



State of Utah

SPENCER J. COX
Governor

DEIDRE HENDERSON
Lieutenant Governor

Department of
Environmental Quality

Kimberly D. Shelley
Executive Director

DIVISION OF WATER QUALITY
Erica Brown Gaddis, PhD
Director

MEMORANDUM

TO: Lonnie Shull III, Permit Writer

FROM: Chris Bittner, Standards Coordinator

DATE: April 3, 2021

SUBJECT: Level I Antidegradation Review for Compass Minerals Permit Renewal
UT0000647

Outfall 001. No substantive changes are observed for the effluents from Outfall 001 that would affect the conclusions that the effluent limits from the previous permit will protect the uses of Great Salt Lake (R317-2-6.5).

Outfalls 006, 007, and 008

Compass operates several outfalls for mineral return flows. The primary purpose of mineral return flows is to return the leftover salts in the evaporation ponds back to the Great Salt Lake. Water from Bear River Bay is conveyed to the various evaporation ponds and then back to Bear River Bay. The immediate receiving waters for the return flows are bound by railroad bridges to the north and south and are informally known as the Trapezoid (Figure 1). The Trapezoid is designated as Bear River Bay (R317-2-6.5.c.). However, the water quality characteristics of the Trapezoid are much more similar to Gilbert Bays south of the Union Pacific bridge than Bear River Bay upstream of the bridge that forms the northern boundary of the Trapezoid. This bridge is located at a land constriction where the dominant flow direction is from north to south and fresher to more saline. As indicated by the elevated salinity in the Trapezoid relative to upstream, more saline Gilbert Bay waters regularly influence the Trapezoid.

Compass Minerals does not add any substances to the evaporation ponds. All the substances in the return flows originated from the Lake. The primary purpose of the monitoring conducting during the mineral return flows is to confirm that the Narrative Standards (R317-2-7.2) are met. The results of the monitoring were reviewed to ensure that existing uses are protected (Level I antidegradation review; R317-2-3).

Figure 1 shows the monitoring locations for the mineral return flows. In addition to the return flow monitoring at Outfalls 006, 007 and 008, the receiving waters directly affected by return

flows (Mid Trapezoid) and locations that represent ambient conditions for the Lake (Background North, GSL-NE and South Promontory Point) were also monitored.

Prior to 2017, the analyses for the mineral return samples were provided by the Geosciences laboratory at the University of Utah. Beginning in 2017, Brooks Applied Laboratories provided the analyses. In 2018, the samples were split between the University of Utah and Brooks Applied laboratories. The splits were analyzed to verify that the Brooks Applied Laboratory data were comparable to the University of Utah. Comparability is one of the EPA-recommended data quality objectives in addition to precision, accuracy, and completeness.

The tables presented on pages 10 through 13 provide the analytical results for 2017 return flow monitoring. The results for 2018, 2019, and 2020 are provided in the tables beginning on page 14. The results from the two laboratories for arsenic, lead, manganese and mercury are generally comparable whereas the results for cadmium, copper, nickel, selenium and zinc are generally different. The causes of the differences are unknown. Figures 2 and 3 illustrate these observations for results from the two laboratories for the GSL NE and Outfall 006 sample locations, respectively.

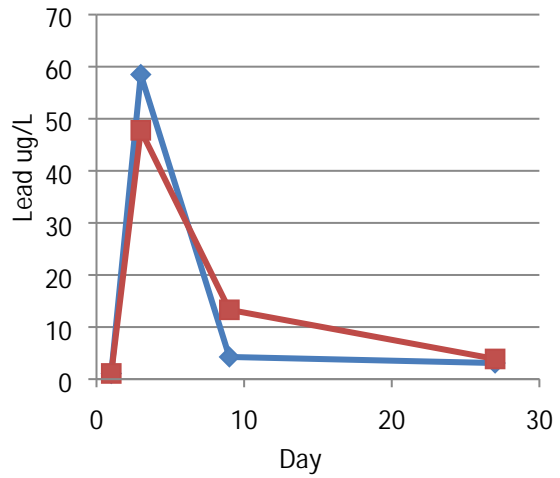
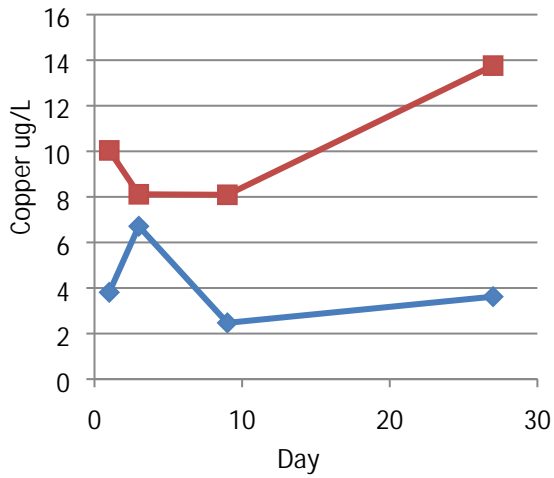
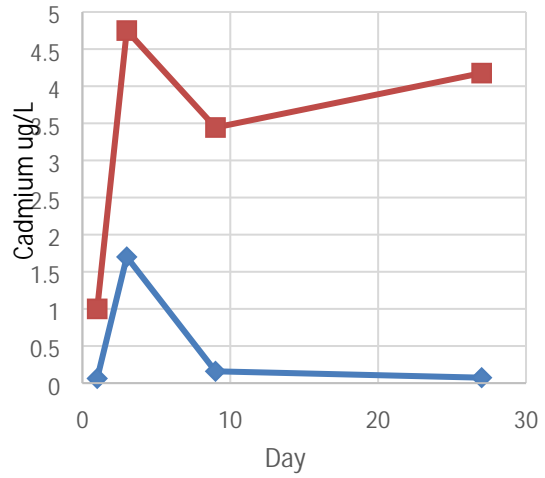
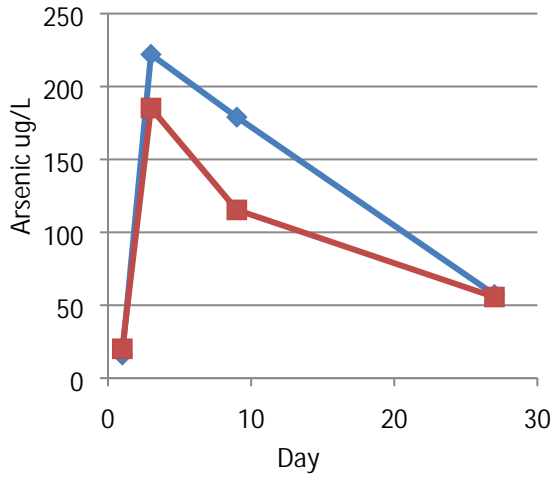
The general trends observed in concentrations over time are similar regardless of analyte. As expected, concentrations for the mineral return flows from Outfall 006 generally decrease over time (Figure 3). Based on the currently available information, the Brooks Applied Laboratory data are presumed to be the most representative because of completeness, more rigorous quality control documentation, and because DWQ has previously observed positive interferences with Great Salt Lake selenium analyses from the University of Utah laboratory.

Figure 4 compares the concentrations observed at Outfall 006, Mid Trapezoid and GSL NE sample locations from the fall, 2018. These results are similar to the other years of mineral return flows. The fall 2018 results show that arsenic, mercury, nickel, selenium and zinc are initially present in the mineral return flows at concentrations 3 to 7 times greater than ambient waters in Gilbert Bay but by Day 27 the concentrations decreased to close to ambient concentrations. If the maximum concentrations are screened against Utah Class 3D freshwater criteria (Table 2.14.2, R317-2-14), only the arsenic and mercury screening criteria are exceeded. The rapid assimilation demonstrated by comparing the analytical results from the Outfall 006 to the Mid Trapezoid and GSL NE sample locations and the limited bird use documented by the Jacobs Engineering 2017-2018 bird survey supports that the mineral return flows are unlikely to adversely impact the designated uses of the receiving waters. These results also support that seasonal restrictions for the mineral return flows are unnecessary.

Monitoring is recommended to continue until return flows for all different return flow conditions and ponds have been characterized. The currently available results support that monitoring beyond about Day 28 of the return flows is unnecessary because concentrations approach ambient concentrations. At minimum, arsenic, mercury, nickel, selenium and zinc should be retained as target analytes. The summary monitoring and reporting should also include a measure of salinity such as conductivity.



Figure 1. Sampling locations for mineral return flow monitoring, Compass Minerals, Great Salt Lake, Utah



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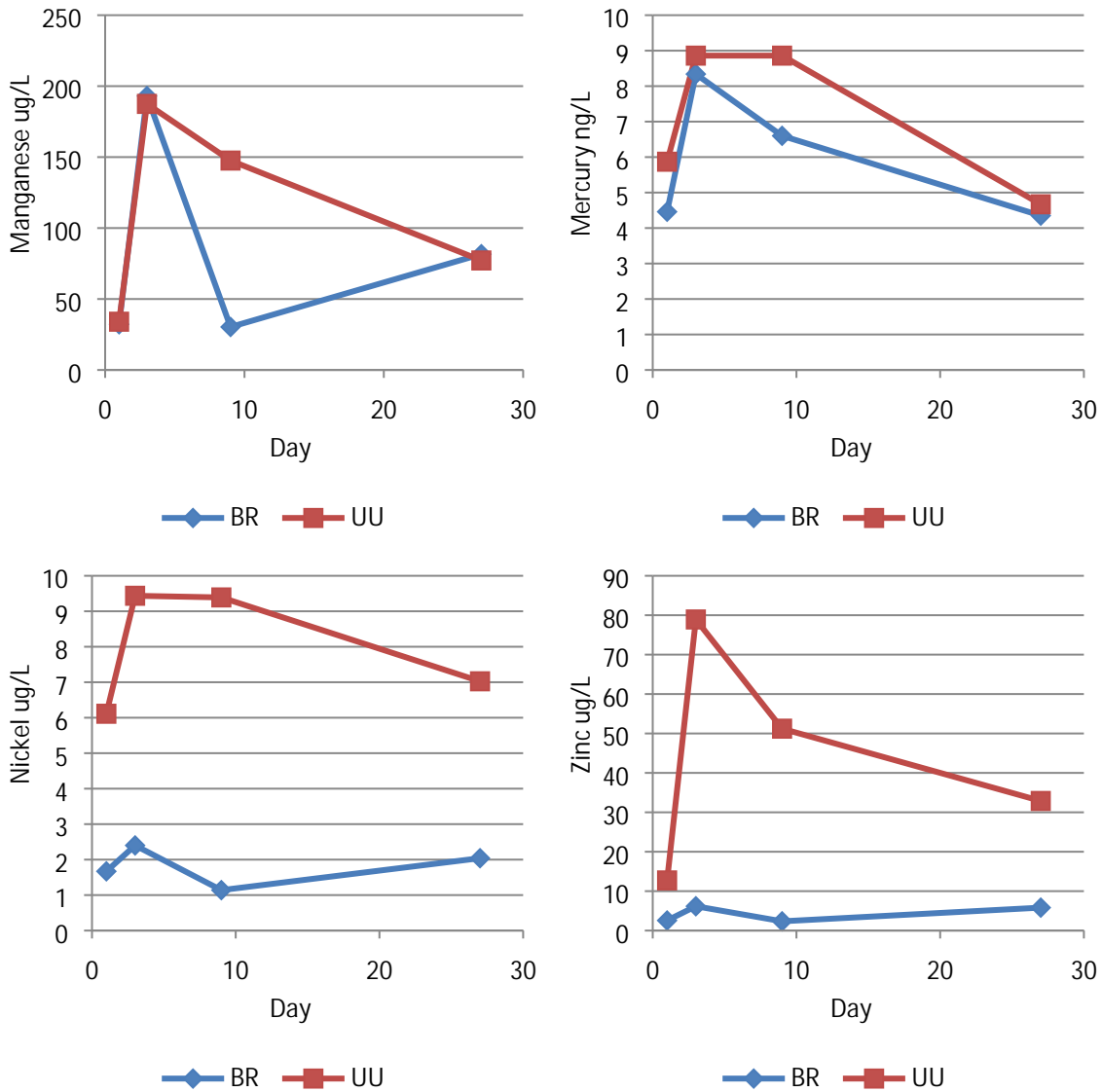
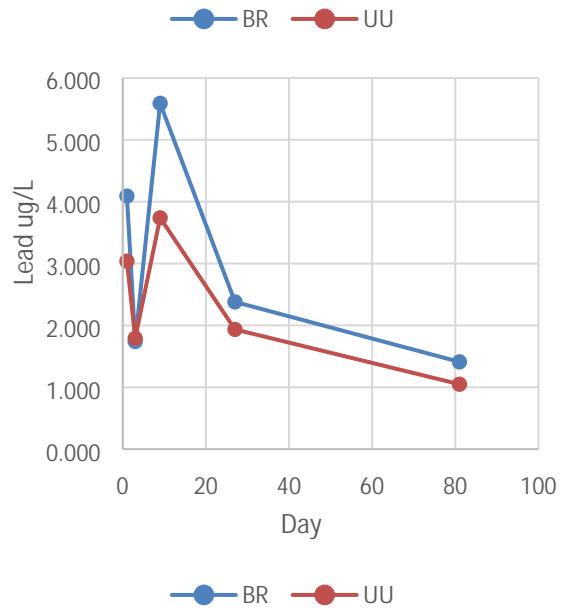
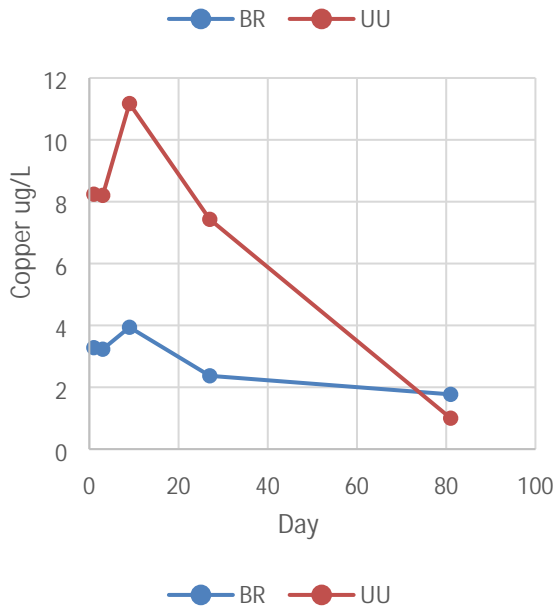
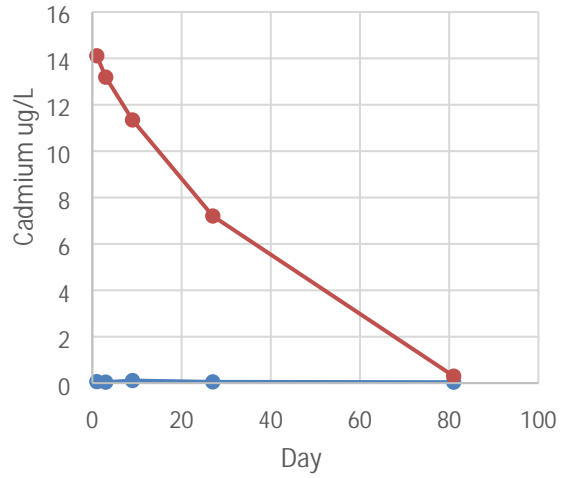
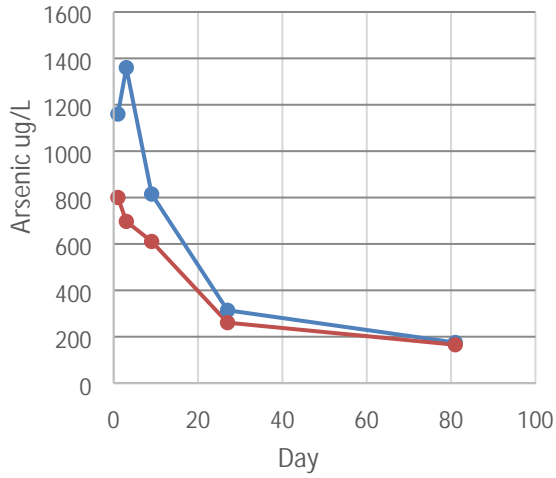


Figure 2. Comparisons of analytical results from Brooks Applied Laboratories (BR) and University of Utah Geosciences (UU) laboratories from GSL-NE sample location, November 2018



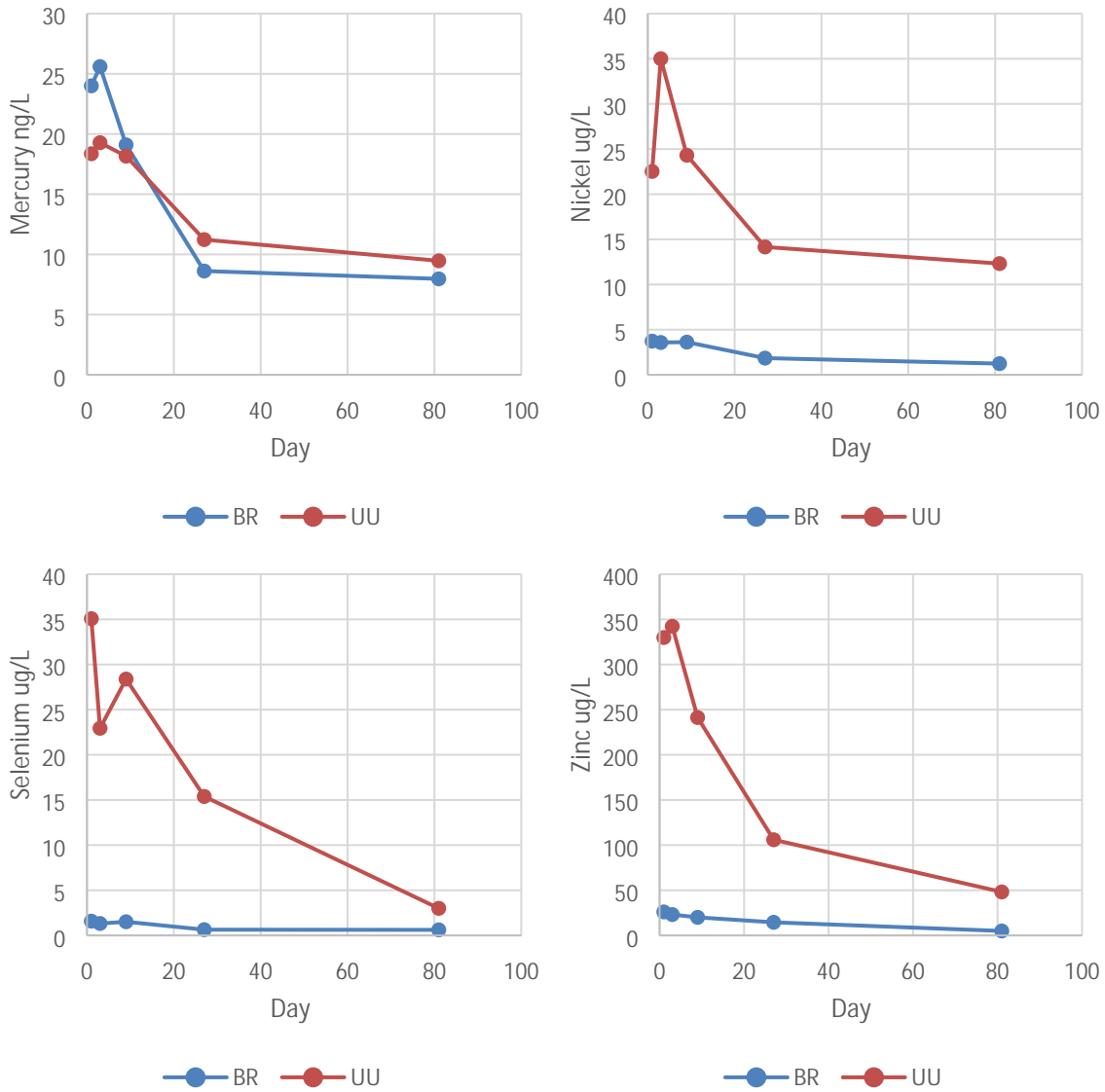
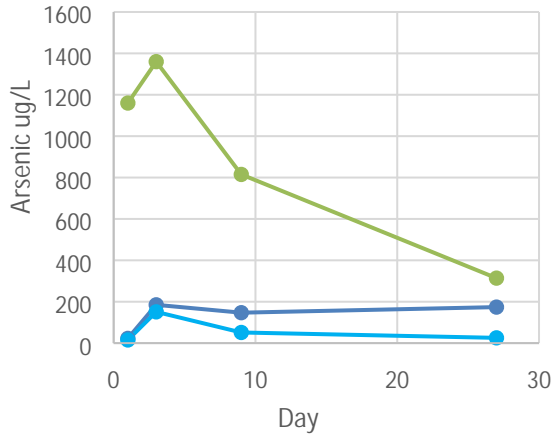
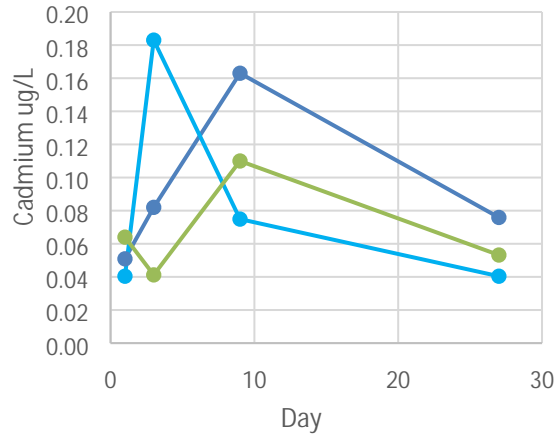


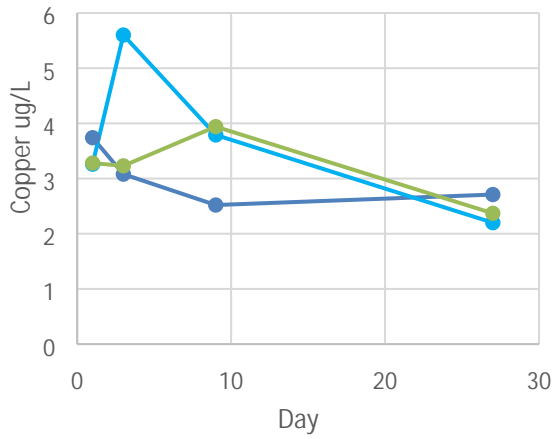
Figure 3. Comparisons of analytical results from Brooks Applied Laboratories (BR) and University of Utah Geosciences (UU) laboratories from Outfall 006, November 2018



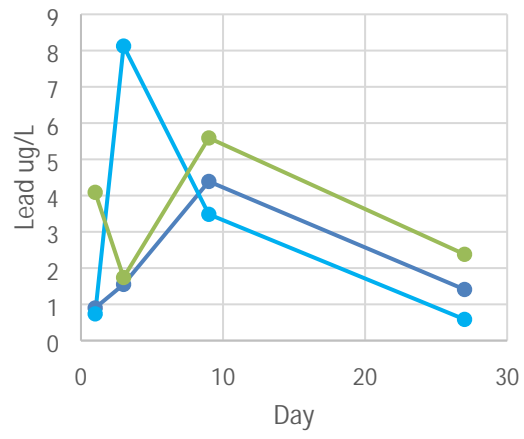
● S. Promontory ● Trapezoid
● Outfall 006



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● Outfall 006

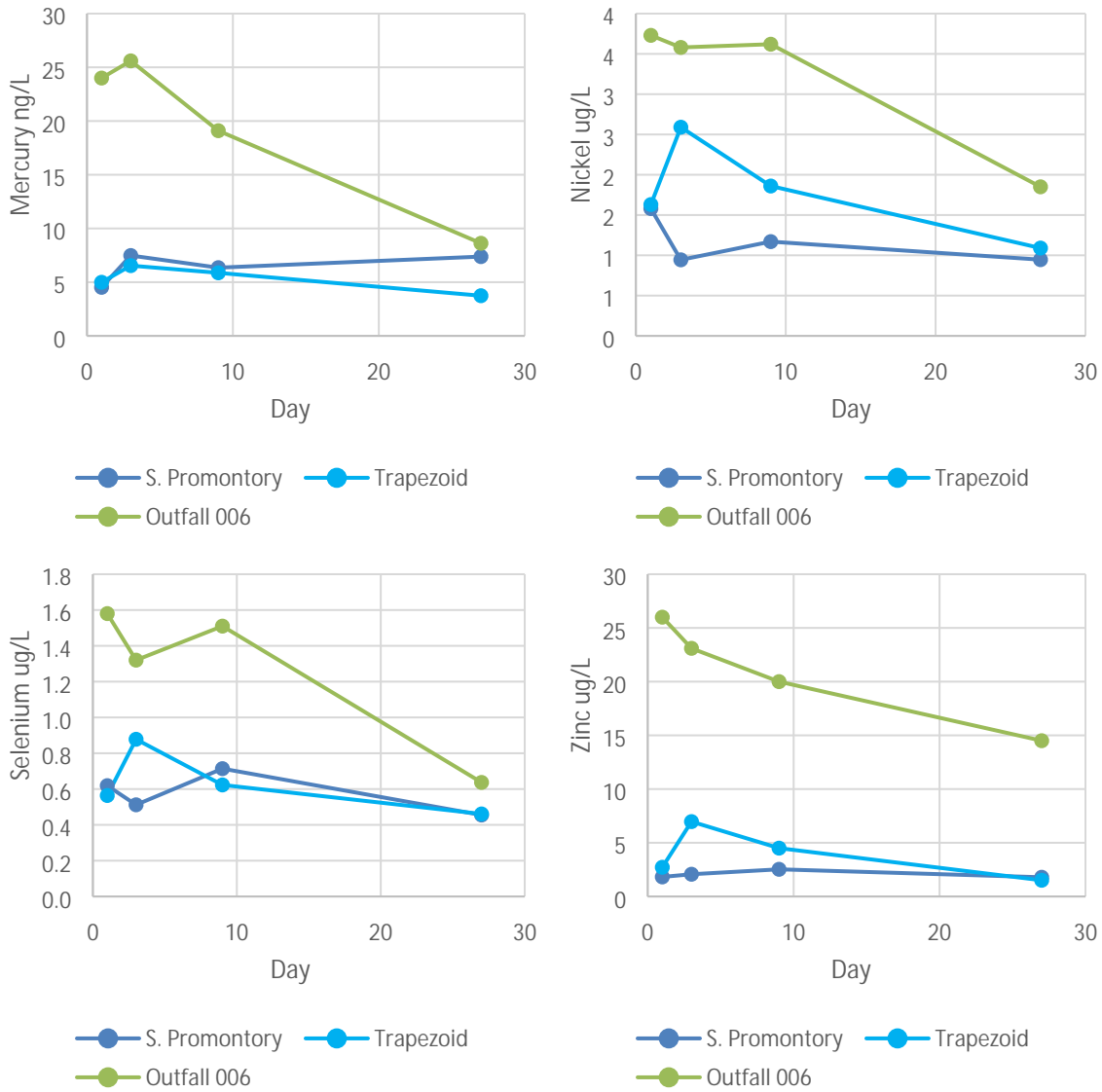


Figure 4. Comparisons of analytical results from South Promontory, Mid-Trapezoid, and Outfall 006 monitoring locations from the Brooks Applied laboratory for November 2018

Outfall 006 - Brooks Applied Labs													
	Units	Day 1		Day 3		Day 3 (Dup 1)		Day 9		Day 27		Day 81	
		11/07/2017 0730		11/09/2017 0730		11/09/2017		11/18/2017		12/07/2017		01/29/2018	
pH	SU	7.42		7.66		7.70		7.58		7.75		8.14	
Arsenic	µg/L	303		241		244		275		165		93.6	
Barium	µg/L	83.7		101		98.4		80.3		159		77.4	
Cadmium	µg/L	0.0901	J	0.0477	J	0.0585	J	0.0810	J	0.0424	J	0.0593	J
Cobalt	µg/L	1.63		0.944		0.949		1.39		0.713		0.486	
Copper	µg/L	2.64		2.10		1.90		2.74		2.01		2.31	
Iron	µg/L	350		273		186		299		361		186	
Iron	µg/L	461		191		271		219		220		143	
Mercury	ng/L	9.01	J-1	13.1		14.5		7.95		14.4		7.42	
Nickel	µg/L	404		321		314		422		264		223	
Manganese	µg/L	2.71		2.27		2.34		2.88		1.70		1.45	
Lead	µg/L	3.91		2.74		2.69		6.47		2.78		2.81	
Selenium	µg/L	0.830		0.734		0.768		0.917		0.464		0.566	
Zinc	µg/L	13.0		10.2		8.31		16.4		8.95		7.64	

J: Detected by the instrument, the result is > the MDL but ≤ the MRL. Result is reported and considered an estimate.

J-1: Estimated value. A full explanation is presented in the narrative

U: Result is ≤ the MDL or client requested reporting limit (CRRL). Result reported as the MDL or CRRL.

Outfall 007 - Brooks Applied Labs							
	Units	Day 1		Day 3		Day 9	
		03/01/2018 1000		03/02/2018 1700		03/13/2018 0800	
pH	SU	7.56		7.57		7.48	
Arsenic	µg/L	129		147		123	
Barium	µg/L	175		211		211	
Cadmium	µg/L	0.107		0.116		0.0404	U
Cobalt	µg/L	0.366		0.594		0.326	
Copper	µg/L	2.71		5.09		2.92	
Iron	µg/L	165		596		108	
Iron	µg/L	285		821		95.8	
Mercury	ng/L	15.8		37.3		0.66	
Nickel	µg/L	70.2		106		54.4	
Manganese	µg/L	1.37		2.04		1.27	
Lead	µg/L	3.20		3.77		0.165	
Selenium	µg/L	0.515		0.566		0.442	
Zinc	µg/L	6.41		8.53		6.91	

J: Detected by the instrument, the result is > the MDL but ≤ the MRL. Result is reported and considered

J-1: Estimated value. A full explanation is presented in the narrative

U: Result is ≤ the MDL or client requested reporting limit (CRRL). Result reported as the MDL or CRRL.

Outfall 008 - Brooks Applied Labs											
	Units	Day 1		Day 3		Day 9		Day 27		Day 81	
		11/07/2017 0930		11/08/2017 1700		11/18/2017		12/07/2017		01/29/2018	
pH	SU	7.41		7.51		7.69		7.66		8.02	
Arsenic	µg/L	322		304		200		156		118	
Barium	µg/L	98.9		114				215		117	
Cadmium	µg/L	0.0404	U	0.0605	J	0.0694	J	0.170		0.0617	J
Cobalt	µg/L	0.549		0.515		0.364		0.260		0.271	
Copper	µg/L	2.59		2.84		2.67		2.16		2.92	
Iron	µg/L	86.0		99.6		103		118		69.8	
Iron	µg/L	134	J	64.6		152		77.3		68.6	J
Mercury	ng/L	2.52	J-1	4.08	J-1	5.55		20.2		6.74	
Nickel	µg/L	58.8		62.1		49.0		38.6		21.9	
Manganese	µg/L	1.92		2.13		1.50		1.03		1.02	
Lead	µg/L	1.47		2.45		2.19		3.04		1.50	
Selenium	µg/L	0.923		0.827		0.772		0.549		0.460	
Zinc	µg/L	14.0		9.66		4.78		10.5		6.19	

J: Detected by the instrument, the result is > the MDL but ≤ the MRL. Result is reported and considered an estimate.

J-1: Estimated value. A full explanation is presented in the narrative

U: Result is ≤ the MDL or client requested reporting limit (CRRL). Result reported as the MDL or CRRL.

Background North / Ambient - Brooks Applied Labs											
	Units	Day 1		Day 3		Day 9		Day 27		Day 81	
		11/06/2017		11/08/2017		11/21/2017		12/06/2017		02/07/2018	
pH	SU	8.80		8.37		8.71		8.66		8.48	
Arsenic	µg/L	3.00		3.40		2.69		3.57		2.01	
Barium	µg/L	69.9		78.6		69.7		81.6		62.7	
Cadmium	µg/L	0.0162		0.0260		0.0193		0.0404	U	0.0648	J
Cobalt	µg/L	0.453		0.637		0.477		0.715		1.17	
Copper	µg/L	2.57		3.48		2.96		4.20		7.49	
Iron	µg/L	1170		1530		1010		1680		2620	
Iron	µg/L	1040		1440		1110		1380		2380	
Mercury	ng/L	1.23	J-1	2.25	J-1	1.63		2.38		3.38	
Nickel	µg/L	1.29		39.9		25.6		38.0		72.9	
Manganese	µg/L	26.9		1.75		1.44		1.98		3.00	
Lead	µg/L	1.19		1.76		1.14		1.71		3.62	
Selenium	µg/L	0.275		0.289		0.337		0.343		0.421	
Zinc	µg/L	9.29		12.3		9.51		18.5		23.6	

J: Detected by the instrument, the result is > the MDL but ≤ the MRL. Result is reported and considered an estimate.

J-1: Estimated value. A full explanation is presented in the narrative

U: Result is ≤ the MDL or client requested reporting limit (CRRL). Result reported as the MDL or CRRL.

Mid-Trapezoid - Brooks Applied Labs											
	Units	Day 1		Day 3		Day 9		Day 27		Day 81	
		11/06/2017		11/08/2017		11/21/2017		12/06/2017		02/07/2018	
pH	SU	8.74		8.60		9.61		8.54		8.49	8.48
Arsenic	µg/L	4.10		7.41		2.64		3.67		3.80	3.68
Barium	µg/L	79.0		81.1		80.6		86.7		85.0	69.7
Cadmium	µg/L	0.0400		0.0354		0.0241		0.0502	J	0.0974	J
Cobalt	µg/L	0.770		0.723		0.585		0.950		1.50	0.926
Copper	µg/L	4.28		4.38		3.66		5.89		9.77	6.75
Iron	µg/L	1880		1810		1300		2190		3430	2220
Iron	µg/L	1830		1660		1500		2020		3090	1890
Mercury	ng/L	2.59	J-1	2.94	J-1	1.81		3.33		4.62	2.82
Nickel	µg/L	54.1		53.0		35.8		63.0		109	62.2
Manganese	µg/L	2.05		2.00		1.70		2.56		3.88	2.66
Lead	µg/L	2.39		2.08		1.51		2.89		5.36	2.89
Selenium	µg/L	0.252		0.290		0.305		0.313		0.402	0.380
Zinc	µg/L	13.2		13.3		11.1		19.7		29.7	19.7

J: Detected by the instrument, the result is > the MDL but ≤ the MRL. Result is reported and considered an estimate.

J-1: Estimated value. A full explanation is presented in the narrative

U: Result is ≤ the MDL or client requested reporting limit (CRRL). Result reported as the MDL or CRRL.

Background South (Gilbert Bay) - Brooks Applied Labs											
	Units	Day 1		Day 3		Day 9		Day 9 (Dup 2)		Day 81	
		11/06/2017		11/08/2017		11/21/2017		11/21/2017		12/06/2017	
pH	SU	8.62		8.45		8.43		8.58		8.04	8.39
Arsenic	µg/L	25.9		56.0		14.5		3.00		14.8	7.09
Barium	µg/L	89.7		86.1		65.8		83.5		141	58.4
Cadmium	µg/L	0.0912		0.0362		0.0251		0.0370		0.151	0.0404
Cobalt	µg/L	0.563		0.255		0.413		0.748		2.07	0.620
Copper	µg/L	3.94		1.60		2.88		4.57		14.2	4.99
Iron	µg/L	1130		269		890		2010		7380	1280
Iron	µg/L	1120		229		824		1830		4420	1390
Mercury	ng/L	4.53	J-1	1.99	J-1	2.13		2.43		16.1	2.34
Nickel	µg/L	37.6		27.7		34.6		49.2		156	40.8
Manganese	µg/L	1.79		1.03		1.32		2.09		5.19	1.83
Lead	µg/L	2.51		0.952		1.13		2.13		8.00	1.76
Selenium	µg/L	0.423		0.456		0.295		0.391		0.366	0.400
Zinc	µg/L	10.5		3.09		8.05		18.1		42.6	14.8

J: Detected by the instrument, the result is > the MDL but ≤ the MRL. Result is reported and considered an estimate.

J-1: Estimated value. A full explanation is presented in the narrative

U: Result is ≤ the MDL or client requested reporting limit (CRRL). Result reported as the MDL or CRRL.

South Promontory Point - Brooks Applied Labs									
	Units	Day 1	Day 3	Day 9	Day 27	Day 27 (Dup 3)	Day 81		
		11/06/2017	11/08/2017	11/21/2017	12/06/2017	12/06/2017	02/07/2018		
pH	SU	not collected	8.27	8.59	8.08	8.10	8.30		
Arsenic	µg/L	not collected	113	0.565	U	114	112	7.29	
Barium	µg/L	not collected	129	67.3		129	141	54.0	
Cadmium	µg/L	not collected	0.0406	0.0142	0.0404	U	0.0588	J	0.0404
Cobalt	µg/L	not collected	0.269	0.245	0.311		0.324		0.326
Copper	µg/L	not collected	2.40	1.59	2.99		3.10		2.79
Iron	µg/L	not collected	230	341	307		304		519
Iron	µg/L	not collected	196	374	265		202		694
Mercury	ng/L	not collected	3.76	J-1	1.49	3.65	5.16		1.01
Nickel	µg/L	not collected	13.8	24.6	32.8		21.6		17.8
Manganese	µg/L	not collected	1.07	0.952	1.13		1.16		1.12
Lead	µg/L	not collected	1.10	0.578	1.18		1.34		0.657
Selenium	µg/L	not collected	0.448	0.0581	U	0.490	0.499		0.371
Zinc	µg/L	not collected	3.22	3.82	6.02		5.57		7.79

J: Detected by the instrument, the result is > the MDL but ≤ the MRL. Result is reported and considered an estimate.

J-1: Estimated value. A full explanation is presented in the narrative

U: Result is ≤ the MDL or client requested reporting limit (CRRL). Result reported as the MDL or CRRL.

**Table 1 - Outfall 006
Mineral Return Data -
2018/2019 Mineral Return Season
Compass Minerals Ogden, Inc.**

Outfall 006 - Brooks Applied Labs												
	Units	Day 1	Duplicate	Day 3	Day 9	Day 27	Duplicate	Day 81	Last Day MR	Duplicate		
		10/27/2018	10/27/2018	10/31/2018	11/05/2018	11/21/2018	11/21/2018	01/17/2019	3/20/2019	3/20/2019		
Arsenic	µg/L	1160	1220	1360	815	314	311	175	251	251		
Iron	µg/L	107	96.7	88.6	229	128	143	103	379	395		
Mercury	ng/L	24	23.3	25.6	19.1	8.62	7.34	7.97	30.3	26.7		
Manganese	µg/L	524	460	409	456	197	199	139	356	372		
pH	SU	7.01	7.05	7.04	7.23	7.94	7.95	8.03	9.01	H	8.98	H
Selenium	µg/L	1.58	1.52	1.32	1.51	0.637	0.712	0.614	0.711	0.697		
Cadmium	µg/L	0.064	J 0.063	0.0412	J 0.11	0.0532	J 0.0534	0.0404	U 0.150	0.153		
Cobalt	µg/L	1.23	1.21	1.14	1.15	0.452	0.457	0.397	0.680	0.713		
Copper	µg/L	3.28	3.28	3.23	3.94	2.37	2.41	1.77	4.65	4.87		
Nickel	µg/L	3.73	3.69	3.58	3.62	1.85	1.88	1.24	2.04	2.11		
Lead	µg/L	4.09	3.98	1.74	5.59	2.38	2.39	1.41	8.19	8.58		
Zinc	µg/L	26	25.9	23.1	20	14.5	6.93	4.93	9.07	9.31		
Barium	µg/L	816	U 816	U 20.9	816	U 102	99.6	112	150	144		
Iron	µg/L	16300	U 16300	U 108	16300	U 191	187	61.9	296	342		

J: Detected by the instrument, the result is > the MDL but ≤ the MRL. Result is reported and considered an estimate.

U: Result is ≤ the MDL or client requested reporting limit (CRRLL). Result reported as the MDL or CRRLL.

H: pH was measured upon arrival by Brooks Applied Labs, but outside of the 48 hour hold time.

Samples were not submitted U of U Labs for the Last of Day of Mineral Return sampling event.

Outfall 006 - U of U Geoscience Lab							
	Units	Day 1	Day 3	Day 9	Day 27	Day 81	Last Day MR
		10/27/2018	10/31/2018	11/05/2018	11/21/2018	01/17/2019	3/20/2019
Arsenic	µg/L	800	868	611	261	165	
Iron	µg/L	119	697	275	128	28	
Mercury	ng/L	18.36	19.28	18.16	11.23	9.47	
Manganese	µg/L	493	419	384	205	127	
Selenium	µg/L	35	23	28	15	<3	
Cadmium	µg/L	14	13	11	7	<0.3	
Cobalt	µg/L	25	32	21	9	1	
Copper	µg/L	8	8	11	7	<2	
Nickel	µg/L	23	35	24	14	12	
Lead	µg/L	3	2	4	2	1	
Zinc	µg/L	330	342	241	106	48	
Barium	µg/L	12	23	127	100	98	

**Table 2 - Background North
Mineral Return Data -
2018/2019 Mineral Return Season
Compass Minerals Ogden, Inc.**

Background North / Ambient - Brooks Applied Labs													
	Units	Day 1		Day 3		Day 9		Day 27		Day 81		Last Day MR	
		10/26/2018		10/30/2018		11/05/2018		11/21/2018		01/17/2019		3/20/2019	
Arsenic	µg/L	5.43		14.5		11.3		6.87				7.74	
Iron	µg/L	16300	U	379		16300	U	219				845	
Mercury	ng/L	5.11		5.24		12.9		2.80				5.87	
Manganese	µg/L	40.6		39.8		286		20.3				23.5	
pH	SU	8.56		8.72		8.86		8.50				8.03	H
Selenium	µg/L	0.488		0.626		1.02		0.470				0.595	
Cadmium	µg/L	0.0413	J	0.0404	U	0.341		0.0404	U			0.0404	U
Cobalt	µg/L	0.459		0.357		2.70		0.185				0.483	
Copper	µg/L	3.15		2.68		14.5		1.92				2.63	
Nickel	µg/L	1.74		1.64		7.70		0.993				1.95	
Lead	µg/L	1.53		1.20		13.3		0.653				0.903	
Zinc	µg/L	4.46		3.89		28.6		1.64				5.04	
Barium	µg/L	816	U	74.9		816	U	55.5				65.8	
Iron	µg/L	721		405		5330		194				1180	

J: Detected by the instrument, the result is > the MDL but ≤ the MRL. Result is reported and considered an estimate.

U: Result is ≤ the MDL or client requested reporting limit (CRRL). Result reported as the MDL or CRRL.

H: pH was measured upon arrival by Brooks Applied Labs, but outside of the 48 hour hold time.

Samples were not submitted U of U Labs for the Last of Day of Mineral Return sampling event.

Samples were not collected from Background North, Mid-Trapezoid, GSL-Northeast, or South Promontory Point for Day 81 due to frozen conditions on the GSL.

Background North - U of U Geoscience Lab													
	Units	Day 1		Day 3		Day 9		Day 27		Day 81		Last Day MR	
		10/26/2018		10/30/2018		11/05/2018		11/21/2018		01/17/2019		3/20/2019	
Arsenic	mg/L	<9		11		14		<9					
Iron	mg/L	599		174		1319		100					
Mercury	ng/L	4.37		4.36		8.79		3.23					
Manganese	mg/L	46		36		96		17					
Selenium	mg/L	<5		<5		<5		<5					
Cadmium	mg/L	<2		<2		<2		<2					
Cobalt	mg/L	<0.9		<0.9		2		1					
Copper	mg/L	6.0		6.3		12.1		5.7					
Nickel	mg/L	2.6		3.0		10.1		3.5					
Lead	mg/L	1.5		1.0		4.2		0.8					
Zinc	mg/L	10.8		15.8		23.3		9.7					
Barium	mg/L	71		75		183		55					

**Table 3 - Mid Trapezoid
Mineral Return Data -
2018/2019 Mineral Return Season
Compass Minerals Ogden, Inc.**

Mid-Trapezoid - Brooks Applied Labs									
	Units	Day 1	Day 3	Duplicate	Day 9	Day 27	Day 81	Last Day MR	
		10/26/2018	10/30/2018	10/30/2018	11/05/2018	11/21/2018	01/17/2019	3/20/2019	
Arsenic	µg/L	15.2	151	131	51.4	25.4			9.89
Iron	µg/L	16300 U	849	1100	544	178			738
Mercury	ng/L	4.93	7.98	8.41	6.11	2.22			4.03
Manganese	µg/L	36.1	154	163	98.5	32.8			23.5
pH	SU	8.82	8.19	8.45	8.28	8.45			8.09 H
Selenium	µg/L	0.564	0.878	0.809	0.623	0.461			0.472
Cadmium	µg/L	0.0404 U	0.183	0.187	0.0749 J	0.0404 U			0.0404 U
Cobalt	µg/L	0.349	0.681	0.773	0.419	0.185			0.430
Copper	µg/L	3.26	5.60	6.0	3.79	2.20			2.91
Nickel	µg/L	1.63	2.59	2.85	1.86	1.09			1.77
Lead	µg/L	0.991	11.5	11.1	3.20	0.731			0.835
Zinc	µg/L	2.72	6.97	7.92	4.50	1.51			3.81
Barium	µg/L	816 U	114	105	816 U	70.6			57.6
Iron	µg/L	369	945	1320	16300 U	104			679

J: Detected by the instrument, the result is > the MDL but ≤ the MRL. Result is reported and considered an estimate.

U: Result is ≤ the MDL or client requested reporting limit (CRRL). Result reported as the MDL or CRRL.

H: pH was measured upon arrival by Brooks Applied Labs, but outside of the 48 hour hold time.

Samples were not submitted U of U Labs for the Last of Day of Mineral Return sampling event.

Samples were not collected from Background North, Mid-Trapezoid, GSL-Northeast, or South Promontory Point for Day 81 due to frozen conditions on the GSL.

Mid-Trapezoid - U of U Geoscience Lab									
	Units	Day 1	Day 3	Day 9	Day 27	Day 81	Last Day MR		
		10/26/2018	10/30/2018	11/05/2018	11/21/2018	01/17/2019	3/20/2019		
Arsenic	µg/L	14.4	94.2	46.0	18.8				
Iron	µg/L	179	705	348	81				
Mercury	ng/L	4.99	6.54	5.87	3.74				
Manganese	µg/L	33	132	96	22				
Selenium	µg/L	<5	<5	<5	<5				
Cadmium	µg/L	<2	2.9	<2	<2				
Cobalt	µg/L	<0.9	3.5	1.8	0.9				
Copper	µg/L	2.7	306.7	8.1	3.5				
Nickel	µg/L	<2	6.7	4.9	2.6				
Lead	µg/L	0.7	8.1	3.5	0.6				
Zinc	µg/L	<6	43.6	33.9	9.0				
Barium	µg/L	112.3	100.0	118.3	67.6				

**Table 4 - GSL - NE
(Formerly known as Background South)
Mineral Return Data -
2018/2019 Mineral Return Season
Compass Minerals Ogden, Inc.**

GSL - Northeast - Brooks Applied Labs													
	Units	Day 1		Day 3		Day 9		Day 27		Day 81		Last Day MR	
		10/26/2018		10/30/2018		11/05/2018		11/21/2018		01/17/2019		3/20/2019	
Arsenic	µg/L	15.9		222		179		57.3				43.7	
Iron	µg/L	16300	U	517		178		964				564	
Mercury	ng/L	4.46		8.34		6.6		4.35				4.97	
Manganese	µg/L	32.2		193		30.3		81.6				34.6	
Lead	µg/L	1.08		58.5		4.26		3.09				9.05	H
pH	SU	8.86		8.13		8.03		8.44				0.476	
Selenium	µg/L	0.538		0.983		0.506		0.527				0.0465	J
Cadmium	µg/L	0.0627	J	1.7		0.159		0.0733	J			0.379	
Cobalt	µg/L	0.34		0.602		0.277		0.62				3.40	
Copper	µg/L	3.81		6.71		2.47		3.62				1.61	
Nickel	µg/L	1.67		2.4		1.14		2.04				1.35	
Zinc	µg/L	2.56		6.17		2.35		5.82				3.61	
Barium	µg/L	816	U	117		816	U	80.1				78.5	
Iron	µg/L	321		692		16300	U	563				530	

J: Detected by the instrument, the result is > the MDL but ≤ the MRL. Result is reported and considered an estimate.

U: Result is ≤ the MDL or client requested reporting limit (CRRL). Result reported as the MDL or CRRL.

H: pH was measured upon arrival by Brooks Applied Labs, but outside of the 48 hour hold time.

Samples were not submitted U of U Labs for the Last of Day of Mineral Return sampling event.

Samples were not collected from Background North, Mid-Trapezoid, GSL-Northeast, or South Promontory Point for Day 81 due to frozen conditions on the GSL.

Great Salt Lake NE - U of U Geoscience Lab													
	Units	Day 1		Day 3		Day 9		Day 27		Day 81		Last Day MR	
		10/26/2018		10/30/2018		11/05/2018		11/21/2018		01/17/2019		3/20/2019	
Arsenic	µg/L	20		185		115		56					
Iron	µg/L	230		330		356		399					
Mercury	ng/L	5.87		8.86		8.86		4.67					
Manganese	µg/L	34		187		148		77					
Selenium	µg/L	<5		10		<5		<5					
Cadmium	µg/L	<2		5		3		4					
Cobalt	µg/L	<0.9		7		5		3					
Copper	µg/L	10.0		8.1		8.1		13.8					
Nickel	µg/L	6.1		9.4		9.4		7.0					
Lead	µg/L	1.1		47.8		13.3		3.9					
Zinc	µg/L	12.7		78.9		51.2		32.9					
Barium	µg/L	86		110		98		173					

**Table 5 -South Promontory Pt
Mineral Return Data -
2018/2019 Mineral Return Season
Compass Minerals Ogden, Inc.**

South Promontory Point - Brooks Applied Labs													
	Units	Day 1		Day 3		Day 9		Day 27		Day 81		Last Day MR	
		10/26/2018		10/30/2018		11/05/2018		11/21/2018		01/17/2019		3/20/2019	
Arsenic	µg/L	22.8		185		147		174				157	
Iron	µg/L	16300	U	79		188		104				145	
Mercury	ng/L	4.52		7.48		6.35		7.38				8.10	
Manganese	µg/L	29.4		14.5		31.8		19.8				16.7	
pH	SU	8.7		8.16		8.28		8.19				9.03	H
Selenium	µg/L	0.619		0.512		0.714		0.455				0.536	
Cadmium	µg/L	0.0509	J	0.082	J	0.163		0.0759	J			0.0840	J
Cobalt	µg/L	0.273		0.228		0.293		0.223				0.251	
Copper	µg/L	3.74		3.08		2.52		2.71				4.19	
Nickel	µg/L	1.58		0.944		1.17		0.946				1.07	J
Lead	µg/L	0.9		1.55		4.39		1.41				1.47	
Zinc	µg/L	1.82		2.07		2.53		1.79				3.02	
Barium	µg/L	816	U	133		816	U	131				120	
Iron	µg/L	174		78.5	J	16300	U	86.2	J			131	

J: Detected by the instrument, the result is > the MDL but ≤ the MRL. Result is reported and considered an estimate.

U: Result is ≤ the MDL or client requested reporting limit (CRRL). Result reported as the MDL or CRRL.

H: pH was measured upon arrival by Brooks Applied Labs, but outside of the 48 hour hold time.

Samples were not submitted U of U Labs for the Last of Day of Mineral Return sampling event.

Samples were not collected from Background North, Mid-Trapezoid, GSL-Northeast, or South Promontory Point for Day 81 due to frozen conditions on the GSL.

South Promontory Point - U of U Geoscience Lab													
	Units	Day 1		Day 3		Day 9		Day 27		Day 81		Last Day MR	
		10/26/2018		10/30/2018		11/05/2018		11/21/2018		01/17/2019		3/20/2019	
Arsenic	µg/L	19		154		165		163					
Iron	µg/L	171		168		205		91					
Mercury	ng/L	4.07		6.41		5.29		9.62					
Manganese	µg/L	32		19		36		31					
Selenium	µg/L	<5		6.82		7.69		13.99					
Cadmium	µg/L	<2		7.00		6.44		7.16					
Cobalt	µg/L	<0.9		5.69		4.78		5.93					
Copper	µg/L	6.97		8.83		6.29		4.30					
Nickel	µg/L	3.43		17.3		14.4		18.4					
Lead	µg/L	0.62		1.2		3.2		1.3					
Zinc	µg/L	14.5		48		49		51					
Barium	µg/L	84.2		159		134		141					

Table 1a -- Outfall 006
Mineral Return Data - 2019/2020 Mineral Return Season
Compass Minerals Ogden, Inc.

		Outfall 006: 2019 - 2020 MR Season											
Parameter	Units	Day 1		Day 3		Day 9		Day 27		Last Day MR (Outfall 006 only)		Last Day MR (final return*)	
		10/16/2019		10/16/2019		10/25/2019		11/15/2019		12/23/2019		3/30/2020	
Arsenic	µg/L	80.8		853		402		248		525		185	
Barium	µg/L	94.3		57.9		80.2		83.1		46.6		179	
Cadmium	µg/L	0.0421	J	0.125		0.0936	J	0.0765	J	0.13		0.0842	J
Cobalt	µg/L	0.418		1.44		0.991		0.656		1.16		0.453	
Copper	µg/L	1.73		3.62		2.47		1.9		3.27		2.19	
Iron	µg/L	376		301		527		204		229		253	
Iron	µg/L	415		230		282		259		234		357	
Mercury	ng/L	3.76		2.56		6.54		3.14		7.24		17.9	
Manganese	µg/L	37.8		499		373		367		426		86	
Nickel	µg/L	1.71		3.75		2.69		1.83		3.24		1.78	
Lead	µg/L	1.28		7.14		5.4		4.1		6.89		3.2	
pH	SJ	8.58	H	7.41		7.77	H	7.92		7.77		7.56	M
Selenium	µg/L	0.489		1.28		0.821		0.63		0.868		0.548	
Zinc	µg/L	2.89		28.3		14		6.6		28.7		38.2	

J: Detected by the instrument, the result is > the MDL but ≤ the MRL. Result is reported and considered an estimate.

U: Result is ≤ the MDL or client requested reporting limit (CRRL). Result reported as the MDL or CRRL.

H: pH was measured upon arrival by Brooks Applied Labs, but outside of the 48 hour hold time.

M: Duplicate precision (RPD) was not within acceptance criteria.

* The last day of mineral return at Outfall 006 was December 23, 2019. Outfall 006 was briefly reactivated on March 25, 2020 and operated until March 30, 2020.

Table 1b -- Outfall 008
Mineral Return Data - 2019/2020 Mineral Return Season
Compass Minerals Ogden, Inc.

		Outfall 008: 2019 - 2020 MR Season									
Parameter	Units	Day 1		Day 3		Day 9		Day 27		Last Day MR	
		10/16/2019		10/16/2019		10/25/2019		11/15/2019		3/30/2020	
Arsenic	µg/L	533		554		234		132		160	
Barium	µg/L	136		142		127		112		193	
Cadmium	µg/L	0.0404	U	0.0404	U	0.134		0.0953	J	0.0477	J
Cobalt	µg/L	0.305		0.303		0.218		0.285		0.549	
Copper	µg/L	2.41		2.47		2.27		1.9		3.52	
Iron	µg/L	29.2	J	24.2	J	57.6		132		181	
Iron	µg/L	36.4	U	36.4	U	36.4	U	156		310	
Mercury	ng/L	6.02		1.39		6.88		4.28		10	
Manganese	µg/L	21.3		23.6		16.9		20.4		73.2	
Nickel	µg/L	1.78		1.83		1.03	J	0.987	J	1.83	
Lead	µg/L	0.161		0.149	J	2.53		1.81		1.92	
pH	SJ	7.52	H	7.55		7.85	H	7.98		7.59	
Selenium	µg/L	1.17		1.05		0.601		0.499		0.539	
Zinc	µg/L	6.89		7.25		3.32		1.93		7.84	

J: Detected by the instrument, the result is > the MDL but ≤ the MRL. Result is reported and considered an estimate.

U: Result is ≤ the MDL or client requested reporting limit (CRRL). Result reported as the MDL or CRRL.

H: pH was measured upon arrival by Brooks Applied Labs, but outside of the 48 hour hold time.

A sample was not collected at Outfall 008 for Day 81.

**Table 2 - Background North
Mineral Return Data - 2019/2020 Mineral Return Season
Compass Minerals Ogden, Inc.**

Parameter	Units	Background North: 2019 - 2020 MR Season						
		Day 1		Day 3		Day 9		Last Day MR
		10/16/2019	10/18/2019	10/25/2019	3/30/2020			
Arsenic	µg/L	11.9	11.2	7.95	5.24			
Barium	µg/L	93.6	120	80.1	75.7			
Cadmium	µg/L	0.0465	J 0.0759	J 0.0427	J 0.0438	J	J	
Cobalt	µg/L	0.675	1.03	0.824	0.933			
Copper	µg/L	2.57	3.99	2.88	3.13			
Iron	µg/L	800	M 2190	M 2640	1620			
Iron	µg/L	1110	1670	1360	1740			
Mercury	ng/L	3.11	6.18	2.99	3.67			
Manganese	µg/L	50.1	80.4	54.2	61.8			
Nickel	µg/L	1.98	2.74	2.2	2.76			
Lead	µg/L	2.39	4.26	2.51	2.79			
pH	SU	8.54	H 8.66	8.76	H 8.94			
Selenium	µg/L	0.348	0.376	0.286	0.35			
Zinc	µg/L	8.88	13.6	7.35	10.1			

J: Detected by the instrument, the result is > the MDL but ≤ the MRL. Result is reported and considered an estimate.

U: Result is ≤ the MDL or client requested reporting limit (CRRL). Result reported as the MDL or CRRL.

H: pH was measured upon arrival by Brooks Applied Labs, but outside of the 48 hour hold time.

M: Duplicate precision (RPD) was not within acceptance criteria.

Samples were not collected from Background North, Mid-Trapezoid, GSL-Northeast, or South Promontory Point for Days 27 and 81 due to inaccessibility of an airboat and conditions on the GSL.

**Table 3 - Mid Trapezoid
Mineral Return Data - 2019/2020 Mineral Return Season
Compass Minerals Ogden, Inc.**

Parameter	Units	Mid-Trapezoid : 2019 - 2020 MR Season						
		Day 1		Day 3		Day 9		Last Day MR
		10/16/2019	10/18/2019	10/25/2019	3/30/2020			
Arsenic	µg/L	10.7	13.4	17.5	7.33			
Barium	µg/L	91.5	118	97.8	78.8			
Cadmium	µg/L	0.0404	U 0.109	0.0404	U 0.0806	J	J	
Cobalt	µg/L	0.393	1.35	0.478	1.45			
Copper	µg/L	2.39	5.9	2.13	5.22			
Iron	µg/L	643	2500	2170	2340			
Iron	µg/L	558	2380	631	2820			
Mercury	ng/L	6.67	8.02	2.82	6.47			
Manganese	µg/L	25.2	107	38.4	107			
Nickel	µg/L	1.38	J 3.34	1.54	3.99			
Lead	µg/L	1.34	5.88	1.73	4.92			
pH	SU	8.92	H 8.88	8.57	H 9.03			
Selenium	µg/L	0.323	0.429	0.35	0.42			
Zinc	µg/L	72.2	13.4	3.89	14.1			

J: Detected by the instrument, the result is > the MDL but ≤ the MRL. Result is reported and considered an estimate.

U: Result is ≤ the MDL or client requested reporting limit (CRRL). Result reported as the MDL or CRRL.

H: pH was measured upon arrival by Brooks Applied Labs, but outside of the 48 hour hold time.

Samples were not collected from Background North, Mid-Trapezoid, GSL-Northeast, or South Promontory Point for Days 27 and 81 due to inaccessibility of an airboat and conditions on the GSL.

Table 4 - GSL - NE
(Formerly known as Background South) Mineral Return Data -
2019/2020 Mineral Return Season
Compass Minerals Ogden, Inc.

Parameter	Units	GSL Northeast: 2019 - 2020 MR Season						
		Day 1		Day 3		Day 9	Last Day MR	
		10/16/2019		10/18/2019		10/25/2019		3/30/2020
Arsenic	µg/L	13.2		32.6		51.8	16.2	
Barium	µg/L	89.6		90.7		91.1	81	
Cadmium	µg/L	0.0404	U	0.0423	J	0.0404	U	0.0404
Cobalt	µg/L	0.36		0.34		0.308	0.728	
Copper	µg/L	1.95		1.75		1.27	2.66	
Iron	µg/L	378		404		554	1880	
Iron	µg/L	516		453		273	1290	
Mercury	ng/L	2.53		3.16		2.16	5.12	
Manganese	µg/L	26		24.7		39.2	50	
Nickel	µg/L	1.31	J	1.26	J	1.18	J	2.24
Lead	µg/L	1.33		1.35		1.06	2.1	
pH	SU	8.53	H	8.6		8.23	H	8.94
Selenium	µg/L	0.312		0.4		0.402	0.414	
Zinc	µg/L	16.5		2.84		1.91	6.56	

J: Detected by the instrument, the result is > the MDL but ≤ the MRL. Result is reported and considered an estimate.

U: Result is ≤ the MDL or client requested reporting limit (CRRL). Result reported as the MDL or CRRL.

H: pH was measured upon arrival by Brooks Applied Labs, but outside of the 48 hour hold time.

Samples were not collected from Background North, Mid-Trapezoid, GSL-Northeast, or South Promontory Point for Days 27 and 81 due to inaccessibility of an airboat and conditions on the GSL.

Table 5 -South Promontory Pt
Mineral Return Data - 2019/2020 Mineral Return Season
Compass Minerals Ogden, Inc.

Parameter	Units	South Promontory Point: 2019 - 2020 MR Season						
		Day 1		Day 3		Day 9	Last Day MR	
		10/16/2019		10/18/2019		10/25/2019		3/30/2020
Arsenic	µg/L	154		103		59	79.8	
Barium	µg/L	128		112		90.3	95.9	
Cadmium	µg/L	0.0615	J	0.0463	J	0.0404	U	0.447
Cobalt	µg/L	0.164		0.299		0.262	0.333	
Copper	µg/L	2.18		2		1.27	2.24	
Iron	µg/L	123		374		409	422	
Iron	µg/L	36.4	U	307		199	381	
Mercury	ng/L	4.32		4.06		2.19	4.31	
Manganese	µg/L	16.1		20.6		36.7	26.3	
Nickel	µg/L	0.801	J	1.17	J	1.08	J	1.34
Lead	µg/L	1.03		1.33		0.854	1.08	
pH	SU	8.2	H	8.36		8.26	H	8.67
Selenium	µg/L	0.57		0.465		0.381	0.488	
Zinc	µg/L	1.21	J	4.78		1.56	4.15	

J: Detected by the instrument, the result is > the MDL but ≤ the MRL. Result is reported and considered an estimate.

U: Result is ≤ the MDL or client requested reporting limit (CRRL). Result reported as the MDL or CRRL.

H: pH was measured upon arrival by Brooks Applied Labs, but outside of the 48 hour hold time.

Samples were not collected from Background North, Mid-Trapezoid, GSL-Northeast, or South Promontory Point for Days 27 and 81 due to inaccessibility of an airboat and conditions on the GSL.