderpod	S	2006-06-27	019S070W 019S070W	06 07		G3	S3	A	-		
4,846	Vascular Plants	*Nuttallia chrysantha*	golden blazing star	M	1996-07-15	019S070W 019S070W 019S071W 019S071W 019S071W 019S071W	07 18 11 12 13 14		G2	S2	E	-	BLM	
2,874	Vascular Plants	*Nuttallia densa*	Arkansas Canyon stickleaf	S	1992-06-25	019S071W 019S071W 019S071W	09 10 16		G2	S2	C	-	BLM	
11,798	Vascular Plants	*Penstemon degeneri*	Degener beardtongue	S	1998-06-05	019S070W 019S071W			G2	S2	E	-	BLM USFS	
3,832	Vascular Plants	*Thamnosma texana*	Dutchman's breeches	G	1877-99-99	017S070W 017S070W 017S070W 018S069W 018S069W 018S069W 018S069W	32 33 34 07 17 18 19		G5	SH	H	-		

precision codes: S = "seconds", location known within 100m; M = "minutes", location known within 1 mile; G = "general", location kn

EO_ID	major group	scientific name	common name	Prec	last obs	Town/ Range	Sec	TRS Note	grank	srank	eo-rank	ESA	fed stat	st stat
						018S069W	20							
						018S069W	29							
						018S069W	30							
						018S069W	31							
						018S069W	32							
						018S070W	01							
						018S070W	02							
						018S070W	03							
						018S070W	04							
						018S070W	05							
						018S070W	06							
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						018S070W	27							
						018S070W	28							
						018S070W	29							

EO_ID	major group	scientific name	common name	Prec	last obs	Town/ Range	Sec	TRS Note	grank	srank	eo-rank	ESA	fed stat	st stat
						018S070W	30							
						018S070W	31							
						018S070W	32							
						018S070W	33							
						018S070W	34							
						018S070W	35							
						018S070W	36							
						018S071W	01							
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						018S071W	12							
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						019S070W	03							
						019S070W	04							
						019S070W	05							
						019S070W	06							
						019S070W	07							
						019S070W	08							

EO_ID	major group	scientific name	common name	Prec	last obs	Town/ Range	Sec	TRS Note	grank	srank	eo- rank	ESA	fed stat	st stat
						019S070W	09							
						019S070W	10							
						019S070W	11							
						019S070W	12							
						019S070W	13							
						019S070W	14							
						019S070W	15							
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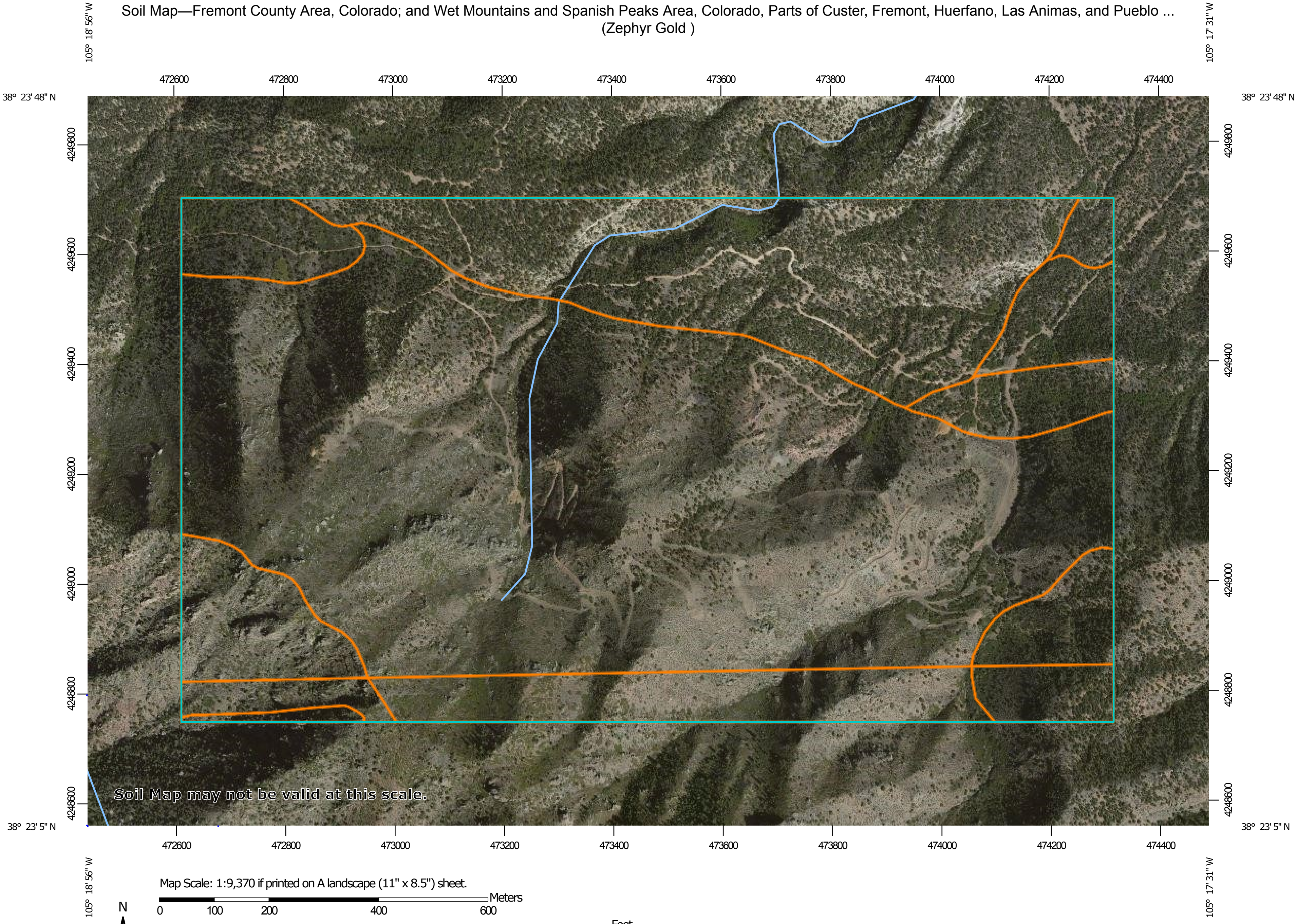
						019S070W	21							
						019S070W	22							
						019S070W	23							
						019S070W	24							
						019S071W	01							
						019S071W	02							
						019S071W	11							
						019S071W	12							
						019S071W	13							

APPENDIX H: NRCS Soil Survey and Soil Descriptions

Soil Map—Fremont County Area, Colorado; and Wet Mountains and Spanish Peaks Area, Colorado, Parts of Custer, Fremont, Huerfano, Las Animas, and Pueblo ...
(Zephyr Gold)



Map Scale: 1:9,370 if printed on A landscape (11" x 8.5") sheet.

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 13N WGS84

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Fremont County Area, Colorado
Survey Area Data: Version 14, Sep 24, 2015

Soil Survey Area: Wet Mountains and Spanish Peaks Area, Colorado, Parts of Custer, Fremont, Huerfano, Las Animas, and Pueblo Counties
Survey Area Data: Version 5, Sep 24, 2014

Your area of interest (AOI) includes more than one soil survey area. These survey areas may have been mapped at different scales, with a different land use in mind, at different times, or at different levels of detail. This may result in map unit symbols, soil properties, and interpretations that do not completely agree across soil survey area boundaries.

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Sep 11, 2010—Nov 18, 2011

MAP LEGEND

MAP INFORMATION

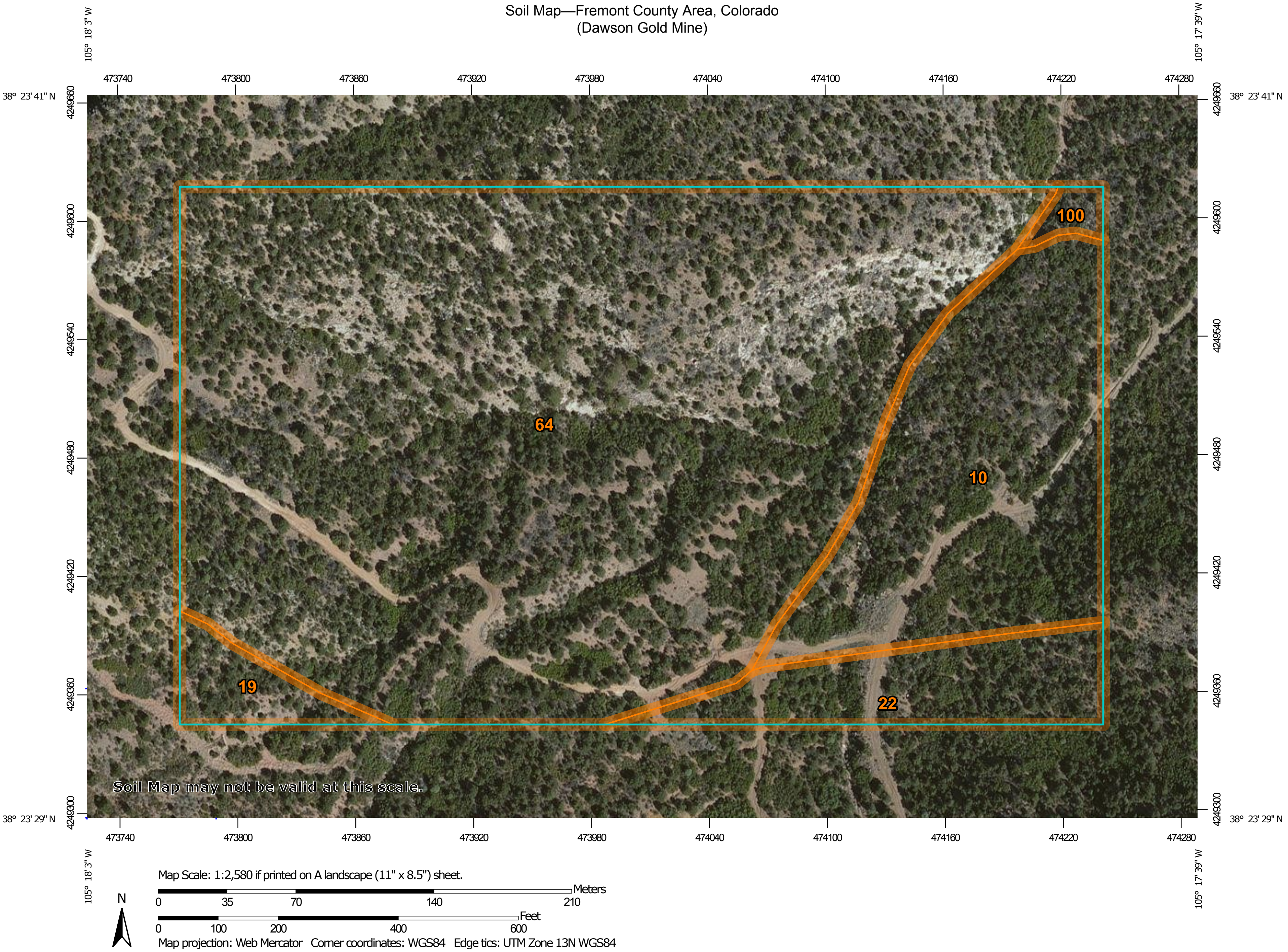
The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Fremont County Area, Colorado (CO637)			
Map Unit Symbol	**Map Unit Name**	**Acres in AOI**	**Percent of AOI**
10	Bronell gravelly sandy loam, 2 to 15 percent slopes	9.1	2.3%
19	Cathedral-Rock outcrop complex, 45 to 80 percent slopes	237.5	58.8%
22	Coaldale very gravelly sandy loam, 20 to 45 percent slopes	8.9	2.2%
64	Louviers-Travessilla complex, 20 to 50 percent slopes	73.2	18.1%
100	Sedillo cobbly sandy loam, 4 to 25 percent slopes	2.7	0.7%
112	Tecolote very gravelly sandy loam, 15 to 40 percent slopes	10.6	2.6%
120	Ustic Torriorthents, bouldery-Rock outcrop complex, 35 to 90 percent slopes	23.9	5.9%
Subtotals for Soil Survey Area		**365.8**	**90.6%**
Totals for Area of Interest		**403.8**	**100.0%**

Wet Mountains and Spanish Peaks Area, Colorado, Parts of Custer, Fremont, Huerfano, Las Animas, and Pueblo Counties (CO636)			
Map Unit Symbol	**Map Unit Name**	**Acres in AOI**	**Percent of AOI**
706YB	Cathedral family-Rock outcrop complex, 40 to 150 percent slopes	26.3	6.5%
737Y	Aridic Ustorthents-Rock outcrop complex, 40 to 150 percent slopes	11.8	2.9%
Subtotals for Soil Survey Area		**38.0**	**9.4%**
Totals for Area of Interest		**403.8**	**100.0%**

Soil Map—Fremont County Area, Colorado
(Dawson Gold Mine)



Map Scale: 1:2,580 if printed on A landscape (11" x 8.5") sheet.

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 13N WGS84

MAP LEGEND

Area of Interest (AOI)

- ☐ Area of Interest (AOI)

Soils

- ☐ Soil Map Unit Polygons
- 〰 Soil Map Unit Lines
- ■ Soil Map Unit Points

Special Point Features

- ◉ Blowout
- ⊠ Borrow Pit
- ✱ Clay Spot
- ◇ Closed Depression
- ✕ Gravel Pit
- ∴ Gravelly Spot
- ⊛ Landfill
- Λ Lava Flow
- ⏚ Marsh or swamp
- ⚒ Mine or Quarry
- ◎ Miscellaneous Water
- ○ Perennial Water
- ∨ Rock Outcrop
- + Saline Spot
- ⁘ Sandy Spot
- ⊖ Severely Eroded Spot
- ◈ Sinkhole
- ≫ Slide or Slip
- ø Sodic Spot
- ≣ Spoil Area
- ⬯ Stony Spot
- ∞ Very Stony Spot
- ψ Wet Spot
- △ Other
- ╍ Special Line Features

Water Features

- 〜 Streams and Canals

Transportation

- ┼┼┼ Rails
- 〰 Interstate Highways
- 〰 US Routes
- 〰 Major Roads
- 〰 Local Roads

Background

- ▨ Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Fremont County Area, Colorado
Survey Area Data: Version 14, Sep 24, 2015

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

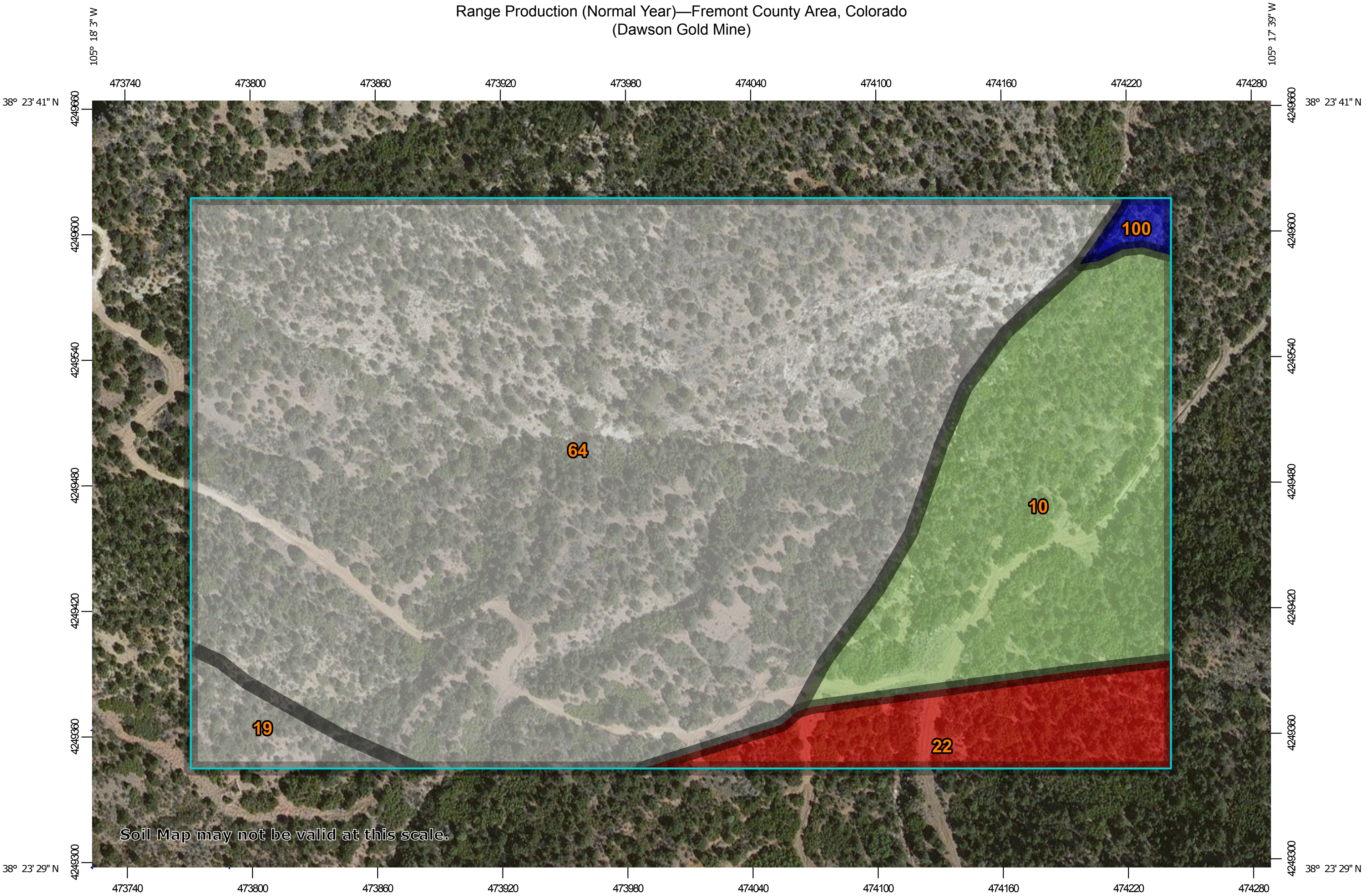
Date(s) aerial images were photographed: Sep 11, 2010—Nov 18, 2011

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Fremont County Area, Colorado (CO637)			
Map Unit Symbol	**Map Unit Name**	**Acres in AOI**	**Percent of AOI**
10	Bronell gravelly sandy loam, 2 to 15 percent slopes	5.7	17.9%
19	Cathedral-Rock outcrop complex, 45 to 80 percent slopes	0.7	2.3%
22	Coaldale very gravelly sandy loam, 20 to 45 percent slopes	2.0	6.3%
64	Louviers-Travessilla complex, 20 to 50 percent slopes	23.1	72.8%
100	Sedillo cobbly sandy loam, 4 to 25 percent slopes	0.2	0.6%
Totals for Area of Interest		**31.8**	**100.0%**

Range Production (Normal Year)—Fremont County Area, Colorado
(Dawson Gold Mine)



105° 18' 3" W

105° 17' 39" W

Map Scale: 1:2,580 if printed on A landscape (11" x 8.5") sheet.

N

0	35	70	140	210 Meters

0	100	200	400	600 Feet

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 13N WGS84

MAP LEGEND

Area of Interest (AOI)

- ☐ Area of Interest (AOI)

Soils

Soil Rating Polygons

- 🟥 <= 180
- 🟩 > 180 and <= 600
- 🟦 > 600 and <= 850
- ⬜ Not rated or not available

Soil Rating Lines

- 〰 <= 180
- 〰 > 180 and <= 600
- 〰 > 600 and <= 850
- 〰 Not rated or not available

Soil Rating Points

- ■ <= 180
- ■ > 180 and <= 600
- ■ > 600 and <= 850
- ■ Not rated or not available

Water Features

- 〰 Streams and Canals

Transportation

- ┼┼┼ Rails
- 〰 Interstate Highways
- 〰 US Routes
- 〰 Major Roads
- 〰 Local Roads

Background

- ▨ Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Fremont County Area, Colorado
Survey Area Data: Version 14, Sep 24, 2015

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Sep 11, 2010—Nov 18, 2011

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Range Production (Normal Year)

Range Production (Normal Year)— Summary by Map Unit — Fremont County Area, Colorado (CO637)				
Map unit symbol	**Map unit name**	**Rating (pounds per acre per year)**	**Acres in AOI**	**Percent of AOI**
10	Bronell gravelly sandy loam, 2 to 15 percent slopes	600	5.7	17.9%
19	Cathedral-Rock outcrop complex, 45 to 80 percent slopes		0.7	2.3%
22	Coaldale very gravelly sandy loam, 20 to 45 percent slopes	180	2.0	6.3%
64	Louviers-Travessilla complex, 20 to 50 percent slopes		23.1	72.8%
100	Sedillo cobbly sandy loam, 4 to 25 percent slopes	850	0.2	0.6%
Totals for Area of Interest			**31.8**	**100.0%**

Description

Total range production is the amount of vegetation that can be expected to grow annually in a well managed area that is supporting the potential natural plant community. It includes all vegetation, whether or not it is palatable to grazing animals. It includes the current year's growth of leaves, twigs, and fruits of woody plants. It does not include the increase in stem diameter of trees and shrubs. It is expressed in pounds per acre of air-dry vegetation. In a normal year, growing conditions are about average. Yields are adjusted to a common percent of air-dry moisture content.

In areas that have similar climate and topography, differences in the kind and amount of vegetation produced on rangeland are closely related to the kind of soil. Effective management is based on the relationship between the soils and vegetation and water.

Rating Options

Units of Measure: pounds per acre per year

Aggregation Method: Weighted Average

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

Interpret Nulls as Zero: Yes

Fremont County Area, Colorado

19—Cathedral-Rock outcrop complex, 45 to 80 percent slopes

Map Unit Setting

National map unit symbol: jqhm
Elevation: 6,800 to 7,700 feet
Mean annual precipitation: 14 to 16 inches
Mean annual air temperature: 43 to 46 degrees F
Frost-free period: 95 to 115 days
Farmland classification: Not prime farmland

Map Unit Composition

Cathedral and similar soils: 75 percent
Rock outcrop: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Cathedral

Setting

Landform: Mountainsides
Landform position (three-dimensional): Mountaintop
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Colluvium derived from gneiss and/or residuum weathered from gneiss

Typical profile

A - 0 to 6 inches: very gravelly coarse sandy loam
C - 6 to 19 inches: very gravelly sandy loam, extremely gravelly sandy loam
C - 6 to 19 inches: unweathered bedrock
R - 19 to 23 inches:

Properties and qualities

Slope: 45 to 75 percent
Depth to restrictive feature: 6 to 20 inches to lithic bedrock
Natural drainage class: Well drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Very low (about 1.9 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: D

Hydric soil rating: No

Description of Rock Outcrop

Typical profile

R - 0 to 60 inches: unweathered bedrock

Properties and qualities

Slope: 50 to 80 percent
Depth to restrictive feature: 0 inches to lithic bedrock
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)
Available water storage in profile: Very low (about 0.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8s
Hydric soil rating: No

Minor Components

Moderately deep soils

Percent of map unit:
Hydric soil rating: No

Talus

Percent of map unit:
Hydric soil rating: No

Tecolote

Percent of map unit:
Hydric soil rating: No

Data Source Information

Soil Survey Area: Fremont County Area, Colorado
Survey Area Data: Version 14, Sep 24, 2015

Soil Survey Area: Wet Mountains and Spanish Peaks Area, Colorado, Parts of Custer, Fremont, Huerfano, Las Animas, and Pueblo Counties
Survey Area Data: Version 5, Sep 24, 2014

Fremont County Area, Colorado

10—Bronell gravelly sandy loam, 2 to 15 percent slopes

Map Unit Setting

National map unit symbol: jqgb
Elevation: 6,900 to 7,800 feet
Mean annual precipitation: 12 to 15 inches
Mean annual air temperature: 43 to 46 degrees F
Frost-free period: 95 to 115 days
Farmland classification: Not prime farmland

Map Unit Composition

Bronell and similar soils: 85 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Bronell

Setting

Landform: Fan terraces, fans
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium

Typical profile

A - 0 to 16 inches: gravelly sandy loam
Bk - 16 to 60 inches: extremely gravelly sandy loam, very gravelly sandy loam
Bk - 16 to 60 inches:

Properties and qualities

Slope: 2 to 15 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): High (2.00 to 6.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 10 percent
Available water storage in profile: Moderate (about 6.5 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: A
Ecological site: Gravelly Foothill (R049BY214CO)
Hydric soil rating: No

Minor Components

Mussel

Percent of map unit:
Hydric soil rating: No

Sand and gravel

Percent of map unit:
Hydric soil rating: No

Data Source Information

Soil Survey Area: Fremont County Area, Colorado
Survey Area Data: Version 14, Sep 24, 2015

Fremont County Area, Colorado

19—Cathedral-Rock outcrop complex, 45 to 80 percent slopes

Map Unit Setting

National map unit symbol: jqhm
Elevation: 6,800 to 7,700 feet
Mean annual precipitation: 14 to 16 inches
Mean annual air temperature: 43 to 46 degrees F
Frost-free period: 95 to 115 days
Farmland classification: Not prime farmland

Map Unit Composition

Cathedral and similar soils: 75 percent
Rock outcrop: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Cathedral

Setting

Landform: Mountainsides
Landform position (three-dimensional): Mountaintop
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Colluvium derived from gneiss and/or residuum weathered from gneiss

Typical profile

A - 0 to 6 inches: very gravelly coarse sandy loam
C - 6 to 19 inches: very gravelly sandy loam, extremely gravelly sandy loam
C - 6 to 19 inches: unweathered bedrock
R - 19 to 23 inches:

Properties and qualities

Slope: 45 to 75 percent
Depth to restrictive feature: 6 to 20 inches to lithic bedrock
Natural drainage class: Well drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Very low (about 1.9 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: D

Hydric soil rating: No

Description of Rock Outcrop

Typical profile

R - 0 to 60 inches: unweathered bedrock

Properties and qualities

Slope: 50 to 80 percent
Depth to restrictive feature: 0 inches to lithic bedrock
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)
Available water storage in profile: Very low (about 0.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8s
Hydric soil rating: No

Minor Components

Moderately deep soils

Percent of map unit:
Hydric soil rating: No

Talus

Percent of map unit:
Hydric soil rating: No

Tecolote

Percent of map unit:
Hydric soil rating: No

Data Source Information

Soil Survey Area: Fremont County Area, Colorado
Survey Area Data: Version 14, Sep 24, 2015

Fremont County Area, Colorado

22—Coaldale very gravelly sandy loam, 20 to 45 percent slopes

Map Unit Setting

National map unit symbol: jqhr
Elevation: 6,700 to 7,700 feet
Mean annual precipitation: 12 to 16 inches
Mean annual air temperature: 43 to 46 degrees F
Frost-free period: 85 to 105 days
Farmland classification: Not prime farmland

Map Unit Composition

Coaldale and similar soils: 90 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Coaldale

Setting

Landform: Mountain slopes
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Mountainflank
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Residuum weathered from granite and/or residuum weathered from gneiss

Typical profile

A - 0 to 3 inches: very gravelly sandy loam
Bt - 3 to 10 inches: very gravelly sandy clay loam
Bk - 10 to 18 inches: very gravelly sandy loam
R - 18 to 22 inches: bedrock

Properties and qualities

Slope: 20 to 45 percent
Depth to restrictive feature: 10 to 20 inches to lithic bedrock
Natural drainage class: Well drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 5 percent
Available water storage in profile: Very low (about 1.3 inches)

Interpretive groups

Land capability classification (irrigated): 7e
Land capability classification (nonirrigated): 7e

Hydrologic Soil Group: D
Other vegetative classification: Twoneedle pinyon - oneseed juniper/mountain mahogany (PIED-JUMO/CEMO2) (W0407)
Hydric soil rating: No

Minor Components

Bronell

Percent of map unit: 5 percent
Landform: Mountain slopes, drainageways
Landform position (three-dimensional): Mountainbase
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: No

Rock outcrop

Percent of map unit: 5 percent
Landform: Mountain slopes
Landform position (three-dimensional): Mountainflank
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No

Data Source Information

Soil Survey Area: Fremont County Area, Colorado
Survey Area Data: Version 14, Sep 24, 2015

Fremont County Area, Colorado

64—Louviers-Travessilla complex, 20 to 50 percent slopes

Map Unit Setting

National map unit symbol: jqk7
Elevation: 5,300 to 6,800 feet
Mean annual precipitation: 13 to 15 inches
Mean annual air temperature: 48 to 52 degrees F
Frost-free period: 120 to 150 days
Farmland classification: Not prime farmland

Map Unit Composition

Louviers and similar soils: 40 percent
Travessilla and similar soils: 35 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Louviers

Setting

Landform: Hogbacks, canyons, hills
Landform position (three-dimensional): Crest
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Residuum weathered from shale and siltstone

Typical profile

A - 0 to 3 inches: very channery clay loam
C - 3 to 16 inches: clay, clay loam
C - 3 to 16 inches: weathered bedrock
Cr - 16 to 20 inches:

Properties and qualities

Slope: 20 to 50 percent
Depth to restrictive feature: 10 to 20 inches to paralithic bedrock
Natural drainage class: Well drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 4.5 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: D
Hydric soil rating: No

Description of Travessilla

Setting

Landform: Hills, hogbacks, canyons
Landform position (three-dimensional): Crest
Down-slope shape: Linear
Across-slope shape: Linear

Typical profile

A - 0 to 4 inches: channery loam
C - 4 to 14 inches: channery loam
R - 14 to 18 inches: unweathered bedrock

Properties and qualities

Slope: 20 to 50 percent
Depth to restrictive feature: 4 to 20 inches to lithic bedrock
Natural drainage class: Well drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 15 percent
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: Very low (about 1.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: D
Hydric soil rating: No

Minor Components

Cascajo

Percent of map unit:
Hydric soil rating: No

Kim

Percent of map unit:
Hydric soil rating: No

Moderately deep soils

Percent of map unit:
Hydric soil rating: No

Rock outcrop

Percent of map unit:
Hydric soil rating: No

Shingle

Percent of map unit:

Hydric soil rating: No

Data Source Information

Soil Survey Area: Fremont County Area, Colorado
Survey Area Data: Version 14, Sep 24, 2015

Fremont County Area, Colorado

100—Sedillo cobbly sandy loam, 4 to 25 percent slopes

Map Unit Setting

National map unit symbol: jqgc
Elevation: 5,700 to 6,800 feet
Mean annual precipitation: 13 to 15 inches
Mean annual air temperature: 48 to 50 degrees F
Frost-free period: 130 to 160 days
Farmland classification: Not prime farmland

Map Unit Composition

Sedillo and similar soils: 85 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Sedillo

Setting

Landform: Fan terraces
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Calcareous, gravelly & cobbly alluvium

Typical profile

A - 0 to 5 inches: cobbly sandy loam
Bt - 5 to 9 inches: very gravelly sandy clay loam
Bk - 9 to 60 inches: very gravelly sandy loam

Properties and qualities

Slope: 4 to 25 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 30 percent
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: Low (about 3.9 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: B
Ecological site: Gravelly Foothill (R049BY214CO)
Hydric soil rating: No

Minor Components

Neville

Percent of map unit:
Hydric soil rating: No

Rizozo

Percent of map unit:
Hydric soil rating: No

Data Source Information

Soil Survey Area: Fremont County Area, Colorado
Survey Area Data: Version 14, Sep 24, 2015

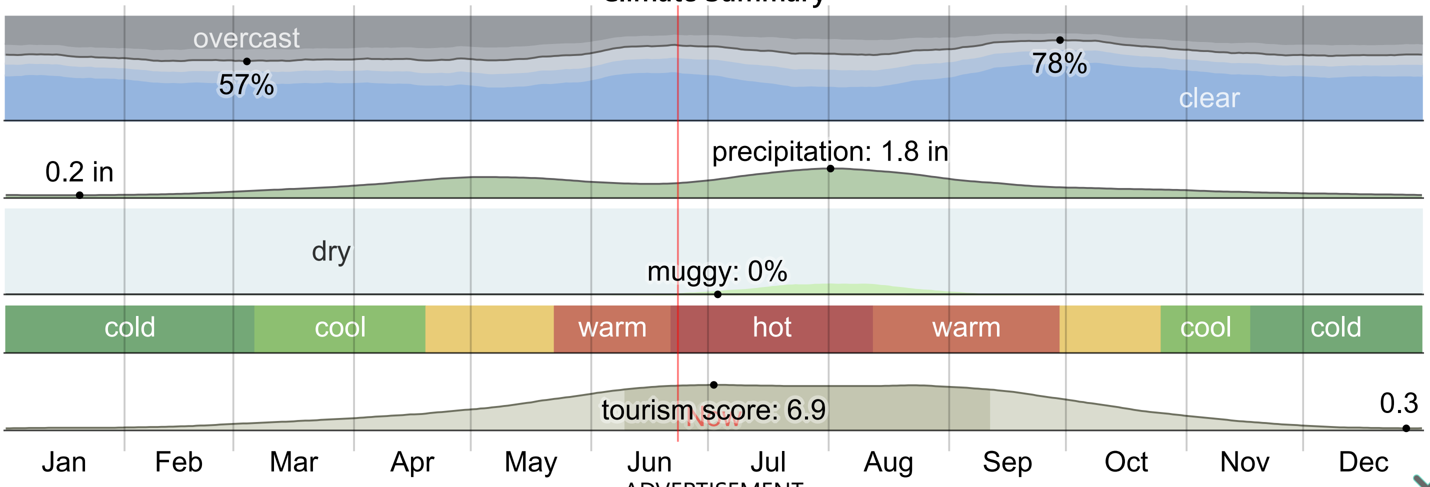
APPENDIX I: Average Weather Data for Cañon City, CO

Average Weather in Cañon City Colorado, United States

In Cañon City, the summers are warm; the winters are very cold, dry, and windy; and it is partly cloudy year round. Over the course of the year, the temperature typically varies from 23°F to 88°F and is rarely below 10°F or above 95°F.

Based on the tourism score (https://weatherspark.com/y/3517/Average-Weather-in-Ca%C3%B1on-City-Colorado-United-States-Year-Round#Sections-BestTime), the best time of year to visit Cañon City for warm-weather activities is from early June to mid September.

Climate Summary



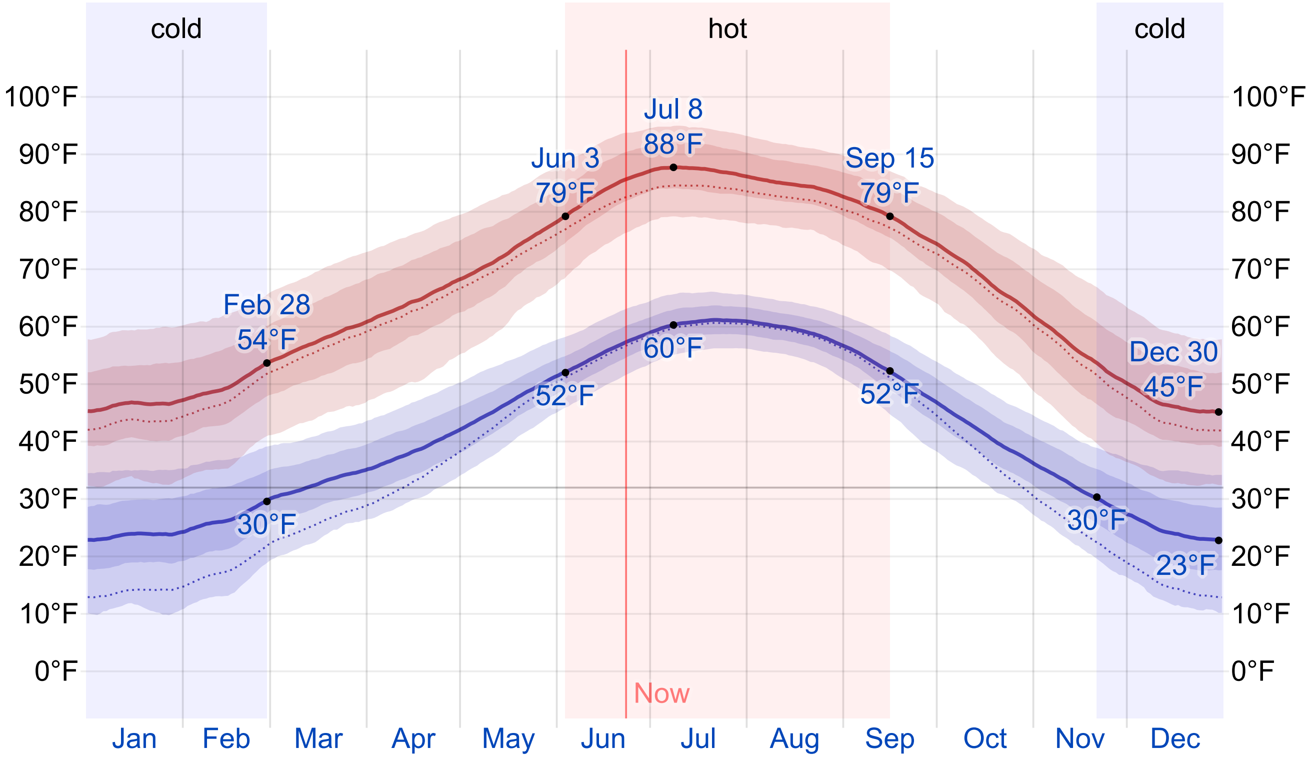
Click on each chart for more information.

Temperature

The hot season lasts for 3.4 months, from June 3 to September 15, with an average daily high temperature above 79°F. The hottest day of the year is July 8, with an average high of 88°F and low of 60°F.

The cold season lasts for 3.2 months, from November 21 to February 28, with an average daily high temperature below 54°F. The coldest day of the year is December 30, with an average low of 23°F and high of 45°F.

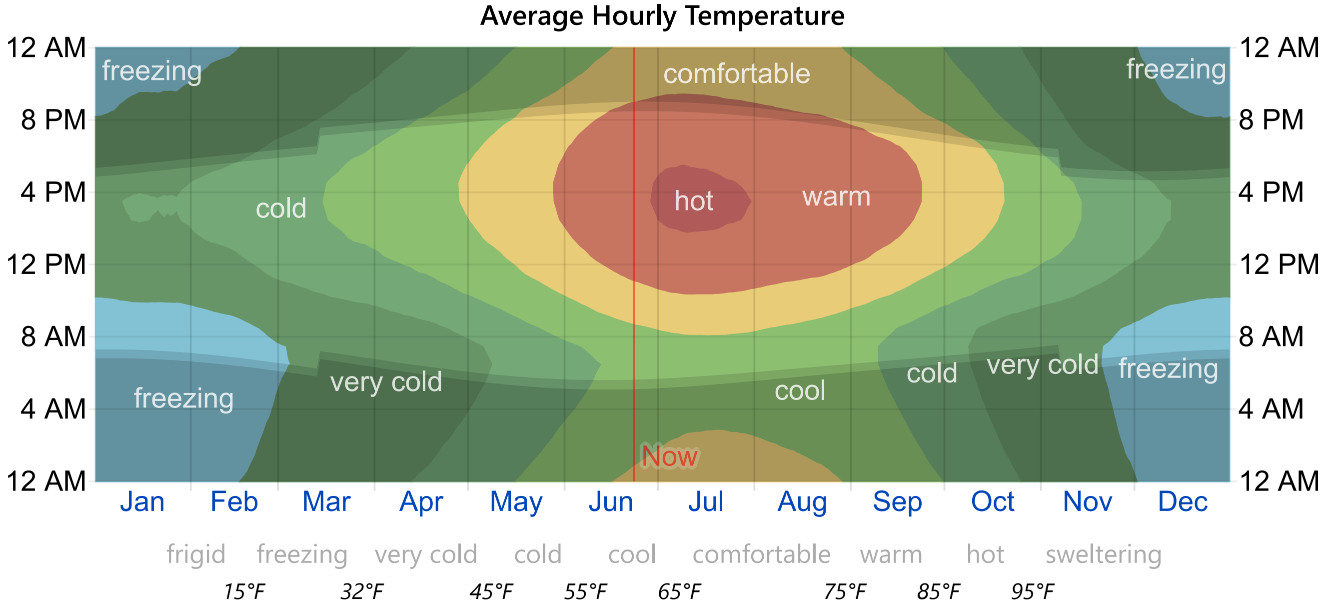
Average High and Low Temperature



The daily average high (red line) and low (blue line) temperature, with 25th to 75th and 10th to 90th percentile bands. The thin dotted lines are the corresponding average perceived temperatures.

ADVERTISEMENT

The figure below shows you a compact characterization of the entire year of hourly average temperatures. The horizontal axis is the day of the year, the vertical axis is the hour of the day, and the color is the average temperature for that hour and day.



The average hourly temperature, color coded into bands. The shaded overlays indicate night and civil twilight.

Kırıkkale, Turkey (/y/97736/Average-Weather-in-K%C4%B1r%C4%B1kkale-Turkey-Year-Round) (6,438 miles away) and Yabrūd, Syria (/y/99635/Average-Weather-in-Yabr%C5%ABd-Syria-Year-Round) (6,877 miles) are the far-away foreign places with temperatures most similar to Cañon City (view comparison (/compare/y/3517~97736~99635/Comparison-of-the-Average-Weather-in-Ca%C3%B1on-City-K%C4%B1r%C4%B1kkale-and-Yabr%C5%ABd)).

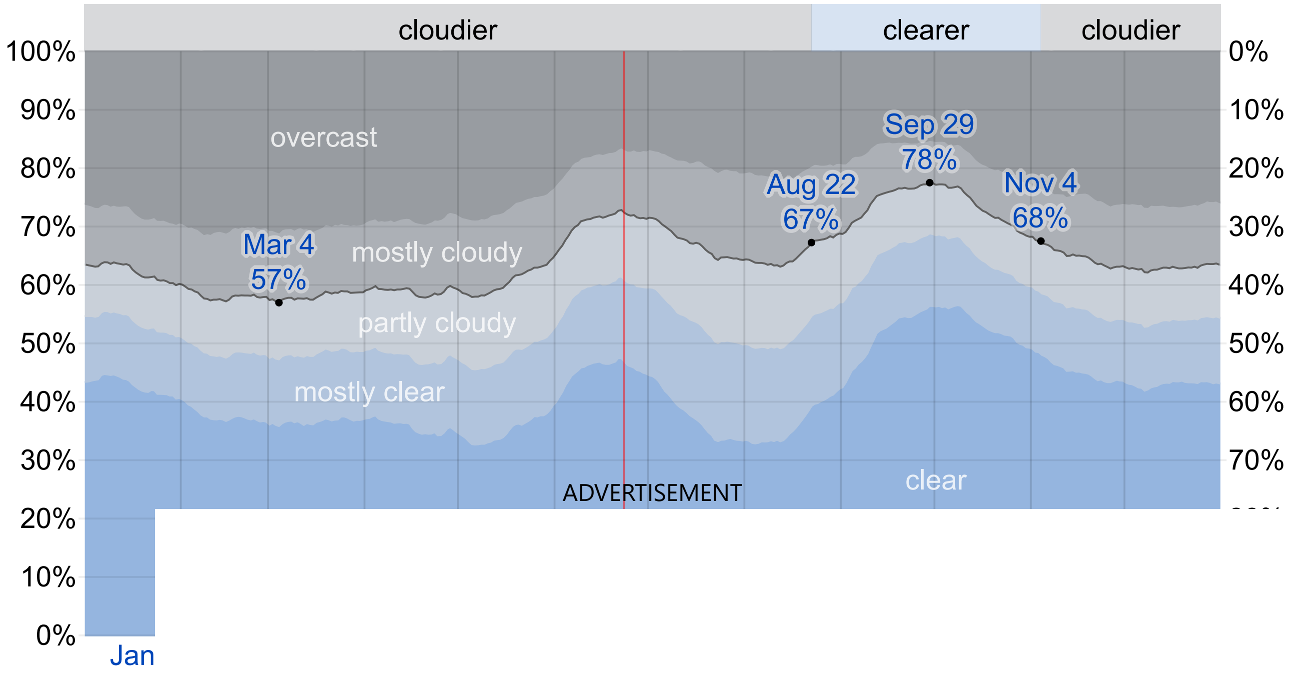
Clouds

In Cañon City, the average percentage of the sky covered by clouds experiences significant seasonal variation over the course of the year.

The clearer part of the year in Cañon City begins around August 22 and lasts for 2.4 months, ending around November 4. On September 29, the clearest day of the year, the sky is clear, mostly clear, or partly cloudy 78% of the time, and overcast or mostly cloudy 22% of the time.

The cloudier part of the year begins around November 4 and lasts for 9.6 months, ending around August 22. On March 4, the cloudiest day of the year, the sky is overcast or mostly cloudy 43% of the time, and clear, mostly clear, or partly cloudy 57% of the time.

Cloud Cover Categories



clear mostly clear partly cloudy mostly cloudy overcast

0% 20% 40% 60% 80% 100%

The percentage of time spent in each cloud cover band, categorized by the percentage of the sky covered by clouds.

Precipitation

A wet day is one with at least 0.04 inches of liquid or liquid-equivalent precipitation. The chance of wet days in Cañon City varies significantly throughout the year.

The wetter season lasts 2.3 months, from June 27 to September 6, with a greater than 20% chance of a given day being a wet day. The chance of a wet day peaks at 36% on August 10.

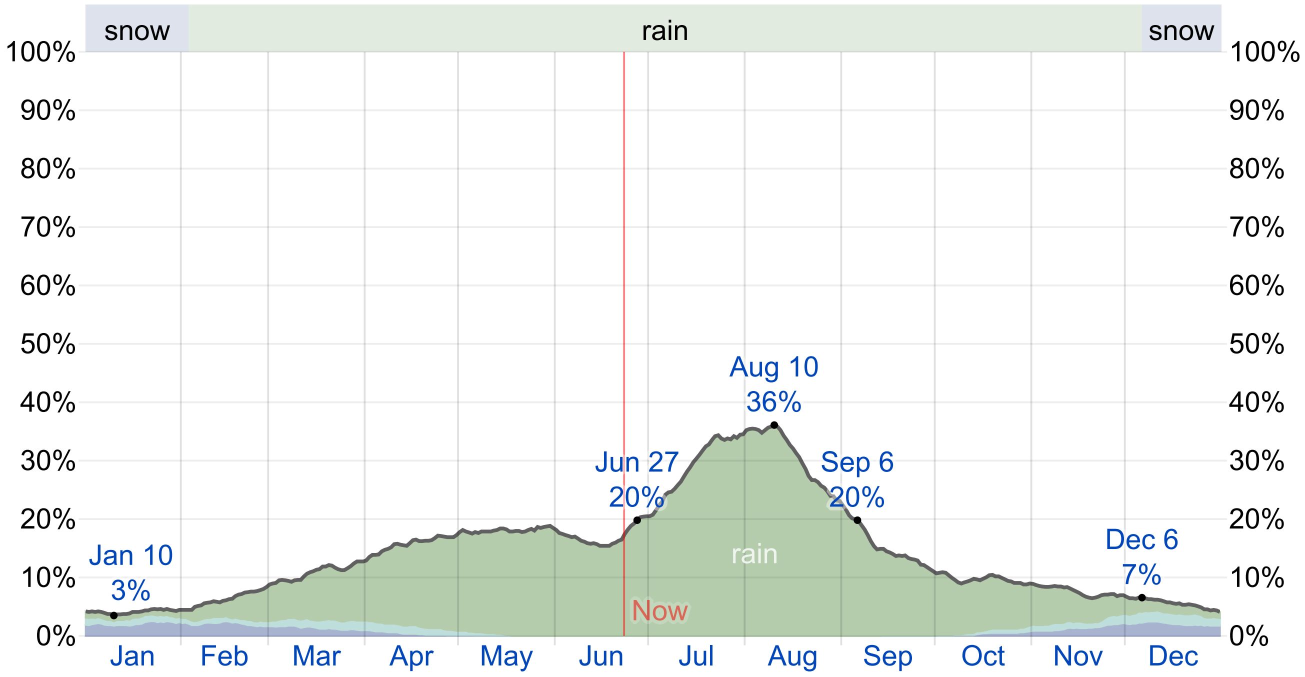
The drier season lasts 9.7 months, from September 6 to June 27. The smallest chance of a wet day is 3% on January 10.

Among wet days, we distinguish between those that experience rain alone, snow alone, or a mixture of the two. Based on this categorization, the most common form of precipitation in Cañon City changes throughout the year.

Rain alone is the most common for 10 months, from February 3 to December 6. The highest chance of a day with rain alone is 36% on August 10.

Snow alone is the most common for 1.9 months, from December 6 to February 3. The highest chance of a day with snow alone is 3% on January 22.

Daily Chance of Precipitation



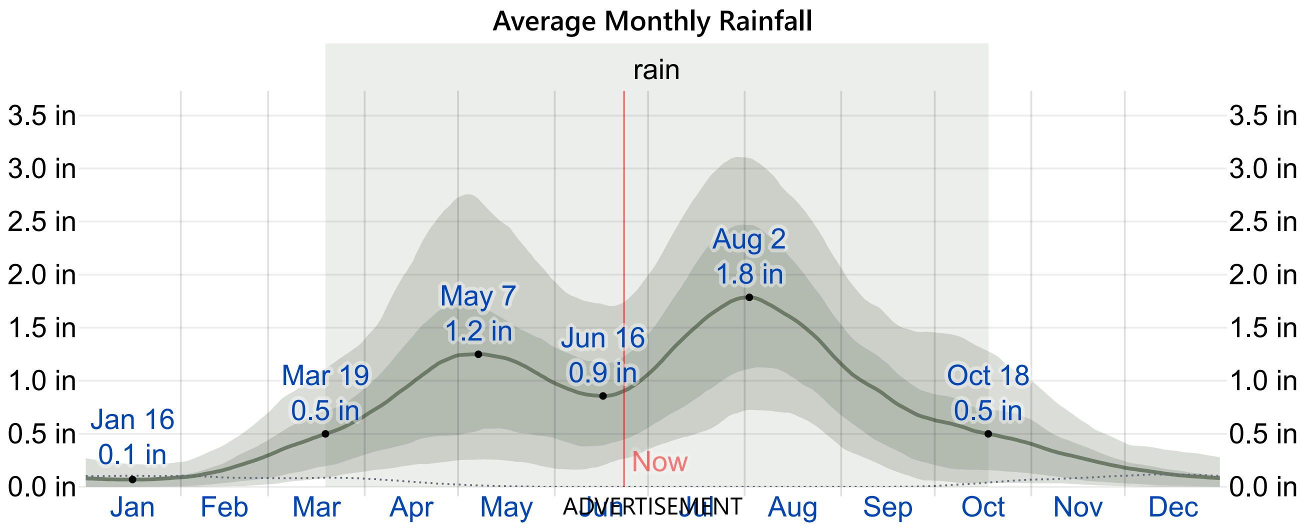
The percentage of days in which various types of precipitation are observed, excluding trace quantities: rain alone, snow alone, and mixed (both rain and snow fell in the same day).

Rainfall

To show variation within the months and not just the monthly totals, we show the rainfall accumulated over a sliding 31-day period centered around each day of the year. Cañon City experiences some seasonal variation in monthly rainfall.

The rainy period of the year lasts for 7.0 months, from March 19 to October 18, with a sliding 31-day rainfall of at least 0.5 inches. The most rain falls during the 31 days centered around August 2, with an average total accumulation of 1.8 inches.

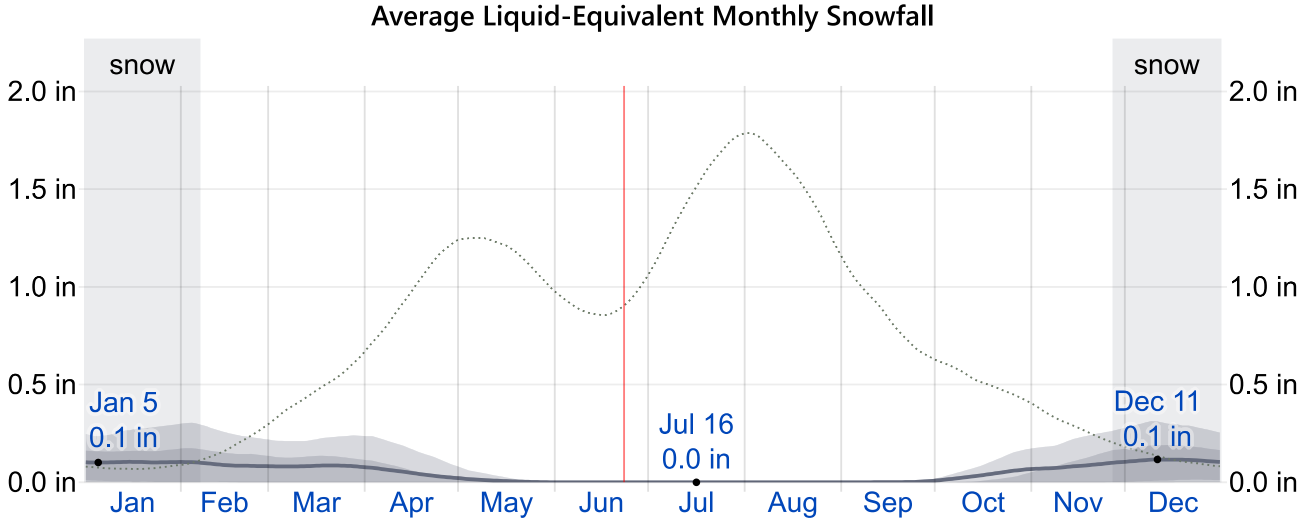
The rainless period of the year lasts for 5.0 months, from October 18 to March 19. The least rain falls around January 16, with an average total accumulation of 0.1 inches.



The aver
in questi

Snowfall

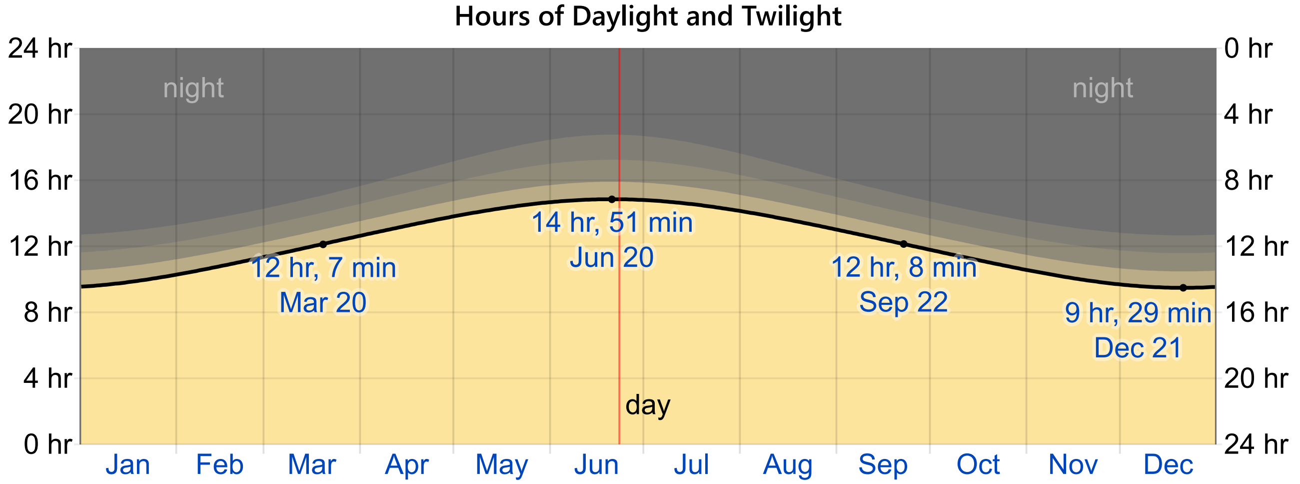
The sliding 31-day liquid-equivalent quantity of snowfall in Cañon City does not vary significantly over the course of the year, staying within 0.1 inches of 0.1 inches throughout.



The average liquid-equivalent snowfall (solid line) accumulated over the course of a sliding 31-day period centered on the day in question, with 25th to 75th and 10th to 90th percentile bands. The thin dotted line is the corresponding average rainfall.

Sun

The length of the day in Cañon City varies significantly over the course of the year. In 2021, the shortest day is December 21, with 9 hours, 29 minutes of daylight; the longest day is June 20, with 14 hours, 51 minutes of daylight.

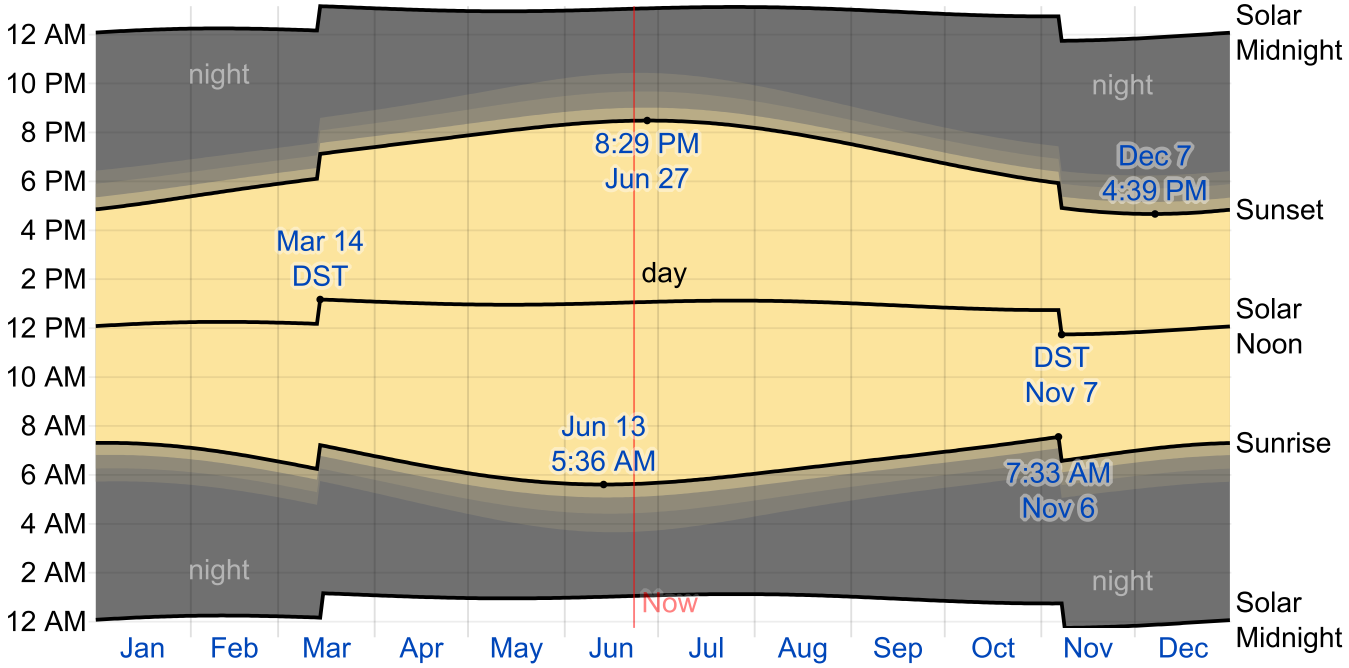


The number of hours during which the Sun is visible (black line). From bottom (most yellow) to top (most gray), the color bands indicate: full daylight, twilight (civil, nautical, and astronomical), and full night.

The earliest sunrise is at 5:36 AM on June 13, and the latest sunrise is 1 hour, 57 minutes later at 7:33 AM on November 6. The earliest sunset is at 4:39 PM on December 7, and the latest sunset is 3 hours, 49 minutes later at 8:29 PM on June 27.

Daylight saving tin
and ending in the

Sunrise & Sunset with Twilight and Daylight Saving Time

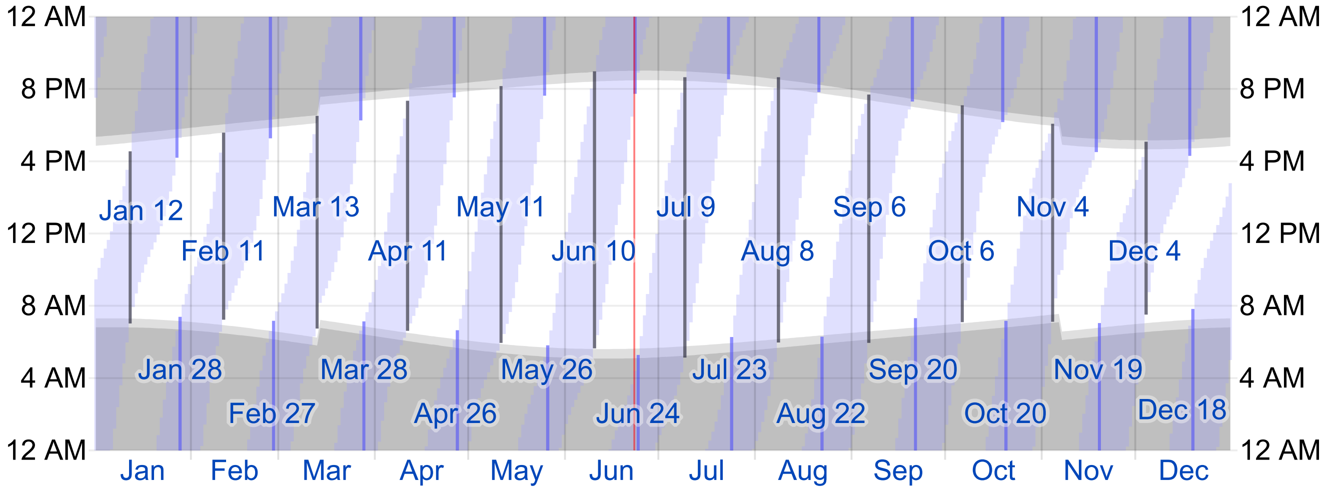


The solar day over the course of the year 2021. From bottom to top, the black lines are the previous solar midnight, sunrise, solar noon, sunset, and the next solar midnight. The day, twilights (civil, nautical, and astronomical), and night are indicated by the color bands from yellow to gray. The transitions to and from daylight saving time are indicated by the 'DST' labels.

Moon

The figure below presents a compact representation of key lunar data for 2021. The horizontal axis is the day, the vertical axis is the hour of the day, and the colored areas indicate when the moon is above the horizon. The vertical gray bars (new Moons) and blue bars (full Moons) indicate key Moon phases.

Moon Rise, Set & Phases



The time in which the moon is above the horizon (light blue area), with new moons (dark gray lines) and full moons (blue lines) indicated. The shaded overlays indicate night and civil twilight.

Humidity

We base the humidity comfort level on the dew point, as it determines whether perspiration will evaporate from the skin, thereby cooling the body. Lower dew points feel drier and higher dew points feel more humid. Unlike temperature, which typically varies significantly between night and day, dew point tends to change more slowly, so while the temperature may drop at night, a muggy day is typically followed by a muggy night.

The perceived humidity level in Cañon City, as measured by the percentage of time in which the humidity comfort level is muggy, oppressive, or miserable, does not vary significantly over the course of the year, remaining a virtually constant 0% throughout.

Humidity Comfort Levels

The percentage of time spent at various humidity comfort levels, categorized by dew point.

Wind

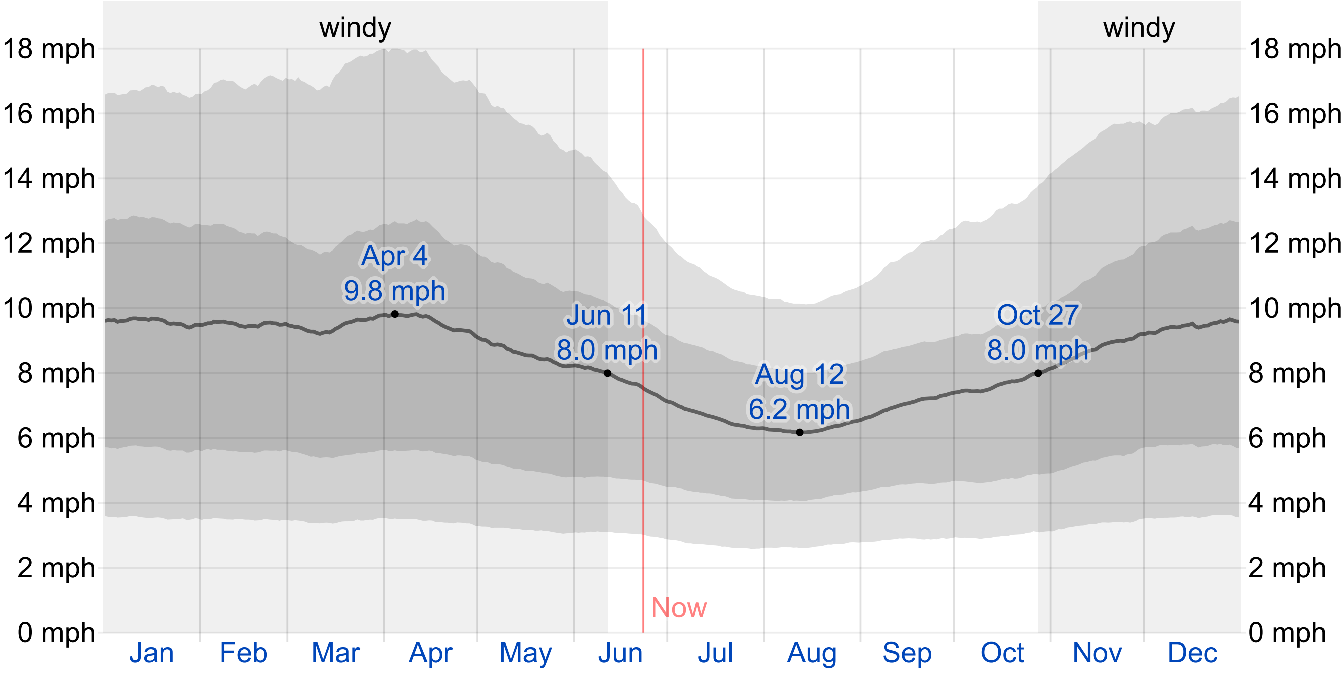
This section discusses the wide-area hourly average wind vector (speed and direction) at 10 meters above the ground. The wind experienced at any given location is highly dependent on local topography and other factors, and instantaneous wind speed and direction vary more widely than hourly averages.

The average hourly wind speed in Cañon City experiences significant seasonal variation over the course of the year.

The windier part of the year lasts for 7.5 months, from October 27 to June 11, with average wind speeds of more than 8.0 miles per hour. The windiest day of the year is April 4, with an average hourly wind speed of 9.8 miles per hour.

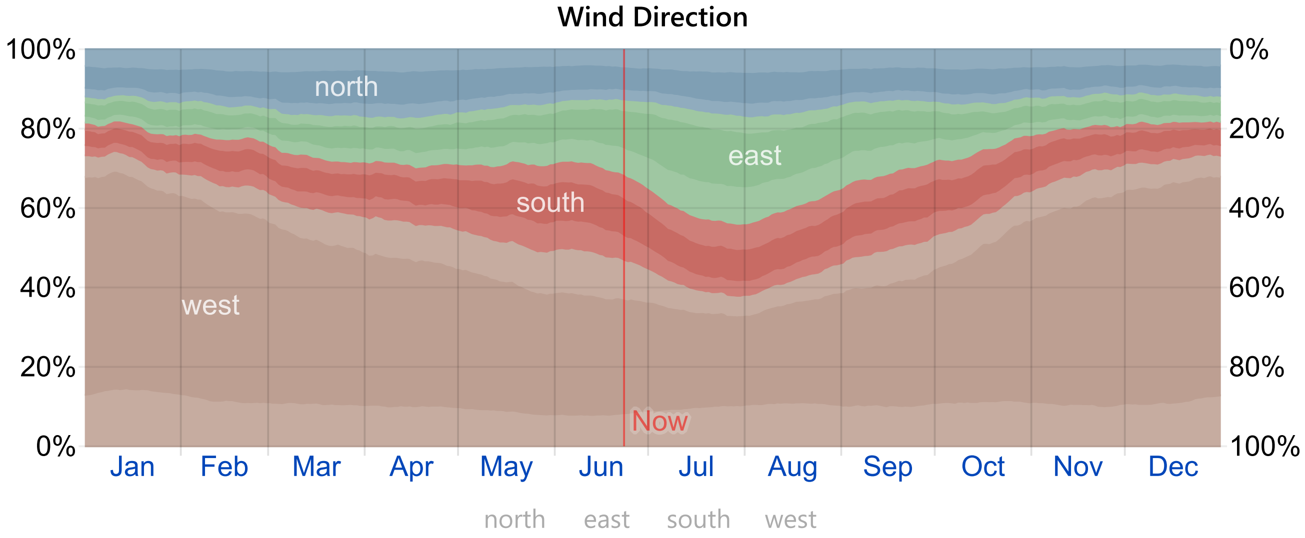
The calmer time of year lasts for 4.5 months, from June 11 to October 27. The calmest day of the year is August 12, with an average hourly wind speed of 6.2 miles per hour.

Average Wind Speed



The average of mean hourly wind speeds (dark gray line), with 25th to 75th and 10th to 90th percentile bands.

The predominant average hourly wind direction in Cañon City is from the west throughout the year.

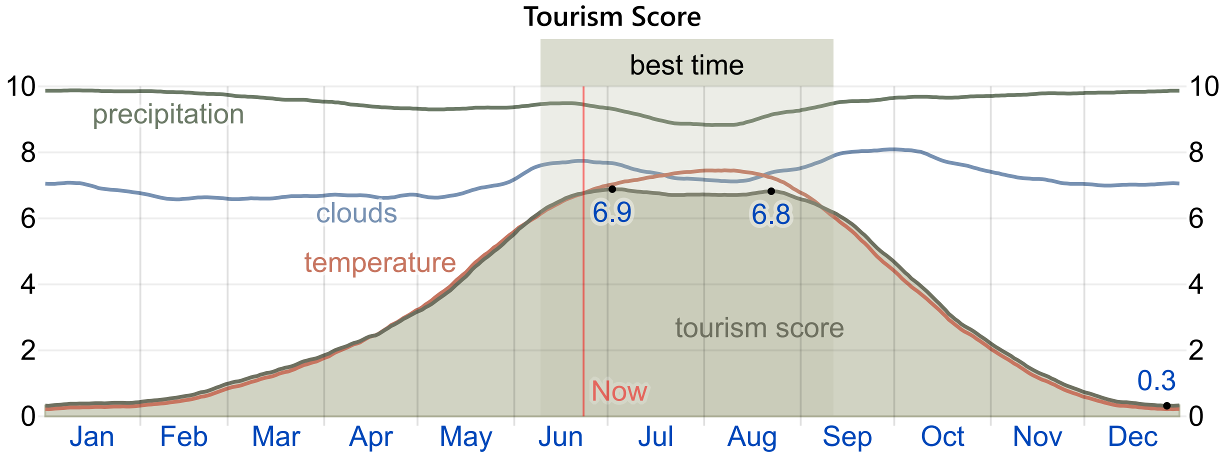


The percentage of hours in which the mean wind direction is from each of the four cardinal wind directions, excluding hours in which the mean wind speed is less than 1.0 mph. The lightly tinted areas at the boundaries are the percentage of hours spent in the implied intermediate directions (northeast, southeast, southwest, and northwest).

Best Time of Year to Visit

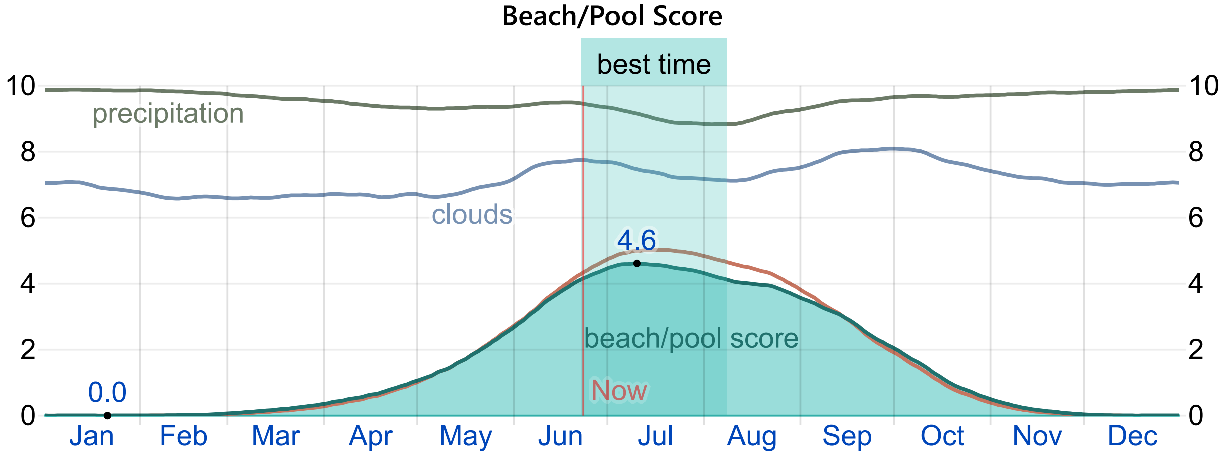
To characterize how pleasant the weather is in Cañon City throughout the year, we compute two travel scores.

The tourism score
best time of year t
score in the first w



The tourism score (filled area), and its constituents: the temperature score (red line), the cloud cover score (blue line), and the precipitation score (green line).

The beach/pool score favors clear, rainless days with perceived temperatures between 75°F and 90°F. Based on this score, the best time of year to visit Cañon City for hot-weather activities is from late June to early August, with a peak score in the second week of July.



The beach/pool score (filled area), and its constituents: the temperature score (red line), the cloud cover score (blue line), and the precipitation score (green line).

Methodology

For each hour between 8:00 AM and 9:00 PM of each day in the analysis period (1980 to 2016), independent scores are computed for perceived temperature, cloud cover, and total precipitation. Those scores are combined into a single hourly composite score, which is then aggregated into days, averaged over all the years in the analysis period, and smoothed.

Our cloud cover score is 10 for fully clear skies, falling linearly to 9 for mostly clear skies, and to 1 for fully overcast skies.

Our precipitation score, which is based on the three-hour precipitation centered on the hour in question, is 10 for no precipitation, falling linearly to 9 for trace precipitation, and to 0 for 0.04 inches of precipitation or more.

Our tourism temperature score is 0 for perceived temperatures below 50°F, rising linearly to 9 for 65°F, to 10 for 75°F, falling linearly to 9 for 80°F, and to 1 for 90°F or hotter.

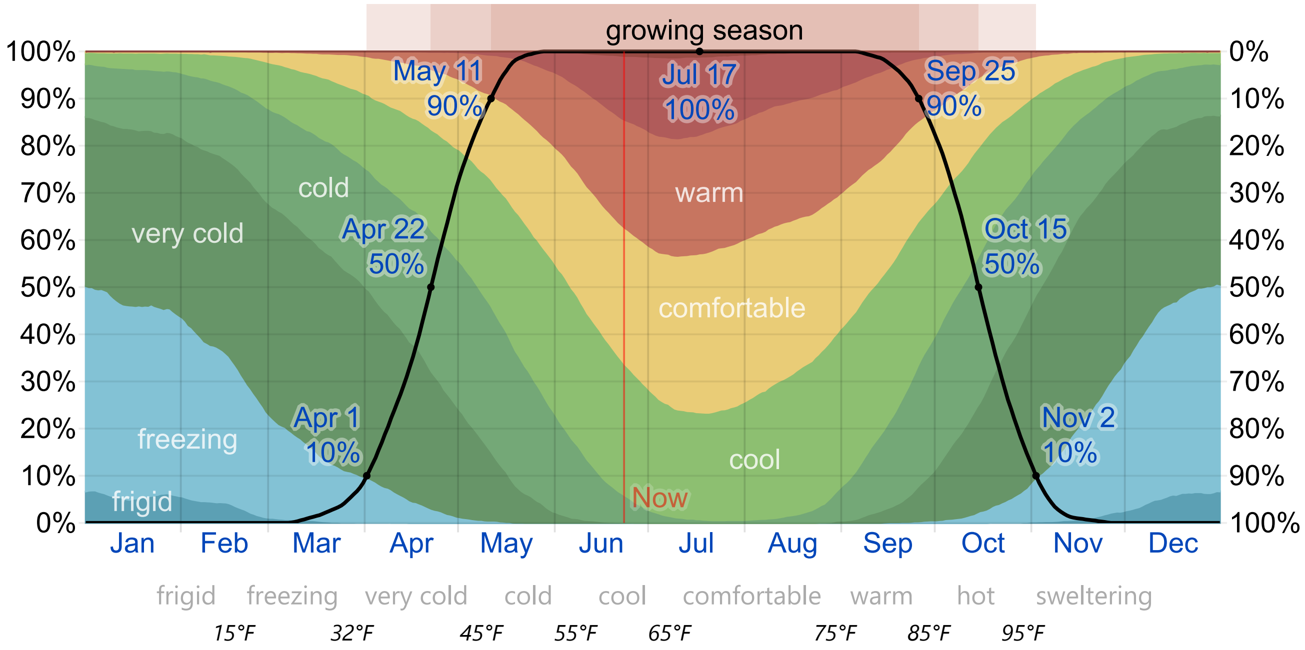
Our beach/pool te
falling linearly to 9

Growing Sea

Definitions of the growing season vary throughout the world, but for the purposes of this report, we define it as the longest continuous period of non-freezing temperatures (≥ 32°F) in the year (the calendar year in the Northern Hemisphere, or from July 1 until June 30 in the Southern Hemisphere).

The growing season in Cañon City typically lasts for 5.8 months (176 days), from around April 22 to around October 15, rarely starting before April 1 or after May 11, and rarely ending before September 25 or after November 2.

Time Spent in Various Temperature Bands and the Growing Season

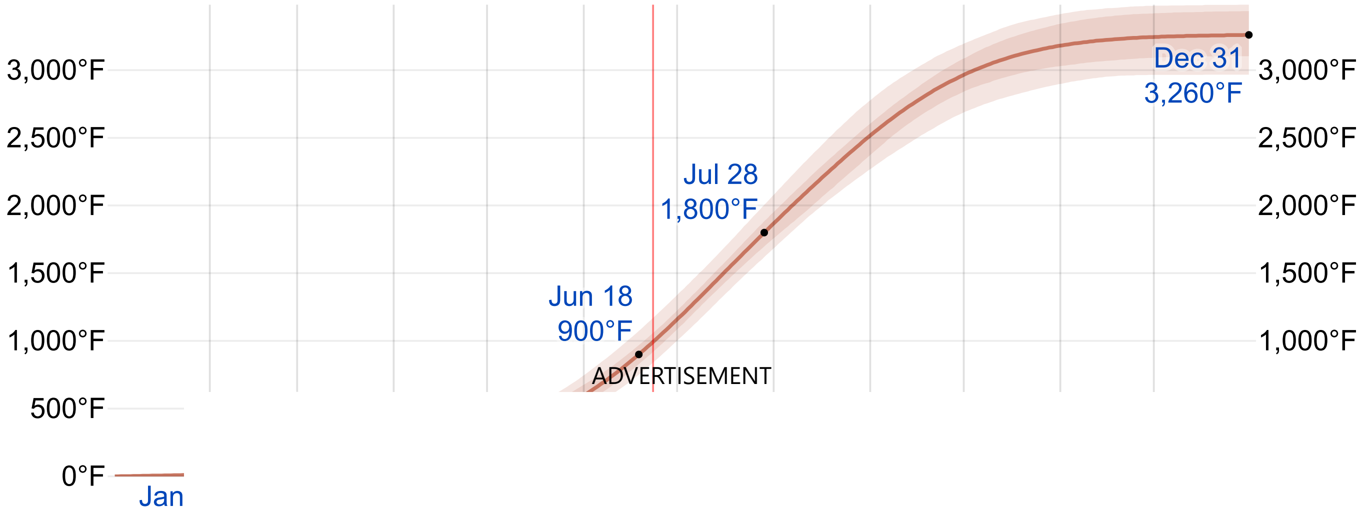


The percentage of time spent in various temperature bands. The black line is the percentage chance that a given day is within the growing season.

Growing degree days are a measure of yearly heat accumulation used to predict plant and animal development, and defined as the integral of warmth above a base temperature, discarding any excess above a maximum temperature. In this report, we use a base of 50°F and a cap of 86°F.

Based on growing degree days alone, the first spring blooms in Cañon City should appear around March 24, only rarely appearing before March 10 or after April 10.

Growing Degree Days



The average growing degree days accumulated over the course of the year, with 25th to 75th and 10th to 90th percentile bands.

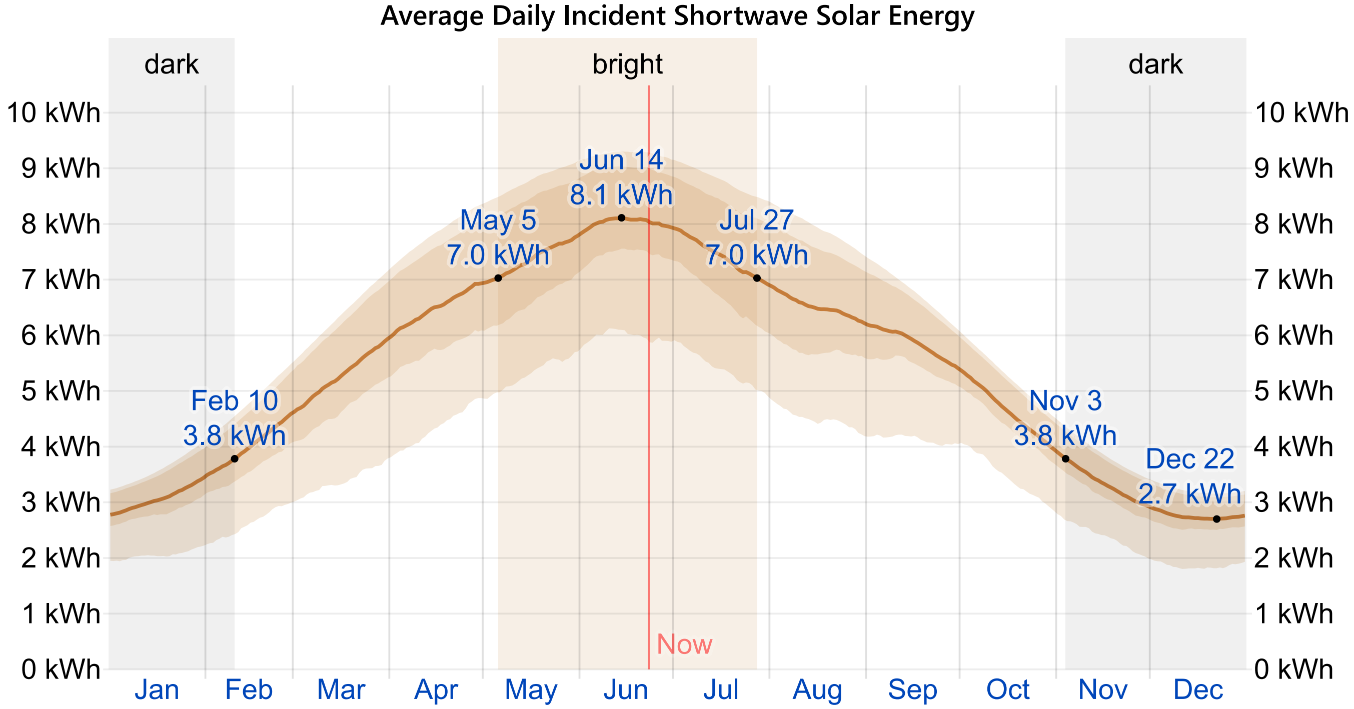
Solar Energy

This section discusses the total daily incident shortwave solar energy reaching the surface of the ground over a wide area, taking full account of seasonal variations in the length of the day, the elevation of the Sun above the horizon, and absorption by clouds and other atmospheric constituents. Shortwave radiation includes visible light and ultraviolet radiation.

The average daily incident shortwave solar energy experiences extreme seasonal variation over the course of the year.

The brighter period of the year lasts for 2.7 months, from May 5 to July 27, with an average daily incident shortwave energy per square meter above 7.0 kWh. The brightest day of the year is June 14, with an average of 8.1 kWh.

The darker period of the year lasts for 3.2 months, from November 3 to February 10, with an average daily incident shortwave energy per square meter below 3.8 kWh. The darkest day of the year is December 22, with an average of 2.7 kWh.



The average daily shortwave solar energy reaching the ground per square meter (orange line), with 25th to 75th and 10th to 90th percentile bands.

Topography

For the purposes of this report, the geographical coordinates of Cañon City are 38.441 deg latitude, -105.242 deg longitude, and 5,344 ft elevation.

The topography within 2 miles of Cañon City contains very significant variations in elevation, with a maximum elevation change of 1,732 fe

variations in elevat

The area within 2 r
10 miles by shrubs

Data Sources

This report illustrates the typical weather in Cañon City, based on a statistical analysis of historical hourly weather reports and model reconstructions from January 1, 1980 to December 31, 2016.

Temperature and Dew Point

There are 5 weather stations near enough to contribute to our estimation of the temperature and dew point in Cañon City.

For each station, the records are corrected for the elevation difference between that station and Cañon City according to the International Standard Atmosphere (https://en.wikipedia.org/wiki/International_Standard_Atmosphere), and by the relative change present in the MERRA-2 satellite-era reanalysis (https://gmao.gsfc.nasa.gov/reanalysis/MERRA-2/) between the two locations.

The estimated value at Cañon City is computed as the weighted average of the individual contributions from each station, with weights proportional to the inverse of the distance between Cañon City and a given station.

The stations contributing to this reconstruction are: Butts Army Air Field (/y/145682/Average-Weather-at-Butts-Army-Air-Field-Colorado-United-States-Year-Round) (43%, 50 kilometers, northeast); Pueblo Memorial Airport (/y/145685/Average-Weather-at-Pueblo-Memorial-Airport-Colorado-United-States-Year-Round) (28%, 67 kilometers, east); Harriet Alexander Field Airport (/y/145627/Average-Weather-at-Harriet-Alexander-Field-Airport-Colorado-United-States-Year-Round) (17%, 71 kilometers, west); Wilkerson Pass (6%, 72 kilometers, north); and La Veta Mountain, La Veta Pass (/y/145650/Average-Weather-at-La-Veta-Mountain-La-Veta-Pass;-Colorado;-United-States-Year-Round) (7%, 105 kilometers, south).

Other Data

All data relating to the Sun's position (e.g., sunrise and sunset) are computed using astronomical formulas from the book, Astronomical Algorithms 2nd Edition (https://www.amazon.com/Astronomical-Algorithms-Jean-Meeus/dp/0943396611), by Jean Meeus.

All other weather data, including cloud cover, precipitation, wind speed and direction, and solar flux, come from NASA's MERRA-2 Modern-Era Retrospective Analysis (https://gmao.gsfc.nasa.gov/reanalysis/MERRA-2/). This reanalysis combines a variety of wide-area measurements in a state-of-the-art global meteorological model to reconstruct the hourly history of weather throughout the world on a 50-kilometer grid.

Land Use data comes from the Global Land Cover SHARE database (http://www.fao.org/land-water/land/land-governance/land-resources-planning-toolbox/category/details/en/c/1036355/), published by the Food and Agriculture Organization of the United Nations.

Elevation data comes from the Shuttle Radar Topography Mission (SRTM) (http://www2.jpl.nasa.gov/srtm/), published by NASA's Jet Propulsion Laboratory.

Names, locations, and time zones of places and some airports come from the GeoNames Geographical Database (http://www.geonames.org/).

Time zones for airports and weather stations are provided by AskGeo.com (https://askgeo.com/).

Maps are © Esri, with data from National Geographic, Esri, DeLorme, NAVTEQ, UNEP-WCMC, USGS, NASA, ESA, METI, NRCAN, GEBCO, NOAA, and iPC.

Disclaimer

The information on this site is provided as is, without any assurances as to its accuracy or suitability for any purpose. Weather data is prone to errors, outages, and other defects. We assume no responsibility for any decisions made on the basis of the conter

We draw particular

important data ser

reconstructions: (1

grid and are therefore unable to reconstruct the local variations of many microclimates, and (3) have particular difficulty with the weather in some coastal areas, especially small islands.

We further caution that our travel scores are only as good as the data that underpin them, that weather conditions at any given location and time are unpredictable and variable, and that the definition of the scores reflects a particular set of preferences that may not agree with those of any particular reader.

APPENDIX J: Proof of Ownership and Legal Right to Enter Documents

1000931 Pages: 1 of 1
05/10/2021 08:37 AM R Fee:$8.25
Justin D Grantham, Clerk and Recorder, Fremont County, CO

PROPERTY EASEMENT

I, **Mary Louise Adamic**, whose address is 860 Chantilly Lane, Idaho Falls, Idaho, 83402, USA, (the "**Grantor**"), hereby grant **Zephyr Gold USA Ltd**., a Colorado corporation, doing business at Zephyr Gold USA Ltd., 451 Valley Road, Canon City, CO 81212 (the "**Grantee**") an easement ("**Easement**") onto property MS 13952 ("**Diamond Placer Claim**") as described in Exhibit "A".

RECITALS

WHEREAS, Grantor owns a 100% interest in the "**Diamond Placer Claim**", as further described in Exhibit A, hereto, located in Fremont County, Colorado.

AND WHEREAS, Grantee wishes to build a new access road to the Fremont Placer Claim, from the Temple Canyon Road through the BLM land MS 16908 ("**BLM Land**").

AND WHEREAS, the Easement will allow the Grantee approximately 40 feet of right of way from the Temple Canyon Road, south, through the Diamond Placer Claim to BLM Land, as further described in Exhibit B.

AND WHEREAS, the term of the Agreement shall commence immediately upon signing and shall continue indefinitely unless mutually terminated in writing by the Grantor and the Grantee.

IN WITNESS WHEREOF, witness the signatures of the parties hereto on this 18th day of July, 2017.

WITNESS:
~~Angela Bellantoni~~
John E. Olson

WITNESS:
Angela Bellantoni

GRANTOR:
Mary J. Adamic
Mary Louise Adamic

GRANTEE:
Zephyr Gold USA Ltd.:
G.W. FELDERHOF
By:
Its: DIRECTOR

982545 02/05/2020 03:47 PM
Total Pages: 5 Rec Fee: $28.50
Justin D. Grantham - Clerk and Recorder, Fremont County, CO

GRANT OF NONEXCLUSIVE EASEMENT WITH OPTION AGREEMENT TO PURCHASE EXCLUSIVE EASEMENT

Randy V. Keller and Jeri Jean Keller (hereinafter "Keller" or "Grantor") of Fremont County, State of Colorado, own land located in Fremont County, State of Colorado, described as follows: Mineral Survey No. 16908, as described in the Fremont County, Colorado assessor's tax parcel database for Parcel 17000630 and 17000740 (hereinafter "American Placer").

For good and valuable consideration, the description and payment terms of which are contained in that certain Confidential Settlement Agreement between Grantor and Grantee herein filed in case no. 2019CV30090, Fremont County District Court (hereinafter "Confidential Settlement Agreement"), the sufficiency of said consideration being acknowledged, Grantor does grant, bargain, sell and convey to Zephyr Gold USA Ltd., a Colorado corporation, (hereinafter "Zephyr" or "Grantee"), its successors and assigns, a nonexclusive easement (hereinafter "Easement" or "Nonexclusive Easement") over, through and across an existing road that traverses American Placer, in its current "as is" condition and location.

The Easement shall run with the land and is for the benefit of, and appurtenant to, the Fremont Placer (Mineral Survey No. 2002, as described in the Fremont County, Colorado Assessor's tax parcel database for Parcel 394300000021and Parcel 394300000053) and Grantee's adjacent properties.

This Grant of Easement is subject to the following terms and conditions:

1. Grantee shall not widen, improve or change the existing road unless and until further Order is entered by the Court. Grantee may maintain the road to keep it in a condition that is accessible to two-wheel drive vehicles. Such maintenance shall be confined to the road and Grantee shall not park its equipment or other vehicles on Grantor's premises. Grantee shall notify Grantor of the date and time it intends to perform any such maintenance.

2. Zephyr shall operate upon the Easement in such a manner that its operation will in no way hinder or prevent the proper and reasonable use and enjoyment of the American Placer, nor the use of the Easement by Grantor or any third party who has a right to such use. Likewise, Grantor shall not interfere with Zephyr's reasonable use and enjoyment of the Easement granted hereunder.

3. The Easement shall remain gated at the northern boundary of the American Placer Claim. Keller and Zephyr shall each maintain separate locks to the gate so that each may access their respective property (American Placer and Fremont Placer) independently of the other.

4. Any notice from Grantor or Grantee to the other shall be made by first class mail, postage prepaid, to the following addresses or such other address as either party, or successor or assignee to a party, shall provide in writing to the other:

Randy and Jean Keller
P.O. Box 1347
Canon City, CO 81215-1347
USA

Zephyr Gold USA Ltd.
1300-1959 Upper Water Street
Purdy's Wharf Tower 1
Halifax, Nova Scotia B3J 3N2
Canada

OPTION

For good and valuable consideration, the description and payment terms of which are contained in the Confidential Settlement Agreement, Grantor agrees to sell to Grantee, at the option of the Grantee, an exclusive easement, subject to all existing easements of record, (hereinafter "Exclusive Easement") located in Fremont County, State of Colorado, described as follows:

Beginning at the north west corner of the American Placer Claim (Mineral Survey No. 16908) as described in Fremont County, Colorado assessor's tax parcel database for Parcel 17000740 then 45 feet east then south to the southern boundary of Parcel 17000740 continuing another 100 feet south into American Placer Claim as described in Fremont County, Colorado assessor's tax parcel database for Parcel 17000630 then west to the western boundary of Parcel 17000630 then north to the northern boundary of Parcel 17000630 continuing north in Parcel 17000740 to the north west corner of Parcel 17000740 being the point of the beginning. (attached as Exhibit 1 is a GIS depiction of the location of this Exclusive Easement);

for the purpose of granting access to Grantee's properties, . The Exclusive Easement shall run with the land, and be for the benefit of, and appurtenant to, the Fremont Placer and Grantee's adjacent properties.

The terms and conditions of said Option are as described in the Confidential Settlement Agreement. Unless the Option is exercised by Grantee, the Option term expires ten (10) years from the date of this Grant, unless extended by the terms and conditions of the Confidential Settlement Agreement; but in no event shall the term of the unexercised Option extend beyond twenty (20) years from the date hereof.

Upon exercise of the Option by Grantee, and completion of the construction of the Exclusive Easement that is the subject of this Option, Grantee agrees to convey the Nonexclusive Easement back to Grantor, or its personal representatives or assigns by way of quit claim deed.

Upon execution of this Grant of Nonexclusive Easement With Option Agreement to Purchase Exclusive Easement by Grantor, and approval of same as evidenced by Grantee's signature hereupon, Grantee agrees to withdraw its application for access to Fremont Placer through land owned by the Bureau of Land Management pursuant to Grantee's Plan of Operations. Grantee also agrees not to reapply for road access across land owned by the BLM (to access land related to Zephyr's permit that contemplates use of this Exclusive Easement) during the term of the subject Option or any extension thereof.

The terms of this Grant of Nonexclusive Easement with Option Agreement to Purchase Exclusive Easement are binding on the heirs, personal representatives, successors and assigns of the Parties hereto.

Grantor: Grantor:

Randy V Keller
Randy V. Keller

Jeri Jean Keller
Jeri Jean Keller

STATE OF COLORADO)
) ss.
County of Fremont)

The above and foregoing instrument was acknowledged, subscribed and sworn to before me this 4th day of February, 2020 by Grantors Randy V. Keller and Jeri Jean Keller.

SALLY JANE FORMANEK
NOTARY PUBLIC
STATE OF COLORADO
NOTARY ID 20174025209
MY COMMISSION EXPIRES JUNE14, 2021

WITNESS MY hand and official seal.

My commission expires: 6-14-21

Notary Public

Grantee:
Zephyr Gold USA Ltd.

By: ______________________
David Felderhof, as President. of Zephyr Gold USA Ltd.

(Notarial Certificate Annexed Hereto).

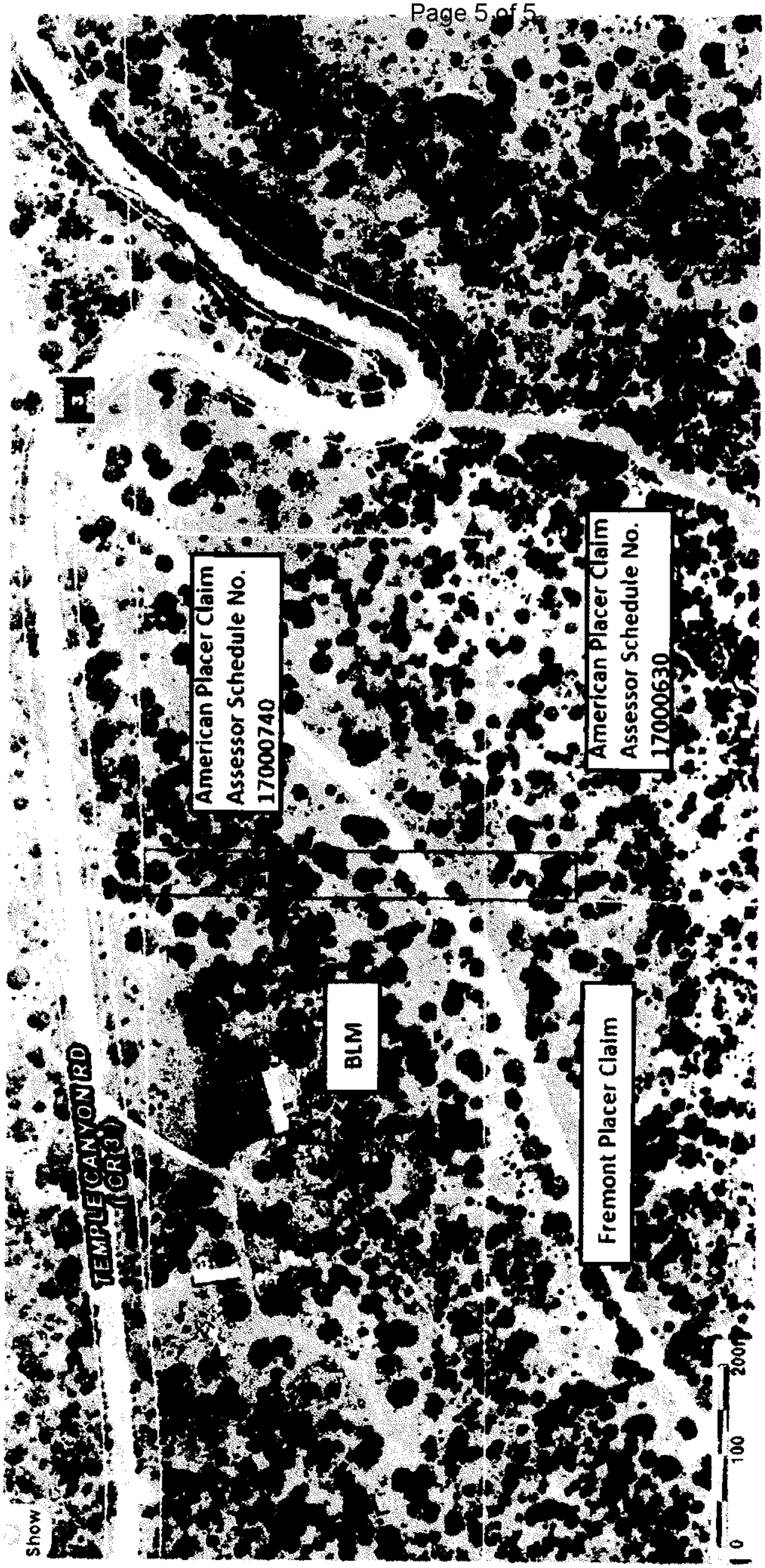
CANADA
PROVINCE OF NOVA SCOTIA

The above and foregoing instrument was acknowledged, subscribed and sworn to before me this 31st day of January, ~~2002~~ 2020 by DAVID FELDERHOF, President of ZEPHYR GOLD USA Ltd.

WITNESS MY HAND and official seal.

Peter W. Kidston
A Barrister of the Supreme
Court of Nova Scotia

EXHIBIT
1


American Placer Claim
Assessor Schedule No.
17000740
American Placer Claim
Assessor Schedule No.
17000630
BLM
Fremont Placer Claim
TEMPLE CANYON RD
(CR 3)
3
Show
0
100
200ft

991855 Pages: 1 of 2
10/14/2020 12:25 PM R Fee:$13.25 D Fee:$18.00
Justin D. Grantham, Clerk and Recorder, Fremont County, CO

Land Title
GUARANTEE COMPANY

35051461 LR

WARRANTY DEED

THIS DEED, made this 8Th day October, 2020, between PVK Investment, LLC a Colorado Limited Liability Company, Grantor, and Zephyr Gold USA Ltd., Grantee:

WITNESSETH, that the Grantor, for and in consideration of the sum of One hundred eighty thousand dollars and other good and valuable considerations, the receipt and sufficiency of which is hereby acknowledged, has granted, bargained, sold and conveyed and by these presents does grant, bargain, sell, convey and confirm unto the Grantee, its successors and assigns forever, all the real property, together with improvements, if any, situate, lying and being in the County Fremont, State of Colorado, described as follows:

> The Judith Placer Mining Claim described as the SW ¼ NE ¼; S ½ S ½ NW ¼; N ½ N ½ SW ¼; and Lot 10, Section 14, Township 19, South, Range 71 West of the 6th P.M

SDF: 18.00

TO HAVE AND TO HOLD said placer mining premises together with all the rights, privileges, immunities and appurtenances of whatsoever nature thereunto belonging, unto said grantee above named and to its successors and assigns forever, subject nevertheless to conditions and stipulations contained in the Mineral Patent from the United States of America to the Diamond Fire Brick Co., Patent Number 346827, dated July 15, 1913 and Filed for record, June 26, 1917, and all interest of Sellers in vacated streets and alleys adjacent thereto, all easements and other appurtenances thereto, all improvements thereon and all attached fixtures thereon, except as herein excluded.

TOGETHER with all and singular the hereditaments and appurtenances thereto belonging, or in anywise appertaining, and the reversion and reversions, remainder and remainders, rents, issues and profits thereof, and all the estate, right, title, interest, claim and demand whatsoever of the Grantor, either in law or equity, of, in and to the above bargained premises, with the hereditaments and appurtenances.

Grantor does covenant, grant, bargain and agree to and with the Grantee, its successors and assigns, that at the time of the ensealing and delivery of these presents, it is well seized of the premises above conveyed, has good, sure, perfect, absolute and indefeasible estate of inheritance, in law, in fee simple, and has good right, full power and authority to grant, bargain, sell and convey the same in manner and form as aforesaid, and that the same are free and clear from all former and other grants, bargains, sales, liens, taxes, assessments, encumbrances, and restrictions of whatever kind or nature whatsoever, except: None.

The Grantor shall and will **WARRANT AND FOREVER DEFEND** the above-bargained premises in the quiet and peaceable possession of the Grantee, its heirs and assigns, against all and every person or persons lawfully claiming the whole or any part thereof.

IN WITNESS WHEREOF, the Grantor has executed this Deed on the date set forth above.

PVK Investments, LLC

By: ______________________
James J. Pesavento, Manager

STATE OF COLORADO)
) ss.
COUNTY OF PUEBLO)

The foregoing instrument was acknowledged before me this 8Th day of October, 2020, by James J. Pesavento as Manager of PVK Investment, LLC.

* See attached acknowledgment

Witness my hand and official seal.

Notary Public

My Comm. Exp. 11/5/2021

LISA M ROMO
NOTARY PUBLIC
STATE OF COLORADO
NOTARY ID 20094036278
My Commission Expires November 5, 2021

982545 02/05/2020 03:47 PM
Total Pages: 5 Rec Fee: $28.50
Justin D. Grantham - Clerk and Recorder, Fremont County, CO

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1. Grantee shall not widen, improve or change the existing road unless and until further Order is entered by the Court. Grantee may maintain the road to keep it in a condition that is accessible to two-wheel drive vehicles. Such maintenance shall be confined to the road and Grantee shall not park its equipment or other vehicles on Grantor's premises. Grantee shall notify Grantor of the date and time it intends to perform any such maintenance.

2. Zephyr shall operate upon the Easement in such a manner that its operation will in no way hinder or prevent the proper and reasonable use and enjoyment of the American Placer, nor the use of the Easement by Grantor or any third party who has a right to such use. Likewise, Grantor shall not interfere with Zephyr's reasonable use and enjoyment of the Easement granted hereunder.

3. The Easement shall remain gated at the northern boundary of the American Placer Claim. Keller and Zephyr shall each maintain separate locks to the gate so that each may access their respective property (American Placer and Fremont Placer) independently of the other.

4. Any notice from Grantor or Grantee to the other shall be made by first class mail, postage prepaid, to the following addresses or such other address as either party, or successor or assignee to a party, shall provide in writing to the other:

Randy and Jean Keller
P.O. Box 1347
Canon City, CO 81215-1347
USA

Zephyr Gold USA Ltd.
1300-1959 Upper Water Street
Purdy's Wharf Tower 1
Halifax, Nova Scotia B3J 3N2
Canada

OPTION

For good and valuable consideration, the description and payment terms of which are contained in the Confidential Settlement Agreement, Grantor agrees to sell to Grantee, at the option of the Grantee, an exclusive easement, subject to all existing easements of record, (hereinafter "Exclusive Easement") located in Fremont County, State of Colorado, described as follows:

Beginning at the north west corner of the American Placer Claim (Mineral Survey No. 16908) as described in Fremont County, Colorado assessor's tax parcel database for Parcel 17000740 then 45 feet east then south to the southern boundary of Parcel 17000740 continuing another 100 feet south into American Placer Claim as described in Fremont County, Colorado assessor's tax parcel database for Parcel 17000630 then west to the western boundary of Parcel 17000630 then north to the northern boundary of Parcel 17000630 continuing north in Parcel 17000740 to the north west corner of Parcel 17000740 being the point of the beginning. (attached as Exhibit 1 is a GIS depiction of the location of this Exclusive Easement);

for the purpose of granting access to Grantee's properties, . The Exclusive Easement shall run with the land, and be for the benefit of, and appurtenant to, the Fremont Placer and Grantee's adjacent properties.

The terms and conditions of said Option are as described in the Confidential Settlement Agreement. Unless the Option is exercised by Grantee, the Option term expires ten (10) years from the date of this Grant, unless extended by the terms and conditions of the Confidential Settlement Agreement; but in no event shall the term of the unexercised Option extend beyond twenty (20) years from the date hereof.

Upon exercise of the Option by Grantee, and completion of the construction of the Exclusive Easement that is the subject of this Option, Grantee agrees to convey the Nonexclusive Easement back to Grantor, or its personal representatives or assigns by way of quit claim deed.

Upon execution of this Grant of Nonexclusive Easement With Option Agreement to Purchase Exclusive Easement by Grantor, and approval of same as evidenced by Grantee's signature hereupon, Grantee agrees to withdraw its application for access to Fremont Placer through land owned by the Bureau of Land Management pursuant to Grantee's Plan of Operations. Grantee also agrees not to reapply for road access across land owned by the BLM (to access land related to Zephyr's permit that contemplates use of this Exclusive Easement) during the term of the subject Option or any extension thereof.

The terms of this Grant of Nonexclusive Easement with Option Agreement to Purchase Exclusive Easement are binding on the heirs, personal representatives, successors and assigns of the Parties hereto.

Grantor: Grantor:

Randy V Keller
Randy V. Keller

Jeri Jean Keller
Jeri Jean Keller

STATE OF COLORADO)
) **ss.**
County of Fremont)

The above and foregoing instrument was acknowledged, subscribed and sworn to before me this 4th day of February, 2020 by Grantors Randy V. Keller and Jeri Jean Keller.

SALLY JANE FORMANEK
NOTARY PUBLIC
STATE OF COLORADO
NOTARY ID 20174025209
MY COMMISSION EXPIRES JUNE14, 2021

WITNESS MY hand and official seal.

My commission expires: 6-14-21

Notary Public

Grantee:
Zephyr Gold USA Ltd.

By:
David Felderhof, as President. of Zephyr Gold USA Ltd.

(Notarial Certificate Annexed Hereto).

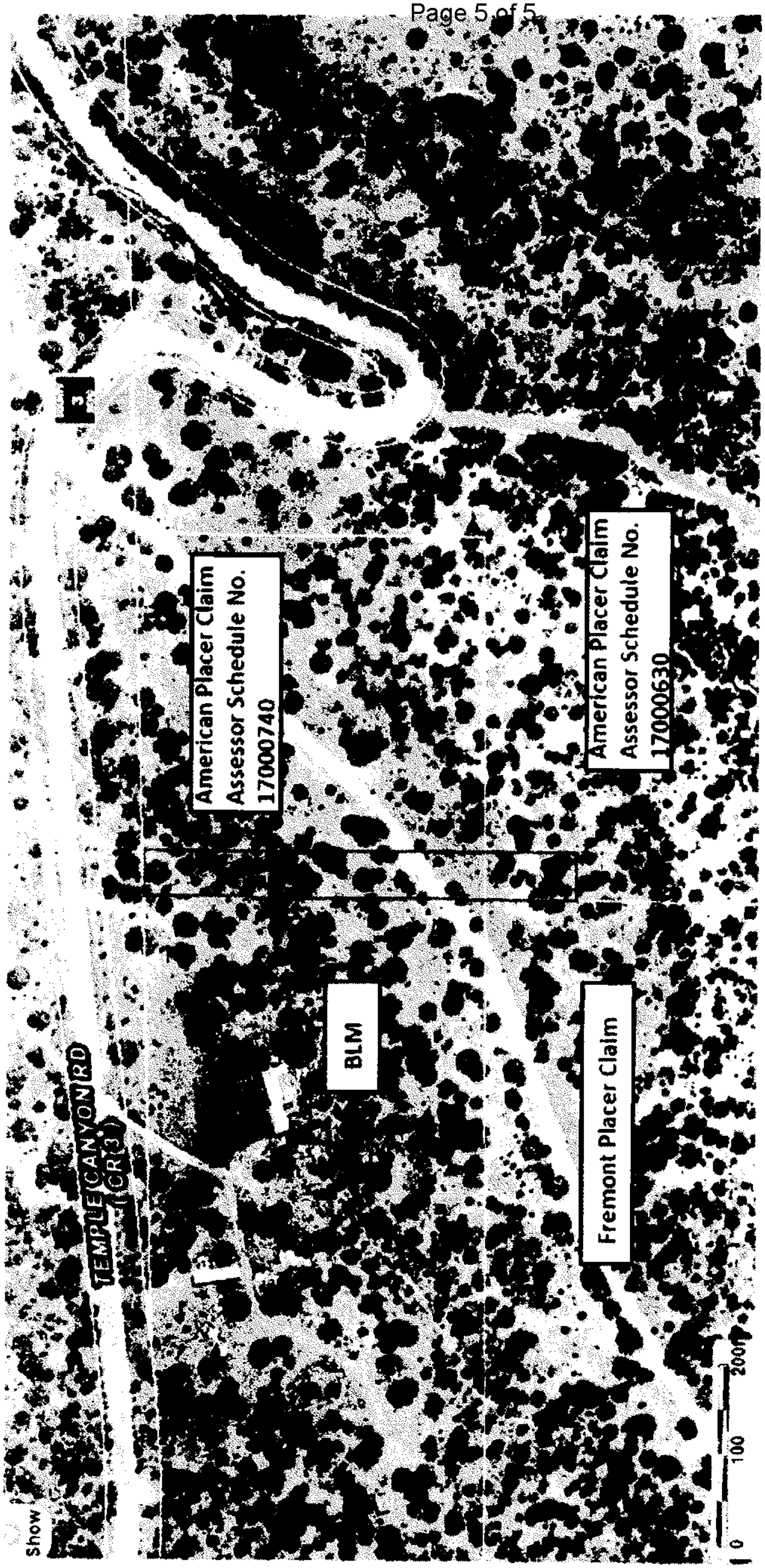
CANADA
PROVINCE OF NOVA SCOTIA

The above and foregoing instrument was acknowledged, subscribed and sworn to before me this 31st day of January, ~~2002~~ 2020 by DAVID FELDERHOF, President of ZEPHYR GOLD USA Ltd.

WITNESS MY HAND and official seal.

Peter W. Kidston
A Barrister of the Supreme Court of Nova Scotia

EXHIBIT
1


Show
TEMPLE CANYON RD
(CR 3)
3
American Placer Claim
Assessor Schedule No.
17000740
BLM
American Placer Claim
Assessor Schedule No.
17000630
Fremont Placer Claim
0
100
200ft

Accession/Serial #: COCOAA 060795 **BLM Serial #:** COCOAA 060795

Note: This record has not been checked against the Legal Land Patent. We don't have an electronic image for this document.

Names

Patentees: GEORGE D KAYE,
STELLA M VAUGHN,
BENJAMIN G WOODFORD

Survey

State:	COLORADO
Acres:	10.328
Geographic Name:	COPPER BOY
Metes/Bounds:	No

Title Transfer

Issue Date:	11/20/1900
Land Office:	Assigned For Automation
Cancelled:	No
U.S. Reservations:	Yes
Mineral Reservations:	No
Authority:	July 26, 1866: Mineral Patent-Lode (14 Stat. 251)

Document Numbers

Document Nr.:	33216
Accession/Serial Nr.:	COCOAA 060795
BLM Serial Nr.:	COCOAA 060795

Aliquot Parts	Sec./ Block	Township	Range	Fract. Section	Meridian	State	Counties	Survey Nr.
	14/	19-S	71-W	No	6th PM	CO	Fremont	

Accession/Serial #: COCOAA 060781 **BLM Serial #:** COCOAA 060781

Note: This record has not been checked against the Legal Land Patent. We don't have an electronic image for this document.

Names

Patentee: COPPER KING FREE GOLD MINI

Survey

State:	COLORADO
Acres:	10.331
Geographic Name:	COPPER KING
Metes/Bounds:	No

Title Transfer

Issue Date:	10/23/1899
Land Office:	Assigned For Automation
Cancelled:	No
U.S. Reservations:	Yes
Mineral Reservations:	No
Authority:	July 26, 1866: Mineral Patent-Lode (14 Stat. 251)

Document Numbers

Document Nr.:	31618
Accession/Serial Nr.:	COCOAA 060781
BLM Serial Nr.:	COCOAA 060781

Aliquot Parts	Sec./ Block	Township	Range	Fract. Section	Meridian	State	Counties	Survey Nr.
	14/	19-S	71-W	No	6th PM	CO	Fremont	

Accession/Serial #: COCOAA 060811 **BLM Serial #:** COCOAA 060811

Note: This record has not been checked against the Legal Land Patent. We don't have an electronic image for this document.

Names

Patentee: COPPER KING FREE GOLD MINI

Survey

State: COLORADO
Acres: 5.662
Geographic Name: COPPEROPOLIS
Metes/Bounds: No

Title Transfer

Issue Date: 10/28/1903
Land Office: Assigned For Automation
Cancelled: No
U.S. Reservations: Yes
Mineral Reservations: No
Authority: July 26, 1866: Mineral Patent-Lode (14 Stat. 251)

Document Numbers

Document Nr.: 37311
Accession/Serial Nr.: COCOAA 060811
BLM Serial Nr.: COCOAA 060811

Aliquot Parts	Sec./ Block	Township	Range	Fract. Section	Meridian	State	Counties	Survey Nr.
	14/	19-S	71-W	No	6th PM	CO	Fremont	
	/	19-S	71-W	No	6th PM	CO	Fremont	

Remarks: MS 14991 EXCL MS 12986 MS 13077 POR OF MS13056 MS IN CNFLT WITH MS 12986 MS 13077

Accession/Serial #: COCOAA 060787 **BLM Serial #:** COCOAA 060787

Note: This record has not been checked against the Legal Land Patent. We don't have an electronic image for this document.

Names

Patentee: GREENHORN GOLD MINING COMP

Survey

State:	COLORADO
Acres:	144.39
Geographic Name:	FREMONT
Metes/Bounds:	No

Title Transfer

Issue Date:	4/18/1900
Land Office:	Assigned For Automation
Cancelled:	No
U.S. Reservations:	Yes
Mineral Reservations:	No
Authority:	July 26, 1866: Mineral Patent-Placer (15 Stat. 251)

Document Numbers

Document Nr.:	32379
Accession/Serial Nr.:	COCOAA 060787
BLM Serial Nr.:	COCOAA 060787

Aliquot Parts	Sec./ Block	Township	Range	Fract. Section	Meridian	State	Counties	Survey Nr.
SWNW	13/	19-S	71-W	No	6th PM	CO	Fremont	
SENE	14/	19-S	71-W	No	6th PM	CO	Fremont	
8	14/	19-S	71-W	No	6th PM	CO	Fremont	

Remarks: LOT 8 OR NESE QUARTER

Aliquot Parts	Sec./ Block	Township	Range	Fract. Section	Meridian	State	Counties	Survey Nr.
9	14/	19-S	71-W	No	6th PM	CO	Fremont	

Remarks: LOT 9 OR NWSE QUARTER

Accession/Serial #: COCOAA 060814 **BLM Serial #:** COCOAA 060814

Note: This record has not been checked against the Legal Land Patent. We don't have an electronic image for this document.

Names

Patentee: COPPER KING FREE GOLD MINI

Survey

State:	COLORADO
Acres:	1.058
Geographic Name:	LAST SHOW
Metes/Bounds:	No

Title Transfer

Issue Date:	2/9/1904
Land Office:	Assigned For Automation
Cancelled:	No
U.S. Reservations:	Yes
Mineral Reservations:	No
Authority:	July 26, 1866: Mineral Patent-Lode (14 Stat. 251)

Document Numbers

Document Nr.:	37963
Accession/Serial Nr.:	COCOAA 060814
BLM Serial Nr.:	COCOAA 060814

Aliquot Parts	Sec./ Block	Township	Range	Fract. Section	Meridian	State	Counties	Survey Nr.
	14/	19-S	71-W	No	6th PM	CO	Fremont	
	/	19-S	71-W	No	6th PM	CO	Fremont	

Remarks: MS 14992 EXCL MS 12986 TRS A B C

Accession/Serial #: COCOAA 060816 **BLM Serial #:** COCOAA 060816

Note: This record has not been checked against the Legal Land Patent. We don't have an electronic image for this document.

Names

Patentee: COPPER KING FREE GOLD MINI

Survey

State:	COLORADO
Acres:	19.594
Geographic Name:	MIKE SUTTON
Metes/Bounds:	No

Title Transfer

Issue Date:	2/18/1904
Land Office:	Assigned For Automation
Cancelled:	No
U.S. Reservations:	Yes
Mineral Reservations:	No
Authority:	July 26, 1866: Mineral Patent-Lode (14 Stat. 251)

Document Numbers

Document Nr.:	38038
Accession/Serial Nr.:	COCOAA 060816
BLM Serial Nr.:	COCOAA 060816

Aliquot Parts	Sec./ Block	Township	Range	Fract. Section	Meridian	State	Counties	Survey Nr.
	14/	19-S	71-W	No	6th PM	CO	Fremont	
	/	19-S	71-W	No	6th PM	CO	Fremont	

Remarks: MS 14993 EXCL MS 12986 TR A DESCR BY M B

Accession/Serial #: COCOAA 060785 **BLM Serial #:** COCOAA 060785

Note: This record has not been checked against the Legal Land Patent. We don't have an electronic image for this document.

Names

Patentees: GRANT DICKINSON,
M CHARLES GOODWIN,
CLARENCE P HARRIS,
CHARLES G LACEY,
FREDERIC A RAYNOLDS

Survey

State:	COLORADO
Acres:	10.22
Geographic Name:	ROSE BUD
Metes/Bounds:	No

Title Transfer

Issue Date:	2/3/1900
Land Office:	Assigned For Automation
Cancelled:	No
U.S. Reservations:	Yes
Mineral Reservations:	No
Authority:	July 26, 1866: Mineral Patent-Lode (14 Stat. 251)

Document Numbers

Document Nr.:	32066
Accession/Serial Nr.:	COCOAA 060785
BLM Serial Nr.:	COCOAA 060785

Aliquot Parts	Sec./ Block	Township	Range	Fract. Section	Meridian	State	Counties	Survey Nr.
	14/	19-S	71-W	No	6th PM	CO	Fremont	
	/	19-S	71-W	No	6th PM	CO	Fremont	

Remarks: MS 13170 EXCL MS 13056

Accession/Serial #: COCOAA 060793 **BLM Serial #:** COCOAA 060793

Note: This record has not been checked against the Legal Land Patent. We don't have an electronic image for this document.

Names

Patentees: BONEWITZ I DAWSON,
ERNEST JEWETT

Survey

State:	COLORADO
Acres:	0
Geographic Name:	SENTINEL
Metes/Bounds:	No

Title Transfer

Issue Date:	11/12/1900
Land Office:	Assigned For Automation
Cancelled:	No
U.S. Reservations:	Yes
Mineral Reservations:	No
Authority:	July 26, 1866: Mineral Patent-Lode (14 Stat. 251)

Document Numbers

Document Nr.:	33126
Accession/Serial Nr.:	COCOAA 060793
BLM Serial Nr.:	COCOAA 060793

Aliquot Parts	Sec./ Block	Township	Range	Fract. Section	Meridian	State	Counties	Survey Nr.
	13/	19-S	71-W	No	6th PM	CO	Fremont	
	14/	19-S	71-W	No	6th PM	CO	Fremont	

APPENDIX K: Groundwater Quality Data

ALS Environmental -- FC

Sample Number(s) Cross-Reference Table

OrderNum: 1410046
Client Name: Environmental Alternatives, Inc.
Client Project Name: Zephyr Gold USA
Client Project Number: ZML1265
Client PO Number:
Report Due Date: 10/16/2014

Client Sample Number	Lab Sample Number	Test Group	COC Number	Matrix	Date Collected	Time Collected
South MW	1410046-1	1		WATER	01-Oct-14	10:00
North MW	1410046-2	1		WATER	01-Oct-14	9:40

*****Designated QC***

Analytical Methods by Test Group

Test Group: 1

EPA120.1
EPA150.1
EPA160.1
EPA200.7
EPA245.1
EPA300.0
EPA310.1
NONE

ALS Laboratory Group

225 Commerce Drive, Fort Collins, Colorado 80524
TF: (800) 443-1511 PH: (970) 490-1511 FX: (970) 490-1522

Chain-of-Custody

Form 202r8

WORKORDER # 1410046

PAGE of

DISPOSAL By Lab or Return to Client

PROJECT NAME ZephyrGold USA
PROJECT No. ZML1265
COMPANY NAME EAI
SEND REPORT TO A.Bellantoni
ADDRESS 1107 Main St.
CITY / STATE / ZIP CanonCity, Co 81212
PHONE 719-275-8951
FAX 719-275-1715
E-MAIL angela@envalternatives.com

SAMPLER A. Bellantoni
SITE ID Dawson Mine
EDD FORMAT
PURCHASE ORDER
BILL TO COMPANY SAME
INVOICE ATTN TO
ADDRESS
CITY / STATE / ZIP
PHONE
FAX
E-MAIL

DATE
TURNAROUND

Method

Lab ID	Field ID	Matrix	Sample Date	Sample Time	# Bottles	Pres.	QC	Cations 6010 or 200.7	Hg 7470 or 245.1	pH 150.1	Sp. Cond 120.1	Anions 300.0	Alkalinity 310.1	See attached for specific analytes
①	South MW	W	10/1/14	10:00A	2	–	✓	✓	✓	✓	✓	✓	✓	
②	North MW	W	10/1/14	9:40A	2	–	✓	✓	✓	✓	✓	✓	✓	

*Time Zone (Circle): EST CST MST PST Matrix: O = oil S = soil NS = non-soil solid W = water L = liquid E = extract F = filter

For metals or anions, please detail analytes below.

Comments:

QC PACKAGE (check below)
☐ LEVEL II (Standard QC)
☐ LEVEL III (Std QC + forms)
☐ LEVEL IV (Std QC + forms + raw data)

Preservative Key: 1-HCl 2-HNO3 3-H2SO4 4-NaOH 5-NaHSO4 7-Other 8-4 degrees C 9-5035

	SIGNATURE	PRINTED NAME	DATE	TIME
RELINQUISHED BY	Angela M Bellantoni	Angela M. Bellantoni	10/1/14	13:00
RECEIVED BY		Jacob Roddy	10-2-14	1005
RELINQUISHED BY				
RECEIVED BY				
RELINQUISHED BY				
RECEIVED BY				

ALS Environmental - Fort Collins
CONDITION OF SAMPLE UPON RECEIPT FORM

Client: EAI
Workorder No: 1410046
Project Manager: ARW
Initials: JLR
Date: 10-2-14

1. Does this project require any special handling in addition to standard ALS procedures?		YES	[✓ NO]
2. Are custody seals on shipping containers intact?	[✓ NONE]	YES	NO
3. Are Custody seals on sample containers intact?	[✓ NONE]	YES	NO
4. Is there a COC (Chain-of-Custody) present or other representative documents?		[✓ YES]	NO
5. Are the COC and bottle labels complete and legible?		[✓ YES]	NO
6. Is the COC in agreement with samples received? (IDs, dates, times, no. of samples, no. of containers, matrix, requested analyses, etc.)		[✓ YES]	NO
7. Were airbills / shipping documents present and/or removable?	DROP OFF	[✓ YES]	NO
8. Are all aqueous samples requiring preservation preserved correctly? (excluding volatiles)	[✓ N/A]	YES	NO
9. Are all aqueous non-preserved samples pH 4-9?	N/A	[✓ YES]	NO
10. Is there sufficient sample for the requested analyses?		[✓ YES]	NO
11. Were all samples placed in the proper containers for the requested analyses?		[✓ YES]	NO
12. Are all samples within holding times for the requested analyses?		[✓ YES]	NO
13. Were all sample containers received intact? (not broken or leaking, etc.)		[✓ YES]	NO
14. Are all samples requiring no headspace (VOC, GRO, RSK/MEE, Rx CN/S, radon) headspace free? Size of bubble: ___ < green pea ___ > green pea	[✓ N/A]	YES	NO
15. Do any water samples contain sediment? Amount Amount of sediment: ___ dusting ___ moderate ___ heavy	N/A	YES	[✓ NO]
16. Were the samples shipped on ice?		[✓ YES]	NO
17. Were cooler temperatures measured at 0.1-6.0°C? IR gun used*: [✓ #2] #4	RAD ONLY	YES	[✓ NO]

Cooler #:	1						
★ Temperature (°C):	7.2° ⊛						
No. of custody seals on cooler:	0						
DOT Survey/ Acceptance Information — External µR/hr reading:	14						
Background µR/hr reading:	13						

Were external µR/hr readings ≤ two times background and within DOT acceptance criteria? [✓ YES] / NO / NA (If no, see Form 008.)

Additional Information: PROVIDE DETAILS BELOW FOR A NO RESPONSE TO ANY QUESTION ABOVE, EXCEPT #1 AND #16.

⊛ Proceed with analysis.

If applicable, was the client contacted? [✓ YES] / NO / [✓ NA] Contact: Angela Bellantoni Date/Time: 10/2/14 ~~3:35~~ am 10/2/14 15:35

Project Manager Signature / Date: 10/2/14

*IR Gun #2: Oakton, SN 29922500201-0066
*IR Gun #4: Oakton, SN 2372220101-0002

1410046

ORIGIN ID:PUBA (719) 276-0269
SUSIE PACHECO
MASTER PRINTERS
306 MAIN STREET

CANON CITY , CO 81212
UNITED STATES US

SHIP DATE: 01OCT14
ACTWGT: 20.0 LB MAN
CAD: 4722127/CAFE2806
DIMS: 28x16x12 IN

BILL SENDER

TO

ALS LABORATORY
225 COMMERCE DRIVE

FORT COLLINS CO 80524

14

REF:
INV:
PO:
DEPT:

-0

FedEx
Express

E

THU - 02 OCT 10:30A
PRIORITY OVERNIGHT

TRK# 0201 9905 0018 1070

72 FTCA

80524
CO-US DEN

Part # 156148-434 NRIT V3 10-08

7.2°C

ALS Environmental -- FC

SAMPLE SUMMARY REPORT

Client: Environmental Alternatives, Inc.
Date: *08-Oct-14*
Project: ZML1265 Zephyr Gold USA
Work Order: 1410046
Sample ID: South MW
Lab ID: 1410046-1
Legal Location:
Matrix: WATER
Collection Date: 10/1/2014 10:00
Percent Moisture:

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
Alkalinity as Calcium Carbonate			**EPA310.1**		Prep Date: **10/8/2014**	PrepBy: **AJD**
BICARBONATE AS CaCO3	**220**		**20**	**MG/L**	1	10/8/2014
CARBONATE AS CaCO3	ND		20	MG/L	1	10/8/2014
TOTAL ALKALINITY AS CaCO3	**220**		**20**	**MG/L**	1	10/8/2014
Ion Chromatography			**EPA300.0**		Prep Date: **10/2/2014**	PrepBy: **AJD**
CHLORIDE	**12**		**0.2**	**MG/L**	1	10/2/2014 19:15
FLUORIDE	**1.8**		**0.1**	**MG/L**	1	10/2/2014 19:15
NITRITE AS N	ND		0.1	MG/L	1	10/2/2014 19:15
NITRATE/NITRITE AS N	ND		0.1	MG/L	1	10/2/2014 19:15
NITRATE AS N	ND		0.2	MG/L	1	10/2/2014 19:15
SULFATE	**66**		**1**	**MG/L**	1	10/2/2014 19:15
Dissolved Mercury			**EPA245.1**		Prep Date: **10/6/2014**	PrepBy: **BAS**
MERCURY	ND		0.0002	MG/L	1	10/6/2014 16:05
Dissolved Metals by 200.7			**EPA200.7**		Prep Date: **10/6/2014**	PrepBy: **NAQ**
ALUMINUM	ND		0.2	MG/L	1	10/6/2014 17:34
ARSENIC	ND		0.01	MG/L	1	10/6/2014 17:34
BORON	ND		0.1	MG/L	1	10/6/2014 17:34
BERYLLIUM	ND		0.005	MG/L	1	10/6/2014 17:34
CALCIUM	**67**		**1**	**MG/L**	1	10/6/2014 17:34
CADMIUM	ND		0.005	MG/L	1	10/6/2014 17:34
COBALT	ND		0.01	MG/L	1	10/6/2014 17:34
CHROMIUM	ND		0.01	MG/L	1	10/6/2014 17:34
COPPER	**0.012**		**0.01**	**MG/L**	1	10/6/2014 17:34
IRON	ND		0.1	MG/L	1	10/6/2014 17:34
POTASSIUM	**4.9**		**1**	**MG/L**	1	10/6/2014 17:34
LITHIUM	**0.013**		**0.01**	**MG/L**	1	10/6/2014 17:34
MAGNESIUM	**19**		**1**	**MG/L**	1	10/6/2014 17:34
MANGANESE	**0.036**		**0.01**	**MG/L**	1	10/6/2014 17:34
SODIUM	**27**		**1**	**MG/L**	1	10/6/2014 17:34
NICKEL	ND		0.02	MG/L	1	10/6/2014 17:34
LEAD	ND		0.003	MG/L	1	10/6/2014 17:34
SELENIUM	ND		0.005	MG/L	1	10/6/2014 17:34
VANADIUM	ND		0.01	MG/L	1	10/6/2014 17:34
ZINC	**0.091**		**0.02**	**MG/L**	1	10/6/2014 17:34
pH			**EPA150.1**		Prep Date: **10/3/2014**	PrepBy: **KMP**
PH	**7.7**		**0.1**	**pH**	1	10/3/2014
Specific Conductance in Water			**EPA120.1**		Prep Date: **10/3/2014**	PrepBy: **KMP**
SPECIFIC CONDUCTIVITY	**591**		**1**	**umhos/cm**	1	10/3/2014
Total Dissolved Solids			**EPA160.1**		Prep Date: **10/3/2014**	PrepBy: **KMP**
TOTAL DISSOLVED SOLIDS	**360**		**20**	**MG/L**	1	10/6/2014

ALS Environmental -- FC SAMPLE SUMMARY REPORT

Client:	Environmental Alternatives, Inc.	**Date:**	*08-Oct-14*
Project:	ZML1265 Zephyr Gold USA	**Work Order:**	1410046
Sample ID:	North MW	**Lab ID:**	1410046-2
Legal Location:		**Matrix:**	WATER
Collection Date:	10/1/2014 09:40	**Percent Moisture:**	

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
Alkalinity as Calcium Carbonate			**EPA310.1**		Prep Date: **10/8/2014**	PrepBy: **AJD**
BICARBONATE AS CaCO3	**260**		**20**	**MG/L**	1	10/8/2014
CARBONATE AS CaCO3	ND		20	MG/L	1	10/8/2014
TOTAL ALKALINITY AS CaCO3	**260**		**20**	**MG/L**	1	10/8/2014
Ion Chromatography			**EPA300.0**		Prep Date: **10/2/2014**	PrepBy: **AJD**
CHLORIDE	**25**		**2**	**MG/L**	10	10/2/2014 19:57
FLUORIDE	**2.4**		**0.1**	**MG/L**	1	10/2/2014 19:29
NITRITE AS N	ND		0.1	MG/L	1	10/2/2014 19:29
NITRATE/NITRITE AS N	ND		0.1	MG/L	1	10/2/2014 19:29
NITRATE AS N	ND		0.2	MG/L	1	10/2/2014 19:29
SULFATE	**110**		**10**	**MG/L**	10	10/2/2014 19:57
Dissolved Mercury			**EPA245.1**		Prep Date: **10/6/2014**	PrepBy: **BAS**
MERCURY	ND		0.0002	MG/L	1	10/6/2014 16:16
Dissolved Metals by 200.7			**EPA200.7**		Prep Date: **10/6/2014**	PrepBy: **NAQ**
ALUMINUM	ND		0.2	MG/L	1	10/6/2014 17:35
ARSENIC	ND		0.01	MG/L	1	10/6/2014 17:35
BORON	**0.26**		**0.1**	**MG/L**	1	10/6/2014 17:35
BERYLLIUM	ND		0.005	MG/L	1	10/6/2014 17:35
CALCIUM	**52**		**1**	**MG/L**	1	10/6/2014 17:35
CADMIUM	ND		0.005	MG/L	1	10/6/2014 17:35
COBALT	ND		0.01	MG/L	1	10/6/2014 17:35
CHROMIUM	ND		0.01	MG/L	1	10/6/2014 17:35
COPPER	ND		0.01	MG/L	1	10/6/2014 17:35
IRON	ND		0.1	MG/L	1	10/6/2014 17:35
POTASSIUM	**6.2**		**1**	**MG/L**	1	10/6/2014 17:35
LITHIUM	**0.051**		**0.01**	**MG/L**	1	10/6/2014 17:35
MAGNESIUM	**20**		**1**	**MG/L**	1	10/6/2014 17:35
MANGANESE	**0.1**		**0.01**	**MG/L**	1	10/6/2014 17:35
SODIUM	**80**		**1**	**MG/L**	1	10/6/2014 17:35
NICKEL	ND		0.02	MG/L	1	10/6/2014 17:35
LEAD	ND		0.003	MG/L	1	10/6/2014 17:35
SELENIUM	ND		0.005	MG/L	1	10/6/2014 17:35
VANADIUM	ND		0.01	MG/L	1	10/6/2014 17:35
ZINC	**0.025**		**0.02**	**MG/L**	1	10/6/2014 17:35
pH			**EPA150.1**		Prep Date: **10/3/2014**	PrepBy: **KMP**
PH	**7.85**		**0.1**	**pH**	1	10/3/2014
Specific Conductance in Water			**EPA120.1**		Prep Date: **10/3/2014**	PrepBy: **KMP**
SPECIFIC CONDUCTIVITY	**779**		**1**	**umhos/cm**	1	10/3/2014
Total Dissolved Solids			**EPA160.1**		Prep Date: **10/3/2014**	PrepBy: **KMP**
TOTAL DISSOLVED SOLIDS	**480**		**20**	**MG/L**	1	10/6/2014

ALS Environmental -- FC

SAMPLE SUMMARY REPORT

Client: Environmental Alternatives, Inc.
Date: *08-Oct-14*
Project: ZML1265 Zephyr Gold USA
Work Order: 1410046
Sample ID: North MW
Lab ID: 1410046-2
Legal Location:
Matrix: WATER
Collection Date: 10/1/2014 09:40
Percent Moisture:

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed

Explanation of Qualifiers

Radiochemistry:

U or ND - Result is less than the sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative yield is assumed.

Y2 - Chemical Yield outside default limits.

W - DER is greater than Warning Limit of 1.42

* - Aliquot Basis is 'As Received' while the Report Basis is 'Dry Weight'.

- Aliquot Basis is 'Dry Weight' while the Report Basis is 'As Received'.

G - Sample density differs by more than 15% of LCS density.

D - DER is greater than Control Limit

M - Requested MDC not met.

LT - Result is less than requested MDC but greater than achieved MDC.

M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

L - LCS Recovery below lower control limit.

H - LCS Recovery above upper control limit.

P - LCS, Matrix Spike Recovery within control limits.

N - Matrix Spike Recovery outside control limits

NC - Not Calculated for duplicate results less than 5 times MDC

B - Analyte concentration greater than MDC.

B3 - Analyte concentration greater than MDC but less than Requested MDC.

Inorganics:

B - Result is less than the requested reporting limit but greater than the instrument method detection limit (MDL).

U or ND - Indicates that the compound was analyzed for but not detected.

E - The reported value is estimated because of the presence of interference. An explanatory note may be included in the narrative.

M - Duplicate injection precision was not met.

N - Spiked sample recovery not within control limits. A post spike is analyzed for all ICP analyses when the matrix spike and or spike duplicate fail and the native sample concentration is less than four times the spike added concentration.

Z - Spiked recovery not within control limits. An explanatory note may be included in the narrative.

* - Duplicate analysis (relative percent difference) not within control limits.

S - SAR value is estimated as one or more analytes used in the calculation were not detected above the detection limit.

Organics:

U or ND - Indicates that the compound was analyzed for but not detected.

B - Analyte is detected in the associated method blank as well as in the sample. It indicates probable blank contamination and warns the data user.

E - Analyte concentration exceeds the upper level of the calibration range.

J - Estimated value. The result is less than the reporting limit but greater than the instrument method detection limit (MDL).

A - A tentatively identified compound is a suspected aldol-condensation product.

X - The analyte was diluted below an accurate quantitation level.

* - The spike recovery is equal to or outside the control criteria used.

+ - The relative percent difference (RPD) equals or exceeds the control criteria.

G - A pattern resembling gasoline was detected in this sample.

D - A pattern resembling diesel was detected in this sample.

M - A pattern resembling motor oil was detected in this sample.

C - A pattern resembling crude oil was detected in this sample.

4 - A pattern resembling JP-4 was detected in this sample.

5 - A pattern resembling JP-5 was detected in this sample.

H - Indicates that the fuel pattern was in the heavier end of the retention time window for the analyte of interest.

L - Indicates that the fuel pattern was in the lighter end of the retention time window for the analyte of interest.

Z - This flag indicates that a significant fraction of the reported result did not resemble the patterns of any of the following petroleum hydrocarbon products:
- gasoline
- JP-8
- diesel
- mineral spirits
- motor oil
- Stoddard solvent
- bunker C

ALS Environmental -- FC

Date: *10/8/2014 4:22:*

Client: Environmental Alternatives, Inc.
Work Order: 1410046
Project: ZML1265 Zephyr Gold USA

QC BATCH REPORT

Batch ID: **HG141006-1-1** Instrument ID **CETAC7500** Method: **EPA245.1**

LCS Sample ID **HG141006-1** Units: **MG/L** Analysis Date: **10/6/2014 16:03**
Client ID: Run ID: **HG141006-1A2** Prep Date: **10/6/2014** DF: **1**

Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	RPD	RPD Limit	Qual
MERCURY	0.000988	0.0002	0.001		99	85-115			20	

MB Sample ID **HG141006-1** Units: **MG/L** Analysis Date: **10/6/2014 16:01**
Client ID: Run ID: **HG141006-1A2** Prep Date: **10/6/2014** DF: **1**

Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	RPD	RPD Limit	Qual
MERCURY	ND	0.0002								

MS Sample ID **1410046-1** Units: **MG/L** Analysis Date: **10/6/2014 16:11**
Client ID: **South MW** Run ID: **HG141006-1A2** Prep Date: **10/6/2014** DF: **1**

Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	RPD	RPD Limit	Qual
MERCURY	0.00188	0.0002	0.002	0.0002	94	70-130			20	

MSD Sample ID **1410046-1** Units: **MG/L** Analysis Date: **10/6/2014 16:14**
Client ID: **South MW** Run ID: **HG141006-1A2** Prep Date: **10/6/2014** DF: **1**

Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	RPD	RPD Limit	Qual
MERCURY	0.00183	0.0002	0.002	0.0002	91	70-130	0.00188	3	20	

The following samples were analyzed in this batch: 1410046-1 1410046-2

Client: Environmental Alternatives, Inc.
Work Order: 1410046
Project: ZML1265 Zephyr Gold USA

QC BATCH REPORT

Batch ID: **IP141006-3-1** Instrument ID **ICPTrace2** Method: **EPA200.7**

LCS Sample ID **FP141006-3** Units: **MG/L** Analysis Date: **10/6/2014 17:32**

Client ID: Run ID: **IT141006-2A6** Prep Date: **10/6/2014** DF: **1**

Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	RPD	RPD Limit	Qual
ALUMINUM	2.09	0.2	2		104	85-115			20	
ARSENIC	1.08	0.01	1		108	85-115			20	
BERYLLIUM	0.0532	0.005	0.05		106	85-115			20	
BORON	1.06	0.1	1		106	85-115			20	
CADMIUM	0.0558	0.005	0.05		112	85-115			20	
CALCIUM	41.6	1	40		104	85-115			20	
CHROMIUM	0.212	0.01	0.2		106	85-115			20	
COBALT	0.498	0.01	0.5		100	85-115			20	
COPPER	0.272	0.01	0.25		109	85-115			20	
IRON	0.963	0.1	1		96	85-115			20	
LEAD	0.541	0.003	0.5		108	85-115			20	
LITHIUM	0.501	0.01	0.5		100	85-115			20	
MAGNESIUM	40.9	1	40		102	85-115			20	
MANGANESE	0.518	0.01	0.5		104	85-115			20	
NICKEL	0.541	0.02	0.5		108	85-115			20	
POTASSIUM	41.5	1	40		104	85-115			20	
SELENIUM	2.25	0.005	2		113	85-115			20	
SODIUM	40	1	40		100	85-115			20	
VANADIUM	0.537	0.01	0.5		107	85-115			20	
ZINC	0.541	0.02	0.5		108	85-115			20	

Client: Environmental Alternatives, Inc.
Work Order: 1410046
Project: ZML1265 Zephyr Gold USA

QC BATCH REPORT

Batch ID: **IP141006-3-1** Instrument ID **ICPTrace2** Method: **EPA200.7**

MB Sample ID **FP141006-3** Units: **MG/L** Analysis Date: **10/6/2014 17:27**

Client ID: Run ID: **IT141006-2A6** Prep Date: **10/6/2014** DF: **1**

Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	RPD	RPD Limit	Qual
ALUMINUM	ND	0.2								
ARSENIC	ND	0.01								
BERYLLIUM	ND	0.005								
BORON	ND	0.1								
CADMIUM	ND	0.005								
CALCIUM	ND	1								
CHROMIUM	ND	0.01								
COBALT	ND	0.01								
COPPER	ND	0.01								
IRON	ND	0.1								
LEAD	ND	0.003								
LITHIUM	ND	0.01								
MAGNESIUM	ND	1								
MANGANESE	ND	0.01								
NICKEL	ND	0.02								
POTASSIUM	ND	1								
SELENIUM	ND	0.005								
SODIUM	ND	1								
VANADIUM	ND	0.01								
ZINC	ND	0.02								

The following samples were analyzed in this batch: 1410046-1 1410046-2

QC BATCH REPORT

Batch ID: **AK141008-1-3** Instrument ID **Balance** Method: **EPA310.1**

LCS Sample ID **AK141008-1** Units: **MG/L** Analysis Date: **10/8/2014**

Client ID: Run ID: **AK141008-1A1** Prep Date: **10/8/2014** DF: **1**

Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	RPD	RPD Limit	Qual
TOTAL ALKALINITY AS C	99.8	5	100		100	85-115			15	

MB Sample ID **AK141008-1** Units: **MG/L** Analysis Date: **10/8/2014**

Client ID: Run ID: **AK141008-1A1** Prep Date: **10/8/2014** DF: **1**

Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	RPD	RPD Limit	Qual
BICARBONATE AS CaCO	ND	5								
CARBONATE AS CaCO3	ND	5								
TOTAL ALKALINITY AS C	ND	5								

The following samples were analyzed in this batch: 1410046-1 1410046-2

Client: Environmental Alternatives, Inc.
Work Order: 1410046
Project: ZML1265 Zephyr Gold USA

QC BATCH REPORT

Batch ID: **IC141002-1-2** Instrument ID **IC** Method: **EPA300.0**

LCS Sample ID **IC141002-1** Units: **MG/L** Analysis Date: **10/2/2014 15:44**
Client ID: Run ID: **IC141002-1A4** Prep Date: **10/2/2014** DF: **1**

Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	RPD	RPD Limit	Qual
FLUORIDE	1.88	0.1	2		94	90-110			15	
CHLORIDE	5.04	0.2	5		101	90-110			15	
NITRITE AS N	1.84	0.1	2		92	90-110			15	
NITRATE AS N	4.97	0.2	5		100	90-110			15	
SULFATE	19.7	1	20		99	90-110			15	

MB Sample ID **IC141002-1** Units: **MG/L** Analysis Date: **10/2/2014 15:58**
Client ID: Run ID: **IC141002-1A4** Prep Date: **10/2/2014** DF: **1**

Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	RPD	RPD Limit	Qual
FLUORIDE	ND	0.1								
CHLORIDE	ND	0.2								
NITRITE AS N	ND	0.1								
NITRATE AS N	ND	0.2								
SULFATE	ND	1								

The following samples were analyzed in this batch: 1410046-1 1410046-2

Client: Environmental Alternatives, Inc.
Work Order: 1410046
Project: ZML1265 Zephyr Gold USA

QC BATCH REPORT

Batch ID: **pH141003-1-1** Instrument ID **pH-1** Method: **EPA150.1**

DUP Sample ID **1410046-1** Units: **pH** Analysis Date: **10/3/2014**

Client ID: **South MW** Run ID: **pH141003-1A1** Prep Date: **10/3/2014** DF: **1**

Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	RPD	RPD Limit	Qual
PH	7.72	0.1					7.7		0.2	

The following samples were analyzed in this batch: 1410046-1 1410046-2

Client: Environmental Alternatives, Inc.
Work Order: 1410046
Project: ZML1265 Zephyr Gold USA

QC BATCH REPORT

Batch ID: **SC141003-1-1** Instrument ID **pH-2** Method: **EPA120.1**

DUP Sample ID **1410046-1** Units: **umhos/cm** Analysis Date: **10/3/2014**

Client ID: **South MW** Run ID: **SC141003-1A1** Prep Date: **10/3/2014** DF: **1**

Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	RPD	RPD Limit	Qual
SPECIFIC CONDUCTIVIT	564	1					591	5	10	

The following samples were analyzed in this batch: 1410046-1 1410046-2

Client: Environmental Alternatives, Inc.
Work Order: 1410046
Project: ZML1265 Zephyr Gold USA

QC BATCH REPORT

Batch ID: **TD141003-1-1** Instrument ID **Balance** Method: **EPA160.1**

DUP Sample ID **1410046-1** Units: **MG/L** Analysis Date: **10/6/2014**
Client ID: **South MW** Run ID: **TD141006-1A1** Prep Date: **10/3/2014** DF: **1**

Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	RPD	RPD Limit	Qual
TOTAL DISSOLVED SOLI	346	20					360	3	5	

LCS Sample ID **TD141003-1** Units: **MG/L** Analysis Date: **10/6/2014**
Client ID: Run ID: **TD141006-1A1** Prep Date: **10/3/2014** DF: **1**

Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	RPD	RPD Limit	Qual
TOTAL DISSOLVED SOLI	418	20	400		105	85-115			5	

MB Sample ID **TD141003-1** Units: **MG/L** Analysis Date: **10/6/2014**
Client ID: Run ID: **TD141006-1A1** Prep Date: **10/3/2014** DF: **1**

Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	RPD	RPD Limit	Qual
TOTAL DISSOLVED SOLI	ND	20								

The following samples were analyzed in this batch: 1410046-1 1410046-2

Inorganics

Case Narrative

Environmental Alternatives, Inc.

Zephyr Gold USA -- ZML1265

Work Order Number: 1501020

1. This report consists of 2 water samples.

2. The samples were received cool and intact by ALS on 01/06/15.

3. The samples were prepared for analysis based on Methods for the Chemical Analysis of Waters and Wastes (MCAWW), May 1994 procedures and Environmental Monitoring Systems Laboratory (EMSL) Rev 2.1 procedures.

4. The samples were analyzed following MCAWW and EMSL procedures for the current revisions of the following SOPs and methods:

Analyte	Method	SOP #
Alkalinity	310.1	1106
Bicarbonate	310.1	1106
Carbonate	310.1	1106
pH	150.1	1126
Specific conductance	120.1	1128
TDS	160.1	1101
Bromide	300.0 Revision 2.1	1113
Chloride	300.0 Revision 2.1	1113
Fluoride	300.0 Revision 2.1	1113
Nitrate as N	300.0 Revision 2.1	1113
Nitrite as N	300.0 Revision 2.1	1113
Total Nitrates	300.0 Revision 2.1	1113
Sulfate	300.0 Revision 2.1	1113

5. All standards and solutions were used within their recommended shelf life.

6. The samples were prepared and analyzed within the established hold time for each analysis.

All in house quality control procedures were followed, as described below.

7. General quality control procedures.

   - A preparation (method) blank and laboratory control sample (LCS) were prepared and analyzed with the samples in each applicable preparation batch.

   - The method blank associated with each applicable batch was below the reporting limit for the requested analytes.

   - All laboratory control sample criteria were met.

   - All initial and continuing calibration blanks were below the reporting limit for the requested analytes.

   - All initial and continuing calibration verifications were within the acceptance criteria for the requested analytes.

8. Matrix specific quality control procedures.

   Sample 1501020-1 was designated as the quality control sample for the alkalinity, bicarbonate, carbonate, pH, and specific conductance analyses. Per method requirements, matrix QC was performed for the remaining analyses. Since a sample from this order number was not the selected quality control (QC) sample, matrix specific QC results are not included in this report.

   Similarity of matrix and therefore relevance of the QC results should not be automatically inferred for any sample other than the native sample selected for QC.

   - A sample duplicate was prepared and analyzed with the alkalinity, bicarbonate, carbonate, pH, and specific conductance batches. All guidance criteria for precision were met.

     For pH, the difference between the pH of the sample and its duplicate must be less than or equal to 0.2 pH units to be in control. RPD is not calculated for this analysis.

9. Reduced aliquots were taken of the samples for the alkalinity, bicarbonate, and carbonate analysis. Reporting limits were elevated accordingly.

10. Manual integrations are performed when needed to provide consistent and defensible data following the guidelines in the current revision of SOP 939.

11. Total nitrate/nitrite as N is the sum of nitrate as N and nitrite as N. If a sample is analyzed at multiple dilutions, the total will be obtained by adding the results from nitrate as N and nitrite as N at the dilution that brought each analyte within the calibration range of the instrument. Therefore, a dilution factor for total nitrate/nitrite as N is not reported. Qualifier flags (other than “U” flags) and reporting limits are not applicable for the total. The reporting limit shown on the report is a placeholder to accommodate client EDD requirements. A “J” flag is reported, at the client’s request, if any component of the total was “J” flagged

The data contained in the following report have been reviewed and approved by the personnel listed below. In addition, ALS certifies that the analyses reported herein are true, complete and correct within the limits of the methods employed.

Megan Johnstone 1/13/15
Megan Johnstone Date
Inorganics Primary Data Reviewer

1/14/15
Inorganics Final Data Reviewer Date

Inorganic Data Reporting Qualifiers

The following qualifiers are used by the laboratory when reporting results of inorganic analyses.

- Concentration qualifier -- If the analyte was analyzed for but not detected a “U” is entered.
- QC qualifier -- Specified entries and their meanings are as follows:

  N - Spiked sample recovery not within control limits.

  * - Duplicate analysis (relative percent difference) not within control limits.

  Z - Calibration spike recovery not within control limits.

ALS Environmental -- FC

Sample Number(s) Cross-Reference Table

OrderNum: 1501020
Client Name: Environmental Alternatives, Inc.
Client Project Name: Zephyr Gold USA
Client Project Number: ZML1265
Client PO Number:

Client Sample Number	Lab Sample Number	COC Number	Matrix	Date Collected	Time Collected
South MW	1501020-1		WATER	05-Jan-15	11:30
North MW	1501020-2		WATER	05-Jan-15	11:07

ALS Laboratory Group

225 Commerce Drive, Fort Collins, Colorado 80524
TF: (800) 443-1511 PH: (970) 490-1511 FX: (970) 490-1522

Chain-of-Custody

Form 202r8

WORKORDER # 1501020

		SAMPLER	A. Bellantoni	**DATE**	1/5/2015	**PAGE**	1 of 1
PROJECT NAME	Zephyr Gold USA	**SITE ID**	Dawson Mine	**TURNAROUND**	SLOW	**DISPOSAL**	[✓ By Lab] or Return to Client
PROJECT No.	ZML 1265	**EDD FORMAT**					
		PURCHASE ORDER					
COMPANY NAME	EAI	**BILL TO COMPANY**	SAME				
SEND REPORT TO	A. Bellantoni	**INVOICE ATTN TO**					
ADDRESS	1107 Main St.	**ADDRESS**					
CITY / STATE / ZIP	Canon City, CO 81212	**CITY / STATE / ZIP**					
PHONE	719-275-8951	**PHONE**					
FAX	719-275-1715	**FAX**					
E-MAIL	angela@envalternatives.com	**E-MAIL**					

Lab ID	Field ID	Matrix	Sample Date	Sample Time	# Bottles	Pros.	QC	6010 or 200.7 Cations	7470 or 245.1 Hg	150.1 pH	120.1 Sp. Cond.	300.0 Anions	310.1 Alkalinity	See attached for specific analysis
①	South MW	W	1/5/15	11:07	2	No	✓	✓	✓	✓	✓	✓	✓	
②	North MW	W	1/5/15	11:30	2	No	✓	✓	✓	✓	✓	✓	✓	

*Time Zone (Circle): EST CST MST PST Matrix: O = oil S = soil NS = non-soil solid W = water L = liquid E = extract F = filter

For metals or anions, please detail analytes below.

Comments:

QC PACKAGE (check below)	
✓	LEVEL II (Standard QC)
	LEVEL III (Std QC + forms)
	LEVEL IV (Std QC + forms + raw data)

Preservative Key: 1-HCl 2-HNO3 3-H2SO4 4-NaOH 5-NaHSO4 7-Other 8-4 degrees C 9-5035

	SIGNATURE	PRINTED NAME	DATE	TIME
RELINQUISHED BY		Angela UBellant	1/5/15	1:30P
RECEIVED BY	Erin Peter	Erin Peterson	1/6/15	1020
RELINQUISHED BY				
RECEIVED BY				
RELINQUISHED BY				
RECEIVED BY				

ALS Environmental - Fort Collins

CONDITION OF SAMPLE UPON RECEIPT FORM

Client: EAI Workorder No: 1501020

Project Manager: ARW Initials: ECP Date: 1/6/15

1.	Does this project require any special handling in addition to standard ALS procedures?		YES	[✓ NO]
2.	Are custody seals on shipping containers intact?	NONE	[✓ YES]	NO
3.	Are Custody seals on sample containers intact?	[✓ NONE]	YES	NO
4.	Is there a COC (Chain-of-Custody) present or other representative documents?		[✓ YES]	NO
5.	Are the COC and bottle labels complete and legible?		[✓ YES]	NO
6.	✱ Is the COC in agreement with samples received? (IDs, dates, times, no. of samples, no. of containers, matrix, requested analyses, etc.)		YES	[✓ NO]
7.	Were airbills / shipping documents present and/or removable?	DROP OFF	[✓ YES]	NO
8.	Are all aqueous samples requiring preservation preserved correctly? (excluding volatiles)	[✓ N/A]	YES	NO
9.	Are all aqueous non-preserved samples pH 4-9?	N/A	[✓ YES]	NO
10.	Is there sufficient sample for the requested analyses?		[✓ YES]	NO
11.	Were all samples placed in the proper containers for the requested analyses?		[✓ YES]	NO
12.	Are all samples within holding times for the requested analyses?		[✓ YES]	NO
13.	Were all sample containers received intact? (not broken or leaking, etc.)		[✓ YES]	NO
14.	Are all samples requiring no headspace (VOC, GRO, RSK/MEE, Rx CN/S, radon) headspace free? Size of bubble: ____ < green pea ____ > green pea	[✓ N/A]	YES	NO
15.	Do any water samples contain sediment? Amount Amount of sediment: X dusting ____ moderate ____ heavy	N/A	[✓ YES]	NO
16.	Were the samples shipped on ice?		[✓ YES]	NO
17.	Were cooler temperatures measured at 0.1-6.0°C? IR gun used*: #2 [✓ #4]	RAD ONLY	[✓ YES]	NO

Cooler #: 1

Temperature (°C): 0.8°

No. of custody seals on cooler: 1

DOT Survey/ Acceptance Information

External µR/hr reading: 11

Background µR/hr reading: 11

Were external µR/hr readings ≤ two times background and within DOT acceptance criteria? [✓ YES] / NO / NA (If no, see Form 008.)

✱ Log per bottle time per email dated 1/6/15 AW 1/6/15

Additional Information: PROVIDE DETAILS BELOW FOR A NO RESPONSE TO ANY QUESTION ABOVE, EXCEPT #1 AND #16.

6) sample time from bottles: sample 1 = 1130, sample 2 = 1107 (switched on COC).

15) 1-1, 1-2 = Light dusting, 2-1, 2-2 = moderate dusting

↳ Noted AW

If applicable, was the client contacted? [✓ YES] / NO / NA Contact: Angela Bellantoni Date/Time: 1/6/15 email

Project Manager Signature / Date: 1/6/15

*IR Gun #2: Oakton, SN 20922500201-0066

*IR Gun #4: Oakton, SN 2372220101-0002

Form 201r24.xls (06/04/2012)

Page 1 of ___

1501020

ORIGIN ID:PUBA (719) 275-0269
SUSIE PACHECO
MASTER PRINTERS
306 MAIN STREET

CANON CITY , CO 81212
UNITED STATES US

SHIP DATE: 05JAN15
ACTWGT: 24.0 LB MAN
CAD: 472212/CAFE2806
DIMS: 18x18x12 IN

BILL SENDER

TO

ALS ENVIRONMENTAL
225 COMMERCE DRIVE

FORT COLLINS CO 80524

INV:
PO: REF: DEPT:

021C1/0F10/8F03

FedEx
Express

E

J141214072801uv

TUE - 06 JAN 10:30A

TRK# 0201 **9905 0018 2536** **PRIORITY OVERNIGHT**

72 FTCA 0.8°

80524
CO-US **DEN**

Part # 156148-434 NRIT V3 10-08

BICARBONATE AS CaCO3

Method EPA310.1

Sample Results

Lab Name: **ALS Environmental -- FC**
Client Name: Environmental Alternatives, Inc.
Client Project ID: Zephyr Gold USA ZML1265
Work Order Number: 1501020
Reporting Basis: As Received
Prep Method: NONE
Analyst: Kerry M. Petrie

Final Volume: 100 ml
Matrix: WATER
Result Units: MG/L

Client Sample ID	Lab ID	Date Collected	Date Prepared	Date Analyzed	Percent Moisture	Dilution Factor	Result	RptLimit/ LOQ/LOD	Flag	Sample Aliquot
South MW	1501020-1	01/05/2015	01/08/2015	01/08/2015	N/A	1	210	20		25 ml
North MW	1501020-2	01/05/2015	01/08/2015	01/08/2015	N/A	1	230	20		25 ml

Comments:

1. ND or U = Not Detected at or above the client requested detection limit.

Data Package ID: *ak1501020-1*

CARBONATE AS CaCO3

Method EPA310.1

Sample Results

Lab Name: **ALS Environmental -- FC**
Client Name: Environmental Alternatives, Inc.
Client Project ID: Zephyr Gold USA ZML1265
Work Order Number: 1501020
Reporting Basis: As Received
Prep Method: NONE
Analyst: Kerry M. Petrie

Final Volume: 100 ml
Matrix: WATER
Result Units: MG/L

Client Sample ID	Lab ID	Date Collected	Date Prepared	Date Analyzed	Percent Moisture	Dilution Factor	Result	RptLimit/ LOQ/LOD	Flag	Sample Aliquot
South MW	1501020-1	01/05/2015	01/08/2015	01/08/2015	N/A	1	20	20	U	25 ml
North MW	1501020-2	01/05/2015	01/08/2015	01/08/2015	N/A	1	20	20	U	25 ml

Comments:

1. ND or U = Not Detected at or above the client requested detection limit.

Data Package ID: *ak1501020-1*

TOTAL ALKALINITY AS CaCO3

Method EPA310.1

Sample Results

Lab Name: **ALS Environmental -- FC**
Client Name: Environmental Alternatives, Inc.
Client Project ID: Zephyr Gold USA ZML1265
Work Order Number: 1501020
Reporting Basis: As Received
Prep Method: NONE
Analyst: Kerry M. Petrie

Final Volume: 100 ml
Matrix: WATER
Result Units: MG/L

Client Sample ID	Lab ID	Date Collected	Date Prepared	Date Analyzed	Percent Moisture	Dilution Factor	Result	RptLimit/ LOQ/LOD	Flag	Sample Aliquot
South MW	1501020-1	01/05/2015	01/08/2015	01/08/2015	N/A	1	210	20		25 ml
North MW	1501020-2	01/05/2015	01/08/2015	01/08/2015	N/A	1	230	20		25 ml

Comments:

1. ND or U = Not Detected at or above the client requested detection limit.

Data Package ID: *ak1501020-1*

pH in water @25 Degrees Celsius

Method EPA150.1

Sample Results

Lab Name:	**ALS Environmental -- FC**		
Client Name:	Environmental Alternatives, Inc.		
Client Project ID:	Zephyr Gold USA ZML1265		
Work Order Number:	1501020	**Final Volume:**	20 ml
Reporting Basis:	As Received	**Matrix:**	WATER
Prep Method:	NONE	**Result Units:**	pH
Analyst:	Kerry M. Petrie		

Client Sample ID	Lab ID	Date Collected	Date Prepared	Date Analyzed	Percent Moisture	Dilution Factor	Result	RptLimit/ LOQ/LOD	Flag	Sample Aliquot
South MW	1501020-1	01/05/2015	01/09/2015	01/09/2015	N/A	1	7.85	0.1		20 ml
North MW	1501020-2	01/05/2015	01/09/2015	01/09/2015	N/A	1	7.88	0.1		20 ml

Comments:

1. ND or U = Not Detected at or above the client requested detection limit.

Data Package ID: *ph1501020-1*

SPECIFIC CONDUCTIVITY

Method EPA120.1

Sample Results

Lab Name: **ALS Environmental -- FC**
Client Name: Environmental Alternatives, Inc.
Client Project ID: Zephyr Gold USA ZML1265
Work Order Number: 1501020
Reporting Basis: As Received
Prep Method: NONE
Analyst: Kerry M. Petrie

Final Volume: 45 ml
Matrix: WATER
Result Units: umhos/cm

Client Sample ID	Lab ID	Date Collected	Date Prepared	Date Analyzed	Percent Moisture	Dilution Factor	Result	RptLimit/ LOQ/LOD	Flag	Sample Aliquot
South MW	1501020-1	01/05/2015	01/09/2015	01/09/2015	N/A	1	531	1		45 ml
North MW	1501020-2	01/05/2015	01/09/2015	01/09/2015	N/A	1	653	1		45 ml

Comments:

1. ND or U = Not Detected at or above the client requested detection limit.

Data Package ID: *sc1501020-1*

TOTAL DISSOLVED SOLIDS

Method EPA160.1

Sample Results

Lab Name: **ALS Environmental -- FC**
Client Name: Environmental Alternatives, Inc.
Client Project ID: Zephyr Gold USA ZML1265
Work Order Number: 1501020
Reporting Basis: As Received
Prep Method: METHOD
Analyst: Kerry M. Petrie

Final Volume: 100 ml
Matrix: WATER
Result Units: MG/L

Client Sample ID	Lab ID	Date Collected	Date Prepared	Date Analyzed	Percent Moisture	Dilution Factor	Result	RptLimit/ LOQ/LOD	Flag	Sample Aliquot
South MW	1501020-1	01/05/2015	01/07/2015	01/08/2015	N/A	1	330	20		100 ml
North MW	1501020-2	01/05/2015	01/07/2015	01/08/2015	N/A	1	450	20		100 ml

Comments:

1. ND or U = Not Detected at or above the client requested detection limit.

Data Package ID: *td1501020-1*

Ion Chromatography

Method EPA300.0 Revision 2.1

Sample Results

Lab Name: **ALS Environmental -- FC**
Work Order Number: 1501020
Client Name: Environmental Alternatives, Inc.
ClientProject ID: Zephyr Gold USA ZML1265

Field ID: South MW
Lab ID: 1501020-1

Sample Matrix: WATER
% Moisture: N/A
Date Collected: 05-Jan-15
Date Extracted: 06-Jan-15
Date Analyzed: 06-Jan-15
Prep Method: NONE

Prep Batch: IC150106-1
QCBatchID: IC150106-1-2
Run ID: IC150106-1A4
Cleanup: NONE
Basis: As Received
File Name: 50106_021.dxd

Analyst: Alex J. Devonald
Sample Aliquot: 5 ML
Final Volume: 5 ML
Result Units: MG/L
Clean DF: 1

CASNO	Target Analyte	Dilution Factor	Result	RptLimit/ LOQ/LOD	Result Qualifier	EPA Qualifier
16984-48-8	FLUORIDE AnalysisTime: 14:46	1	1.5	0.1		
16887-00-6	CHLORIDE AnalysisTime: 14:46	1	8.2	0.2		
14797-65-0	NITRITE AS N AnalysisTime: 14:46	1	0.1	0.1	U	
1-005	NITRATE/NITRITE AS N AnalysisTime: 14:46	1	0.1	0.1	U	
14797-55-8	NITRATE AS N AnalysisTime: 14:46	1	0.2	0.2	U	
14808-79-8	SULFATE AnalysisTime: 14:46	1	56	1		

Data Package ID: *ic1501020-1*

Ion Chromatography

Method EPA300.0 Revision 2.1

Sample Results

Lab Name: **ALS Environmental -- FC**
Work Order Number: 1501020
Client Name: Environmental Alternatives, Inc.
ClientProject ID: Zephyr Gold USA ZML1265

Field ID: North MW
Lab ID: 1501020-2

Sample Matrix: WATER
% Moisture: N/A
Date Collected: 05-Jan-15
Date Extracted: 06-Jan-15
Date Analyzed: 06-Jan-15
Prep Method: NONE

Prep Batch: IC150106-1
QCBatchID: IC150106-1-2
Run ID: IC150106-1A4
Cleanup: NONE
Basis: As Received
File Name: 50106_025.dxd

Analyst: Alex J. Devonald
Sample Aliquot: 5 ML
Final Volume: 5 ML
Result Units: MG/L
Clean DF: 1

CASNO	Target Analyte	Dilution Factor	Result	RptLimit/ LOQ/LOD	Result Qualifier	EPA Qualifier
16984-48-8	FLUORIDE AnalysisTime: 15:42	1	1.9	0.1		
16887-00-6	CHLORIDE AnalysisTime: 15:42	1	16	0.2		
14797-65-0	NITRITE AS N AnalysisTime: 15:42	1	0.1	0.1	U	
1-005	NITRATE/NITRITE AS N AnalysisTime: 15:42	1	0.1	0.1	U	
14797-55-8	NITRATE AS N AnalysisTime: 15:42	1	0.2	0.2	U	
14808-79-8	SULFATE AnalysisTime: 15:42	1	92	1		

Data Package ID: *ic1501020-1*

BICARBONATE AS CaCO3

Method EPA310.1

Method Blank

Lab Name: **ALS Environmental -- FC**
Work Order Number: 1501020
Client Name: Environmental Alternatives, Inc.
ClientProject ID: Zephyr Gold USA ZML1265

Lab ID: AK150108-2MB

Sample Matrix: WATER
% Moisture: N/A

Prep Batch: AK150108-2
QCBatchID: AK150108-2-2
Run ID: AK150108-1A1
Cleanup: NONE
Basis: N/A

Sample Aliquot: 100 ml
Final Volume: 100 ml
Result Units: MG/L

Lab ID	Date Prepared	Date Analyzed	Percent Moisture	Dilution Factor	Result	RptLimit/ LOQ	Flag
AK150108-2MB	1/8/2015	01/08/2015	N/A	1	5	5	U

Comments:

1. ND or U = Not Detected at or above the client requested detection limit.

Data Package ID: *ak1501020-1*

CARBONATE AS CaCO3

Method EPA310.1

Method Blank

Lab Name: **ALS Environmental -- FC**
Work Order Number: 1501020
Client Name: Environmental Alternatives, Inc.
ClientProject ID: Zephyr Gold USA ZML1265

Lab ID: AK150108-2MB

Sample Matrix: WATER
% Moisture: N/A

Prep Batch: AK150108-2
QCBatchID: AK150108-2-2
Run ID: AK150108-1A1
Cleanup: NONE
Basis: N/A

Sample Aliquot: 100 ml
Final Volume: 100 ml
Result Units: MG/L

Lab ID	Date Prepared	Date Analyzed	Percent Moisture	Dilution Factor	Result	RptLimit/ LOQ	Flag
AK150108-2MB	1/8/2015	01/08/2015	N/A	1	5	5	U

Comments:

1. ND or U = Not Detected at or above the client requested detection limit.

Data Package ID: *ak1501020-1*

TOTAL ALKALINITY AS CaCO3

Method EPA310.1

Method Blank

Lab Name: **ALS Environmental -- FC**
Work Order Number: 1501020
Client Name: Environmental Alternatives, Inc.
ClientProject ID: Zephyr Gold USA ZML1265

Lab ID: AK150108-2MB

Sample Matrix: WATER
% Moisture: N/A

Prep Batch: AK150108-2
QCBatchID: AK150108-2-2
Run ID: AK150108-1A1
Cleanup: NONE
Basis: N/A

Sample Aliquot: 100 ml
Final Volume: 100 ml
Result Units: MG/L

Lab ID	Date Prepared	Date Analyzed	Percent Moisture	Dilution Factor	Result	RptLimit/ LOQ	Flag
AK150108-2MB	1/8/2015	01/08/2015	N/A	1	5	5	U

Comments:

1. ND or U = Not Detected at or above the client requested detection limit.

Data Package ID: *ak1501020-1*

TOTAL ALKALINITY AS CaCO3

Method EPA310.1

Laboratory Control Sample

Lab Name: **ALS Environmental -- FC**
Work Order Number: 1501020
Client Name: Environmental Alternatives, Inc.
ClientProject ID: Zephyr Gold USA ZML1265

Lab ID: AK150108-2LCS

Sample Matrix: WATER
% Moisture: N/A
Date Collected: N/A
Date Extracted: 01/08/2015
Date Analyzed: 01/08/2015

Prep Batch: AK150108-2
QCBatchID: AK150108-2-2
Run ID: AK150108-1A1
Cleanup: NONE
Basis: N/A

Sample Aliquot: 100 ml
Final Volume: 100 ml
Result Units: MG/L

CASNO	Target Analyte	Spike Added	LCS Result	Reporting Limit	Result Qualifier	LCS % Rec.	Control Limits
	TOTAL ALKALINITY AS CaCO3	100	99.5	5		99	85 - 115

Data Package ID: *ak1501020-1*

BICARBONATE AS CaCO3

Method EPA310.1

Duplicate Sample Results

Lab Name: **ALS Environmental -- FC**
Work Order Number: 1501020
Client Name: Environmental Alternatives, Inc.
ClientProject ID: Zephyr Gold USA ZML1265

Reporting Basis: As Received
Sample Aliquot: 25 ml
Final Volume: 100ml
Matrix: WATER
Result Units MG/L

Client Sample ID	Lab ID	Date Prepared	Date Analyzed	Dilution Factor	Duplicate Result	Dup Qual	Sample Result	Samp Qual	Reporting Limit	RPD	RPD Limit
South MW	1501020-1D	01/08/2015	01/08/2015	1	214		210		20	0	15

Comments:

1. ND or U = Not Detected at or above the client requested detection limit.

Data Package ID: *ak1501020-1*

CARBONATE AS CaCO3

Method EPA310.1

Duplicate Sample Results

Lab Name: **ALS Environmental -- FC**
Work Order Number: 1501020
Client Name: Environmental Alternatives, Inc.
ClientProject ID: Zephyr Gold USA ZML1265

Reporting Basis: As Received
Sample Aliquot: 25 ml
Final Volume: 100ml
Matrix: WATER
Result Units MG/L

Client Sample ID	Lab ID	Date Prepared	Date Analyzed	Dilution Factor	Duplicate Result	Dup Qual	Sample Result	Samp Qual	Reporting Limit	RPD	RPD Limit
South MW	1501020-1D	01/08/2015	01/08/2015	1	20	U	20	U	20		15

Comments:

1. ND or U = Not Detected at or above the client requested detection limit.

Data Package ID: *ak1501020-1*

TOTAL ALKALINITY AS CaCO3

Method EPA310.1

Duplicate Sample Results

Lab Name: **ALS Environmental -- FC**
Work Order Number: 1501020
Client Name: Environmental Alternatives, Inc.
ClientProject ID: Zephyr Gold USA ZML1265

Reporting Basis: As Received
Sample Aliquot: 25 ml
Final Volume: 100ml
Matrix: WATER
Result Units MG/L

Client Sample ID	Lab ID	Date Prepared	Date Analyzed	Dilution Factor	Duplicate Result	Dup Qual	Sample Result	Samp Qual	Reporting Limit	RPD	RPD Limit
South MW	1501020-1D	01/08/2015	01/08/2015	1	214		210		20	0	15

Comments:

1. ND or U = Not Detected at or above the client requested detection limit.

Data Package ID: *ak1501020-1*

pH

Method EPA150.1

Duplicate Sample Results

Lab Name: **ALS Environmental -- FC**
Work Order Number: 1501020
Client Name: Environmental Alternatives, Inc.
ClientProject ID: Zephyr Gold USA ZML1265

Field ID: South MW
Lab ID: 1501020-1D

Sample Matrix: WATER
% Moisture: N/A
Date Collected: 01/05/2015
Date Extracted: 01/09/2015
Date Analyzed: 01/09/2015

Prep Batch: pH150109-1
QCBatchID: pH150109-1-2
Run ID: pH150109-1A1
Cleanup: NONE
Basis: As Received
File Name:

Sample Aliquot: 20 ml
Final Volume: 20 ml
Result Units: pH
Clean DF: 1

CASNO	Target Analyte	Sample Result	Samp Qual	Duplicate Result	Dup Qual	Reporting Limit	Dilution Factor	RPD	RPD Limit
10-29-7	PH	7.85		7.85		0.1	1		0.2

Data Package ID: *ph1501020-1*

Specific Conductance in Water

Method EPA120.1

Duplicate Sample Results

Lab Name: **ALS Environmental -- FC**
Work Order Number: 1501020
Client Name: Environmental Alternatives, Inc.
ClientProject ID: Zephyr Gold USA ZML1265

Field ID: South MW
Lab ID: 1501020-1D

Sample Matrix: WATER
% Moisture: N/A
Date Collected: 01/05/2015
Date Extracted: 01/09/2015
Date Analyzed: 01/09/2015

Prep Batch: SC150109-1
QCBatchID: SC150109-1-1
Run ID: SC150109-1A1
Cleanup: NONE
Basis: As Received
File Name:

Sample Aliquot: 45 ml
Final Volume: 45 ml
Result Units: umhos/cm
Clean DF: 1

CASNO	Target Analyte	Sample Result	Samp Qual	Duplicate Result	Dup Qual	Reporting Limit	Dilution Factor	RPD	RPD Limit
10-34-4	SPECIFIC CONDUCTIVITY	531		530		1	1	0	10

Data Package ID: *sc1501020-1*

Total Dissolved Solids

Method EPA160.1

Method Blank

Lab Name: **ALS Environmental -- FC**

Work Order Number: 1501020

Client Name: Environmental Alternatives, Inc.

ClientProject ID: Zephyr Gold USA ZML1265

Lab ID: TD150107-1MB

Sample Matrix: WATER
% Moisture: N/A
Date Collected: N/A
Date Extracted: 07-Jan-15
Date Analyzed: 08-Jan-15
Prep Method: METHOD

Prep Batch: TD150107-1
QCBatchID: TD150107-1-2
Run ID: TD150108-1A1
Cleanup: NONE
Basis: N/A
File Name: Manual Entry

Sample Aliquot: 100 ml
Final Volume: 100 ml
Result Units: MG/L
Clean DF: 1

CASNO	Target Analyte	DF	Result	RptLimit/ LOQ/LOD	Result Qualifier	EPA Qualifier
10-33-3	TOTAL DISSOLVED SOLIDS	1	20	20	U	

Data Package ID: *td1501020-1*

Total Dissolved Solids

Method EPA160.1

Laboratory Control Sample

Lab Name: **ALS Environmental -- FC**
Work Order Number: 1501020
Client Name: Environmental Alternatives, Inc.
ClientProject ID: Zephyr Gold USA ZML1265

Lab ID: TD150107-1LCS

Sample Matrix: WATER
% Moisture: N/A
Date Collected: N/A
Date Extracted: 01/07/2015
Date Analyzed: 01/08/2015
Prep Method: METHOD

Prep Batch: TD150107-1
QCBatchID: TD150107-1-2
Run ID: TD150108-1A1
Cleanup: NONE
Basis: N/A
File Name: Manual Entry

Sample Aliquot: 100 ml
Final Volume: 100 ml
Result Units: MG/L
Clean DF: 1

CASNO	Target Analyte	Spike Added	LCS Result	Reporting Limit	Result Qualifier	LCS % Rec.	Control Limits
10-33-3	TOTAL DISSOLVED SOLIDS	400	418	20		105	85 - 115%

Data Package ID: *td1501020-1*

Ion Chromatography

Method EPA300.0 Revision 2.1

Method Blank

Lab Name: **ALS Environmental -- FC**
Work Order Number: 1501020
Client Name: Environmental Alternatives, Inc.
ClientProject ID: Zephyr Gold USA ZML1265

Lab ID: IC150106-1MB

Sample Matrix: WATER
% Moisture: N/A
Date Collected: N/A
Date Extracted: 06-Jan-15
Date Analyzed: 06-Jan-15
Prep Method: NONE

Prep Batch: IC150106-1
QCBatchID: IC150106-1-2
Run ID: IC150106-1A4
Cleanup: NONE
Basis: N/A
File Name: 50106_016.dxd

Sample Aliquot: 5 ml
Final Volume: 5 ml
Result Units: MG/L
Clean DF: 1

CASNO	Target Analyte	DF	Result	RptLimit/ LOQ/LOD	Result Qualifier	EPA Qualifier
16984-48-8	FLUORIDE	1	0.1	0.1	U	
16887-00-6	CHLORIDE	1	0.2	0.2	U	
14797-65-0	NITRITE AS N	1	0.1	0.1	U	
14797-55-8	NITRATE AS N	1	0.2	0.2	U	
14808-79-8	SULFATE	1	1	1	U	

Data Package ID: *ic1501020-1*

Ion Chromatography

Method EPA300.0 Revision 2.1

Laboratory Control Sample

Lab Name: **ALS Environmental -- FC**
Work Order Number: 1501020
Client Name: Environmental Alternatives, Inc.
ClientProject ID: Zephyr Gold USA ZML1265

Lab ID: IC150106-1LCS

Sample Matrix: WATER
% Moisture: N/A
Date Collected: N/A
Date Extracted: 01/06/2015
Date Analyzed: 01/06/2015
Prep Method: NONE

Prep Batch: IC150106-1
QCBatchID: IC150106-1-2
Run ID: IC150106-1A4
Cleanup: NONE
Basis: N/A
File Name: 50106_015.dxd

Sample Aliquot: 5 ml
Final Volume: 5 ml
Result Units: MG/L
Clean DF: 1

CASNO	Target Analyte	Spike Added	LCS Result	Reporting Limit	Result Qualifier	LCS % Rec.	Control Limits
16984-48-8	FLUORIDE	2	1.99	0.1		100	90 - 110%
16887-00-6	CHLORIDE	5	5.13	0.2		103	90 - 110%
14797-65-0	NITRITE AS N	2	1.93	0.1		97	90 - 110%
14797-55-8	NITRATE AS N	5	5.13	0.2		103	90 - 110%
14808-79-8	SULFATE	20	20.2	1		101	90 - 110%

Data Package ID: *ic1501020-1*

Metals

Case Narrative

Environmental Alternatives, Inc.

Zephyr Gold USA – ZML 1265

Work Order Number: 1501020

1. This report consists of 2 water samples.

2. The samples were received cool and intact by ALS on 01/06/15.

3. The samples were to be analyzed for dissolved metals. The samples were filtered through a 0.45 micron filter and preserved with nitric acid to a pH less than 2 prior to analysis.

4. The samples were prepared and analyzed based on Methods for the Determination of Metals in Environmental Samples – Supplement 1 procedures.

   For analysis by Trace ICP, the samples were digested following method 200.2 and the current revision of SOP 806.

   For analysis by Cold Vapor AA (CVAA), the samples were digested following method 245.1 and the current revision of SOP 812.

5. Analysis by Trace ICP followed method 200.7 and the current revision of SOP 807.

   Analysis by CVAA followed method 245.1 and the current revision of SOP 812.

6. All standards and solutions are NIST traceable and were used within their recommended shelf life.

7. The samples were prepared and analyzed within the established hold times.

All in house quality control procedures were followed, as described below.

8. General quality control procedures.

- A preparation (method) blank and laboratory control sample were digested and analyzed with the samples in each digestion batch.
- The preparation (method) blank associated with each digestion batch was below the reporting limit for the requested analytes.
- All laboratory control sample criteria were met.
- All initial and continuing calibration blanks were below the reporting limit for the requested analytes.
- All initial and continuing calibration verifications were within the acceptance criteria for the requested analytes.
- The interference check samples associated with Method 200.7 were within acceptance criteria.

9. Matrix specific quality control procedures.

   Sample 1501020-1 was designated as the quality control sample for the mercury analysis. Per method requirements, matrix QC was performed for the Trace ICP analysis. Since a sample from this order number was not the selected quality control (QC) sample, matrix specific QC results are not included in this report.

   Similarity of matrix and therefore relevance of the QC results should not be automatically inferred for any sample other than the native sample selected for QC.

   - A matrix spike and matrix spike duplicate were digested and analyzed with the mercury batch. All acceptance criteria for accuracy were met.
   - A sample duplicate and matrix spike duplicate were digested and analyzed with the mercury batch. All acceptance criteria for precision were met.

10. Sample dilutions were not required for the requested analyses.

The data contained in the following report have been reviewed and approved by the personnel listed below. In addition, ALS certifies that the analyses reported herein are true, complete and correct within the limits of the methods employed.

Jill Latelle ______________________ 1/12/15
Jill Latelle Date
Inorganics Primary Data Reviewer

______________________ 1/14/15
Inorganics Final Data Reviewer Date

Inorganic Data Reporting Qualifiers

The following qualifiers are used by the laboratory when reporting results of inorganic analyses.

- Result qualifier -- If the analyte was analyzed for but not detected a “U” is entered.

- QC qualifier -- Specified entries and their meanings are as follows:

  E - The reported value is estimated because of the presence of interference. An explanatory note may be included in the narrative.

  M - Duplicate injection precision was not met.

  N - Spiked sample recovery not within control limits. A post spike is analyzed for all ICP analyses when the matrix spike and or spike duplicate fail and the native sample concentration is less than four times the spike added concentration.

  Z - Spiked recovery not within control limits. An explanatory note may be included in the narrative.

  * - Duplicate analysis (relative percent difference) not within control limits.

  S - SAR value is estimated as one or more analytes used in the calculation were not detected above the detection limit.

ALS Environmental -- FC

Sample Number(s) Cross-Reference Table

OrderNum: 1501020
Client Name: Environmental Alternatives, Inc.
Client Project Name: Zephyr Gold USA
Client Project Number: ZML1265
Client PO Number:

Client Sample Number	Lab Sample Number	COC Number	Matrix	Date Collected	Time Collected
South MW	1501020-1		WATER	05-Jan-15	11:30
North MW	1501020-2		WATER	05-Jan-15	11:07

ALS Laboratory Group

225 Commerce Drive, Fort Collins, Colorado 80524
TF: (800) 443-1511 PH: (970) 490-1511 FX: (970) 490-1522

Chain-of-Custody

Form 202r8

WORKORDER # 1501020

PROJECT NAME	Zephyr Gold USA	SAMPLER	A. Bellantoni	DATE	1/5/2015	PAGE	1 of 1
PROJECT No.	ZML 1265	SITE ID	Dawson Mine	TURNAROUND	SLOW	DISPOSAL	[✓ By Lab] or Return to Client
		EDD FORMAT					
		PURCHASE ORDER					
COMPANY NAME	EAI	BILL TO COMPANY	SAME				
SEND REPORT TO	A. Bellantoni	INVOICE ATTN TO					
ADDRESS	1107 Main St.	ADDRESS					
CITY / STATE / ZIP	Canon City, CO 81212	CITY / STATE / ZIP					
PHONE	719-275-8951	PHONE					
FAX	719-275-1715	FAX					
E-MAIL	angela@envalternatives.com	E-MAIL					

Lab ID	Field ID	Matrix	Sample Date	Sample Time	# Bottles	Pres.	QC	6010 or 200.7 Cations	7470 or 245.1 Hg	150.1 pH	120.1 Sp. Cond.	300.0 Anions	310.1 Alkalinity	See attached for specific analysis
①	South MW	W	1/5/15	11:07	2	No	✓	✓	✓	✓	✓	✓	✓	
②	North MW	W	1/5/15	11:30	2	No	✓	✓	✓	✓	✓	✓	✓	

*Time Zone (Circle): EST CST MST PST Matrix: O = oil S = soil NS = non-soil solid W = water L = liquid E = extract F = filter

For metals or anions, please detail analytes below.

Comments:

QC PACKAGE (check below)
- ☑ LEVEL II (Standard QC)
- ☐ LEVEL III (Std QC + forms)
- ☐ LEVEL IV (Std QC + forms + raw data)

Preservative Key: 1-HCl 2-HNO3 3-H2SO4 4-NaOH 5-NaHSO4 7-Other 8-4 degrees C 9-5035

	SIGNATURE	PRINTED NAME	DATE	TIME
RELINQUISHED BY		Angela U Bellant	1/5/15	1:30P
RECEIVED BY		Erin Peterson	1/6/15	1020
RELINQUISHED BY				
RECEIVED BY				
RELINQUISHED BY				
RECEIVED BY				

ALS Environmental - Fort Collins
CONDITION OF SAMPLE UPON RECEIPT FORM

Client: EAI Workorder No: 1501020

Project Manager: ARW Initials: ECP Date: 1/6/15

1. Does this project require any special handling in addition to standard ALS procedures?		YES	[✓ NO]
2. Are custody seals on shipping containers intact?	NONE	[✓ YES]	NO
3. Are Custody seals on sample containers intact?	[✓ NONE]	YES	NO
4. Is there a COC (Chain-of-Custody) present or other representative documents?		[✓ YES]	NO
5. Are the COC and bottle labels complete and legible?		[✓ YES]	NO
✱ 6. Is the COC in agreement with samples received? (IDs, dates, times, no. of samples, no. of containers, matrix, requested analyses, etc.)		YES	[✓ NO]
7. Were airbills / shipping documents present and/or removable?	DROP OFF	[✓ YES]	NO
8. Are all aqueous samples requiring preservation preserved correctly? (excluding volatiles)	[✓ N/A]	YES	NO
9. Are all aqueous non-preserved samples pH 4-9?	N/A	[✓ YES]	NO
10. Is there sufficient sample for the requested analyses?		[✓ YES]	NO
11. Were all samples placed in the proper containers for the requested analyses?		[✓ YES]	NO
12. Are all samples within holding times for the requested analyses?		[✓ YES]	NO
13. Were all sample containers received intact? (not broken or leaking, etc.)		[✓ YES]	NO
14. Are all samples requiring no headspace (VOC, GRO, RSK/MEE, Rx CN/S, radon) headspace free? Size of bubble: ____ < green pea ____ > green pea	[✓ N/A]	YES	NO
15. Do any water samples contain sediment? Amount Amount of sediment: X dusting ____ moderate ____ heavy	N/A	[✓ YES]	NO
16. Were the samples shipped on ice?		[✓ YES]	NO
17. Were cooler temperatures measured at 0.1-6.0°C? IR gun used*: #2 [✓ #4]	RAD ONLY	[✓ YES]	NO

Cooler #:	1							
Temperature (°C):	0.8°							
No. of custody seals on cooler:	1							
External µR/hr reading:	11							
Background µR/hr reading:	11							

DOT Survey/ Acceptance Information

Were external µR/hr readings ≤ two times background and within DOT acceptance criteria? [✓ YES] / NO / NA (If no, see Form 008.)

✱ Log per bottle time per email dated 1/6/15 ✱ AW 1/6/15

Additional Information: PROVIDE DETAILS BELOW FOR A NO RESPONSE TO ANY QUESTION ABOVE, EXCEPT #1 AND #16.

6) sample time from bottles: sample 1 = 1130, sample 2 = 1107 (switched on COC).

15) 1-1, 1-2 = light dusting, 2-1, 2-2 = moderate dusting

↳ Noted AW

If applicable, was the client contacted? [✓ YES] / NO / NA Contact: Angela Bellantoni Date/Time: 1/6/15 email

Project Manager Signature / Date: 1/6/15

*IR Gun #2: Oakton, SN 29922500201-0066

*IR Gun #4: Oakton, SN 2372220101-0002

Form 201r24.xls (06/04/2012)

Page 1 of ___

1501020

ORIGIN ID:PUBA (719) 275-0269
SUSIE PACHECO
MASTER PRINTERS
306 MAIN STREET

CANON CITY, CO 81212
UNITED STATES US

SHIP DATE: 05JAN15
ACTWGT: 24.0 LB MAN
CAD: 472212/CAFE2806
DIMS: 18x18x12 IN

BILL SENDER

TO
ALS ENVIRONMENTAL
225 COMMERCE DRIVE

FORT COLLINS CO 80524

INV:
PO: REF: DEPT:

021C1/0E1D/8E03

FedEx
Express

E

J141214073801uv

TUE - 06 JAN 10:30A
PRIORITY OVERNIGHT

TRK# 0201 9905 0018 2536

72 FTCA 0.8°

80524
CO-US DEN

Part # 156148-434 NRIT V3 10-08

Dissolved Metals by 200.7

Method EPA200.7 Revision 4.4

Sample Results

Lab Name: **ALS Environmental -- FC**
Work Order Number: 1501020
Client Name: Environmental Alternatives, Inc.
ClientProject ID: Zephyr Gold USA ZML1265

Field ID: South MW
Lab ID: 1501020-1

Sample Matrix: WATER
% Moisture: N/A
Date Collected: 05-Jan-15
Date Extracted: 07-Jan-15
Date Analyzed: 08-Jan-15
Prep Method: EPA200.2 Rev 2.2

Prep Batch: IP150107-1
QCBatchID: IP150107-1-1
Run ID: IT150108-2A2
Cleanup: NONE
Basis: As Received
File Name: 150108A.

Analyst: Brent A. Stanfield
Sample Aliquot: 50 ML
Final Volume: 50 ML
Result Units: MG/L
Clean DF: 1

CASNO	Target Analyte	Dilution Factor	Result	RptLimit/ LOQ/LOD	Result Qualifier	EPA Qualifier
7429-90-5	ALUMINUM	1	0.2	0.2	U	
7440-38-2	ARSENIC	1	0.01	0.01	U	
7440-41-7	BERYLLIUM	1	0.005	0.005	U	
7440-42-8	BORON	1	0.1	0.1	U	
7440-43-9	CADMIUM	1	0.005	0.005	U	
7440-70-2	CALCIUM	1	66	1		
7440-47-3	CHROMIUM	1	0.01	0.01	U	
7440-48-4	COBALT	1	0.01	0.01	U	
7440-50-8	COPPER	1	0.01	0.01	U	
7439-89-6	IRON	1	0.1	0.1	U	
7439-92-1	LEAD	1	0.003	0.003	U	
7439-93-2	LITHIUM	1	0.01	0.01	U	
7439-95-4	MAGNESIUM	1	19	1		
7439-96-5	MANGANESE	1	0.013	0.01		
7440-02-0	NICKEL	1	0.02	0.02	U	
7440-09-7	POTASSIUM	1	4	1		
7782-49-2	SELENIUM	1	0.005	0.005	U	
7440-23-5	SODIUM	1	15	1		
7440-62-2	VANADIUM	1	0.01	0.01	U	
7440-66-6	ZINC	1	0.12	0.02		

Data Package ID: *it1501020-1*

Dissolved Metals by 200.7

Method EPA200.7 Revision 4.4

Sample Results

Lab Name: **ALS Environmental -- FC**
Work Order Number: 1501020
Client Name: Environmental Alternatives, Inc.
ClientProject ID: Zephyr Gold USA ZML1265

Field ID: North MW
Lab ID: 1501020-2

Sample Matrix: WATER
% Moisture: N/A
Date Collected: 05-Jan-15
Date Extracted: 07-Jan-15
Date Analyzed: 08-Jan-15
Prep Method: EPA200.2 Rev 2.2

Prep Batch: IP150107-1
QCBatchID: IP150107-1-1
Run ID: IT150108-2A2
Cleanup: NONE
Basis: As Received
File Name: 150108A.

Analyst: Brent A. Stanfield
Sample Aliquot: 50 ML
Final Volume: 50 ML
Result Units: MG/L
Clean DF: 1

CASNO	Target Analyte	Dilution Factor	Result	RptLimit/ LOQ/LOD	Result Qualifier	EPA Qualifier
7429-90-5	ALUMINUM	1	0.2	0.2	U	
7440-38-2	ARSENIC	1	0.01	0.01	U	
7440-41-7	BERYLLIUM	1	0.005	0.005	U	
7440-42-8	BORON	1	0.15	0.1		
7440-43-9	CADMIUM	1	0.005	0.005	U	
7440-70-2	CALCIUM	1	61	1		
7440-47-3	CHROMIUM	1	0.01	0.01	U	
7440-48-4	COBALT	1	0.01	0.01	U	
7440-50-8	COPPER	1	0.01	0.01	U	
7439-89-6	IRON	1	0.1	0.1	U	
7439-92-1	LEAD	1	0.003	0.003	U	
7439-93-2	LITHIUM	1	0.038	0.01		
7439-95-4	MAGNESIUM	1	24	1		
7439-96-5	MANGANESE	1	0.089	0.01		
7440-02-0	NICKEL	1	0.02	0.02	U	
7440-09-7	POTASSIUM	1	5.6	1		
7782-49-2	SELENIUM	1	0.005	0.005	U	
7440-23-5	SODIUM	1	36	1		
7440-62-2	VANADIUM	1	0.01	0.01	U	
7440-66-6	ZINC	1	0.11	0.02		

Data Package ID: *it1501020-1*

Dissolved MERCURY

Method EPA245.1 Revision 3.0

Sample Results

Lab Name:	**ALS Environmental -- FC**		
Client Name:	Environmental Alternatives, Inc.		
Client Project ID:	Zephyr Gold USA ZML1265		
Work Order Number:	1501020	**Final Volume:**	10 g
Reporting Basis:	As Received	**Matrix:**	WATER
Prep Method:	METHOD	**Result Units:**	MG/L
Analyst:	Brent A. Stanfield		

Client Sample ID	Lab ID	Date Collected	Date Prepared	Date Analyzed	Percent Moisture	Dilution Factor	Result	RptLimit/ LOQ/LOD	Flag	Sample Aliquot
South MW	1501020-1	01/05/2015	01/09/2015	01/11/2015	N/A	1	0.0002	0.0002	U	10 g
North MW	1501020-2	01/05/2015	01/09/2015	01/11/2015	N/A	1	0.0002	0.0002	U	10 g

Comments:

1. ND or U = Not Detected at or above the client requested detection limit.

Data Package ID: *hg1501020-1*

Metals by 200.7

Method EPA200.7 Revision 4.4

Method Blank

Lab Name: **ALS Environmental -- FC**
Work Order Number: 1501020
Client Name: Environmental Alternatives, Inc.
ClientProject ID: Zephyr Gold USA ZML1265

Lab ID: FP150107-1MB

Sample Matrix: WATER
% Moisture: N/A
Date Collected: N/A
Date Extracted: 07-Jan-15
Date Analyzed: 08-Jan-15
Prep Method: EPA200.2 Rev 2.2

Prep Batch: IP150107-1
QCBatchID: IP150107-1-1
Run ID: IT150108-2A2
Cleanup: NONE
Basis: N/A
File Name: 150108A.

Sample Aliquot: 50 ml
Final Volume: 50 ml
Result Units: MG/L
Clean DF: 1

CASNO	Target Analyte	DF	Result	RptLimit/ LOQ/LOD	Result Qualifier	EPA Qualifier
7429-90-5	ALUMINUM	1	0.2	0.2	U	
7440-38-2	ARSENIC	1	0.01	0.01	U	
7440-41-7	BERYLLIUM	1	0.005	0.005	U	
7440-42-8	BORON	1	0.1	0.1	U	
7440-43-9	CADMIUM	1	0.005	0.005	U	
7440-70-2	CALCIUM	1	1	1	U	
7440-47-3	CHROMIUM	1	0.01	0.01	U	
7440-48-4	COBALT	1	0.01	0.01	U	
7440-50-8	COPPER	1	0.01	0.01	U	
7439-89-6	IRON	1	0.1	0.1	U	
7439-92-1	LEAD	1	0.003	0.003	U	
7439-93-2	LITHIUM	1	0.01	0.01	U	
7439-95-4	MAGNESIUM	1	1	1	U	
7439-96-5	MANGANESE	1	0.01	0.01	U	
7440-02-0	NICKEL	1	0.02	0.02	U	
7440-09-7	POTASSIUM	1	1	1	U	
7782-49-2	SELENIUM	1	0.005	0.005	U	
7440-23-5	SODIUM	1	1	1	U	
7440-62-2	VANADIUM	1	0.01	0.01	U	
7440-66-6	ZINC	1	0.02	0.02	U	

Data Package ID: *it1501020-1*

Metals by 200.7

Method EPA200.7 Revision 4.4

Laboratory Control Sample

Lab Name: **ALS Environmental -- FC**
Work Order Number: 1501020
Client Name: Environmental Alternatives, Inc.
ClientProject ID: Zephyr Gold USA ZML1265

Lab ID: FP150107-1LCS

Sample Matrix: WATER
% Moisture: N/A
Date Collected: N/A
Date Extracted: 01/07/2015
Date Analyzed: 01/08/2015
Prep Method: EPA200.22.2

Prep Batch: IP150107-1
QCBatchID: IP150107-1-1
Run ID: IT150108-2A2
Cleanup: NONE
Basis: N/A
File Name: 150108A.

Sample Aliquot: 50 ml
Final Volume: 50 ml
Result Units: MG/L
Clean DF: 1

CASNO	Target Analyte	Spike Added	LCS Result	Reporting Limit	Result Qualifier	LCS % Rec.	Control Limits
7429-90-5	ALUMINUM	2	2.09	0.2		104	85 - 115%
7440-38-2	ARSENIC	1	1.06	0.01		106	85 - 115%
7440-41-7	BERYLLIUM	0.05	0.0477	0.005		95	85 - 115%
7440-42-8	BORON	1	1.03	0.1		103	85 - 115%
7440-43-9	CADMIUM	0.05	0.051	0.005		102	85 - 115%
7440-70-2	CALCIUM	40	39.1	1		98	85 - 115%
7440-47-3	CHROMIUM	0.2	0.198	0.01		99	85 - 115%
7440-48-4	COBALT	0.5	0.509	0.01		102	85 - 115%
7440-50-8	COPPER	0.25	0.248	0.01		99	85 - 115%
7439-89-6	IRON	1	0.944	0.1		94	85 - 115%
7439-92-1	LEAD	0.5	0.506	0.003		101	85 - 115%
7439-93-2	LITHIUM	0.5	0.496	0.01		99	85 - 115%
7439-95-4	MAGNESIUM	40	40.4	1		101	85 - 115%
7439-96-5	MANGANESE	0.5	0.5	0.01		100	85 - 115%
7440-02-0	NICKEL	0.5	0.521	0.02		104	85 - 115%
7440-09-7	POTASSIUM	40	42.9	1		107	85 - 115%
7782-49-2	SELENIUM	2	2.1	0.005		105	85 - 115%
7440-23-5	SODIUM	40	41.7	1		104	85 - 115%
7440-62-2	VANADIUM	0.5	0.524	0.01		105	85 - 115%
7440-66-6	ZINC	0.5	0.496	0.02		99	85 - 115%

Data Package ID: *it1501020-1*

Mercury

Method EPA245.1 Revision 3.0

Method Blank

Lab Name: **ALS Environmental -- FC**
Work Order Number: 1501020
Client Name: Environmental Alternatives, Inc.
ClientProject ID: Zephyr Gold USA ZML1265

Lab ID: HG150109-3MB

Sample Matrix: WATER
% Moisture: N/A
Date Collected: N/A
Date Extracted: 09-Jan-15
Date Analyzed: 11-Jan-15
Prep Method: METHOD

Prep Batch: HG150109-3
QCBatchID: HG150109-3-1
Run ID: HG150111-1A2
Cleanup: NONE
Basis: N/A
File Name: HG150111-1

Sample Aliquot: 10 g
Final Volume: 10 g
Result Units: MG/L
Clean DF: 1

CASNO	Target Analyte	DF	Result	RptLimit/ LOQ/LOD	Result Qualifier	EPA Qualifier
7439-97-6	MERCURY	1	0.0002	0.0002	U	

Data Package ID: *hg1501020-1*

Mercury

Method EPA245.1 Revision 3.0

Laboratory Control Sample

Lab Name: **ALS Environmental -- FC**
Work Order Number: 1501020
Client Name: Environmental Alternatives, Inc.
ClientProject ID: Zephyr Gold USA ZML1265

Lab ID: HG150109-3LCS

Sample Matrix: WATER
% Moisture: N/A
Date Collected: N/A
Date Extracted: 01/09/2015
Date Analyzed: 01/11/2015
Prep Method: METHOD

Prep Batch: HG150109-3
QCBatchID: HG150109-3-1
Run ID: HG150111-1A2
Cleanup: NONE
Basis: N/A
File Name: HG150111-1

Sample Aliquot: 10 g
Final Volume: 10 g
Result Units: MG/L
Clean DF: 1

CASNO	Target Analyte	Spike Added	LCS Result	Reporting Limit	Result Qualifier	LCS % Rec.	Control Limits
7439-97-6	MERCURY	0.001	0.001	0.0002		100	85 - 115%

Data Package ID: *hg1501020-1*

Mercury

Method EPA245.1 Revision 3.0

Matrix Spike And Matrix Spike Duplicate

Lab Name: **ALS Environmental -- FC**
Work Order Number: 1501020
Client Name: Environmental Alternatives, Inc.
ClientProject ID: Zephyr Gold USA ZML1265

Field ID: South MW
LabID: 1501020-1MS

Sample Matrix: WATER
% Moisture: N/A
Date Collected: 05-Jan-15
Date Extracted: 09-Jan-15
Date Analyzed: 11-Jan-15
Prep Method: METHOD

Prep Batch: HG150109-3
QCBatchID: HG150109-3-1
Run ID: HG150111-1A2
Cleanup: NONE
Basis: As Received

Sample Aliquot: 10 g
Final Volume: 10 g
Result Units: MG/L
File Name: HG150111-1

CASNO	Target Analyte	Sample Result	Samp Qual	MS Result	MS Qual	Reporting Limit	Spike Added	MS % Rec.	Control Limits
7439-97-6	MERCURY	0.0002	U	0.00209		0.0002	0.002	104	70 - 130%

Field ID: South MW
LabID: 1501020-1MSD

Sample Matrix: WATER
% Moisture: N/A
Date Collected: 05-Jan-15
Date Extracted: 09-Jan-15
Date Analyzed: 11-Jan-15
Prep Method: METHOD

Prep Batch: HG150109-3
QCBatchID: HG150109-3-1
Run ID: HG150111-1A2
Cleanup: NONE
Basis: As Received

Sample Aliquot: 10 g
Final Volume: 10 g
Result Units: MG/L
File Name: HG150111-1

CASNO	Target Analyte	MSD Result	MSD Qual	Spike Added	MSD % Rec.	Reporting Limit	RPD Limit	RPD
7439-97-6	MERCURY	0.00212		0.002	106	0.0002	20	2

Data Package ID: *hg1501020-1*

Tuesday, June 09, 2015

Angela Bellantoni
Environmental Alternatives, Inc.
1107 Main Street
Canon City, CO 81212

Re: ALS Workorder: 1506035
Project Name: Zephyr Gold USA
Project Number: ZML1265

Dear Ms. Bellantoni:

One water sample was received from Environmental Alternatives, Inc., on 6/3/2015. The sample was scheduled for the following analyses:

Inorganics
Metals

The results for these analyses are contained in the enclosed reports.

The data contained in the following report have been reviewed and approved by the personnel listed below. In addition, ALS certifies that the analyses reported herein are true, complete and correct within the limits of the methods employed.

Thank you for your confidence in ALS Environmental. Should you have any questions, please call.

Sincerely,

Debbie Fazio

ALS Environmental
Amy R. Wolf (for)
Project Manager

ALS Environmental – Fort Collins is accredited by the following accreditation bodies for various testing scopes in accordance with requirements of each accreditation body. All testing is performed under the laboratory management system, which is maintained to meet these requirement and regulations. Please contact the laboratory or accreditation body for the current scope testing parameters.

ALS Environmental – Fort Collins	
Accreditation Body	License or Certification Number
Alaska (AK)	UST-086
Alaska (AK)	CO01099
Arizona (AZ)	AZ0742
California (CA)	06251CA
Colorado (CO)	CO01099
Connecticut (CT)	PH-0232
Florida (FL)	E87914
Idaho (ID)	CO01099
Kansas (KS)	E-10381
Kentucky (KY)	90137
L-A-B (DoD ELAP/ISO 170250)	L2257
Maryland (MD)	285
Missouri (MO)	175
Nebraska(NE)	NE-OS-24-13
Nevada (NV)	CO000782008A
New Jersey (NJ)	CO003
New York (NY)	12036
North Dakota (ND)	R-057
Oklahoma (OK)	1301
Pennsylvania (PA)	68-03116
Tennessee (TN)	2976
Texas (TX)	T104704241
Utah (UT)	CO01099
Washington (WA)	C1280

1506035

Metals:

The sample was analyzed following Methods for the Determination of Metals in Environmental Samples – Supplement 1 procedures. Analysis by Trace ICP followed method 200.7 and the current revision of SOP 807. Mercury analysis by CVAA followed method 245.1 and the current revision of SOP 812.

The sample was to be analyzed for dissolved metals. The sample was filtered through a 0.45 micron filter and preserved with nitric acid to a pH less than 2 prior to analysis.

All acceptance criteria were met.

Inorganics:

The sample was analyzed following MCAWW and EMSL procedures for the current revisions of the following SOPs and methods:

Analyte	Method	SOP #
Alkalinity	310.1	1106
Bicarbonate	310.1	1106
Carbonate	310.1	1106
pH	150.1	1126
Specific conductance	120.1	1128
TDS	160.1	1101
Chloride	300.0 Revision 2.1	1113
Fluoride	300.0 Revision 2.1	1113
Nitrate as N	300.0 Revision 2.1	1113
Nitrite as N	300.0 Revision 2.1	1113
Total Nitrates	300.0 Revision 2.1	1113
Sulfate	300.0 Revision 2.1	1113

All acceptance criteria were met.

ALS Environmental -- FC

Sample Number(s) Cross-Reference Table

OrderNum: 1506035
Client Name: Environmental Alternatives, Inc.
Client Project Name: Zephyr Gold USA
Client Project Number: ZML1265
Client PO Number:

Client Sample Number	Lab Sample Number	COC Number	Matrix	Date Collected	Time Collected
Dawson Surface PT #2	1506035-1		WATER	02-Jun-15	8:47

ALS Laboratory Group

225 Commerce Drive, Fort Collins, Colorado 80524
TF: (800) 443-1511 PH: (970) 490-1511 FX: (970) 490-1522

Chain-of-Custody

Form 202r8

WORKORDER # 1506035

		SAMPLER	A. Bellantoni	**DATE**	6/2/2015	**PAGE**	1 of 1
PROJECT NAME	Zephyr Gold USA	**SITE ID**	Dawson Mine	**TURNAROUND**	SLOW	**DISPOSAL**	[✓ By Lab] or Return to Client
PROJECT No.	ZM 1265	**EDD FORMAT**					
		PURCHASE ORDER					
COMPANY NAME	EAI	**BILL TO COMPANY**					
SEND REPORT TO	A. Bellantoni	**INVOICE ATTN TO**					
ADDRESS	1107 Main St.	**ADDRESS**					
CITY / STATE / ZIP	Canon City, CO 81212	**CITY / STATE / ZIP**					
PHONE	719-275-8951	**PHONE**					
FAX	719-275-1715	**FAX**					
E-MAIL	angela@envalternatives.com	**E-MAIL**					

Lab ID	Field ID	Matrix	Sample Date	Sample Time	# Bottles	Pres.	QC	Cations 6010 or 200.7	Hg 7470 or 245.1	pH 150.1	Sp Cond 120.1	Anions 300.0	Alkalinity 310.1	TDS 160.1	see attached	please
①	Dawson Surface Pt #2	W	6/2/15	8:47A	2		✓									

*Time Zone (Circle): EST CST MST PST Matrix: O = oil S = soil NS = non-soil solid W = water L = liquid E = extract F = filter

For metals or anions, please detail analytes below.

Comments:

QC PACKAGE (check below)	
	LEVEL II (Standard QC)
	LEVEL III (Std QC + forms)
	LEVEL IV (Std QC + forms + raw data)

	SIGNATURE	PRINTED NAME	DATE	TIME
RELINQUISHED BY	Angela Bellantoni	Angela M. Bellantoni	6/2/2015	11 AM
RECEIVED BY	Erin Peterson	Erin Peterson	6/3/15	1005
RELINQUISHED BY				
RECEIVED BY				
RELINQUISHED BY				
RECEIVED BY				

Preservative Key: 1-HCl 2-HNO3 3-H2SO4 4-NaOH 5-NaHSO4 7-Other 8-4 degrees C 9-5035

ALS Environmental - Fort Collins
CONDITION OF SAMPLE UPON RECEIPT FORM

Client: EAI
Workorder No: 1506035
Project Manager: ARW
Initials: ECP Date: 6/3/15

1. Does this project require any special handling in addition to standard ALS procedures?		YES	[✓ NO]
2. Are custody seals on shipping containers intact?	NONE	[✓ YES]	NO
3. Are Custody seals on sample containers intact?	[✓ NONE]	YES	NO
4. Is there a COC (Chain-of-Custody) present or other representative documents?		[✓ YES]	NO
5. Are the COC and bottle labels complete and legible?		[✓ YES]	NO
6. Is the COC in agreement with samples received? (IDs, dates, times, no. of samples, no. of containers, matrix, requested analyses, etc.)		[✓ YES]	NO
7. Were airbills / shipping documents present and/or removable?	DROP OFF	[✓ YES]	NO
8. Are all aqueous samples requiring preservation preserved correctly? (excluding volatiles)	[✓ N/A]	YES	NO
9. Are all aqueous non-preserved samples pH 4-9?	N/A	[✓ YES]	NO
10. Is there sufficient sample for the requested analyses?		[✓ YES]	NO
11. Were all samples placed in the proper containers for the requested analyses?		[✓ YES]	NO
12. Are all samples within holding times for the requested analyses?		[✓ YES]	NO
13. Were all sample containers received intact? (not broken or leaking, etc.)		[✓ YES]	NO
14. Are all samples requiring no headspace (VOC, GRO, RSK/MEE, Rx CN/S, radon) headspace free? Size of bubble: ____ < green pea ____ > green pea	[✓ N/A]	YES	NO
* 15. Do any water samples contain sediment? Amount Amount of sediment: ____ dusting ____ moderate ____heavy	N/A	[✓ YES]	NO
16. Were the samples shipped on ice?		[✓ YES]	NO
17. Were cooler temperatures measured at 0.1-6.0°C? IR gun used*: #2 [✓ #4]	RAD ONLY	[✓ YES]	NO

Cooler #: 1
Temperature (°C): 3.4°
No. of custody seals on cooler: 1

DOT Survey/ Acceptance Information

External µR/hr reading: 9
Background µR/hr reading: 11

Were external µR/hr readings ≤ two times background and within DOT acceptance criteria? [✓ YES] / NO / NA (If no, see Form 008.)

Additional Information: PROVIDE DETAILS BELOW FOR A NO RESPONSE TO ANY QUESTION ABOVE, EXCEPT #1 AND #16.

15) 1-1, 1-2 very Light dusting.

If applicable, was the client contacted? YES / NO / [✓ NA] Contact: ____________ Date/Time: ________

Project Manager Signature / Date: 6/5/15

*IR Gun #2: Oakton, SN 29922500201-0066
*IR Gun #4: Oakton, SN 2372220101-0002

Form 201r24.xls (06/04/2012)

Page 1 of 1

1506035.

SUSIE
(719) 275-0269
SUSIE SMITH PACHECO
306 MAIN ST
CANON CITY CO 81212

19 LBS

1 OF 1

DWT: 22,11,14

SHIP TO:
ALS LABORATORY GROUP
225 COMMERCE DRIVE
FORT COLLINS CO 80524

CO 805 0-01

UPS NEXT DAY AIR **1**

TRACKING #: 1Z 045 5E7 01 5537 7926

BILLING: P/P

3.4°

W8 18.0.30 Zebra ZP 450 63.0A 04/2015

ALS Environmental -- FC

SAMPLE SUMMARY REPORT

Client: Environmental Alternatives, Inc.
Project: ZML1265 Zephyr Gold USA
Sample ID: Dawson Surface PT #2
Legal Location:
Collection Date: 6/2/2015 08:47

Date: *09-Jun-15*
Work Order: 1506035
Lab ID: 1506035-1
Matrix: WATER
Percent Moisture:

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
Alkalinity as Calcium Carbonate		**EPA310.1**			Prep Date: **6/4/2015**	PrepBy: **JAC**
BICARBONATE AS CaCO3	**180**		**20**	**MG/L**	1	6/4/2015
CARBONATE AS CaCO3	ND		20	MG/L	1	6/4/2015
TOTAL ALKALINITY AS CaCO3	**180**		**20**	**MG/L**	1	6/4/2015
Ion Chromatography		**EPA300.0**			Prep Date: **6/3/2015**	PrepBy: **AJD**
CHLORIDE	**4.5**		**0.2**	**MG/L**	1	6/3/2015 23:50
FLUORIDE	**2.1**		**0.1**	**MG/L**	1	6/3/2015 23:50
NITRITE AS N	ND		0.1	MG/L	1	6/3/2015 23:50
NITRATE/NITRITE AS N	**0.82**		**0.1**	**MG/L**	1	6/3/2015 23:50
NITRATE AS N	**0.82**		**0.2**	**MG/L**	1	6/3/2015 23:50
SULFATE	**78**		**1**	**MG/L**	1	6/3/2015 23:50
Dissolved Mercury		**EPA245.1**			Prep Date: **6/8/2015**	PrepBy: **NAQ**
MERCURY	ND		0.0002	MG/L	1	6/8/2015 15:06
Dissolved Metals by 200.7		**EPA200.7**			Prep Date: **6/4/2015**	PrepBy: **NAQ**
ALUMINUM	ND		0.2	MG/L	1	6/4/2015 17:27
ARSENIC	ND		0.01	MG/L	1	6/4/2015 17:27
BORON	ND		0.1	MG/L	1	6/4/2015 17:27
BERYLLIUM	ND		0.005	MG/L	1	6/4/2015 17:27
CALCIUM	**75**		**1**	**MG/L**	1	6/4/2015 17:27
CADMIUM	ND		0.005	MG/L	1	6/4/2015 17:27
COBALT	ND		0.01	MG/L	1	6/4/2015 17:27
CHROMIUM	ND		0.01	MG/L	1	6/4/2015 17:27
COPPER	ND		0.01	MG/L	1	6/4/2015 17:27
IRON	ND		0.1	MG/L	1	6/4/2015 17:27
POTASSIUM	**2.6**		**1**	**MG/L**	1	6/4/2015 17:27
LITHIUM	ND		0.01	MG/L	1	6/4/2015 17:27
MAGNESIUM	**22**		**1**	**MG/L**	1	6/4/2015 17:27
MANGANESE	ND		0.01	MG/L	1	6/4/2015 17:27
SODIUM	**9.5**		**1**	**MG/L**	1	6/4/2015 17:27
NICKEL	ND		0.02	MG/L	1	6/4/2015 17:27
LEAD	ND		0.003	MG/L	1	6/4/2015 17:27
SELENIUM	**0.0062**		**0.005**	**MG/L**	1	6/4/2015 17:27
VANADIUM	ND		0.01	MG/L	1	6/4/2015 17:27
ZINC	**0.34**		**0.02**	**MG/L**	1	6/4/2015 17:27
pH		**EPA150.1**			Prep Date: **6/5/2015**	PrepBy: **JAC**
PH	**8.36**		**0.1**	**pH**	1	6/5/2015
Specific Conductance in Water		**EPA120.1**			Prep Date: **6/5/2015**	PrepBy: **JAC**
SPECIFIC CONDUCTIVITY	**513**		**1**	**umhos/cm**	1	6/5/2015
Total Dissolved Solids		**EPA160.1**			Prep Date: **6/5/2015**	PrepBy: **JAC**
TOTAL DISSOLVED SOLIDS	**340**		**20**	**MG/L**	1	6/8/2015

Client:	Environmental Alternatives, Inc.	**Date:**	*09-Jun-15*
Project:	ZML1265 Zephyr Gold USA	**Work Order:**	1506035
Sample ID:	Dawson Surface PT #2	**Lab ID:**	1506035-1
Legal Location:		**Matrix:**	WATER
Collection Date:	6/2/2015 08:47	**Percent Moisture:**	

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed

Explanation of Qualifiers

Radiochemistry:

U or ND - Result is less than the sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative yield is assumed.

Y2 - Chemical Yield outside default limits.

W - DER is greater than Warning Limit of 1.42

* - Aliquot Basis is 'As Received' while the Report Basis is 'Dry Weight'.

- Aliquot Basis is 'Dry Weight' while the Report Basis is 'As Received'.

G - Sample density differs by more than 15% of LCS density.

D - DER is greater than Control Limit

M - Requested MDC not met.

LT - Result is less than requested MDC but greater than achieved MDC.

M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

L - LCS Recovery below lower control limit.

H - LCS Recovery above upper control limit.

P - LCS, Matrix Spike Recovery within control limits.

N - Matrix Spike Recovery outside control limits

NC - Not Calculated for duplicate results less than 5 times MDC

B - Analyte concentration greater than MDC.

B3 - Analyte concentration greater than MDC but less than Requested MDC.

Inorganics:

B - Result is less than the requested reporting limit but greater than the instrument method detection limit (MDL).

U or ND - Indicates that the compound was analyzed for but not detected.

E - The reported value is estimated because of the presence of interference. An explanatory note may be included in the narrative.

M - Duplicate injection precision was not met.

N - Spiked sample recovery not within control limits. A post spike is analyzed for all ICP analyses when the matrix spike and or spike duplicate fail and the native sample concentration is less than four times the spike added concentration.

Z - Spiked recovery not within control limits. An explanatory note may be included in the narrative.

* - Duplicate analysis (relative percent difference) not within control limits.

S - SAR value is estimated as one or more analytes used in the calculation were not detected above the detection limit.

Organics:

U or ND - Indicates that the compound was analyzed for but not detected.

B - Analyte is detected in the associated method blank as well as in the sample. It indicates probable blank contamination and warns the data user.

E - Analyte concentration exceeds the upper level of the calibration range.

J - Estimated value. The result is less than the reporting limit but greater than the instrument method detection limit (MDL).

A - A tentatively identified compound is a suspected aldol-condensation product.

X - The analyte was diluted below an accurate quantitation level.

* - The spike recovery is equal to or outside the control criteria used.

+ - The relative percent difference (RPD) equals or exceeds the control criteria.

G - A pattern resembling gasoline was detected in this sample.

D - A pattern resembling diesel was detected in this sample.

M - A pattern resembling motor oil was detected in this sample.

C - A pattern resembling crude oil was detected in this sample.

4 - A pattern resembling JP-4 was detected in this sample.

5 - A pattern resembling JP-5 was detected in this sample.

H - Indicates that the fuel pattern was in the heavier end of the retention time window for the analyte of interest.

L - Indicates that the fuel pattern was in the lighter end of the retention time window for the analyte of interest.

Z - This flag indicates that a significant fraction of the reported result did not resemble the patterns of any of the following petroleum hydrocarbon products:
- gasoline
- JP-8
- diesel
- mineral spirits
- motor oil
- Stoddard solvent
- bunker C

Client: Environmental Alternatives, Inc.
Work Order: 1506035
Project: ZML1265 Zephyr Gold USA

QC BATCH REPORT

Batch ID: **HG150608-1-1** Instrument ID: **CETAC7500** Method: **EPA245.1**

LCS Sample ID: **HG150608-1** Units: **MG/L** Analysis Date: **6/8/2015 15:02**
Client ID: Run ID: **HG150608-1A3** Prep Date: **6/8/2015** DF: **1**

Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	RPD Ref	RPD	RPD Limit	Qual
MERCURY	0.00104	0.0002	0.001		104	85-115				20	

MB Sample ID: **HG150608-1** Units: **MG/L** Analysis Date: **6/8/2015 14:58**
Client ID: Run ID: **HG150608-1A3** Prep Date: **6/8/2015** DF: **1**

Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	RPD Ref	RPD	RPD Limit	Qual
MERCURY	ND	0.0002									

The following samples were analyzed in this batch: 1506035-1

Client: Environmental Alternatives, Inc.
Work Order: 1506035
Project: ZML1265 Zephyr Gold USA

QC BATCH REPORT

Batch ID: **IP150604-3-1** Instrument ID: **ICPTrace2** Method: **EPA200.7**

LCS Sample ID: **FP150604-3** Units: **MG/L** Analysis Date: **6/4/2015 17:26**

Client ID: Run ID: **IT150604-2A3** Prep Date: **6/4/2015** DF: **1**

Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	RPD Ref	RPD	RPD Limit	Qual
ALUMINUM	2.05	0.2	2		102	85-115				20	
ARSENIC	1.04	0.01	1		104	85-115				20	
BERYLLIUM	0.0517	0.005	0.05		103	85-115				20	
BORON	1.02	0.1	1		102	85-115				20	
CADMIUM	0.0509	0.005	0.05		102	85-115				20	
CALCIUM	40.3	1	40		101	85-115				20	
CHROMIUM	0.211	0.01	0.2		105	85-115				20	
COBALT	0.521	0.01	0.5		104	85-115				20	
COPPER	0.245	0.01	0.25		98	85-115				20	
IRON	0.956	0.1	1		96	85-115				20	
LEAD	0.507	0.003	0.5		101	85-115				20	
LITHIUM	0.468	0.01	0.5		94	85-115				20	
MAGNESIUM	39.3	1	40		98	85-115				20	
MANGANESE	0.521	0.01	0.5		104	85-115				20	
NICKEL	0.53	0.02	0.5		106	85-115				20	
POTASSIUM	37.6	1	40		94	85-115				20	
SELENIUM	2.12	0.005	2		106	85-115				20	
SODIUM	37.8	1	40		95	85-115				20	
VANADIUM	0.504	0.01	0.5		101	85-115				20	
ZINC	0.536	0.02	0.5		107	85-115				20	

QC BATCH REPORT

Batch ID: **IP150604-3-1** Instrument ID: **ICPTrace2** Method: **EPA200.7**

MB Sample ID: **FP150604-3** Units: **MG/L** Analysis Date: **6/4/2015 17:23**

Client ID: Run ID: **IT150604-2A3** Prep Date: **6/4/2015** DF: **1**

Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	RPD Ref	RPD	RPD Limit	Qual
ALUMINUM	ND	0.2									
ARSENIC	ND	0.01									
BERYLLIUM	ND	0.005									
BORON	ND	0.1									
CADMIUM	ND	0.005									
CALCIUM	ND	1									
CHROMIUM	ND	0.01									
COBALT	ND	0.01									
COPPER	ND	0.01									
IRON	ND	0.1									
LEAD	ND	0.003									
LITHIUM	ND	0.01									
MAGNESIUM	ND	1									
MANGANESE	ND	0.01									
NICKEL	ND	0.02									
POTASSIUM	ND	1									
SELENIUM	ND	0.005									
SODIUM	ND	1									
VANADIUM	ND	0.01									
ZINC	ND	0.02									

QC BATCH REPORT

Batch ID: **IP150604-3-1** Instrument ID: **ICPTrace2** Method: **EPA200.7**

MS Sample ID: **1506035-1** Units: **MG/L** Analysis Date: **6/4/2015 17:33**

Client ID: **Dawson Surface PT #2** Run ID: **IT150604-2A3** Prep Date: **6/4/2015** DF: **1**

Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	RPD Ref	RPD	RPD Limit	Qual
ALUMINUM	2.17	0.2	2	0.2	109	70-130				20	
ARSENIC	1.11	0.01	1	0.01	111	70-130				20	
BERYLLIUM	0.0541	0.005	0.05	0.005	108	70-130				20	
BORON	1.12	0.1	1	0.1	112	70-130				20	
CADMIUM	0.0548	0.005	0.05	0.005	110	70-130				20	
CALCIUM	117	1	40	75	105	70-130				20	
CHROMIUM	0.221	0.01	0.2	0.01	110	70-130				20	
COBALT	0.548	0.01	0.5	0.01	110	70-130				20	
COPPER	0.27	0.01	0.25	0.01	108	70-130				20	
IRON	1	0.1	1	0.1	100	70-130				20	
LEAD	0.541	0.003	0.5	0.003	108	70-130				20	
LITHIUM	0.55	0.01	0.5	0.01	110	70-130				20	
MAGNESIUM	64.2	1	40	22	105	70-130				20	
MANGANESE	0.548	0.01	0.5	0.01	110	70-130				20	
NICKEL	0.561	0.02	0.5	0.02	112	70-130				20	
POTASSIUM	46.4	1	40	2.6	110	70-130				20	
SELENIUM	2.23	0.005	2	0.0062	111	70-130				20	
SODIUM	55.1	1	40	9.5	114	70-130				20	
VANADIUM	0.536	0.01	0.5	0.01	107	70-130				20	
ZINC	0.87	0.02	0.5	0.34	107	70-130				20	

QC BATCH REPORT

Batch ID: **IP150604-3-1** Instrument ID: **ICPTrace2** Method: **EPA200.7**

MSD Sample ID: **1506035-1** Units: **MG/L** Analysis Date: **6/4/2015 17:39**

Client ID: **Dawson Surface PT #2** Run ID: **IT150604-2A3** Prep Date: **6/4/2015** DF: **1**

Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	RPD Ref	RPD	RPD Limit	Qual
ALUMINUM	2.11	0.2	2	0.2	106	70-130		2.17	3	20	
ARSENIC	1.13	0.01	1	0.01	113	70-130		1.11	2	20	
BERYLLIUM	0.0558	0.005	0.05	0.005	112	70-130		0.0541	3	20	
BORON	1.14	0.1	1	0.1	114	70-130		1.12	2	20	
CADMIUM	0.0554	0.005	0.05	0.005	111	70-130		0.0548	1	20	
CALCIUM	121	1	40	75	115.3	70-130		117	3	20	
CHROMIUM	0.229	0.01	0.2	0.01	114	70-130		0.221	4	20	
COBALT	0.566	0.01	0.5	0.01	113	70-130		0.548	3	20	
COPPER	0.276	0.01	0.25	0.01	110	70-130		0.27	2	20	
IRON	1.19	0.1	1	0.1	119	70-130		1	17	20	
LEAD	0.554	0.003	0.5	0.003	111	70-130		0.541	2	20	
LITHIUM	0.559	0.01	0.5	0.01	112	70-130		0.55	2	20	
MAGNESIUM	65.7	1	40	22	109.1	70-130		64.2	2	20	
MANGANESE	0.563	0.01	0.5	0.01	113	70-130		0.548	3	20	
NICKEL	0.576	0.02	0.5	0.02	115	70-130		0.561	3	20	
POTASSIUM	47.2	1	40	2.6	111.6	70-130		46.4	2	20	
SELENIUM	2.25	0.005	2	0.0062	112.4	70-130		2.23	1	20	
SODIUM	56	1	40	9.5	116.1	70-130		55.1	1	20	
VANADIUM	0.551	0.01	0.5	0.01	110	70-130		0.536	3	20	
ZINC	0.892	0.02	0.5	0.34	111.2	70-130		0.87	3	20	

The following samples were analyzed in this batch: 1506035-1

Client: Environmental Alternatives, Inc.
Work Order: 1506035
Project: ZML1265 Zephyr Gold USA

QC BATCH REPORT

Batch ID: **AK150604-1-1** Instrument ID: **Balance** Method: **EPA310.1**

DUP Sample ID: **1506035-1** Units: **MG/L** Analysis Date: **6/4/2015**
Client ID: **Dawson Surface PT #2** Run ID: **AK150604-1A1** Prep Date: **6/4/2015** DF: **1**

Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	RPD Ref	RPD	RPD Limit	Qual
BICARBONATE AS CaCO3	184	20						180	0	15	
CARBONATE AS CaCO3	ND	20						20		15	
TOTAL ALKALINITY AS CaCO3	184	20						180	0	15	

LCS Sample ID: **AK150604-1** Units: **MG/L** Analysis Date: **6/4/2015**
Client ID: Run ID: **AK150604-1A1** Prep Date: **6/4/2015** DF: **1**

Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	RPD Ref	RPD	RPD Limit	Qual
TOTAL ALKALINITY AS CaCO3	99.4	5	100		99	85-115				15	

MB Sample ID: **AK150604-1** Units: **MG/L** Analysis Date: **6/4/2015**
Client ID: Run ID: **AK150604-1A1** Prep Date: **6/4/2015** DF: **1**

Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	RPD Ref	RPD	RPD Limit	Qual
BICARBONATE AS CaCO3	ND	5									
CARBONATE AS CaCO3	ND	5									
TOTAL ALKALINITY AS CaCO3	ND	5									

The following samples were analyzed in this batch: 1506035-1

Client: Environmental Alternatives, Inc.
Work Order: 1506035
Project: ZML1265 Zephyr Gold USA

QC BATCH REPORT

Batch ID: **IC150603-1-4** Instrument ID: **IC-2** Method: **EPA300.0**

LCS Sample ID: **IC150603-1** Units: **MG/L** Analysis Date: **6/3/2015 19:48**
Client ID: Run ID: **IC150603-1A4** Prep Date: **6/3/2015** DF: **1**

Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	RPD Ref	RPD	RPD Limit	Qual
FLUORIDE	1.91	0.1	2		95	90-110				15	
CHLORIDE	5.04	0.2	5		101	90-110				15	
NITRITE AS N	1.97	0.1	2		99	90-110				15	
NITRATE AS N	4.96	0.2	5		99	90-110				15	
SULFATE	19.6	1	20		98	90-110				15	

MB Sample ID: **IC150603-1** Units: **MG/L** Analysis Date: **6/3/2015 20:03**
Client ID: Run ID: **IC150603-1A4** Prep Date: **6/3/2015** DF: **1**

Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	RPD Ref	RPD	RPD Limit	Qual
FLUORIDE	ND	0.1									
CHLORIDE	ND	0.2									
NITRITE AS N	ND	0.1									
NITRATE AS N	ND	0.2									
SULFATE	ND	1									

The following samples were analyzed in this batch: 1506035-1

Client: Environmental Alternatives, Inc.
Work Order: 1506035
Project: ZML1265 Zephyr Gold USA

QC BATCH REPORT

Batch ID: **TD150605-1-3** Instrument ID: **Balance** Method: **EPA160.1**

LCS Sample ID: **TD150605-1** Units: **MG/L** Analysis Date: **6/8/2015**
Client ID: Run ID: **TD150608-1A1** Prep Date: **6/5/2015** DF: **1**

Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	RPD Ref	RPD	RPD Limit	Qual
TOTAL DISSOLVED SOLIDS	408	20	400		102	85-115				5	

MB Sample ID: **TD150605-1** Units: **MG/L** Analysis Date: **6/8/2015**
Client ID: Run ID: **TD150608-1A1** Prep Date: **6/5/2015** DF: **1**

Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	RPD Ref	RPD	RPD Limit	Qual
TOTAL DISSOLVED SOLIDS	ND	20									

The following samples were analyzed in this batch: 1506035-1

Thursday, July 09, 2015

Angela Bellantoni
Environmental Alternatives, Inc.
1107 Main Street
Canon City, CO 81212

Re: ALS Workorder: 1507032
Project Name: Zephyr Gold USA
Project Number: ZML1265

Dear Ms. Bellantoni:

Two water samples were received from Environmental Alternatives, Inc., on 7/2/2015. The samples were scheduled for the following analyses:

- Inorganics
- Metals

The results for these analyses are contained in the enclosed reports.

The data contained in the following report have been reviewed and approved by the personnel listed below. In addition, ALS certifies that the analyses reported herein are true, complete and correct within the limits of the methods employed.

Thank you for your confidence in ALS Environmental. Should you have any questions, please call.

Sincerely,

AWolf

ALS Environmental
Amy R. Wolf
Project Manager

ALS Environmental – Fort Collins is accredited by the following accreditation bodies for various testing scopes in accordance with requirements of each accreditation body. All testing is performed under the laboratory management system, which is maintained to meet these requirement and regulations. Please contact the laboratory or accreditation body for the current scope testing parameters.

ALS Environmental – Fort Collins	
Accreditation Body	License or Certification Number
Alaska (AK)	UST-086
Alaska (AK)	CO01099
Arizona (AZ)	AZ0742
California (CA)	06251CA
Colorado (CO)	CO01099
Connecticut (CT)	PH-0232
Florida (FL)	E87914
Idaho (ID)	CO01099
Kansas (KS)	E-10381
Kentucky (KY)	90137
L-A-B (DoD ELAP/ISO 170250)	L2257
Maryland (MD)	285
Missouri (MO)	175
Nebraska(NE)	NE-OS-24-13
Nevada (NV)	CO000782008A
New York (NY)	12036
North Dakota (ND)	R-057
Oklahoma (OK)	1301
Pennsylvania (PA)	68-03116
Tennessee (TN)	2976
Texas (TX)	T104704241
Utah (UT)	CO01099
Washington (WA)	C1280

1507032

Metals:

The samples were analyzed following Methods for the Determination of Metals in Environmental Samples – Supplement 1 procedures. Analysis by Trace ICP followed method 200.7 and the current revision of SOP 807. Mercury analysis by CVAA followed method 245.1 and the current revision of SOP 812.

The samples were to be analyzed for dissolved metals. The samples were filtered through a 0.45 micron filter and preserved with nitric acid to a pH less than 2 prior to analysis.

All acceptance criteria were met.

Inorganics:

The samples were analyzed following MCAWW and EMSL procedures for the current revisions of the following SOPs and methods:

Analyte	Method	SOP #
Alkalinity	310.1	1106
Bicarbonate	310.1	1106
Carbonate	310.1	1106
pH	150.1	1126
Specific conductance	120.1	1128
TDS	160.1	1101
Chloride	300.0 Revision 2.1	1113
Fluoride	300.0 Revision 2.1	1113
Nitrate as N	300.0 Revision 2.1	1113
Nitrite as N	300.0 Revision 2.1	1113
Total Nitrates	300.0 Revision 2.1	1113
Sulfate	300.0 Revision 2.1	1113

All acceptance criteria were met.

ALS Environmental -- FC

Sample Number(s) Cross-Reference Table

OrderNum: 1507032
Client Name: Environmental Alternatives, Inc.
Client Project Name: Zephyr Gold USA
Client Project Number: ZML1265
Client PO Number:

Client Sample Number	Lab Sample Number	COC Number	Matrix	Date Collected	Time Collected
North Well	1507032-1		WATER	01-Jul-15	8:42
South Well	1507032-2		WATER	01-Jul-15	9:06

ALS Environmental

225 Commerce Drive, Fort Collins, Colorado 80524
TF: (800) 443-1511 PH: (970) 490-1511 FX: (970) 490-1522

Chain-of-Custody

Form 202r8

WORKORDER #: 1507032

		SAMPLER	Angela Bellantoni	DATE	7/1/2015	PAGE	1 of 1
PROJECT NAME	Zephyr Gold USA	SITE ID	Dawson Mine	TURNAROUND	SLOOOW	DISPOSAL	[✓ By Lab] or Return to Client
PROJECT No.	ZML1265	EDD FORMAT					
		PURCHASE ORDER					
COMPANY NAME	Environmental Alternatives Inc.	BILL TO COMPANY					
SEND REPORT TO	Angela Bellantoni	INVOICE ATTN TO					
ADDRESS	1107 Main Street	ADDRESS					
CITY / STATE / ZIP	Cañon City, CO 81212	CITY / STATE / ZIP					
PHONE	719-275-8951	PHONE					
FAX	719-275-1715	FAX					
E-MAIL	angela@envalternatives.com	E-MAIL					

Lab ID	Field ID	Matrix	Sample Date	Sample Time	# Bottles	Pres.	QC	cations Method 6010 or 200.7	Hg Method 7470 or 245.1	pH Method 150.1	Specific Conductivity Method 120.1	Anions Method 300.0	Alkalinity Method 310.1	TDS Method 160.1
①	North Well	W	7/1/2015	8:42 AM	2		x	x	x	x	x	x	x	x
②	South Well	W	7/1/2015	9:06 AM	2		x	x	x	x	x	x	x	x

*Time Zone (Circle): EST CST MST PST Matrix: O = oil S = soil NS = non-soil solid W = water L = liquid E = extract F = filter

For metals or anions, please detail analytes below.

Comments:

Please see attached analytical suite.

QC PACKAGE (check below)	
X	LEVEL II (Standard QC)
	LEVEL III (Std QC + forms)
	LEVEL IV (Std QC + forms + raw data)

Preservative Key: 1-HCl 2-HNO3 3-H2SO4 4-NaOH 5-NaHSO4 7-Other 8-4 degrees C 9-5035

	SIGNATURE	PRINTED NAME	DATE	TIME
RELINQUISHED BY		Angela M. Bellantoni	7/1/15	13:00
RECEIVED BY		Scott Malley	7/02/15	0930
RELINQUISHED BY				
RECEIVED BY				
RELINQUISHED BY				
RECEIVED BY				

ALS Environmental - Fort Collins
CONDITION OF SAMPLE UPON RECEIPT FORM

Client: EAI
Workorder No: 1507032
Project Manager: ARW
Initials: SDH
Date: 07-02-15

1.	Does this project require any special handling in addition to standard ALS procedures?		YES	[✓ NO]
2.	Are custody seals on shipping containers intact?	NONE	[✓ YES]	NO
3.	Are Custody seals on sample containers intact?	[✓ NONE]	YES	NO
4.	Is there a COC (Chain-of-Custody) present or other representative documents?		[✓ YES]	NO
5.	Are the COC and bottle labels complete and legible?		[✓ YES]	NO
6.	Is the COC in agreement with samples received? (IDs, dates, times, no. of samples, no. of containers, matrix, requested analyses, etc.)		[✓ YES]	NO
7.	Were airbills / shipping documents present and/or removable?	DROP OFF	[✓ YES]	NO
8.	Are all aqueous samples requiring preservation preserved correctly? (excluding volatiles)	[✓ N/A]	YES	NO
9.	Are all aqueous non-preserved samples pH 4-9?	N/A	[✓ YES]	NO
10.	Is there sufficient sample for the requested analyses?		[✓ YES]	NO
11.	Were all samples placed in the proper containers for the requested analyses?		[✓ YES]	NO
12.	Are all samples within holding times for the requested analyses?		[✓ YES]	NO
13.	Were all sample containers received intact? (not broken or leaking, etc.)		[✓ YES]	NO
14.	Are all samples requiring no headspace (VOC, GRO, RSK/MEE, Rx CN/S, radon) headspace free? Size of bubble: ____ < green pea ____ > green pea	[✓ N/A]	YES	NO
* 15.	Do any water samples contain sediment? Amount Amount of sediment: X dusting ____ moderate ____ heavy	N/A	[✓ YES]	NO
16.	Were the samples shipped on ice?		[✓ YES]	NO
17.	Were cooler temperatures measured at 0.1-6.0°C? IR gun used*: [✓ #2] #4	RAD ONLY	[✓ YES]	NO

Cooler #:	1							
Temperature (°C):	0.8							
No. of custody seals on cooler:	1							
External µR/hr reading:	11							
Background µR/hr reading:	11							

DOT Survey/ Acceptance Information

Were external µR/hr readings ≤ two times background and within DOT acceptance criteria? [✓ YES] / NO / NA (If no, see Form 008.)

Additional Information: PROVIDE DETAILS BELOW FOR A NO RESPONSE TO ANY QUESTION ABOVE, EXCEPT #1 AND #16.

15.) Sample 1 (North well) bottles 1 + 2 have a heavy dusting of sediment.
Sample 2 (South well) bottles 1 + 2 have a dusting of sediment.

Noted aw 7/2/15

If applicable, was the client contacted? YES / NO / [✓ NA] Contact: ____ Date/Time: ____

Project Manager Signature / Date: 7/2/15

*IR Gun #2: Oakton, SN 29922500201-0066
*IR Gun #4: Oakton, SN 2372220101-0002

Form 201r24.xls (06/04/2012)

1507032

SUSIE
(719) 275-0269
SUSIE SMITH PACHECO
306 MAIN ST
CANON CITY CO 81212

21 LBS

1 OF 1

SHIP TO:

ALS LABORATORY GROUP
225 COMMERCE DRIVE
FORT COLLINS CO 80524

11

-1

08°c

CO 805 0-01

UPS NEXT DAY AIR

TRACKING #: 1Z 045 5E7 01 5706 0924

1

BILLING: P/P

WS 18.0.30 Zebra ZP 450

1Z0455E7015706 0924 1030
BYX4NGY COLOV153 Jul 02 07:07:57 2015
US 8050 HIP 15.3.3 LP2844

ALS Environmental -- FC

SAMPLE SUMMARY REPORT

Client: Environmental Alternatives, Inc.
Date: *09-Jul-15*
Project: ZML1265 Zephyr Gold USA
Work Order: 1507032
Sample ID: North Well
Lab ID: 1507032-1
Legal Location:
Matrix: WATER
Collection Date: 7/1/2015 08:42
Percent Moisture:

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
Alkalinity as Calcium Carbonate		**EPA310.1**		Prep Date:	**7/8/2015**	PrepBy: **JAC**
BICARBONATE AS CaCO3	**220**		**20**	**MG/L**	1	7/8/2015
CARBONATE AS CaCO3	ND		20	MG/L	1	7/8/2015
TOTAL ALKALINITY AS CaCO3	**220**		**20**	**MG/L**	1	7/8/2015
Ion Chromatography		**EPA300.0**		Prep Date:	**7/2/2015**	PrepBy: **AJD**
CHLORIDE	**5.8**		**0.2**	**MG/L**	1	7/2/2015 16:51
FLUORIDE	**1.8**		**0.1**	**MG/L**	1	7/2/2015 16:51
NITRITE AS N	ND		0.1	MG/L	1	7/2/2015 16:51
NITRATE/NITRITE AS N	**0.21**		**0.1**	**MG/L**	1	7/2/2015 16:51
NITRATE AS N	**0.21**		**0.2**	**MG/L**	1	7/2/2015 16:51
SULFATE	**82**		**1**	**MG/L**	1	7/2/2015 16:51
Dissolved Mercury		**EPA245.1**		Prep Date:	**7/6/2015**	PrepBy: **NAQ**
MERCURY	ND		0.0002	MG/L	1	7/7/2015 11:53
Dissolved Metals by 200.7		**EPA200.7**		Prep Date:	**7/8/2015**	PrepBy: **CDR**
ALUMINUM	ND		0.2	MG/L	1	7/8/2015 15:56
ARSENIC	ND		0.01	MG/L	1	7/8/2015 15:56
BORON	**0.15**		**0.1**	**MG/L**	1	7/8/2015 15:56
BERYLLIUM	ND		0.005	MG/L	1	7/8/2015 15:56
CALCIUM	**72**		**1**	**MG/L**	1	7/8/2015 15:56
CADMIUM	ND		0.005	MG/L	1	7/8/2015 15:56
COBALT	ND		0.01	MG/L	1	7/8/2015 15:56
CHROMIUM	ND		0.01	MG/L	1	7/8/2015 15:56
COPPER	ND		0.01	MG/L	1	7/8/2015 15:56
IRON	ND		0.1	MG/L	1	7/8/2015 15:56
POTASSIUM	**5.3**		**1**	**MG/L**	1	7/8/2015 15:56
LITHIUM	**0.033**		**0.01**	**MG/L**	1	7/8/2015 15:56
MAGNESIUM	**26**		**1**	**MG/L**	1	7/8/2015 15:56
MANGANESE	**0.17**		**0.01**	**MG/L**	1	7/8/2015 15:56
SODIUM	**19**		**1**	**MG/L**	1	7/8/2015 15:56
NICKEL	**0.037**		**0.02**	**MG/L**	1	7/8/2015 15:56
LEAD	ND		0.003	MG/L	1	7/8/2015 15:56
SELENIUM	ND		0.005	MG/L	1	7/8/2015 15:56
VANADIUM	ND		0.01	MG/L	1	7/8/2015 15:56
ZINC	**0.12**		**0.02**	**MG/L**	1	7/8/2015 15:56
pH		**EPA150.1**		Prep Date:	**7/6/2015**	PrepBy: **JAC**
PH	**7.77**		**0.1**	**mg/l**	1	7/6/2015
Specific Conductance in Water		**EPA120.1**		Prep Date:	**7/6/2015**	PrepBy: **JAC**
SPECIFIC CONDUCTIVITY	**567**		**1**	**umhos/cm**	1	7/6/2015
Total Dissolved Solids		**EPA160.1**		Prep Date:	**7/7/2015**	PrepBy: **JAC**
TOTAL DISSOLVED SOLIDS	**370**		**20**	**MG/L**	1	7/8/2015

ALS Environmental -- FC

SAMPLE SUMMARY REPORT

Client: Environmental Alternatives, Inc.
Date: *09-Jul-15*
Project: ZML1265 Zephyr Gold USA
Work Order: 1507032
Sample ID: South Well
Lab ID: 1507032-2
Legal Location:
Matrix: WATER
Collection Date: 7/1/2015 09:06
Percent Moisture:

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
Alkalinity as Calcium Carbonate		**EPA310.1**			Prep Date: **7/8/2015**	PrepBy: **JAC**
BICARBONATE AS CaCO3	**200**		**20**	**MG/L**	1	7/8/2015
CARBONATE AS CaCO3	ND		20	MG/L	1	7/8/2015
TOTAL ALKALINITY AS CaCO3	**200**		**20**	**MG/L**	1	7/8/2015
Ion Chromatography		**EPA300.0**			Prep Date: **7/2/2015**	PrepBy: **AJD**
CHLORIDE	**6.1**		**0.2**	**MG/L**	1	7/2/2015 17:21
FLUORIDE	**2**		**0.1**	**MG/L**	1	7/2/2015 17:21
NITRITE AS N	ND		0.1	MG/L	1	7/2/2015 17:21
NITRATE/NITRITE AS N	**1.6**		**0.1**	**MG/L**	1	7/2/2015 17:21
NITRATE AS N	**1.6**		**0.2**	**MG/L**	1	7/2/2015 17:21
SULFATE	**74**		**1**	**MG/L**	1	7/2/2015 17:21
Dissolved Mercury		**EPA245.1**			Prep Date: **7/6/2015**	PrepBy: **NAQ**
MERCURY	ND		0.0002	MG/L	1	7/7/2015 11:56
Dissolved Metals by 200.7		**EPA200.7**			Prep Date: **7/8/2015**	PrepBy: **CDR**
ALUMINUM	**0.54**		**0.2**	**MG/L**	1	7/8/2015 15:57
ARSENIC	ND		0.01	MG/L	1	7/8/2015 15:57
BORON	ND		0.1	MG/L	1	7/8/2015 15:57
BERYLLIUM	ND		0.005	MG/L	1	7/8/2015 15:57
CALCIUM	**70**		**1**	**MG/L**	1	7/8/2015 15:57
CADMIUM	ND		0.005	MG/L	1	7/8/2015 15:57
COBALT	ND		0.01	MG/L	1	7/8/2015 15:57
CHROMIUM	ND		0.01	MG/L	1	7/8/2015 15:57
COPPER	ND		0.01	MG/L	1	7/8/2015 15:57
IRON	ND		0.1	MG/L	1	7/8/2015 15:57
POTASSIUM	**3.5**		**1**	**MG/L**	1	7/8/2015 15:57
LITHIUM	ND		0.01	MG/L	1	7/8/2015 15:57
MAGNESIUM	**21**		**1**	**MG/L**	1	7/8/2015 15:57
MANGANESE	**0.029**		**0.01**	**MG/L**	1	7/8/2015 15:57
SODIUM	**14**		**1**	**MG/L**	1	7/8/2015 15:57
NICKEL	**0.038**		**0.02**	**MG/L**	1	7/8/2015 15:57
LEAD	ND		0.003	MG/L	1	7/8/2015 15:57
SELENIUM	ND		0.005	MG/L	1	7/8/2015 15:57
VANADIUM	ND		0.01	MG/L	1	7/8/2015 15:57
ZINC	**0.023**		**0.02**	**MG/L**	1	7/8/2015 15:57
pH		**EPA150.1**			Prep Date: **7/6/2015**	PrepBy: **JAC**
PH	**7.81**		**0.1**	**mg/l**	1	7/6/2015
Specific Conductance in Water		**EPA120.1**			Prep Date: **7/6/2015**	PrepBy: **JAC**
SPECIFIC CONDUCTIVITY	**537**		**1**	**umhos/cm**	1	7/6/2015
Total Dissolved Solids		**EPA160.1**			Prep Date: **7/7/2015**	PrepBy: **JAC**
TOTAL DISSOLVED SOLIDS	**350**		**20**	**MG/L**	1	7/8/2015

Client:	Environmental Alternatives, Inc.	**Date:**	*09-Jul-15*
Project:	ZML1265 Zephyr Gold USA	**Work Order:**	1507032
Sample ID:	South Well	**Lab ID:**	1507032-2
Legal Location:		**Matrix:**	WATER
Collection Date:	7/1/2015 09:06	**Percent Moisture:**	

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed

Explanation of Qualifiers

Radiochemistry:

U or ND - Result is less than the sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative yield is assumed.

Y2 - Chemical Yield outside default limits.

W - DER is greater than Warning Limit of 1.42

* - Aliquot Basis is 'As Received' while the Report Basis is 'Dry Weight'.

- Aliquot Basis is 'Dry Weight' while the Report Basis is 'As Received'.

G - Sample density differs by more than 15% of LCS density.

D - DER is greater than Control Limit

M - Requested MDC not met.

LT - Result is less than requested MDC but greater than achieved MDC.

M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

L - LCS Recovery below lower control limit.

H - LCS Recovery above upper control limit.

P - LCS, Matrix Spike Recovery within control limits.

N - Matrix Spike Recovery outside control limits

NC - Not Calculated for duplicate results less than 5 times MDC

B - Analyte concentration greater than MDC.

B3 - Analyte concentration greater than MDC but less than Requested MDC.

Inorganics:

B - Result is less than the requested reporting limit but greater than the instrument method detection limit (MDL).

U or ND - Indicates that the compound was analyzed for but not detected.

E - The reported value is estimated because of the presence of interference. An explanatory note may be included in the narrative.

M - Duplicate injection precision was not met.

N - Spiked sample recovery not within control limits. A post spike is analyzed for all ICP analyses when the matrix spike and or spike duplicate fail and the native sample concentration is less than four times the spike added concentration.

Z - Spiked recovery not within control limits. An explanatory note may be included in the narrative.

* - Duplicate analysis (relative percent difference) not within control limits.

S - SAR value is estimated as one or more analytes used in the calculation were not detected above the detection limit.

Organics:

U or ND - Indicates that the compound was analyzed for but not detected.

B - Analyte is detected in the associated method blank as well as in the sample. It indicates probable blank contamination and warns the data user.

E - Analyte concentration exceeds the upper level of the calibration range.

J - Estimated value. The result is less than the reporting limit but greater than the instrument method detection limit (MDL).

A - A tentatively identified compound is a suspected aldol-condensation product.

X - The analyte was diluted below an accurate quantitation level.

* - The spike recovery is equal to or outside the control criteria used.

+ - The relative percent difference (RPD) equals or exceeds the control criteria.

G - A pattern resembling gasoline was detected in this sample.

D - A pattern resembling diesel was detected in this sample.

M - A pattern resembling motor oil was detected in this sample.

C - A pattern resembling crude oil was detected in this sample.

4 - A pattern resembling JP-4 was detected in this sample.

5 - A pattern resembling JP-5 was detected in this sample.

H - Indicates that the fuel pattern was in the heavier end of the retention time window for the analyte of interest.

L - Indicates that the fuel pattern was in the lighter end of the retention time window for the analyte of interest.

Z - This flag indicates that a significant fraction of the reported result did not resemble the patterns of any of the following petroleum hydrocarbon products:
- gasoline
- JP-8
- diesel
- mineral spirits
- motor oil
- Stoddard solvent
- bunker C

Date: *7/9/2015 4:16:3*

QC BATCH REPORT

Client: Environmental Alternatives, Inc.
Work Order: 1507032
Project: ZML1265 Zephyr Gold USA

Batch ID: **HG150706-2-1** Instrument ID: **CETAC7500** Method: **EPA245.1**

LCS Sample ID: **HG150706-2** Units: **MG/L** Analysis Date: **7/7/2015 09:47**
Client ID: Run ID: **HG150707-1A2** Prep Date: **7/6/2015** DF: **1**

Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	RPD Ref	RPD	RPD Limit	Qual
MERCURY	0.000941	0.0002	0.001		94	85-115				20	

MB Sample ID: **HG150706-2** Units: **MG/L** Analysis Date: **7/7/2015 09:43**
Client ID: Run ID: **HG150707-1A2** Prep Date: **7/6/2015** DF: **1**

Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	RPD Ref	RPD	RPD Limit	Qual
MERCURY	ND	0.0002									

The following samples were analyzed in this batch: 1507032-1 1507032-2

Client: Environmental Alternatives, Inc.
Work Order: 1507032
Project: ZML1265 Zephyr Gold USA

QC BATCH REPORT

Batch ID: **IP150708-2-1** Instrument ID: **ICPTrace2** Method: **EPA200.7**

LCS Sample ID: **FP150708-2** Units: **MG/L** Analysis Date: **7/8/2015 16:06**
Client ID: Run ID: **IT150708-1A4** Prep Date: **7/8/2015** DF: **1**

Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	RPD Ref	RPD	RPD Limit	Qual
ALUMINUM	2.06	0.2	2		103	85-115				20	
ARSENIC	1.05	0.01	1		105	85-115				20	
BERYLLIUM	0.0439	0.005	0.05		88	85-115				20	
BORON	1.02	0.1	1		102	85-115				20	
CADMIUM	0.0472	0.005	0.05		94	85-115				20	
CALCIUM	39.4	1	40		98	85-115				20	
CHROMIUM	0.197	0.01	0.2		99	85-115				20	
COBALT	0.498	0.01	0.5		100	85-115				20	
COPPER	0.254	0.01	0.25		102	85-115				20	
IRON	0.948	0.1	1		95	85-115				20	
LEAD	0.497	0.003	0.5		99	85-115				20	
LITHIUM	0.497	0.01	0.5		99	85-115				20	
MAGNESIUM	40.6	1	40		101	85-115				20	
MANGANESE	0.497	0.01	0.5		99	85-115				20	
NICKEL	0.492	0.02	0.5		98	85-115				20	
POTASSIUM	42.9	1	40		107	85-115				20	
SELENIUM	2.23	0.005	2		111	85-115				20	
SODIUM	41	1	40		103	85-115				20	
VANADIUM	0.487	0.01	0.5		97	85-115				20	
ZINC	0.502	0.02	0.5		100	85-115				20	

Client: Environmental Alternatives, Inc.
Work Order: 1507032
Project: ZML1265 Zephyr Gold USA

QC BATCH REPORT

Batch ID: **IP150708-2-1** Instrument ID: **ICPTrace2** Method: **EPA200.7**

MB Sample ID: **FP150708-2** Units: **MG/L** Analysis Date: **7/8/2015 15:48**

Client ID: Run ID: **IT150708-1A4** Prep Date: **7/8/2015** DF: **1**

Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	RPD Ref	RPD	RPD Limit	Qual
ALUMINUM	ND	0.2									
ARSENIC	ND	0.01									
BERYLLIUM	ND	0.005									
BORON	ND	0.1									
CADMIUM	ND	0.005									
CALCIUM	ND	1									
CHROMIUM	ND	0.01									
COBALT	ND	0.01									
COPPER	ND	0.01									
IRON	ND	0.1									
LEAD	ND	0.003									
LITHIUM	ND	0.01									
MAGNESIUM	ND	1									
MANGANESE	ND	0.01									
NICKEL	ND	0.02									
POTASSIUM	ND	1									
SELENIUM	ND	0.005									
SODIUM	ND	1									
VANADIUM	ND	0.01									
ZINC	ND	0.02									

The following samples were analyzed in this batch: 1507032-1 1507032-2

Batch ID: **AK150708-1-2** Instrument ID: **Balance** Method: **EPA310.1**

LCS Sample ID: **AK150708-1** Units: **MG/L** Analysis Date: **7/8/2015**
Client ID: Run ID: **AK150708-1A1** Prep Date: **7/8/2015** DF: **1**

Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	RPD Ref	RPD	RPD Limit	Qual
TOTAL ALKALINITY AS CaCO3	100	5	100		100	85-115				15	

MB Sample ID: **AK150708-1** Units: **MG/L** Analysis Date: **7/8/2015**
Client ID: Run ID: **AK150708-1A1** Prep Date: **7/8/2015** DF: **1**

Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	RPD Ref	RPD	RPD Limit	Qual
BICARBONATE AS CaCO3	ND	5									
CARBONATE AS CaCO3	ND	5									
TOTAL ALKALINITY AS CaCO3	ND	5									

The following samples were analyzed in this batch: 1507032-1 1507032-2

Client: Environmental Alternatives, Inc.
Work Order: 1507032
Project: ZML1265 Zephyr Gold USA

QC BATCH REPORT

Batch ID: **IC150702-1-2** Instrument ID: **IC-2** Method: **EPA300.0**

LCS Sample ID: **IC150702-1** Units: **MG/L** Analysis Date: **7/2/2015 16:05**
Client ID: Run ID: **IC150702-1A2** Prep Date: **7/2/2015** DF: **1**

Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	RPD Ref	RPD	RPD Limit	Qual
FLUORIDE	1.88	0.1	2		94	90-110				15	
CHLORIDE	4.95	0.2	5		99	90-110				15	
NITRITE AS N	1.96	0.1	2		98	90-110				15	
NITRATE AS N	4.88	0.2	5		98	90-110				15	
SULFATE	19.5	1	20		97	90-110				15	

MB Sample ID: **IC150702-1** Units: **MG/L** Analysis Date: **7/2/2015 16:20**
Client ID: Run ID: **IC150702-1A2** Prep Date: **7/2/2015** DF: **1**

Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	RPD Ref	RPD	RPD Limit	Qual
FLUORIDE	ND	0.1									
CHLORIDE	ND	0.2									
NITRITE AS N	ND	0.1									
NITRATE AS N	ND	0.2									
SULFATE	ND	1									

The following samples were analyzed in this batch: 1507032-1 1507032-2

Client: Environmental Alternatives, Inc.
Work Order: 1507032
Project: ZML1265 Zephyr Gold USA

QC BATCH REPORT

Batch ID: **PH150706-1-1** Instrument ID: **pH-1** Method: **EPA150.1**

DUP Sample ID: **1507032-2** Units: **mg/l** Analysis Date: **7/6/2015**

Client ID: **South Well** Run ID: **PH150706-1A1** Prep Date: **7/6/2015** DF: **1**

Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	RPD Ref	RPD	RPD Limit	Qual
PH	7.81	0.1						7.81		0.2	

The following samples were analyzed in this batch: 1507032-1 1507032-2

Client:	Environmental Alternatives, Inc.
Work Order:	1507032
Project:	ZML1265 Zephyr Gold USA

QC BATCH REPORT

Batch ID: **SC150706-1-1** Instrument ID: **pH-2** Method: **EPA120.1**

DUP Sample ID: **1507032-2** Units: **umhos/cm** Analysis Date: **7/6/2015**

Client ID: **South Well** Run ID: **SC150706-1A1** Prep Date: **7/6/2015** DF: **1**

Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	RPD Ref	RPD	RPD Limit	Qual
SPECIFIC CONDUCTIVITY	536	1						537	0	10	

The following samples were analyzed in this batch: 1507032-1 1507032-2

Client: Environmental Alternatives, Inc.
Work Order: 1507032
Project: ZML1265 Zephyr Gold USA

QC BATCH REPORT

Batch ID: **TD150707-1-1** Instrument ID: **Balance** Method: **EPA160.1**

DUP Sample ID: **1507032-2** Units: **MG/L** Analysis Date: **7/8/2015**
Client ID: **South Well** Run ID: **TD150708-1A1** Prep Date: **7/7/2015** DF: **1**

Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	RPD Ref	RPD	RPD Limit	Qual
TOTAL DISSOLVED SOLIDS	349	20						350	1	5	

LCS Sample ID: **TD150707-1** Units: **MG/L** Analysis Date: **7/8/2015**
Client ID: Run ID: **TD150708-1A1** Prep Date: **7/7/2015** DF: **1**

Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	RPD Ref	RPD	RPD Limit	Qual
TOTAL DISSOLVED SOLIDS	408	20	400		102	85-115				5	

MB Sample ID: **TD150707-1** Units: **MG/L** Analysis Date: **7/8/2015**
Client ID: Run ID: **TD150708-1A1** Prep Date: **7/7/2015** DF: **1**

Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	RPD Ref	RPD	RPD Limit	Qual
TOTAL DISSOLVED SOLIDS	ND	20									

The following samples were analyzed in this batch: 1507032-1 1507032-2

ALS Environmental
Ft. Collins, Colorado

Wednesday, October 14, 2015

Angela Bellantoni
Environmental Alternatives, Inc.
1107 Main Street
Canon City, CO 81212

Re: ALS Workorder: 1510032
Project Name: Zephyr Gold USA
Project Number: ZML1265

Dear Ms. Bellantoni:

Two water samples were received from Environmental Alternatives, Inc., on 10/2/2015. The samples were scheduled for the following analyses:

Inorganics
Metals

The results for these analyses are contained in the enclosed reports.

The data contained in the following report have been reviewed and approved by the personnel listed below. In addition, ALS certifies that the analyses reported herein are true, complete and correct within the limits of the methods employed.

Thank you for your confidence in ALS Environmental. Should you have any questions, please call.

Sincerely,

ALS Environmental
Amy R. Wolf
Project Manager

ALS Environmental – Fort Collins is accredited by the following accreditation bodies for various testing scopes in accordance with requirements of each accreditation body. All testing is performed under the laboratory management system, which is maintained to meet these requirement and regulations. Please contact the laboratory or accreditation body for the current scope testing parameters.

ALS Environmental – Fort Collins	
Accreditation Body	License or Certification Number
Alaska (AK)	UST-086
Alaska (AK)	CO01099
Arizona (AZ)	AZ0742
California (CA)	06251CA
Colorado (CO)	CO01099
Connecticut (CT)	PH-0232
Florida (FL)	E87914
Idaho (ID)	CO01099
Kansas (KS)	E-10381
Kentucky (KY)	90137
L-A-B (DoD ELAP/ISO 170250)	L2257
Louisiana (LA)	05057
Maryland (MD)	285
Missouri (MO)	175
Nebraska(NE)	NE-OS-24-13
Nevada (NV)	CO000782008A
New York (NY)	12036
North Dakota (ND)	R-057
Oklahoma (OK)	1301
Pennsylvania (PA)	68-03116
Tennessee (TN)	2976
Texas (TX)	T104704241
Utah (UT)	CO01099
Washington (WA)	C1280

1510032

Metals:

The samples were analyzed following Methods for the Determination of Metals in Environmental Samples – Supplement 1 procedures. Analysis by Trace ICP followed method 200.7 and the current revision of SOP 807. Mercury analysis by CVAA followed method 245.1 and the current revision of SOP 812.

The samples were to be analyzed for dissolved metals. The samples were filtered through a 0.45 micron filter and preserved with nitric acid to a pH less than 2 prior to analysis.

All acceptance criteria were met.

Inorganics:

The samples were analyzed following MCAWW and EMSL procedures for the current revisions of the following SOPs and methods:

Analyte	Method	SOP #
Alkalinity	310.1	1106
Bicarbonate	310.1	1106
Carbonate	310.1	1106
pH	150.1	1126
Specific conductance	120.1	1128
TDS	160.1	1101
Chloride	300.0 Revision 2.1	1113
Fluoride	300.0 Revision 2.1	1113
Nitrate as N	300.0 Revision 2.1	1113
Nitrite as N	300.0 Revision 2.1	1113
Total Nitrates	300.0 Revision 2.1	1113
Sulfate	300.0 Revision 2.1	1113

All acceptance criteria were met.

ALS Environmental -- FC

Sample Number(s) Cross-Reference Table

OrderNum: 1510032
Client Name: Environmental Alternatives, Inc.
Client Project Name: Zephyr Gold USA
Client Project Number: ZML1265
Client PO Number:

Client Sample Number	Lab Sample Number	COC Number	Matrix	Date Collected	Time Collected
North Well	1510032-1		WATER	01-Oct-15	9:03
South Well	1510032-2		WATER	01-Oct-15	9:22

ALS Environmental
225 Commerce Drive, Fort Collins, Colorado 80524
TF: (800) 443-1511 PH: (970) 490-1511 FX: (970) 490-1522

Chain-of-Custody

Form 202r8

WORKORDER #	1510032
PAGE	1 of 1
DISPOSAL	By Lab or Return to Client

		SAMPLER	Angela Bellantoni	DATE	10/1/2015
PROJECT NAME	Zephyr Gold USA	SITE ID	Dawson Mine	TURNAROUND	SLOOOW
PROJECT No.	ZML1265	EDD FORMAT			
		PURCHASE ORDER			
COMPANY NAME	Environmental Alternatives Inc.	BILL TO COMPANY			
SEND REPORT TO	Angela Bellantoni	INVOICE ATTN TO			
ADDRESS	1107 Main Street	ADDRESS			
CITY / STATE / ZIP	Cañon City, CO 81212	CITY / STATE / ZIP			
PHONE	719-275-8951	PHONE			
FAX	719-275-1715	FAX			
E-MAIL	angela@envalternatives.com	E-MAIL			

Lab ID	Field ID	Matrix	Sample Date	Sample Time	# Bottles	Pres.	QC	cations Method 6010 or 200.7	Hg Method 7470 or 245.1	pH Method 150.1	Specific Conductivity Method 120.1	Anions Method 300.0	Alkalinity Method 310.1	TDS Method 160.1
①	North Well	W	10/1/2015	9:03 AM	2		x	x	x	x	x	x	x	x
②	South Well	W	10/1/2015	9:22 AM	2		x	x	x	x	x	x	x	x

*Time Zone (Circle): EST CST MST PST Matrix: O = oil S = soil NS = non-soil solid W = water L = liquid E = extract F = filter

For metals or anions, please detail analytes below.

Comments:

Please see attached analytical suite.

QC PACKAGE (check below)	
X	LEVEL II (Standard QC)
	LEVEL III (Std QC + forms)
	LEVEL IV (Std QC + forms + raw data)

Preservative Key: 1-HCl 2-HNO3 3-H2SO4 4-NaOH 5-NaHSO4 7-Other 8-4 degrees C 9-5035

	SIGNATURE	PRINTED NAME	DATE	TIME
RELINQUISHED BY		Angela M. Bellantoni	10/1/15	11:00A
RECEIVED BY		Scott Malley	10/2/15	0920
RELINQUISHED BY				
RECEIVED BY				
RELINQUISHED BY				
RECEIVED BY				

ALS Environmental - Fort Collins
CONDITION OF SAMPLE UPON RECEIPT FORM

Client: Environmental Alternatives Workorder No: 1510032

Project Manager: ARW Initials: SDM Date: 10-02-15

1. Does this project require any special handling in addition to standard ALS procedures?		YES	[✓ NO]
2. Are custody seals on shipping containers intact?	NONE	[✓ YES]	NO
3. Are Custody seals on sample containers intact?	[✓ NONE]	YES	NO
4. Is there a COC (Chain-of-Custody) present or other representative documents?		[✓ YES]	NO
5. Are the COC and bottle labels complete and legible?		[✓ YES]	NO
6. Is the COC in agreement with samples received? (IDs, dates, times, no. of samples, no. of containers, matrix, requested analyses, etc.)		[✓ YES]	NO
7. Were airbills / shipping documents present and/or removable?	DROP OFF	[✓ YES]	NO
8. Are all aqueous samples requiring preservation preserved correctly? (excluding volatiles)	[✓ N/A]	YES	NO
9. Are all aqueous non-preserved samples pH 4-9?	N/A	[✓ YES]	NO
10. Is there sufficient sample for the requested analyses?		[✓ YES]	NO
11. Were all samples placed in the proper containers for the requested analyses?		[✓ YES]	NO
12. Are all samples within holding times for the requested analyses?		[✓ YES]	NO
13. Were all sample containers received intact? (not broken or leaking, etc.)		[✓ YES]	NO
14. Are all samples requiring no headspace (VOC, GRO, RSK/MEE, Rx CN/S, radon) headspace free? Size of bubble: ____ < green pea ____ > green pea	[✓ N/A]	YES	NO
15. Do any water samples contain sediment? Amount Amount of sediment: ____ dusting X moderate ____ heavy	N/A	[✓ YES]	NO
16. Were the samples shipped on ice?		[✓ YES]	NO
17. Were cooler temperatures measured at 0.1-6.0°C? IR gun used*: [✓ #2] #4	RAD ONLY	[✓ YES]	NO

Cooler #:	1							
Temperature (°C):	0.8							
No. of custody seals on cooler:	1							
External μR/hr reading:	10							
Background μR/hr reading:	11							

DOT Survey/ Acceptance Information

Were external μR/hr readings ≤ two times background and within DOT acceptance criteria? [✓ YES] / NO / NA (If no, see Form 008.)

Additional Information: PROVIDE DETAILS BELOW FOR A NO RESPONSE TO ANY QUESTION ABOVE, EXCEPT #1 AND #16.

15.) Sample 1 bottles 1+2 have a moderate dusting of sediment.
Sample 2 bottles 1+2 have a moderate dusting of sediment.

If applicable, was the client contacted? YES / NO / [✓ NA] Contact: ____________ Date/Time: ____________

Project Manager Signature / Date: 10/2/15

*IR Gun #2: Oakton, SN 29922500201-0066
*IR Gun #4: Oakton, SN 2372220101-0002

Form 201r24.xls (06/04/2012)

1510032

ID:PUBA (719) 275-0269
Y LESTER
ASTER PRINTER SHIPPING
306 MAIN ST

CANON CITY, CO 81212
UNITED STATES US

SHIP DATF: 01OCT15
ACTWGT: 19.0 LB MAN
CAD: 0550346/CAFE2806
DIMS: 17x15x11 IN

BILL SENDER

TO ALS ENVIRONMENTAL

225 COMMERCE DRIVE

FORT COLLINS CO 80524

10

1

REF:
INV:
PO:
DEPT:

521C2/97D7/6F03

FedEx
Express

E

J141214073001uv

0.8°c

FRI - 02 OCT 10:30A
PRIORITY OVERNIGHT

TRK# 0201 6536 4449 9344

72 FTCA

80524
CO-US DEN

ALS Environmental -- FC

SAMPLE SUMMARY REPORT

Client: Environmental Alternatives, Inc.
Date: *14-Oct-15*
Project: ZML1265 Zephyr Gold USA
Work Order: 1510032
Sample ID: North Well
Lab ID: 1510032-1
Legal Location:
Matrix: WATER
Collection Date: 10/1/2015 09:03
Percent Moisture:

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
Alkalinity as Calcium Carbonate		**SM2320B**		Prep Date:	**10/10/2015**	PrepBy: **TLB**
BICARBONATE AS CaCO3	**210**		**20**	**MG/L**	1	10/10/2015
CARBONATE AS CaCO3	ND		20	MG/L	1	10/10/2015
TOTAL ALKALINITY AS CaCO3	**210**		**20**	**MG/L**	1	10/10/2015
Ion Chromatography		**EPA300.0**		Prep Date:	**10/2/2015**	PrepBy: **JAC**
CHLORIDE	**5.9**		**0.2**	**MG/L**	1	10/2/2015 14:12
FLUORIDE	**2.1**		**0.1**	**MG/L**	1	10/2/2015 14:12
NITRITE AS N	ND		0.1	MG/L	1	10/2/2015 14:12
NITRATE/NITRITE AS N	ND		0.1	MG/L	1	10/2/2015 14:12
NITRATE AS N	ND		0.2	MG/L	1	10/2/2015 14:12
SULFATE	**81**		**5**	**MG/L**	5	10/2/2015 14:27
Dissolved Mercury		**EPA245.1**		Prep Date:	**10/8/2015**	PrepBy: **NAQ**
MERCURY	ND		0.0002	MG/L	1	10/8/2015 14:52
Dissolved Metals by 200.7		**EPA200.7**		Prep Date:	**10/8/2015**	PrepBy: **CDR**
ALUMINUM	**0.26**		**0.2**	**MG/L**	1	10/8/2015 15:17
ARSENIC	ND		0.01	MG/L	1	10/8/2015 15:17
BORON	**0.12**		**0.1**	**MG/L**	1	10/8/2015 15:17
BERYLLIUM	ND		0.005	MG/L	1	10/8/2015 15:17
CALCIUM	**67**		**1**	**MG/L**	1	10/8/2015 15:17
CADMIUM	ND		0.005	MG/L	1	10/8/2015 15:17
COBALT	ND		0.01	MG/L	1	10/8/2015 15:17
CHROMIUM	ND		0.01	MG/L	1	10/8/2015 15:17
COPPER	**0.018**		**0.01**	**MG/L**	1	10/8/2015 15:17
IRON	**0.13**		**0.1**	**MG/L**	1	10/8/2015 15:17
POTASSIUM	**5.1**		**1**	**MG/L**	1	10/8/2015 15:17
LITHIUM	**0.034**		**0.01**	**MG/L**	1	10/8/2015 15:17
MAGNESIUM	**23**		**1**	**MG/L**	1	10/8/2015 15:17
MANGANESE	**0.072**		**0.01**	**MG/L**	1	10/8/2015 15:17
SODIUM	**19**		**1**	**MG/L**	1	10/8/2015 15:17
NICKEL	ND		0.02	MG/L	1	10/8/2015 15:17
LEAD	ND		0.003	MG/L	1	10/8/2015 15:17
SELENIUM	ND		0.005	MG/L	1	10/8/2015 15:17
VANADIUM	ND		0.01	MG/L	1	10/8/2015 15:17
ZINC	**0.057**		**0.02**	**MG/L**	1	10/8/2015 15:17
pH		**EPA150.1**		Prep Date:	**10/6/2015**	PrepBy: **JAC**
PH	**7.92**		**0.1**	**mg/l**	1	10/6/2015
Specific Conductance in Water		**EPA120.1**		Prep Date:	**10/5/2015**	PrepBy: **JAC**
SPECIFIC CONDUCTIVITY	**561**		**1**	**umhos/cm**	1	10/6/2015
Total Dissolved Solids		**EPA160.1**		Prep Date:	**10/7/2015**	PrepBy: **JAC**
TOTAL DISSOLVED SOLIDS	**350**		**20**	**MG/L**	1	10/9/2015

ALS Environmental -- FC

SAMPLE SUMMARY REPORT

Client: Environmental Alternatives, Inc.
Project: ZML1265 Zephyr Gold USA
Sample ID: South Well
Legal Location:
Collection Date: 10/1/2015 09:22

Date: *14-Oct-15*
Work Order: 1510032
Lab ID: 1510032-2
Matrix: WATER
Percent Moisture:

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
Alkalinity as Calcium Carbonate		**SM2320B**		Prep Date:	**10/10/2015**	PrepBy: **TLB**
BICARBONATE AS CaCO3	**210**		**20**	**MG/L**	1	10/10/2015
CARBONATE AS CaCO3	ND		20	MG/L	1	10/10/2015
TOTAL ALKALINITY AS CaCO3	**210**		**20**	**MG/L**	1	10/10/2015
Ion Chromatography		**EPA300.0**		Prep Date:	**10/2/2015**	PrepBy: **JAC**
CHLORIDE	**4.6**		**0.2**	**MG/L**	1	10/2/2015 14:42
FLUORIDE	**2.1**		**0.1**	**MG/L**	1	10/2/2015 14:42
NITRITE AS N	ND		0.1	MG/L	1	10/2/2015 14:42
NITRATE/NITRITE AS N	**1.5**		**0.1**	**MG/L**	1	10/2/2015 14:42
NITRATE AS N	**1.5**		**0.2**	**MG/L**	1	10/2/2015 14:42
SULFATE	**71**		**1**	**MG/L**	1	10/2/2015 14:42
Dissolved Mercury		**EPA245.1**		Prep Date:	**10/8/2015**	PrepBy: **NAQ**
MERCURY	ND		0.0002	MG/L	1	10/8/2015 14:54
Dissolved Metals by 200.7		**EPA200.7**		Prep Date:	**10/8/2015**	PrepBy: **CDR**
ALUMINUM	**0.36**		**0.2**	**MG/L**	1	10/8/2015 15:18
ARSENIC	ND		0.01	MG/L	1	10/8/2015 15:18
BORON	ND		0.1	MG/L	1	10/8/2015 15:18
BERYLLIUM	ND		0.005	MG/L	1	10/8/2015 15:18
CALCIUM	**76**		**1**	**MG/L**	1	10/8/2015 15:18
CADMIUM	ND		0.005	MG/L	1	10/8/2015 15:18
COBALT	ND		0.01	MG/L	1	10/8/2015 15:18
CHROMIUM	ND		0.01	MG/L	1	10/8/2015 15:18
COPPER	**0.02**		**0.01**	**MG/L**	1	10/8/2015 15:18
IRON	**0.52**		**0.1**	**MG/L**	1	10/8/2015 15:18
POTASSIUM	**3.5**		**1**	**MG/L**	1	10/8/2015 15:18
LITHIUM	**0.011**		**0.01**	**MG/L**	1	10/8/2015 15:18
MAGNESIUM	**21**		**1**	**MG/L**	1	10/8/2015 15:18
MANGANESE	**0.023**		**0.01**	**MG/L**	1	10/8/2015 15:18
SODIUM	**15**		**1**	**MG/L**	1	10/8/2015 15:18
NICKEL	ND		0.02	MG/L	1	10/8/2015 15:18
LEAD	ND		0.003	MG/L	1	10/8/2015 15:18
SELENIUM	ND		0.005	MG/L	1	10/8/2015 15:18
VANADIUM	ND		0.01	MG/L	1	10/8/2015 15:18
ZINC	ND		0.02	MG/L	1	10/8/2015 15:18
pH		**EPA150.1**		Prep Date:	**10/6/2015**	PrepBy: **JAC**
PH	**7.91**		**0.1**	**mg/l**	1	10/6/2015
Specific Conductance in Water		**EPA120.1**		Prep Date:	**10/5/2015**	PrepBy: **JAC**
SPECIFIC CONDUCTIVITY	**533**		**1**	**umhos/cm**	1	10/6/2015
Total Dissolved Solids		**EPA160.1**		Prep Date:	**10/7/2015**	PrepBy: **JAC**
TOTAL DISSOLVED SOLIDS	**340**		**20**	**MG/L**	1	10/9/2015

Client:	Environmental Alternatives, Inc.	**Date:**	*14-Oct-15*
Project:	ZML1265 Zephyr Gold USA	**Work Order:**	1510032
Sample ID:	South Well	**Lab ID:**	1510032-2
Legal Location:		**Matrix:**	WATER
Collection Date:	10/1/2015 09:22	**Percent Moisture:**	

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed

Explanation of Qualifiers

Radiochemistry:

U or ND - Result is less than the sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative yield is assumed.

Y2 - Chemical Yield outside default limits.

W - DER is greater than Warning Limit of 1.42

* - Aliquot Basis is 'As Received' while the Report Basis is 'Dry Weight'.

- Aliquot Basis is 'Dry Weight' while the Report Basis is 'As Received'.

G - Sample density differs by more than 15% of LCS density.

D - DER is greater than Control Limit

M - Requested MDC not met.

LT - Result is less than requested MDC but greater than achieved MDC.

M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

L - LCS Recovery below lower control limit.

H - LCS Recovery above upper control limit.

P - LCS, Matrix Spike Recovery within control limits.

N - Matrix Spike Recovery outside control limits

NC - Not Calculated for duplicate results less than 5 times MDC

B - Analyte concentration greater than MDC.

B3 - Analyte concentration greater than MDC but less than Requested MDC.

Inorganics:

B - Result is less than the requested reporting limit but greater than the instrument method detection limit (MDL).

U or ND - Indicates that the compound was analyzed for but not detected.

E - The reported value is estimated because of the presence of interference. An explanatory note may be included in the narrative.

M - Duplicate injection precision was not met.

N - Spiked sample recovery not within control limits. A post spike is analyzed for all ICP analyses when the matrix spike and or spike duplicate fail and the native sample concentration is less than four times the spike added concentration.

Z - Spiked recovery not within control limits. An explanatory note may be included in the narrative.

* - Duplicate analysis (relative percent difference) not within control limits.

S - SAR value is estimated as one or more analytes used in the calculation were not detected above the detection limit.

Organics:

U or ND - Indicates that the compound was analyzed for but not detected.

B - Analyte is detected in the associated method blank as well as in the sample. It indicates probable blank contamination and warns the data user.

E - Analyte concentration exceeds the upper level of the calibration range.

J - Estimated value. The result is less than the reporting limit but greater than the instrument method detection limit (MDL).

A - A tentatively identified compound is a suspected aldol-condensation product.

X - The analyte was diluted below an accurate quantitation level.

* - The spike recovery is equal to or outside the control criteria used.

+ - The relative percent difference (RPD) equals or exceeds the control criteria.

G - A pattern resembling gasoline was detected in this sample.

D - A pattern resembling diesel was detected in this sample.

M - A pattern resembling motor oil was detected in this sample.

C - A pattern resembling crude oil was detected in this sample.

4 - A pattern resembling JP-4 was detected in this sample.

5 - A pattern resembling JP-5 was detected in this sample.

H - Indicates that the fuel pattern was in the heavier end of the retention time window for the analyte of interest.

L - Indicates that the fuel pattern was in the lighter end of the retention time window for the analyte of interest.

Z - This flag indicates that a significant fraction of the reported result did not resemble the patterns of any of the following petroleum hydrocarbon products:
- gasoline
- JP-8
- diesel
- mineral spirits
- motor oil
- Stoddard solvent
- bunker C

Client: Environmental Alternatives, Inc.
Work Order: 1510032
Project: ZML1265 Zephyr Gold USA

QC BATCH REPORT

Batch ID: **HG151008-1-1** Instrument ID: **CETAC7500** Method: **EPA245.1**

LCS Sample ID: **HG151008-1** Units: **MG/L** Analysis Date: **10/8/2015 14:20**
Client ID: Run ID: **HG151008-1A3** Prep Date: **10/8/2015** DF: **1**

Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	RPD Ref	RPD	RPD Limit	Qual
MERCURY	0.00105	0.0002	0.001		105	85-115				20	

MB Sample ID: **HG151008-1** Units: **MG/L** Analysis Date: **10/8/2015 14:15**
Client ID: Run ID: **HG151008-1A3** Prep Date: **10/8/2015** DF: **1**

Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	RPD Ref	RPD	RPD Limit	Qual
MERCURY	ND	0.0002									

The following samples were analyzed in this batch: 1510032-1 1510032-2

Batch ID: **IP151008-3-1** Instrument ID: **ICPTrace2** Method: **EPA200.7**

LCS Sample ID: **FP151008-3** Units: **MG/L** Analysis Date: **10/8/2015 15:16**

Client ID: Run ID: **IT151008-1A4** Prep Date: **10/8/2015** DF: **1**

Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	RPD Ref	RPD	RPD Limit	Qual
ALUMINUM	2.18	0.2	2		109	85-115				20	
ARSENIC	1.08	0.01	1		108	85-115				20	
BERYLLIUM	0.0513	0.005	0.05		103	85-115				20	
BORON	1.09	0.1	1		109	85-115				20	
CADMIUM	0.0548	0.005	0.05		110	85-115				20	
CALCIUM	42	1	40		105	85-115				20	
CHROMIUM	0.215	0.01	0.2		107	85-115				20	
COBALT	0.523	0.01	0.5		105	85-115				20	
COPPER	0.276	0.01	0.25		110	85-115				20	
IRON	1	0.1	1		100	85-115				20	
LEAD	0.537	0.003	0.5		107	85-115				20	
LITHIUM	0.508	0.01	0.5		102	85-115				20	
MAGNESIUM	41.1	1	40		103	85-115				20	
MANGANESE	0.516	0.01	0.5		103	85-115				20	
NICKEL	0.537	0.02	0.5		107	85-115				20	
POTASSIUM	43.9	1	40		110	85-115				20	
SELENIUM	2.22	0.005	2		111	85-115				20	
SODIUM	42.9	1	40		107	85-115				20	
VANADIUM	0.527	0.01	0.5		105	85-115				20	
ZINC	0.544	0.02	0.5		109	85-115				20	

Client: Environmental Alternatives, Inc.
Work Order: 1510032
Project: ZML1265 Zephyr Gold USA

QC BATCH REPORT

Batch ID: **IP151008-3-1** Instrument ID: **ICPTrace2** Method: **EPA200.7**

MB Sample ID: **FP151008-3** Units: **MG/L** Analysis Date: **10/8/2015 15:14**
Client ID: Run ID: **IT151008-1A4** Prep Date: **10/8/2015** DF: **1**

Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	RPD Ref	RPD	RPD Limit	Qual
ALUMINUM	ND	0.2									
ARSENIC	ND	0.01									
BERYLLIUM	ND	0.005									
BORON	ND	0.1									
CADMIUM	ND	0.005									
CALCIUM	ND	1									
CHROMIUM	ND	0.01									
COBALT	ND	0.01									
COPPER	ND	0.01									
IRON	ND	0.1									
LEAD	ND	0.003									
LITHIUM	ND	0.01									
MAGNESIUM	ND	1									
MANGANESE	ND	0.01									
NICKEL	ND	0.02									
POTASSIUM	ND	1									
SELENIUM	ND	0.005									
SODIUM	ND	1									
VANADIUM	ND	0.01									
ZINC	ND	0.02									

The following samples were analyzed in this batch: 1510032-1 1510032-2

Client: Environmental Alternatives, Inc.
Work Order: 1510032
Project: ZML1265 Zephyr Gold USA

QC BATCH REPORT

Batch ID: **AK151010-1-1** Instrument ID: **Balance** Method: **SM2320B**

LCS Sample ID: **AK151010-1** Units: **MG/L** Analysis Date: **10/10/2015**
Client ID: Run ID: **AK151010-1A1** Prep Date: **10/10/2015** DF: **1**

Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	RPD Ref	RPD	RPD Limit	Qual
TOTAL ALKALINITY AS CaCO3	96.3	5	100		96	85-115				15	

MB Sample ID: **AK151010-1** Units: **MG/L** Analysis Date: **10/10/2015**
Client ID: Run ID: **AK151010-1A1** Prep Date: **10/10/2015** DF: **1**

Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	RPD Ref	RPD	RPD Limit	Qual
BICARBONATE AS CaCO3	ND	5									
CARBONATE AS CaCO3	ND	5									
TOTAL ALKALINITY AS CaCO3	ND	5									

The following samples were analyzed in this batch: 1510032-1 1510032-2

QC BATCH REPORT

Batch ID: **IC151002-1-1** Instrument ID: **IC-2** Method: **EPA300.0**

LCS Sample ID: **IC151002-1** Units: **MG/L** Analysis Date: **10/2/2015 13:26**
Client ID: Run ID: **IC151002-1A5** Prep Date: **10/2/2015** DF: **1**

Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	RPD Ref	RPD	RPD Limit	Qual
FLUORIDE	2.01	0.1	2		101	90-110				15	
CHLORIDE	5.05	0.2	5		101	90-110				15	
NITRITE AS N	1.94	0.1	2		97	90-110				15	
NITRATE AS N	5.02	0.2	5		100	90-110				15	
SULFATE	19.9	1	20		100	90-110				15	

MB Sample ID: **IC151002-1** Units: **MG/L** Analysis Date: **10/2/2015 13:42**
Client ID: Run ID: **IC151002-1A5** Prep Date: **10/2/2015** DF: **1**

Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	RPD Ref	RPD	RPD Limit	Qual
FLUORIDE	ND	0.1									
CHLORIDE	ND	0.2									
NITRITE AS N	ND	0.1									
NITRATE AS N	ND	0.2									
SULFATE	ND	1									

MS Sample ID: **1510032-2** Units: **MG/L** Analysis Date: **10/2/2015 15:43**
Client ID: **South Well** Run ID: **IC151002-1A5** Prep Date: **10/2/2015** DF: **1**

Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	RPD Ref	RPD	RPD Limit	Qual
FLUORIDE	4.17	0.1	2	2.1	104	85-115				15	
CHLORIDE	9.66	0.2	5	4.6	100	85-115				15	
NITRITE AS N	1.88	0.1	2	0.1	94	85-115				15	
NITRATE AS N	6.57	0.2	5	1.5	102	85-115				15	
SULFATE	89.4	1	20	71	93	85-115				15	

MSD Sample ID: **1510032-2** Units: **MG/L** Analysis Date: **10/2/2015 15:58**
Client ID: **South Well** Run ID: **IC151002-1A5** Prep Date: **10/2/2015** DF: **1**

Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	RPD Ref	RPD	RPD Limit	Qual
FLUORIDE	4.22	0.1	2	2.1	107	85-115		4.17	1	15	
CHLORIDE	9.7	0.2	5	4.6	101	85-115		9.66	0	15	
NITRITE AS N	1.88	0.1	2	0.1	94	85-115		1.88	0	15	
NITRATE AS N	6.59	0.2	5	1.5	102	85-115		6.57	0	15	
SULFATE	89.4	1	20	71	92	85-115		89.4	0	15	

The following samples were analyzed in this batch: 1510032-1 1510032-2

Client: Environmental Alternatives, Inc.
Work Order: 1510032
Project: ZML1265 Zephyr Gold USA

QC BATCH REPORT

Batch ID: **PH151006-1-1** Instrument ID: **pH-1** Method: **EPA150.1**

DUP Sample ID: **1510032-2** Units: **mg/l** Analysis Date: **10/6/2015**

Client ID: **South Well** Run ID: **PH151006-1A1** Prep Date: **10/6/2015** DF: **1**

Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	RPD Ref	RPD	RPD Limit	Qual
PH	7.92	0.1						7.91		0.2	

The following samples were analyzed in this batch: 1510032-1 1510032-2

Client: Environmental Alternatives, Inc.
Work Order: 1510032
Project: ZML1265 Zephyr Gold USA

QC BATCH REPORT

Batch ID: **TD151007-1-1** Instrument ID: **Balance** Method: **EPA160.1**

DUP Sample ID: **1510032-2** Units: **MG/L** Analysis Date: **10/9/2015**
Client ID: **South Well** Run ID: **TD151008-1A1** Prep Date: **10/7/2015** DF: **1**

Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	RPD Ref	RPD	RPD Limit	Qual
TOTAL DISSOLVED SOLIDS	326	20						340	3	5	

LCS Sample ID: **TD151007-1** Units: **MG/L** Analysis Date: **10/9/2015**
Client ID: Run ID: **TD151008-1A1** Prep Date: **10/7/2015** DF: **1**

Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	RPD Ref	RPD	RPD Limit	Qual
TOTAL DISSOLVED SOLIDS	404	20	400		101	85-115				5	

MB Sample ID: **TD151007-1** Units: **MG/L** Analysis Date: **10/9/2015**
Client ID: Run ID: **TD151008-1A1** Prep Date: **10/7/2015** DF: **1**

Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	RPD Ref	RPD	RPD Limit	Qual
TOTAL DISSOLVED SOLIDS	ND	20									

The following samples were analyzed in this batch: 1510032-1 1510032-2

Monday, April 19, 2021

Angela Bellantoni
Environmental Alternatives, Inc.
PO Box 326
Canon City, CO 81215

Re: ALS Workorder: 2103556
Project Name: Zephyr Gold USA
Project Number: ZML1265

Dear Ms. Bellantoni:

Two water samples were received from Environmental Alternatives, Inc., on 3/30/2021. The samples were scheduled for the following analyses:

- Inorganics
- Metals

The results for these analyses are contained in the enclosed reports.

The data contained in the following report have been reviewed and approved by the personnel listed below. In addition, ALS certifies that the analyses reported herein are true, complete and correct within the limits of the methods employed. Should this laboratory report need to be reproduced, it should be reproduced in full unless written approval has been obtained from ALS Environmental.

Thank you for your confidence in ALS Environmental. Should you have any questions, please call.

Sincerely,

ALS Environmental
Katie M. OBrien
Project Manager

Accreditations: ALS Environmental – Fort Collins is accredited by the following accreditation bodies for various testing scopes in accordance with requirements of each accreditation body. All testing is performed under the laboratory management system, which is maintained to meet these requirement and regulations. Please contact the laboratory or accreditation body for the current scope testing parameters.

ALS Environmental – Fort Collins	
Accreditation Body	License or Certification Number
California (CA)	2926
Colorado (CO)	CO01099
Florida (FL)	E87914
Idaho (ID)	CO01099
Kansas (KS)	E-10381
Kentucky (KY)	90137
PJ-LA (DoD ELAP/ISO 170250)	95377
Maryland (MD)	285
Missouri (MO)	175
Nebraska(NE)	NE-OS-24-13
Nevada (NV)	CO010992018-1
New York (NY)	12036
North Dakota (ND)	R-057
Oklahoma (OK)	1301
Pennsylvania (PA)	68-03116
Tennessee (TN)	TN02976
Texas (TX)	T104704241
Utah (UT)	CO01099
Washington (WA)	C1280

40 CFR Part 136: All analyses for Clean Water Act samples are analyzed using the 40 CFR Part 136 specified method and include all the QC requirements.

2103556

Metals:

The samples were analyzed following Methods for the Determination of Metals in Environmental Samples – Supplement 1 procedures. Analysis by Trace ICP followed method 200.7 and the current revision of SOP 834. Mercury analysis by CVAA followed method 245.1 and the current revision of SOP 812.

The samples were to be analyzed for dissolved metals. The samples were filtered through a 0.45 micron filter and preserved with nitric acid to a pH less than two prior to analysis.

All acceptance criteria were met.

Inorganics:

The samples were analyzed following MCAWW, EMSL and Standard Method procedures for the current revisions of the following SOPs and methods:

Analyte	Method	SOP #
Alkalinity	SM2320B	1106
Bicarbonate	SM2320B	1106
Carbonate	SM2320B	1106
pH	SM4500-H^+ B	1126
Specific conductance	120.1	1128
TDS	SM2540C	1101
Chloride	300.0 Revision 2.1	1113
Fluoride	300.0 Revision 2.1	1113
Nitrate as N	300.0 Revision 2.1	1113
Nitrite as N	300.0 Revision 2.1	1113
Total Nitrates	300.0 Revision 2.1	1113
Sulfate	300.0 Revision 2.1	1113

All acceptance criteria were met.

ALS -- Fort Collins

Sample Number(s) Cross-Reference Table

OrderNum: 2103556
Client Name: Environmental Alternatives, Inc.
Client Project Name: Zephyr Gold USA
Client Project Number: ZML1265
Client PO Number:

Client Sample Number	Lab Sample Number	COC Number	Matrix	Date Collected	Time Collected
North Well	2103556-1		WATER	29-Mar-21	9:08
South Well	2103556-2		WATER	29-Mar-21	9:31

ALS Environmental

225 Commerce Drive, Fort Collins, Colorado 80524
TF: (800) 443-1511 PH: (970) 490-1511 FX: (970) 490-1522

Chain-of-Custody

Form 202r6

		SAMPLER	Angela Bellantoni	DATE	3/29/2021	PAGE	1 of 1
PROJECT NAME	Zephyr Gold USA	SITE ID	Dawson Mine	TURNAROUND	SLOOOW	DISPOSAL	By Lab or Return to Client
PROJECT No.	ZML1265	EDD FORMAT				WORKORDER #	2103556
		PURCHASE ORDER					
COMPANY NAME	Environmental Alternatives Inc.	BILL TO COMPANY	Environmental Alternatives Inc.				
SEND REPORT TO	Angela Bellantoni	INVOICE ATTN TO	Angela Bellantoni				
ADDRESS	P.O. Box 326	ADDRESS	P.O. Box 326				
CITY / STATE / ZIP	Cañon City, CO 81215	CITY / STATE / ZIP	Cañon City, CO 81215				
PHONE	719-275-8951	PHONE	719-275-8951				
FAX	NA	FAX	NA				
E-MAIL	angela@envalternatives.com	E-MAIL	angela@envalternatives.com				

Lab ID	Field ID	Matrix	Sample Date	Sample Time	# Bottles	Pres.	QC	cations Method 6010 or 200.7	Hg Method 7470 or 245.1	pH Method 150.1	Specific Conductivity Method 120.1	Anions Method 300.0	Alkalinity Method 310.1	TDS Method 160.1
1	North Well	W	3/29/2021	9:08 AM	2		x	x	x	x	x	x	x	x
2	South Well	W	3/29/2021	9:31 AM	2		x	x	x	x	x	x	x	x

*Time Zone (Circle): EST CST MST PST Matrix: O = oil S = soil NS = non-soil solid W = water L = liquid E = extract F = filter

For metals or anions, please detail analytes below.

Comments:

Please see attached analytical suite.

QC PACKAGE (check below)	
X	LEVEL II (Standard QC)
	LEVEL III (Std QC + forms)
	LEVEL IV (Std QC + forms + raw data)

Preservative Key: 1-HCl 2-HNO3 3-H2SO4 4-NaOH 5-NaHSO4 7-Other 8-4 degrees C 9-5035

	SIGNATURE	PRINTED NAME	DATE	TIME
RELINQUISHED BY		Angela M. Bellantoni	3/29/21	10:45A
RECEIVED BY		Tyler Mossor	3/30/21	1000
RELINQUISHED BY				
RECEIVED BY				
RELINQUISHED BY				
RECEIVED BY				

ALS Environmental - Fort Collins
CONDITION OF SAMPLE UPON RECEIPT FORM

Client: EAI

Workorder No: 2103556

Project Manager: KMO

Initials: TEM

Date: 3/30/21

		N/A	YES	NO
1.	Are airbills / shipping documents present and/or removable? Tracking number: 1Z 045 5E7 01 6789 9546		x	
2.	Are custody seals on **shipping** containers intact?		x	
3.	Are custody seals on **sample** containers intact?	x		
4.	Is there a COC (chain-of-custody) present?		x	
5.	Is the COC in agreement with samples received? (IDs, dates, times, # of samples, # of containers, matrix, requested analyses, etc.)		x	
6.	Are short-hold samples present?		x	
7.	Are all samples within holding times for the requested analyses?		x	
8.	Were all sample containers received intact? (not broken or leaking)		x	
9.	Is there sufficient sample for the requested analyses?		x	
10.	Are samples in proper containers for requested analyses? (form 250, *Sample Handling Guidelines*)		x	
11.	Are all aqueous samples preserved correctly, if required? (excluding volatiles)	x		
12.	Are all samples requiring no headspace (VOC, GRO, RSK/MEE, radon) free of bubbles > 6 mm (1/4 inch) diameter? (i.e. size of green pea)	x		
13.	Were the samples shipped on ice?		x	
14.	Were cooler temperatures measured at 0.1-6.0°C? IR gun used*: #5	RAD ONLY	x	

Cooler #:	1						
Temperature (°C):	3.8						
# of custody seals on cooler:	1						
External µR/hr reading:	11						
Background µR/hr reading:	11						

Were external µR/hr readings ≤ two times background and within DOT acceptance criteria? YES

*** Please provide details here for NO responses to boxes above - for 2 thru 5 & 7 thru 12, notify PM & continue w/ login.**

Were unpreserved bottles pH checked? N/A

All client bottle ID's vs ALS lab ID's double-checked by: TM

If applicable, was the client contacted? **YES / NO / NA** Contact: Date/Time:

Project Manager Signature / Date: 3/30/21

Form 201r30.xls
03/18/2021

*IR Gun #5, VWR SN 192272629

ALS -- Fort Collins

SAMPLE SUMMARY REPORT

Client: Environmental Alternatives, Inc.
Project: ZML1265 Zephyr Gold USA
Sample ID: North Well
Legal Location:
Collection Date: 3/29/2021 09:08

Date: *19-Apr-21*
Work Order: 2103556
Lab ID: 2103556-1
Matrix: WATER
Percent Moisture:

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
Alkalinity as Calcium Carbonate		**SM2320B**			Prep Date: **4/8/2021**	PrepBy: **TXS**
BICARBONATE AS CaCO3	**200**		**20**	**MG/L**	1	4/8/2021
CARBONATE AS CaCO3	ND		20	MG/L	1	4/8/2021
TOTAL ALKALINITY AS CaCO3	**200**		**20**	**MG/L**	1	4/8/2021
Ion Chromatography		**EPA300.0**			Prep Date: **3/30/2021**	PrepBy: **LMC**
CHLORIDE	**5.3**		**0.2**	**MG/L**	1	3/30/2021 12:42
FLUORIDE	**1.8**		**0.1**	**MG/L**	1	3/30/2021 12:42
NITRITE AS N	ND		0.15	MG/L	1	3/30/2021 12:42
NITRATE/NITRITE AS N	ND		0.15	MG/L	1	3/30/2021 12:42
NITRATE AS N	ND		0.2	MG/L	1	3/30/2021 12:42
SULFATE	**77**		**1**	**MG/L**	1	3/30/2021 12:42
Dissolved Mercury		**EPA245.1**			Prep Date: **4/6/2021**	PrepBy: **JRS**
MERCURY	ND		0.0002	MG/L	1	4/8/2021 11:01
Dissolved Metals by 200.7		**EPA200.7**			Prep Date: **4/2/2021**	PrepBy: **TXS**
ALUMINUM	ND		0.2	MG/L	1	4/2/2021 16:57
ARSENIC	ND		0.03	MG/L	1	4/2/2021 16:57
BORON	**0.1**		**0.1**	**MG/L**	1	4/2/2021 16:57
BERYLLIUM	ND		0.005	MG/L	1	4/2/2021 16:57
CALCIUM	**58**		**1**	**MG/L**	1	4/2/2021 16:57
CADMIUM	ND		0.005	MG/L	1	4/2/2021 16:57
COBALT	ND		0.01	MG/L	1	4/2/2021 16:57
CHROMIUM	ND		0.01	MG/L	1	4/2/2021 16:57
COPPER	ND		0.01	MG/L	1	4/2/2021 16:57
IRON	ND		0.15	MG/L	1	4/2/2021 16:57
POTASSIUM	**6.3**		**1**	**MG/L**	1	4/2/2021 16:57
LITHIUM	**0.028**		**0.01**	**MG/L**	1	4/2/2021 16:57
MAGNESIUM	**24**		**1**	**MG/L**	1	4/2/2021 16:57
MANGANESE	ND		0.01	MG/L	1	4/2/2021 16:57
SODIUM	**18**		**1**	**MG/L**	1	4/2/2021 16:57
NICKEL	ND		0.02	MG/L	1	4/2/2021 16:57
LEAD	ND		0.02	MG/L	1	4/2/2021 16:57
SELENIUM	ND		0.03	MG/L	1	4/2/2021 16:57
VANADIUM	ND		0.01	MG/L	1	4/2/2021 16:57
ZINC	ND		0.02	MG/L	1	4/2/2021 16:57
pH		**SM4500-H**			Prep Date: **4/16/2021**	PrepBy: **LRB**
PH	**8.31**		**0.1**	**pH**	1	4/16/2021
Specific Conductance in Water		**EPA120.1**			Prep Date: **4/16/2021**	PrepBy: **LRB**
SPECIFIC CONDUCTIVITY	**504**		**1**	**umhos/cm**	1	4/16/2021
Total Dissolved Solids		**SM2540C**			Prep Date: **4/5/2021**	PrepBy: **LMC**
TOTAL DISSOLVED SOLIDS	**690**		**20**	**MG/L**	1	4/8/2021

Client: Environmental Alternatives, Inc.
Project: ZML1265 Zephyr Gold USA
Sample ID: South Well
Legal Location:
Collection Date: 3/29/2021 09:31

Date: *19-Apr-21*
Work Order: 2103556
Lab ID: 2103556-2
Matrix: WATER
Percent Moisture:

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
Alkalinity as Calcium Carbonate		**SM2320B**		Prep Date: **4/8/2021**		PrepBy: **TXS**
BICARBONATE AS CaCO3	**210**		**20**	**MG/L**	1	4/8/2021
CARBONATE AS CaCO3	ND		20	MG/L	1	4/8/2021
TOTAL ALKALINITY AS CaCO3	**210**		**20**	**MG/L**	1	4/8/2021
Ion Chromatography		**EPA300.0**		Prep Date: **3/30/2021**		PrepBy: **LMC**
CHLORIDE	**7.2**		**0.2**	**MG/L**	1	3/30/2021 13:08
FLUORIDE	**1.9**		**0.1**	**MG/L**	1	3/30/2021 13:08
NITRITE AS N	ND		0.15	MG/L	1	3/30/2021 13:08
NITRATE/NITRITE AS N	**0.26**		**0.15**	**MG/L**	1	3/30/2021 13:08
NITRATE AS N	**0.26**		**0.2**	**MG/L**	1	3/30/2021 13:08
SULFATE	**58**		**1**	**MG/L**	1	3/30/2021 13:08
Dissolved Mercury		**EPA245.1**		Prep Date: **4/6/2021**		PrepBy: **JRS**
MERCURY	ND		0.0002	MG/L	1	4/8/2021 11:03
Dissolved Metals by 200.7		**EPA200.7**		Prep Date: **4/2/2021**		PrepBy: **TXS**
ALUMINUM	ND		0.2	MG/L	1	4/2/2021 16:58
ARSENIC	ND		0.03	MG/L	1	4/2/2021 16:58
BORON	ND		0.1	MG/L	1	4/2/2021 16:58
BERYLLIUM	ND		0.005	MG/L	1	4/2/2021 16:58
CALCIUM	**68**		**1**	**MG/L**	1	4/2/2021 16:58
CADMIUM	ND		0.005	MG/L	1	4/2/2021 16:58
COBALT	ND		0.01	MG/L	1	4/2/2021 16:58
CHROMIUM	ND		0.01	MG/L	1	4/2/2021 16:58
COPPER	ND		0.01	MG/L	1	4/2/2021 16:58
IRON	ND		0.15	MG/L	1	4/2/2021 16:58
POTASSIUM	**4.3**		**1**	**MG/L**	1	4/2/2021 16:58
LITHIUM	ND		0.01	MG/L	1	4/2/2021 16:58
MAGNESIUM	**19**		**1**	**MG/L**	1	4/2/2021 16:58
MANGANESE	ND		0.01	MG/L	1	4/2/2021 16:58
SODIUM	**16**		**1**	**MG/L**	1	4/2/2021 16:58
NICKEL	ND		0.02	MG/L	1	4/2/2021 16:58
LEAD	ND		0.02	MG/L	1	4/2/2021 16:58
SELENIUM	ND		0.03	MG/L	1	4/2/2021 16:58
VANADIUM	ND		0.01	MG/L	1	4/2/2021 16:58
ZINC	ND		0.02	MG/L	1	4/2/2021 16:58
pH		**SM4500-H**		Prep Date: **4/16/2021**		PrepBy: **LRB**
PH	**8.09**		**0.1**	**pH**	1	4/16/2021
Specific Conductance in Water		**EPA120.1**		Prep Date: **4/16/2021**		PrepBy: **LRB**
SPECIFIC CONDUCTIVITY	**495**		**1**	**umhos/cm**	1	4/16/2021
Total Dissolved Solids		**SM2540C**		Prep Date: **4/5/2021**		PrepBy: **LMC**
TOTAL DISSOLVED SOLIDS	**310**		**20**	**MG/L**	1	4/8/2021

Client: Environmental Alternatives, Inc. **Date:** *19-Apr-21*
Project: ZML1265 Zephyr Gold USA **Work Order:** 2103556
Sample ID: South Well **Lab ID:** 2103556-2
Legal Location: **Matrix:** WATER
Collection Date: 3/29/2021 09:31 **Percent Moisture:**

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed

Explanation of Qualifiers

Radiochemistry:

- "Report Limit" is the MDC
U or ND - Result is less than the sample specific MDC.
Y1 - Chemical Yield is in control at 100-110%. Quantitative yield is assumed.
Y2 - Chemical Yield outside default limits.
W - DER is greater than Warning Limit of 1.42
* - Aliquot Basis is 'As Received' while the Report Basis is 'Dry Weight'.
\# - Aliquot Basis is 'Dry Weight' while the Report Basis is 'As Received'.
G - Sample density differs by more than 15% of LCS density.
D - DER is greater than Control Limit
M - Requested MDC not met.
M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.
L - LCS Recovery below lower control limit.
H - LCS Recovery above upper control limit.
P - LCS, Matrix Spike Recovery within control limits.
N - Matrix Spike Recovery outside control limits
NC - Not Calculated for duplicate results less than 5 times MDC
B - Analyte concentration greater than MDC.
B3 - Analyte concentration greater than MDC but less than Requested MDC.

Inorganics:

B - Result is less than the requested reporting limit but greater than the instrument method detection limit (MDL).
U or ND - Indicates that the compound was analyzed for but not detected.
E - The reported value is estimated because of the presence of interference. An explanatory note may be included in the narrative.
M - Duplicate injection precision was not met.
N - Spiked sample recovery not within control limits. A post spike is analyzed for all ICP analyses when the matrix spike and or spike duplicate fail and the native sample concentration is less than four times the spike added concentration.
Z - Spiked recovery not within control limits. An explanatory note may be included in the narrative.
* - Duplicate analysis (relative percent difference) not within control limits.
S - SAR value is estimated as one or more analytes used in the calculation were not detected above the detection limit.

Organics:

U or ND - Indicates that the compound was analyzed for but not detected.
B - Analyte is detected in the associated method blank as well as in the sample. It indicates probable blank contamination and warns the data user.
E - Analyte concentration exceeds the upper level of the calibration range.
J - Estimated value. The result is less than the reporting limit but greater than the instrument method detection limit (MDL).
A - A tentatively identified compound is a suspected aldol-condensation product.
X - The analyte was diluted below an accurate quantitation level.
* - The spike recovery is equal to or outside the control criteria used.
\+ - The relative percent difference (RPD) equals or exceeds the control criteria.
G - A pattern resembling gasoline was detected in this sample.
D - A pattern resembling diesel was detected in this sample.
M - A pattern resembling motor oil was detected in this sample.
C - A pattern resembling crude oil was detected in this sample.
4 - A pattern resembling JP-4 was detected in this sample.
5 - A pattern resembling JP-5 was detected in this sample.
H - Indicates that the fuel pattern was in the heavier end of the retention time window for the analyte of interest.
L - Indicates that the fuel pattern was in the lighter end of the retention time window for the analyte of interest.
Z - This flag indicates that a significant fraction of the reported result did not resemble the patterns of any of the following petroleum hydrocarbon products:

- gasoline
- JP-8
- diesel
- mineral spirits
- motor oil
- Stoddard solvent
- bunker C

Date: *4/19/2021 11:23*

Client: Environmental Alternatives, Inc.
Work Order: 2103556
Project: ZML1265 Zephyr Gold USA

QC BATCH REPORT

Batch ID: **HG210406-2-1** Instrument ID **CETAC7600** Method: **EPA245.1**

LCS Sample ID: **HG210406-2** Units: **MG/L** Analysis Date: **4/8/2021 10:56**
Client ID: Run ID: **HG210408-1A1** Prep Date: **4/6/2021** DF: **1**

Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	RPD Ref	RPD	RPD Limit	Qual
MERCURY	0.001	0.0002	0.001		100	85-115				20	

LCSD Sample ID: **HG210406-2** Units: **MG/L** Analysis Date: **4/8/2021 10:58**
Client ID: Run ID: **HG210408-1A1** Prep Date: **4/6/2021** DF: **1**

Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	RPD Ref	RPD	RPD Limit	Qual
MERCURY	0.001	0.0002	0.001		100	85-115		0.001	0	20	

MB Sample ID: **FP210401-1** Units: **MG/L** Analysis Date: **4/8/2021 10:52**
Client ID: Run ID: **HG210408-1A1** Prep Date: **4/6/2021** DF: **1**

Analyte	Result	ReportLimit	Qual
MERCURY	ND	0.0002	

The following samples were analyzed in this batch: 2103556-1 2103556-2

Client: Environmental Alternatives, Inc.
Work Order: 2103556
Project: ZML1265 Zephyr Gold USA

QC BATCH REPORT

Batch ID: **IP210402-4-2** Instrument ID **ICPTrace2** Method: **EPA200.7**

LCS Sample ID: **IP210402-4** Units: **MG/L** Analysis Date: **4/2/2021 16:52**

Client ID: Run ID: **IT210402-2A2** Prep Date: **4/2/2021** DF: **1**

Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	RPD Ref	RPD	RPD Limit	Qual
ALUMINUM	2.17	0.2	2		108	85-115				20	
ARSENIC	1.01	0.03	1		101	85-115				20	
BERYLLIUM	0.0494	0.005	0.05		99	85-115				20	
BORON	1.04	0.1	1		104	85-115				20	
CADMIUM	0.0509	0.005	0.05		102	85-115				20	
CALCIUM	38.4	1	40		96	85-115				20	
CHROMIUM	0.206	0.01	0.2		103	85-115				20	
COBALT	0.523	0.01	0.5		105	85-115				20	
COPPER	0.268	0.01	0.25		107	85-115				20	
IRON	1.02	0.15	1		102	85-115				20	
LEAD	0.497	0.02	0.5		99	85-115				20	
LITHIUM	0.452	0.01	0.5		90	85-115				20	
MAGNESIUM	39.4	1	40		98	85-115				20	
MANGANESE	0.499	0.01	0.5		100	85-115				20	
NICKEL	0.509	0.02	0.5		102	85-115				20	
POTASSIUM	41.2	1	40		103	85-115				20	
SELENIUM	2.13	0.03	2		107	85-115				20	
SODIUM	38.7	1	40		97	85-115				20	
VANADIUM	0.517	0.01	0.5		103	85-115				20	
ZINC	0.51	0.02	0.5		102	85-115				20	

Batch ID: **IP210402-4-2** Instrument ID **ICPTrace2** Method: **EPA200.7**

LCSD Sample ID: **IP210402-4** Units: **MG/L** Analysis Date: **4/2/2021 16:56**

Client ID: Run ID: **IT210402-2A2** Prep Date: **4/2/2021** DF: **1**

Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	RPD Ref	RPD	RPD Limit	Qual
ALUMINUM	2.15	0.2	2		108	85-115		2.17	1	20	
ARSENIC	0.97	0.03	1		97	85-115		1.01	4	20	
BERYLLIUM	0.0494	0.005	0.05		99	85-115		0.0494	0	20	
BORON	1.02	0.1	1		102	85-115		1.04	2	20	
CADMIUM	0.0515	0.005	0.05		103	85-115		0.0509	1	20	
CALCIUM	38.2	1	40		95	85-115		38.4	1	20	
CHROMIUM	0.205	0.01	0.2		103	85-115		0.206	1	20	
COBALT	0.518	0.01	0.5		104	85-115		0.523	1	20	
COPPER	0.262	0.01	0.25		105	85-115		0.268	2	20	
IRON	1.02	0.15	1		102	85-115		1.02	0	20	
LEAD	0.495	0.02	0.5		99	85-115		0.497	0	20	
LITHIUM	0.446	0.01	0.5		89	85-115		0.452	1	20	
MAGNESIUM	39.3	1	40		98	85-115		39.4	0	20	
MANGANESE	0.498	0.01	0.5		100	85-115		0.499	0	20	
NICKEL	0.495	0.02	0.5		99	85-115		0.509	3	20	
POTASSIUM	40.7	1	40		102	85-115		41.2	1	20	
SELENIUM	2.1	0.03	2		105	85-115		2.13	1	20	
SODIUM	38.5	1	40		96	85-115		38.7	1	20	
VANADIUM	0.512	0.01	0.5		102	85-115		0.517	1	20	
ZINC	0.514	0.02	0.5		103	85-115		0.51	1	20	

Client: Environmental Alternatives, Inc.
Work Order: 2103556
Project: ZML1265 Zephyr Gold USA

QC BATCH REPORT

Batch ID: **IP210402-4-2** Instrument ID **ICPTrace2** Method: **EPA200.7**

MB Sample ID: **FP210401-4** Units: **MG/L** Analysis Date: **4/2/2021 16:50**
Client ID: Run ID: **IT210402-2A2** Prep Date: **4/2/2021** DF: **1**

Analyte	Result	ReportLimit	Qual
ALUMINUM	ND	0.2	
ARSENIC	ND	0.03	
BERYLLIUM	ND	0.005	
BORON	ND	0.1	
CADMIUM	ND	0.005	
CALCIUM	ND	1	
CHROMIUM	ND	0.01	
COBALT	ND	0.01	
COPPER	ND	0.01	
IRON	ND	0.15	
LEAD	ND	0.02	
LITHIUM	ND	0.01	
MAGNESIUM	ND	1	
MANGANESE	ND	0.01	
NICKEL	ND	0.02	
POTASSIUM	ND	1	
SELENIUM	ND	0.03	
SODIUM	ND	1	
VANADIUM	ND	0.01	
ZINC	ND	0.02	

The following samples were analyzed in this batch: 2103556-1 2103556-2

Client: Environmental Alternatives, Inc.
Work Order: 2103556
Project: ZML1265 Zephyr Gold USA

QC BATCH REPORT

Batch ID: **AK210408-1-1** Instrument ID **NONE** Method: **SM2320B**

LCS Sample ID: **AK210408-1** Units: **MG/L** Analysis Date: **4/8/2021**
Client ID: Run ID: **AK210408-1A1** Prep Date: **4/8/2021** DF: **1**

Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	RPD Ref	RPD	RPD Limit	Qual
TOTAL ALKALINITY AS CaCO3	99.6	5	100		99	85-115				15	

MB Sample ID: **AK210408-1** Units: **MG/L** Analysis Date: **4/8/2021**
Client ID: Run ID: **AK210408-1A1** Prep Date: **4/8/2021** DF: **1**

Analyte	Result	ReportLimit	Qual
BICARBONATE AS CaCO3	ND	5	
CARBONATE AS CaCO3	ND	5	
TOTAL ALKALINITY AS CaCO3	ND	5	

The following samples were analyzed in this batch: 2103556-1 2103556-2

QC BATCH REPORT

Batch ID: **IC210330-2-1** Instrument ID **IC3** Method: **EPA300.0**

LCS Sample ID: **IC210330-2** Units: **MG/L** Analysis Date: **3/30/2021 12:13**
Client ID: Run ID: **IC210330-1A1** Prep Date: **3/30/2021** DF: **1**

Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	RPD Ref	RPD	RPD Limit	Qual
FLUORIDE	5.02	0.1	5		100	90-110				15	
CHLORIDE	10.1	0.2	10		101	90-110				15	
NITRITE AS N	5.02	0.15	4.98		101	90-110				15	
NITRATE AS N	10.1	0.2	10		101	90-110				15	
SULFATE	50.7	1	50		101	90-110				15	

LCSD Sample ID: **IC210330-2** Units: **MG/L** Analysis Date: **3/30/2021 14:14**
Client ID: Run ID: **IC210330-1A1** Prep Date: **3/30/2021** DF: **1**

Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	RPD Ref	RPD	RPD Limit	Qual
FLUORIDE	5.03	0.1	5		101	90-110		5.02	0	15	
CHLORIDE	10.1	0.2	10		101	90-110		10.1	0	15	
NITRITE AS N	4.98	0.15	4.98		100	90-110		5.02	1	15	
NITRATE AS N	10.1	0.2	10		101	90-110		10.1	0	15	
SULFATE	50.6	1	50		101	90-110		50.7	0	15	

MB Sample ID: **IC210330-2** Units: **MG/L** Analysis Date: **3/30/2021 12:27**
Client ID: Run ID: **IC210330-1A1** Prep Date: **3/30/2021** DF: **1**

Analyte	Result	ReportLimit	Qual
FLUORIDE	ND	0.1	
CHLORIDE	ND	0.2	
NITRITE AS N	ND	0.15	
NITRATE AS N	ND	0.2	
SULFATE	ND	1	

MS Sample ID: **2103556-1** Units: **MG/L** Analysis Date: **3/30/2021 12:55**
Client ID: **North Well** Run ID: **IC210330-1A1** Prep Date: **3/30/2021** DF: **1**

Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	RPD Ref	RPD	RPD Limit	Qual
FLUORIDE	3.84	0.1	2	1.8	103	85-115				15	
CHLORIDE	10.5	0.2	5	5.3	103	85-115				15	
NITRITE AS N	1.82	0.15	1.99	0.15	91	85-115				15	
NITRATE AS N	5.25	0.2	5	0.2	105	85-115				15	
SULFATE	95.1	1	20	77	89	85-115				15	

The following samples were analyzed in this batch: 2103556-1 2103556-2

Client: Environmental Alternatives, Inc.
Work Order: 2103556
Project: ZML1265 Zephyr Gold USA

QC BATCH REPORT

Batch ID: **PH210416-1-1** Instrument ID **NONE** Method: **SM4500-H**

DUP Sample ID: **2103556-2** Units: **pH** Analysis Date: **4/16/2021**

Client ID: **South Well** Run ID: **PH210416-1A1** Prep Date: **4/16/2021** DF: **1**

Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	RPD Ref	RPD	RPD Limit	Qual
PH	8.14	0.1						8.09			

The following samples were analyzed in this batch: 2103556-1 2103556-2

QC BATCH REPORT

Batch ID: **SC210416-1-2** Instrument ID **pH-2** Method: **EPA120.1**

DUP Sample ID: **2103556-2** Units: **umhos/cm** Analysis Date: **4/16/2021**

Client ID: **South Well** Run ID: **SC210416-1A1** Prep Date: **4/16/2021** DF: **1**

Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	RPD Ref	RPD	RPD Limit	Qual
SPECIFIC CONDUCTIVITY	498	1						495	1	15	

The following samples were analyzed in this batch: 2103556-1 2103556-2

QC BATCH REPORT

Batch ID: **TD210405-1-1** Instrument ID **Balance** Method: **SM2540C**

LCS Sample ID: **TD210405-1** Units: **MG/L** Analysis Date: **4/8/2021**
Client ID: Run ID: **TD210408-1A1** Prep Date: **4/5/2021** DF: **1**

Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	RPD Ref	RPD	RPD Limit	Qual
TOTAL DISSOLVED SOLIDS	428	20	400		107	85-115				14	

LCSD Sample ID: **TD210405-1** Units: **MG/L** Analysis Date: **4/8/2021**
Client ID: Run ID: **TD210408-1A1** Prep Date: **4/5/2021** DF: **1**

Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	RPD Ref	RPD	RPD Limit	Qual
TOTAL DISSOLVED SOLIDS	391	20	400		98	85-115		428	9	14	

MB Sample ID: **TD210405-1** Units: **MG/L** Analysis Date: **4/8/2021**
Client ID: Run ID: **TD210408-1A1** Prep Date: **4/5/2021** DF: **1**

Analyte	Result	ReportLimit	Qual
TOTAL DISSOLVED SOLIDS	ND	20	

The following samples were analyzed in this batch: 2103556-1 2103556-2

APPENDIX L: MODFLOW Modeling

MEMORANDUM

BBA
water consultants
BISHOP-BROGDEN ASSOCIATES, INC.

To: Mr. David Felderhof
From: Timothy A. Crawford and Rachael D. Frei
Subject: Zephyr Gold USA Ltd – Dawson Property Hydrogeologic Investigation
Job: 1307.00
Date: March 2, 2017

This memorandum presents a hydrogeologic investigation of the impact of mine dewatering at the proposed Zephyr Gold USA (Zephyr) Dawson property gold mine generally located in Section 14, Township 19 South, Range 71 West of the 6th P.M, as shown in Figure 1. Specifically, the hydrogeologic investigation focuses on the impact to ground water level elevations in the hard rock and Dakota formation from the dewatering that will occur during mining. To analyze the potential water level impacts, BBA developed a MODFLOW model of the local mine area. The purpose of this modeling effort is to understand potential impacts of the proposed mining and dewatering on ground water elevations.

Introduction

Based on information provided by the client, the Dawson property contains part of a thin, but laterally extensive zone of gold and base-metal mineralization that trends east-northeast and dips to the south-southeast. This zone of mineralization is contained within material that has been mapped as Precambrian granodiorite consisting of massive to foliated, medium to coarse grained granodiorite and lesser amounts of quartz monzonite and quartz diorite (Miscellaneous Investigations Series Map I-869). Local interpretations of the site geology include gneiss material derived from metamorphic conditions at the property. These formations are not specifically differentiated in the model and are referred to herein as “hard rock”. To the north of the proposed mine location, the hard rock material is in contact with sedimentary units including the Dakota formation. The mapped surface geology at the site is presented in Figure 2.

Available well data, including data from two monitoring wells at the Dawson property, indicate that the hard rock and the Dakota formation are locally saturated and transmit water. The extent of this saturation may be limited based on observations from the borehole data at the site. Regional ground water gradients are generally towards the north in the hard rock from the mountainous areas south of the mine and towards the east/northeast in the Dakota formation towards the center of the Canon City Embayment. Local recharge sources are mainly limited to precipitation that infiltrates the formations either as direct recharge or along drainages during runoff where they are present at the surface. Grape Creek to the north of the mine area appears to be in connection with the hard rock based on winter base flow conditions and the perennial nature of the creek. Based on local topography, the creek appears to drain ground water from the surrounding hard rock. As presented in the geologic mapping, the hard rock and Dakota formation are in contact at the mine location along an unnamed east-west, steeply dipping fault.

Excavation of the mine and mining of the gold bearing material will be accomplished with a series of ramps, sills, cross cuts, draw points, haulage levels, rises and declines. Based on the provided information, the total depth of the mine may be on the order of 1,075 feet from the portal to the lowest main level.

To the extent that the mine excavation intercepts saturated fractures within the hard rock material, ground water from those fractures will be dewatered by the mine, ground water will flow into the mine and will then be pumped from the mine. Dewatering within the mine will impact local water levels in the hard rock adjacent to the mine and the sedimentary bedrock units to the north of the hard rock where the units are in contact along geologic faults. We have conservatively assumed that ground water flows across the fault and that the two rock types are in hydraulic connection. This is a very conservative assumption because major geologic fault systems of this type frequently function as barriers to ground water flow.

Model Description

A MODFLOW model was prepared to analyze the potential impact of the mining on the water levels in both the hard rock material that will be mined and the neighboring Dakota formation.

Model Code

The computer code used to model the impacts of the proposed mining is MODFLOW (McDonald and Harbaugh), a three dimensional, finite-difference ground water flow model developed by the United States Geological Survey. MODFLOW is a widely-accepted tool that when employed properly allows for the investigation of dynamic changes in a ground water system. MODFLOW-2005, was used for this analysis. A graphical user interface (GUI), Ground Water Vistas, was used to set up the MODFLOW files, operate the model and analyze model results.

Model Extent and Discretization

The model domain encompasses an area generally 4 miles from north to south and 6 miles from east to west centered around the Dawson property and mine location. The model has been discretized with a model grid that consists of 215 rows and 312 columns. A grid spacing of 100-foot square cells was used across the model domain. A geographical presentation of the model grid is shown in Figure 3. The model has been prepared as a single layer that has been assigned different characteristics to represent the hard rock that will be mined and the Dakota formation that is in contact with the hard rock, as described below.

Top elevations are based on the ground surface elevation for the hard rock areas and the Dakota formation where it outcrops at the surface based on available geologic mapping (Miscellaneous Investigations Series Map I-869). Where the Dakota formation does not outcrop at the ground surface, the top elevation has been determined based on the mapped outcropping of the top of the formation from the I-869 map and the structural mapping of the top of the Dakota formation presented in Miscellaneous Investigations Series Map I-1022. Bottom elevations for the cells representing hard rock areas were set at 5,000 feet and bottom elevations for the cells representing the Dakota formation were set 1,500 feet below the top of the cell.

Both the hard rock and the Dakota formation were modeled as convertible such that transmissivity is calculated based on the top of the formation when a cell is confined (water level above the top of the cell) and is calculated based on simulated water level elevation when the water level is below the top of the cell. This limits the calculated transmissivity to the thickness of the layer. This setting also allows the storage coefficient to alternate between confined and unconfined values.

An isotropic hydraulic conductivity of 0.02 feet per day was used for the hard rock based on a review of limited well test data from State well completion reports and the potential range of fractured hard rock hydraulic conductivities. The Dakota formation was simulated as a thicker unit than actually occurs in the physical world in order to avoid dry cells in the model and to conservatively allow for ground water flow between the hard rock and the Dakota formation. Accordingly, an isotropic hydraulic conductivity of 0.1333 feet per day was used for the Dakota formation. This value is lower than the estimated actual hydraulic conductivity because we simulated a greater formation thickness and reduced the hydraulic conductivity in order to maintain a realistic formation transmissivity for the Dakota formation. Simulating a thicker Dakota formation is conservative in that it allows for greater ground water flow and interaction between the two rock types than actually occurs in the physical world.

A storage coefficient and a specific yield of 0.01 was used for the hard rock. A storage coefficient of 0.0003 was used for the Dakota formation where the formation is confined and a specific yield of 0.1 was used for the Dakota formation where the formation is unconfined.

Ground water recharge associated with the average precipitation of 18-inches per year on the hard rock and the outcrop areas of the Dakota formation was simulated based on a percentage of total precipitation. Five percent of the average annual precipitation amount has been included as recharge in the model over the hard rock areas and ten percent of the average annual precipitation amount has been included as recharge in the model over the Dakota formation outcrop areas. No recharge has been included in the model for areas of the Dakota formation where the top of the formation is below the ground surface.

Model Boundaries

The MODFLOW model includes several boundary conditions, as described below.

- The hard rock and the Dakota formation are modeled using head dependent cells. The material above and below the Dakota, where present, is modeled using no flow boundaries.

- Grape Creek, a perennial creek, was modeled using the river package. River stage was set to be equal to DEM elevation data at the location of each river cell. The channel width was set to 20 feet based on measurements from available aerial photography. The river bed elevation was set at 2 feet below the river stage. Thickness of the river bed was assumed to be 5 feet with a hydraulic conductivity of 0.01 feet per day. The resulting streambed conductance was calculated to be approximately 30 gallons per day per foot.

- Underflow out of the Dakota formation to the east was modeled using constant head cells.

- The mountainous terrain to the south of the mine area (Dawson Mountain) was modeled using constant head cells to provide for a gradient of flow generally from the south to the north.

- The dewatering of the mine was accomplished using a single constant head cell at the general location of the mine. The use of a single cell approximates the volume of material that will be removed from the mine. The constant head elevation for the mine dewatering is set 700 feet below the top of the cell. This depth was chosen as available investigations performed at the Santa Susana Field Laboratory and by the USGS in Death Valley indicate a drop in the hydraulic conductivity of fractured formations at this depth on the order of 1 to 2 magnitudes as a result of overburden pressures. A drop in hydraulic conductivity of this magnitude within the model is essentially a no flow boundary and very little additional mine inflow is expected below this depth.

Model Operation

The model was initially run in steady state mode to estimate pre-mining ground water conditions and prepare starting heads for a transient mode analysis. The model was then run in transient mode for a period of 10 years with the modeled mine dewatering to determine the impacts of the dewatering on the hydrogeologic system. The results of the two model runs were compared to determine the impact (drawdowns) caused by the proposed mine dewatering.

Sufficient data is not available for the area to allow for a full calibration of the model. The model was refined to simulate the water level elevations in the two existing Zephyr monitoring wells and one existing well (Permit No. 227578) completed in the hard rock material as closely as possible based on the currently available pre-mining water level data.

Mine Dewatering Summary

Dewatering of the proposed mine will cause drawdowns in both the hard rock and the neighboring Dakota formation in the area around the mine. The drawdowns calculated by the model have been presented in the attached Figure 4. As presented, drawdowns are concentrated at the mine site where dewatering will occur with drawdowns as high as approximately 285 feet at the mine. These drawdowns are a result of the construction of the mine which will essentially drain any fractures that the mine encounters. Drawdowns greater than 5 feet in the hard rock indicated by the modeling extend approximately 1.1 miles from the mine location. Drawdowns in the Dakota formation are also concentrated at the mine site where the dewatering occurs. Drawdowns in the Dakota formation greater than 5 feet extend approximately 0.9 miles from the mine location.

We believe that modeled drawdowns in the Dakota formation are overstated by the model for the following reasons:

- The Dakota formation is simulated as a thicker unit than actually occurs in the physical world and there is less opportunity in the physical world for ground water interaction between the hard rock and Dakota formation than simulated in the model.
- The geologic faults that surround the property (see Figure 2) will impede ground water flow across the fault and limit drawdown impacts beyond the faults.
- The model uses an average annual recharge and does not capture the impacts of seasonal recharge events that occur in the physical world. Seasonal recharge in fractured rock systems has the impact of temporarily eliminating water level drawdowns at distance from pumping stresses.
- The modeled mine dewatering assumes full buildout conditions from the beginning of the simulated mine dewatering period. The mine will actually take some time to be completely excavated.

The model was constructed based on very conservative assumptions and the estimated drawdown is overstated by the model.

Summary

- A MODFLOW model was developed and utilized to estimate the potential impact of mine dewatering on ground water elevations.

- Figure 4 presents the modeled changes in water level associated with the proposed mining activities and the dewatering of the mine over a period of 10 years.

- Dewatering of the mine may reduce water level in the hard rock up to 285 feet at the mine location and drawdowns greater than 5 feet may extend distances up to 1.1 miles from the mine.

- Dewatering of the mine may reduce water level in the Dakota formation up to 50 feet at the mine and drawdowns greater than 5 feet may extend distances up to 0.9 miles from the mine.

- Changes in water level indicated by the modeling were greatest in the immediate vicinity of the mine with changes decreasing with distance from the mine. This trend is consistent with expectations.

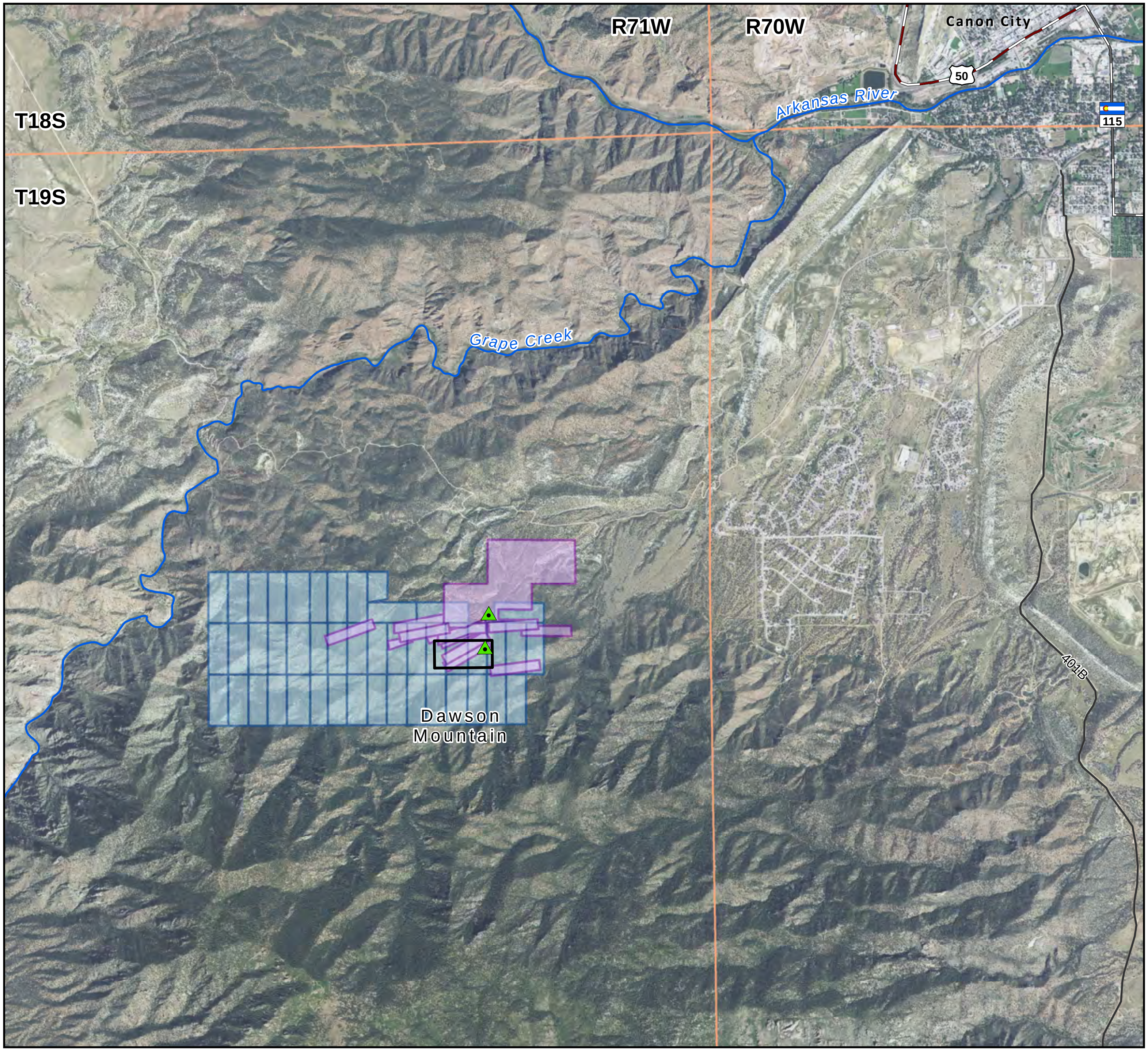


Figure 1
Zephyr Gold USA Dawson Property General Location Map

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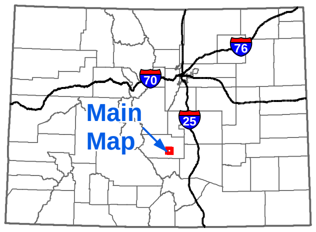
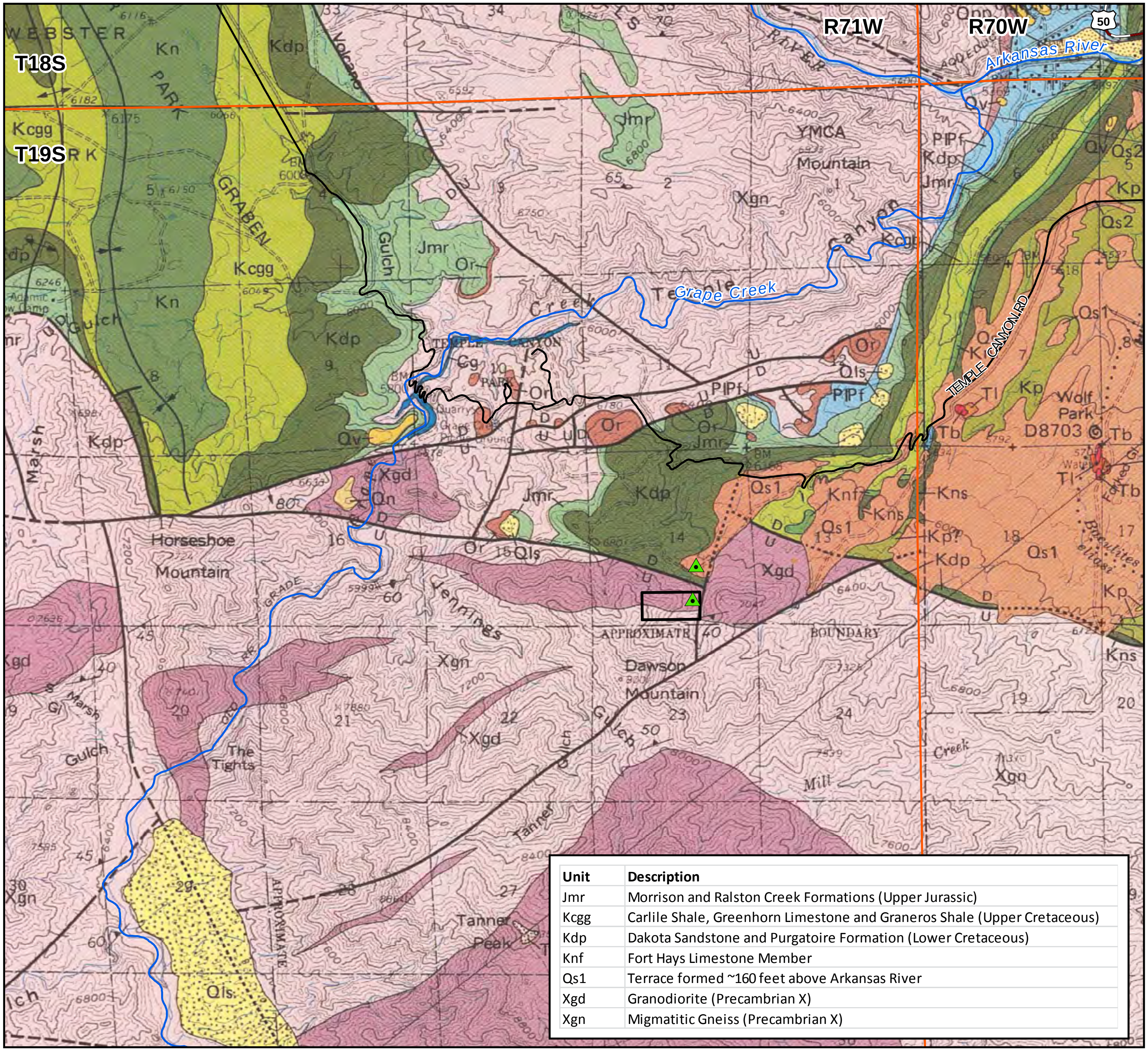
Legend

- ▲ Existing Monitoring Well
- ☐ Approximate Location of Underground Workings
- 🟦 Zephyr Unpatented Claim
- 🟪 Zephyr Patented Claim

Aerial Photo Date: 09/09/2015
Data Source: BBA, USGS, BLM

Colorado





Unit	Description
Jmr	Morrison and Ralston Creek Formations (Upper Jurassic)
Kcgg	Carlile Shale, Greenhorn Limestone and Graneros Shale (Upper Cretaceous)
Kdp	Dakota Sandstone and Purgatoire Formation (Lower Cretaceous)
Knf	Fort Hays Limestone Member
Qs1	Terrace formed ~160 feet above Arkansas River
Xgd	Granodiorite (Precambrian X)
Xgn	Migmatitic Gneiss (Precambrian X)

Figure 2
Zephyr Gold USA Dawson Property Surface Geology Map

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Legend

▲ Existing Monitoring Well

▭ Approximate Location of Underground Workings

Background: Reconnaissance geologic map of the Royal Gorge quadrangle, Fremont and Custer Counties, Colorado. 1975. 1:62,500

Data Source: BBA, USGS, BLM

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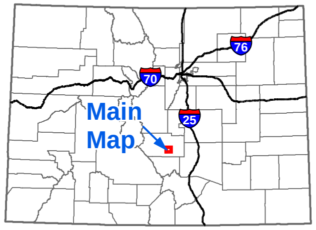

Figure 3
Zephyr Gold USA Dawson Property Model Domain Map

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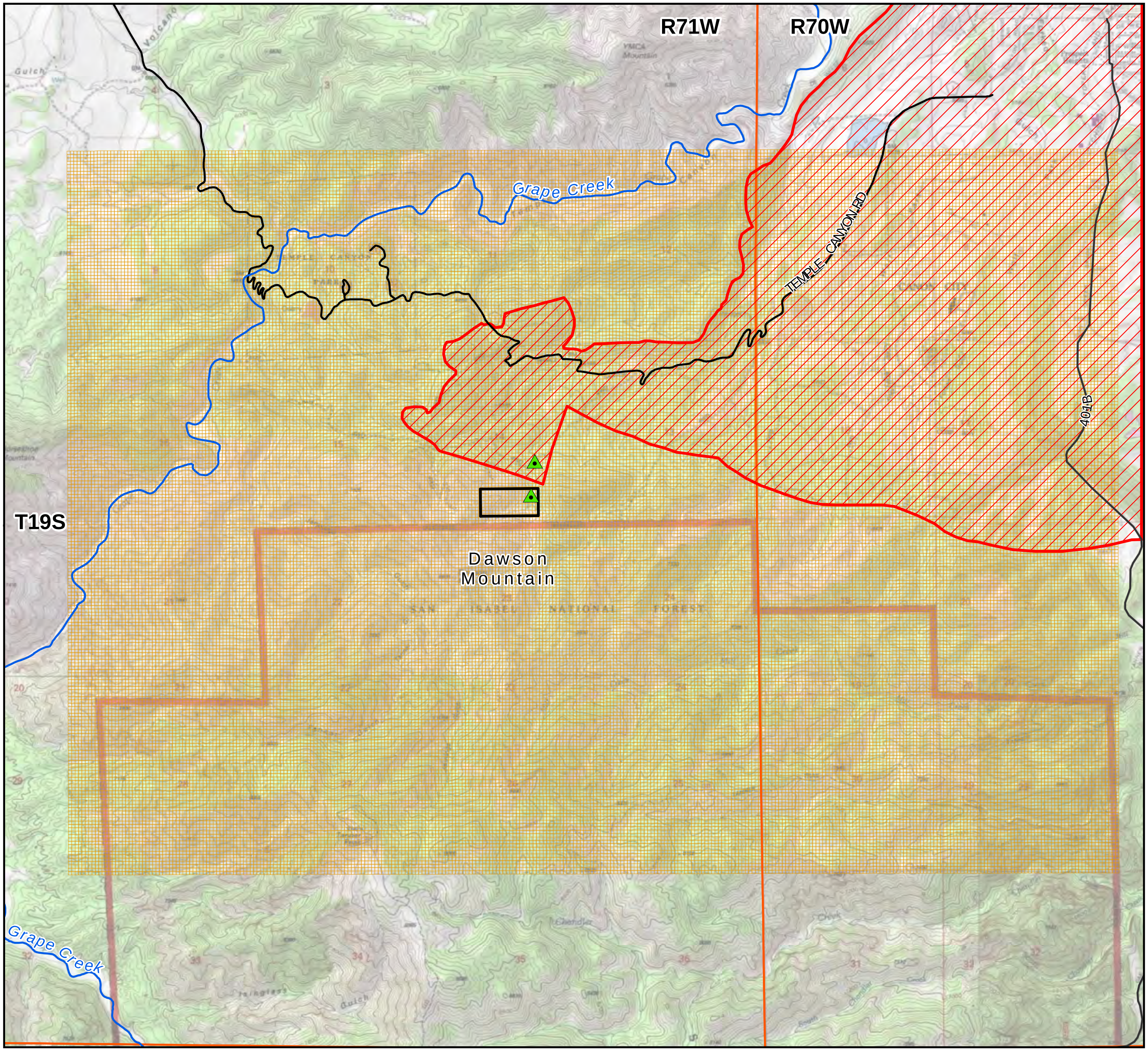
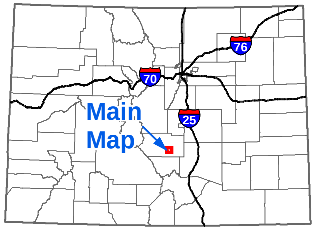


Legend

- ▲ Existing Monitoring Well
- ▭ Approximate Location of Underground Workings
- ▦ Model Grid - 100-ft. x 100-ft.
- ▨ Extent of Dakota Formation

Data Source: BBA, USGS, BLM

Colorado



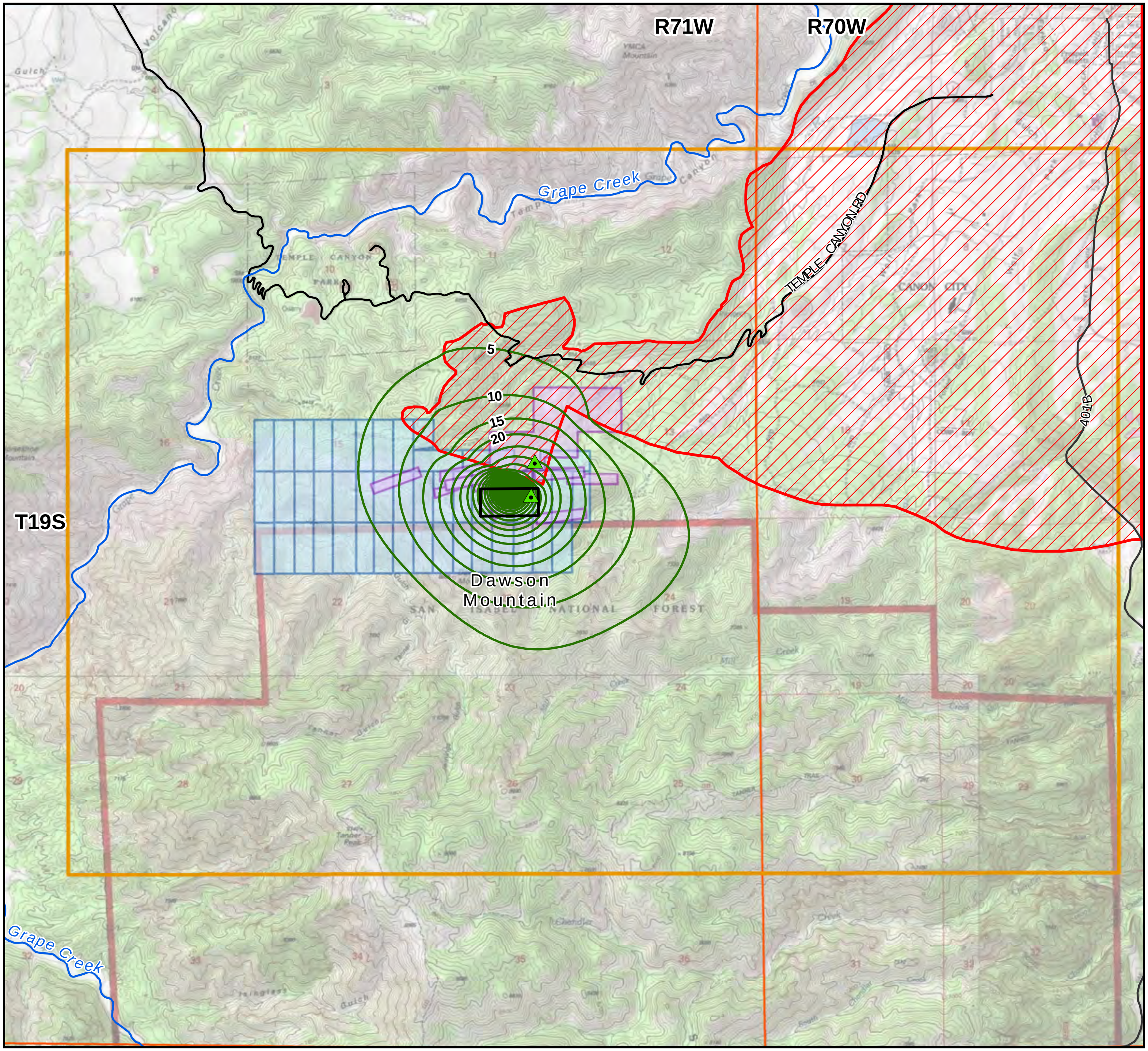


Figure 4
Zephyr Gold USA Dawson Property Modeled Drawdown Map

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Legend

- ▲ Existing Monitoring Well
- ☐ Approximate Location of Underground Workings
- — Drawdown (5-foot Contour Interval)
- 🟥 Extent of Dakota Formation
- 🟪 Zephyr Patented Claim
- 🟦 Zephyr Unpatented Claim
- 🟧 Extent of Model Boundary

Data Source: BBA, USGS, BLM