

August 12, 2022

Report to:
Kara Haas
South32
749 Harshaw Rd
Patagonia, AZ 85624

Bill to:
Accounts Payable
South32
2210 E Fort Lowell Road
Tucson, AZ 85719

Project ID: 4542257445
ACZ Project ID: L73273

Kara Haas:

Enclosed are the analytical results for sample(s) submitted to ACZ Laboratories, Inc. (ACZ) on May 17, 2022. This project has been assigned to ACZ's project number, L73273. Please reference this number in all future inquiries.

All analyses were performed according to ACZ's Quality Assurance Plan. The enclosed results relate only to the samples received under L73273. Each section of this report has been reviewed and approved by the appropriate Laboratory Supervisor, or a qualified substitute.

Except as noted, the test results for the methods and parameters listed on ACZ's current NELAC certificate letter (#ACZ) meet all requirements of NELAC.

This report shall be used or copied only in its entirety. ACZ is not responsible for the consequences arising from the use of a partial report.

All samples and sub-samples associated with this project will be disposed of after August 01, 2024. If the samples are determined to be hazardous, additional charges apply for disposal (typically \$11/sample). If you would like the samples to be held longer than ACZ's stated policy or to be returned, please contact your Project Manager or Customer Service Representative for further details and associated costs. ACZ retains analytical raw data reports for ten years.

If you have any questions or other needs, please contact your Project Manager.



Mark McNeal has reviewed
and approved this report.



South32

August 12, 2022

Project ID: 4542257445

ACZ Project ID: L73273

Sample Receipt

ACZ Laboratories, Inc. (ACZ) received 1 groundwater sample from South32 on May 17, 2022. The sample was received in good condition. Upon receipt, the sample custodian removed the sample from the cooler, inspected the contents, and logged the sample into ACZ's computerized Laboratory Information Management System (LIMS). The sample was assigned ACZ LIMS project number L73273. The custodian verified the sample information entered into the computer against the chain of custody (COC) forms and sample bottle labels.

Holding Times

All analyses were performed within EPA recommended holding times.

Sample Analysis

This sample was analyzed for inorganic, radiochemistry parameters. The individual methods are referenced on both, the ACZ invoice and the analytical reports. The extended qualifier reports may contain footnotes qualifying specific elements due to QC failures. In addition the following has been noted with this specific project:

Sample being rereported for Ra-228 due to client request.

1. Qualifier: (N1) Applies to: L73273-01/URANIUM 235

LCSW recovery for Uranium-235 above acceptance limits. MS recovery for Uranium-235 within limits and used as positive control.

2. Qualifier: N1 Applies to: L73273-01/RADIUM 228

LCSW out of acceptance limits. MS within acceptance limits and used for positive control.

South32

Project ID: 4542257445
 Sample ID: MW3-05162022

ACZ Sample ID: **L73273-01**
 Date Sampled: 05/16/22 11:05
 Date Received: 05/17/22
 Sample Matrix: Groundwater

Metals Analysis

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Antimony, dissolved	M200.8 ICP-MS	2	<0.0008	U		mg/L	0.0008	0.004	06/01/22 20:11	kja
Arsenic, dissolved	M200.8 ICP-MS	2	0.00479			mg/L	0.0004	0.002	06/01/22 20:11	kja
Barium, dissolved	M200.7 ICP	2	0.0214	B		mg/L	0.014	0.07	05/25/22 15:27	keh1
Beryllium, dissolved	M200.8 ICP-MS	2	0.000548			mg/L	0.00016	0.0005	06/01/22 20:11	kja
Cadmium, dissolved	M200.8 ICP-MS	2	0.00472			mg/L	0.0001	0.0005	06/01/22 20:11	kja
Chromium, dissolved	M200.8 ICP-MS	2	<0.001	U		mg/L	0.001	0.004	06/01/22 20:11	kja
Copper, dissolved	M200.8 ICP-MS	2	<0.0016	U		mg/L	0.0016	0.004	06/01/22 20:11	kja
Iron, dissolved	M200.7 ICP	2	1.07			mg/L	0.12	0.3	05/25/22 15:27	keh1
Lead, dissolved	M200.8 ICP-MS	2	0.00262			mg/L	0.0002	0.001	06/01/22 20:11	kja
Manganese, dissolved	M200.7 ICP	2	20.5			mg/L	0.02	0.1	05/25/22 15:27	keh1
Mercury, dissolved	M245.1 CVAA	1	<0.0002	U		mg/L	0.0002	0.001	05/26/22 13:57	mlh
Nickel, dissolved	M200.7 ICP	2	0.0366	B		mg/L	0.016	0.08	05/25/22 15:27	keh1
Selenium, dissolved	M200.8 ICP-MS	2	<0.0002	U		mg/L	0.0002	0.0005	06/01/22 20:11	kja
Thallium, dissolved	M200.8 ICP-MS	2	<0.0002	U		mg/L	0.0002	0.001	06/01/22 20:11	kja
Zinc, dissolved	M200.7 ICP	2	3.91			mg/L	0.04	0.1	05/25/22 15:27	keh1

Wet Chemistry

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Alkalinity as CaCO3	SM2320B - Titration									
Bicarbonate as CaCO3		1	163			mg/L	2	20	05/26/22 0:00	jck
Carbonate as CaCO3		1	<2	U		mg/L	2	20	05/26/22 0:00	jck
Hydroxide as CaCO3		1	<2	U		mg/L	2	20	05/26/22 0:00	jck
Total Alkalinity		1	163			mg/L	2	20	05/26/22 0:00	jck
Conductivity @25C	SM2510B	1	2990			umhos/cm	1	10	05/26/22 21:29	jck
Cyanide, Free	D6888-09/OIA-1677-09	1	<0.003	U	*	mg/L	0.003	0.01	05/20/22 13:25	mjj1
Fluoride	SM4500F-C	1	1.10			mg/L	0.15	0.35	06/06/22 10:40	emk
Nitrate as N, dissolved	Calculation: NO3NO2 minus NO2		<0.02	U		mg/L	0.02	0.1	08/12/22 0:00	calc
Nitrate/Nitrite as N, dissolved	M353.2 - Automated Cadmium Reduction	1	<0.02	U	*	mg/L	0.02	0.1	05/18/22 1:42	pjb
Nitrite as N, dissolved	M353.2 - Automated Cadmium Reduction	1	<0.01	U	*	mg/L	0.01	0.05	05/18/22 1:42	pjb
pH (lab)	SM4500H+ B									
pH		1	7.7	H		units	0.1	0.1	05/26/22 0:00	jck
pH measured at		1	21.6			C	0.1	0.1	05/26/22 0:00	jck
Residue, Filterable (TDS) @180C	SM2540C	1	2970			mg/L	20	40	05/19/22 10:33	anc
Sulfate	D516-02/07-11 - TURBIDIMETRIC	120	1970		*	mg/L	120	600	05/24/22 15:49	bls

Arizona license number: **AZ0102**

Report Header Explanations

<i>Batch</i>	A distinct set of samples analyzed at a specific time
<i>Found</i>	Value of the QC Type of interest
<i>Limit</i>	Upper limit for RPD, in %.
<i>Lower</i>	Lower Recovery Limit, in % (except for LCSS, mg/Kg)
<i>MDL</i>	Method Detection Limit. Same as Minimum Reporting Limit unless omitted or equal to the PQL (see comment #5). Allows for instrument and annual fluctuations.
<i>PCN/SCN</i>	A number assigned to reagents/standards to trace to the manufacturer's certificate of analysis
<i>PQL</i>	Practical Quantitation Limit. Synonymous with the EPA term "minimum level".
<i>QC</i>	True Value of the Control Sample or the amount added to the Spike
<i>Rec</i>	Recovered amount of the true value or spike added, in % (except for LCSS, mg/Kg)
<i>RPD</i>	Relative Percent Difference, calculation used for Duplicate QC Types
<i>Upper</i>	Upper Recovery Limit, in % (except for LCSS, mg/Kg)
<i>Sample</i>	Value of the Sample of interest

QC Sample Types

<i>AS</i>	Analytical Spike (Post Digestion)	<i>LCSWD</i>	Laboratory Control Sample - Water Duplicate
<i>ASD</i>	Analytical Spike (Post Digestion) Duplicate	<i>LFB</i>	Laboratory Fortified Blank
<i>CCB</i>	Continuing Calibration Blank	<i>LFM</i>	Laboratory Fortified Matrix
<i>CCV</i>	Continuing Calibration Verification standard	<i>LFMD</i>	Laboratory Fortified Matrix Duplicate
<i>DUP</i>	Sample Duplicate	<i>LRB</i>	Laboratory Reagent Blank
<i>ICB</i>	Initial Calibration Blank	<i>MS</i>	Matrix Spike
<i>ICV</i>	Initial Calibration Verification standard	<i>MSD</i>	Matrix Spike Duplicate
<i>ICSAB</i>	Inter-element Correction Standard - A plus B solutions	<i>PBS</i>	Prep Blank - Soil
<i>LCSS</i>	Laboratory Control Sample - Soil	<i>PBW</i>	Prep Blank - Water
<i>LCSSD</i>	Laboratory Control Sample - Soil Duplicate	<i>PQV</i>	Practical Quantitation Verification standard
<i>LCSW</i>	Laboratory Control Sample - Water	<i>SDL</i>	Serial Dilution

QC Sample Type Explanations

Blanks	Verifies that there is no or minimal contamination in the prep method or calibration procedure.
Control Samples	Verifies the accuracy of the method, including the prep procedure.
Duplicates	Verifies the precision of the instrument and/or method.
Spikes/Fortified Matrix	Determines sample matrix interferences, if any.
Standard	Verifies the validity of the calibration.

ACZ Qualifiers (Qual)

B	Analyte concentration detected at a value between MDL and PQL. The associated value is an estimated quantity.
H	Analysis exceeded method hold time. pH is a field test with an immediate hold time.
L	Target analyte response was below the laboratory defined negative threshold.
U	The material was analyzed for, but was not detected above the level of the associated value. The associated value is either the sample quantitation limit or the sample detection limit.

Method References

- (1) EPA 600/4-83-020. Methods for Chemical Analysis of Water and Wastes, March 1983.
- (2) EPA 600/R-93-100. Methods for the Determination of Inorganic Substances in Environmental Samples, August 1993.
- (3) EPA 600/R-94-111. Methods for the Determination of Metals in Environmental Samples - Supplement I, May 1994.
- (4) EPA SW-846. Test Methods for Evaluating Solid Waste.
- (5) Standard Methods for the Examination of Water and Wastewater.

Comments

- (1) QC results calculated from raw data. Results may vary slightly if the rounded values are used in the calculations.
- (2) Soil, Sludge, and Plant matrices for Inorganic analyses are reported on a dry weight basis.
- (3) Animal matrices for Inorganic analyses are reported on an "as received" basis.
- (4) An asterisk in the "XQ" column indicates there is an extended qualifier and/or certification qualifier associated with the result.
- (5) If the MDL equals the PQL or the MDL column is omitted, the PQL is the reporting limit.

For a complete list of ACZ's Extended Qualifiers, please click:

<https://acz.com/wp-content/uploads/2019/04/Ext-Qual-List.pdf>

South32

ACZ Project ID: **L73273**

NOTE: If the Rec% column is null, the high/low limits are in the same units as the result. If the Rec% column is not null, then the high/low limits are in % Rec.

Alkalinity as CaCO3 SM2320B - Titration

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG543101													
WG543101PBW1	PBW	05/26/22 19:05				14.2	mg/L		-20	20			
WG543101LCSW3	LCSW	05/26/22 19:24	WC220513-7	820.0001		784.6	mg/L	96	90	110			
L73278-02DUP	DUP	05/26/22 22:14			200	180.7	mg/L				10	20	
WG543101LCSW6	LCSW	05/26/22 22:31	WC220513-7	820.0001		779.2	mg/L	95	90	110			
WG543101PBW2	PBW	05/26/22 22:37				4.8	mg/L		-20	20			
WG543101LCSW9	LCSW	05/27/22 1:21	WC220513-7	820.0001		779.9	mg/L	95	90	110			
WG543101PBW3	PBW	05/27/22 1:27				7.2	mg/L		-20	20			
WG543101LCSW12	LCSW	05/27/22 4:44	WC220513-7	820.0001		783.2	mg/L	96	90	110			
WG543101PBW4	PBW	05/27/22 4:51				5.3	mg/L		-20	20			
WG543101LCSW15	LCSW	05/27/22 7:39	WC220513-7	820.0001		788.2	mg/L	96	90	110			

Antimony, dissolved M200.8 ICP-MS

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG543358													
WG543358ICV	ICV	06/01/22 19:49	MS220502-1	.0201		.01917	mg/L	95	90	110			
WG543358ICB	ICB	06/01/22 19:51				U	mg/L		-0.00088	0.00088			
WG543358LFB	LFB	06/01/22 19:52	MS220506-2	.01		.01038	mg/L	104	85	115			
L73319-02AS	AS	06/01/22 20:14	MS220506-2	.01	U	.0097	mg/L	97	70	130			
L73319-02ASD	ASD	06/01/22 20:16	MS220506-2	.01	U	.0101	mg/L	101	70	130	4	20	

Arsenic, dissolved M200.8 ICP-MS

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG543358													
WG543358ICV	ICV	06/01/22 19:49	MS220502-1	.05		.05175	mg/L	104	90	110			
WG543358ICB	ICB	06/01/22 19:51				U	mg/L		-0.00044	0.00044			
WG543358LFB	LFB	06/01/22 19:52	MS220506-2	.05005		.05166	mg/L	103	85	115			
L73319-02AS	AS	06/01/22 20:14	MS220506-2	.05005	.00036	.05181	mg/L	103	70	130			
L73319-02ASD	ASD	06/01/22 20:16	MS220506-2	.05005	.00036	.05406	mg/L	107	70	130	4	20	

Barium, dissolved M200.7 ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG542886													
WG542886ICV	ICV	05/25/22 15:02	II220519-3	2		1.942	mg/L	97	95	105			
WG542886ICB	ICB	05/25/22 15:08				U	mg/L		-0.021	0.021			
WG542886LFB	LFB	05/25/22 15:21	II220505-2	.5		.4997	mg/L	100	85	115			
L73325-04AS	AS	05/25/22 15:43	II220505-2	.5	.0682	.5623	mg/L	99	85	115			
L73325-04ASD	ASD	05/25/22 15:46	II220505-2	.5	.0682	.5742	mg/L	101	85	115	2	20	

Beryllium, dissolved M200.8 ICP-MS

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG543358													
WG543358ICV	ICV	06/01/22 19:49	MS220502-1	.05		.051394	mg/L	103	90	110			
WG543358ICB	ICB	06/01/22 19:51				.000149	mg/L		-0.000176	0.000176			
WG543358LFB	LFB	06/01/22 19:52	MS220506-2	.05005		.052934	mg/L	106	85	115			
L73319-02AS	AS	06/01/22 20:14	MS220506-2	.05005	U	.053412	mg/L	107	70	130			
L73319-02ASD	ASD	06/01/22 20:16	MS220506-2	.05005	U	.056172	mg/L	112	70	130	5	20	

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NOTE: If the Rec% column is null, the high/low limits are in the same units as the result. If the Rec% column is not null, then the high/low limits are in % Rec.

Cadmium, dissolved

M200.8 ICP-MS

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG543358													
WG543358ICV	ICV	06/01/22 19:49	MS220502-1	.05		.052163	mg/L	104	90	110			
WG543358ICB	ICB	06/01/22 19:51				U	mg/L		-0.00011	0.00011			
WG543358LFB	LFB	06/01/22 19:52	MS220506-2	.05005		.050876	mg/L	102	85	115			
L73319-02AS	AS	06/01/22 20:14	MS220506-2	.05005	U	.050266	mg/L	100	70	130			
L73319-02ASD	ASD	06/01/22 20:16	MS220506-2	.05005	U	.052275	mg/L	104	70	130	4	20	

Chromium, dissolved

M200.8 ICP-MS

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG543358													
WG543358ICV	ICV	06/01/22 19:49	MS220502-1	.05		.05165	mg/L	103	90	110			
WG543358ICB	ICB	06/01/22 19:51				U	mg/L		-0.0011	0.0011			
WG543358LFB	LFB	06/01/22 19:52	MS220506-2	.05		.05089	mg/L	102	85	115			
L73319-02AS	AS	06/01/22 20:14	MS220506-2	.05	U	.05065	mg/L	101	70	130			
L73319-02ASD	ASD	06/01/22 20:16	MS220506-2	.05	U	.05261	mg/L	105	70	130	4	20	

Conductivity @25C

SM2510B

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG543101													
WG543101LCSW2	LCSW	05/26/22 19:11	PCN65454	1409		1497	umhos/cm	106	90	110			
L73278-02DUP	DUP	05/26/22 22:14			722	715	umhos/cm				1	20	
WG543101LCSW5	LCSW	05/26/22 22:20	PCN65454	1409		1484	umhos/cm	105	90	110			
WG543101LCSW8	LCSW	05/27/22 1:09	PCN65454	1409		1482	umhos/cm	105	90	110			
WG543101LCSW11	LCSW	05/27/22 4:33	PCN65454	1409		1473	umhos/cm	105	90	110			
WG543101LCSW14	LCSW	05/27/22 7:28	PCN65454	1409		1464	umhos/cm	104	90	110			

Copper, dissolved

M200.8 ICP-MS

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG543358													
WG543358ICV	ICV	06/01/22 19:49	MS220502-1	.05		.05446	mg/L	109	90	110			
WG543358ICB	ICB	06/01/22 19:51				U	mg/L		-0.00176	0.00176			
WG543358LFB	LFB	06/01/22 19:52	MS220506-2	.05		.05171	mg/L	103	85	115			
L73319-02AS	AS	06/01/22 20:14	MS220506-2	.05	.00082	.05253	mg/L	103	70	130			
L73319-02ASD	ASD	06/01/22 20:16	MS220506-2	.05	.00082	.05452	mg/L	107	70	130	4	20	

Cyanide, Free

D6888-09/OIA-1677-09

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG542646													
WG542646ICV	ICV	05/20/22 12:53	WI220520-3	.3003		.3085	mg/L	103	90	110			
WG542646ICB	ICB	05/20/22 12:55				U	mg/L		-0.003	0.003			
WG542646LFB	LFB	05/20/22 12:59	WI220520-5	.1001		.1037	mg/L	104	90	110			
L73270-01AS	AS	05/20/22 13:29	WI220520-5	.1001	U	.0948	mg/L	95	90	110			
L73270-01ASD	ASD	05/20/22 13:31	WI220520-5	.1001	U	.0972	mg/L	97	90	110	3	20	

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Fluoride SM4500F-C

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG543642													
WG543642ICV	ICV	06/06/22 10:23	WC220602-7	2.008		2.06	mg/L	103	90	110			
WG543642ICB	ICB	06/06/22 10:28				U	mg/L		-0.3	0.3			
WG543642LFB1	LFB	06/06/22 10:35	WC220104-2	5.02		5.46	mg/L	109	90	110			
L73273-01AS	AS	06/06/22 10:45	WC220104-2	5.02	1.1	5.93	mg/L	96	90	110			
L73273-01ASD	ASD	06/06/22 10:49	WC220104-2	5.02	1.1	5.9	mg/L	96	90	110	1	20	

Iron, dissolved M200.7 ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG542886													
WG542886ICV	ICV	05/25/22 15:02	II220519-3	2		1.973	mg/L	99	95	105			
WG542886ICB	ICB	05/25/22 15:08				U	mg/L		-0.18	0.18			
WG542886LFB	LFB	05/25/22 15:21	II220505-2	1.0013		1.017	mg/L	102	85	115			
L73325-04AS	AS	05/25/22 15:43	II220505-2	1.0013	U	1.038	mg/L	104	85	115			
L73325-04ASD	ASD	05/25/22 15:46	II220505-2	1.0013	U	1.066	mg/L	106	85	115	3	20	

Lead, dissolved M200.8 ICP-MS

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG543358													
WG543358ICV	ICV	06/01/22 19:49	MS220502-1	.05		.05332	mg/L	107	90	110			
WG543358ICB	ICB	06/01/22 19:51				U	mg/L		-0.00022	0.00022			
WG543358LFB	LFB	06/01/22 19:52	MS220506-2	.0501		.05233	mg/L	104	85	115			
L73319-02AS	AS	06/01/22 20:14	MS220506-2	.0501	.00089	.05256	mg/L	103	70	130			
L73319-02ASD	ASD	06/01/22 20:16	MS220506-2	.0501	.00089	.05488	mg/L	108	70	130	4	20	

Manganese, dissolved M200.7 ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG542886													
WG542886ICV	ICV	05/25/22 15:02	II220519-3	2		1.95	mg/L	98	95	105			
WG542886ICB	ICB	05/25/22 15:08				U	mg/L		-0.03	0.03			
WG542886LFB	LFB	05/25/22 15:21	II220505-2	.499		.514	mg/L	103	85	115			
L73325-04AS	AS	05/25/22 15:43	II220505-2	.499	U	.519	mg/L	104	85	115			
L73325-04ASD	ASD	05/25/22 15:46	II220505-2	.499	U	.531	mg/L	106	85	115	2	20	

Mercury, dissolved M245.1 CVAA

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG542977													
WG542977ICV	ICV	05/26/22 12:35	HG220523-3	.005005		.00494	mg/L	99	95	105			
WG542977ICB	ICB	05/26/22 12:36				U	mg/L		-0.0002	0.0002			
WG542979													
WG542979LRB	LRB	05/26/22 13:45				U	mg/L		-0.00044	0.00044			
WG542979LFB	LFB	05/26/22 13:45	HG220523-6	.002002		.00187	mg/L	93	85	115			
L73272-01LFM	LFM	05/26/22 13:48	HG220523-6	.002002	U	.00187	mg/L	93	85	115			
L73272-01LFMD	LFMD	05/26/22 13:49	HG220523-6	.002002	U	.00184	mg/L	92	85	115	2	20	

South32

ACZ Project ID: **L73273**

NOTE: If the Rec% column is null, the high/low limits are in the same units as the result. If the Rec% column is not null, then the high/low limits are in % Rec.

Nickel, dissolved M200.7 ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG542886													
WG542886ICV	ICV	05/25/22 15:02	II220519-3	2		1.929	mg/L	96	95	105			
WG542886ICB	ICB	05/25/22 15:08				U	mg/L		-0.024	0.024			
WG542886LFB	LFB	05/25/22 15:21	II220505-2	.5005		.5028	mg/L	100	85	115			
L73325-04AS	AS	05/25/22 15:43	II220505-2	.5005	U	.5037	mg/L	101	85	115			
L73325-04ASD	ASD	05/25/22 15:46	II220505-2	.5005	U	.5128	mg/L	102	85	115	2	20	

Nitrate/Nitrite as N, dissolved M353.2 - Automated Cadmium Reduction

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG542424													
WG542424ICV	ICV	05/18/22 1:04	WI220301-7	2.4161		2.258	mg/L	93	90	110			
WG542424ICB	ICB	05/18/22 1:05				U	mg/L		-0.02	0.02			
WG542424LFB	LFB	05/18/22 1:09	WI220401-10	2		2.004	mg/L	100	90	110			
L73272-03AS	AS	05/18/22 1:31	WI220401-10	2	U	2.048	mg/L	102	90	110			
L73272-04DUP	DUP	05/18/22 1:33			.147	.15	mg/L				2	20	RA

Nitrite as N, dissolved M353.2 - Automated Cadmium Reduction

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG542424													
WG542424ICV	ICV	05/18/22 1:04	WI220301-7	.6089		.609	mg/L	100	90	110			
WG542424ICB	ICB	05/18/22 1:05				U	mg/L		-0.01	0.01			
WG542424LFB	LFB	05/18/22 1:09	WI220401-10	1		1.046	mg/L	105	90	110			
L73272-03AS	AS	05/18/22 1:31	WI220401-10	1	U	1.092	mg/L	109	90	110			
L73272-04DUP	DUP	05/18/22 1:33			U	U	mg/L				0	20	RA

pH (lab) SM4500H+ B

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG543101													
WG543101LCSW1	LCSW	05/26/22 19:09	PCN64057	6		6.1	units	102	5.9	6.1			
L73278-02DUP	DUP	05/26/22 22:14			8.3	8.3	units				0	20	
WG543101LCSW4	LCSW	05/26/22 22:18	PCN64057	6		6.1	units	102	5.9	6.1			
WG543101LCSW7	LCSW	05/27/22 1:08	PCN64057	6		6.1	units	102	5.9	6.1			
WG543101LCSW10	LCSW	05/27/22 4:31	PCN64057	6		6.1	units	102	5.9	6.1			
WG543101LCSW13	LCSW	05/27/22 7:26	PCN64057	6		6.1	units	102	5.9	6.1			

Residue, Filterable (TDS) @180C SM2540C

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG542576													
WG542576PBW	PBW	05/19/22 10:28				U	mg/L		-20	20			
WG542576LCSW	LCSW	05/19/22 10:30	PCN65838	1000		980	mg/L	98	80	120			
L73278-01DUP	DUP	05/19/22 11:02			464	464	mg/L				0	10	

South32

ACZ Project ID: **L73273**

NOTE: If the Rec% column is null, the high/low limits are in the same units as the result. If the Rec% column is not null, then the high/low limits are in % Rec.

Selenium, dissolved

M200.8 ICP-MS

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG543358													
WG543358ICV	ICV	06/01/22 19:49	MS220502-1	.05		.05099	mg/L	102	90	110			
WG543358ICB	ICB	06/01/22 19:51				U	mg/L		-0.00022	0.00022			
WG543358LFB	LFB	06/01/22 19:52	MS220506-2	.05		.04981	mg/L	100	85	115			
L73319-02AS	AS	06/01/22 20:14	MS220506-2	.05	U	.05022	mg/L	100	70	130			
L73319-02ASD	ASD	06/01/22 20:16	MS220506-2	.05	U	.05207	mg/L	104	70	130	4	20	

Sulfate

D516-02/-07/-11 - TURBIDIMETRIC

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG542875													
WG542875ICB	ICB	05/24/22 8:54				U	mg/L		-3	3			
WG542875ICV	ICV	05/24/22 8:54	WI220517-1	20.46		19.6	mg/L	96	90	110			
WG542875LFB	LFB	05/24/22 15:00	WI220415-3	9.95		10.1	mg/L	102	90	110			
L73272-01DUP	DUP	05/24/22 15:29			748	720.7	mg/L				4	20	
L73272-02AS	AS	05/24/22 15:29	SO4TURB25X	10	719	720.7	mg/L	17	90	110			M3

Thallium, dissolved

M200.8 ICP-MS

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG543358													
WG543358ICV	ICV	06/01/22 19:49	MS220502-1	.05		.05403	mg/L	108	90	110			
WG543358ICB	ICB	06/01/22 19:51				U	mg/L		-0.00022	0.00022			
WG543358LFB	LFB	06/01/22 19:52	MS220506-2	.05		.05174	mg/L	103	85	115			
L73319-02AS	AS	06/01/22 20:14	MS220506-2	.05	U	.05153	mg/L	103	70	130			
L73319-02ASD	ASD	06/01/22 20:16	MS220506-2	.05	U	.05336	mg/L	107	70	130	3	20	

Zinc, dissolved

M200.7 ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG542886													
WG542886ICV	ICV	05/25/22 15:02	II220519-3	2		1.895	mg/L	95	95	105			
WG542886ICB	ICB	05/25/22 15:08				U	mg/L		-0.06	0.06			
WG542886LFB	LFB	05/25/22 15:21	II220505-2	.50045		.515	mg/L	103	85	115			
L73325-04AS	AS	05/25/22 15:43	II220505-2	.50045	U	.52	mg/L	104	85	115			
L73325-04ASD	ASD	05/25/22 15:46	II220505-2	.50045	U	.528	mg/L	106	85	115	2	20	

South32

ACZ Project ID: **L73273**

ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
L73273-01	NG542424	Nitrate/Nitrite as N, dissolved	M353.2 - Automated Cadmium Reduction	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
		Nitrite as N, dissolved	M353.2 - Automated Cadmium Reduction	RA	Relative Percent Difference (RPD) was not used for data validation because the concentration of the duplicated sample is too low for accurate evaluation (< 10x MDL).
	WG542875	Sulfate	D516-02/-07/-11 - TURBIDIMETRIC	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS or LFB) was acceptable.

South32

Project ID: 4542257445
 Sample ID: MW3-05162022
 Locator:

ACZ Sample ID: **L73273-01**
 Date Sampled: 05/16/22 11:05
 Date Received: 05/17/22
 Sample Matrix: Groundwater

Combined Radium (total)
 Calculation (RA226 + RA228)

Prep Method:

Parameter	Measure Date	Prep Date	Result	Error(+/-)	LLD	Units	XQ	Analyst
Combined Radium (total)	06/23/22 15:40		3.3			pCi/L		calc

Gross Alpha Total, corrected
 Calculation

Prep Method:

Parameter	Measure Date	Prep Date	Result	Error(+/-)	LLD	Units	XQ	Analyst
Gross Alpha Total, corrected	06/23/22 15:40		5.1			pCi/L		calc

Gross Alpha, total
 M900.0

Prep Method:

Parameter	Measure Date	Prep Date	Result	Error(+/-)	LLD	Units	XQ	Analyst
Gross Alpha, total	06/22/22 0:04		5.1	6.9	38	pCi/L	*	jhd

Radium 226 + Alpha Emitting Radium Isotopes, total
 M903.0

Prep Method:

Parameter	Measure Date	Prep Date	Result	Error(+/-)	LLD	Units	XQ	Analyst
Radium 226 + Alpha	06/09/22 0:02		0.28	0.17	0.59	pCi/L	*	tmb

Radium 228, total
 M904.0

Prep Method:

Parameter	Measure Date	Prep Date	Result	Error(+/-)	LLD	Units	XQ	Analyst
Radium 228, total	08/09/22 11:35		3.3	1.3	2.9	pCi/L	*	jhd

Uranium, Isotopic Total
 Eichrom ACW03

Prep Method:

Parameter	Measure Date	Prep Date	Result	Error(+/-)	LLD	Units	XQ	Analyst
Uranium 234, total	06/07/22 16:56		0.91	0.96	1.5	pCi/L	*	msm
Uranium 235, total	06/07/22 16:56		0.256	0.5	0.94	pCi/L	*	msm
Uranium 238, total	06/07/22 16:56		0.518	0.61	0.96	pCi/L	*	msm

Arizona license number: AZ0102

Report Header Explanations

<i>Batch</i>	A distinct set of samples analyzed at a specific time
<i>Error(+/-)</i>	Calculated sample specific uncertainty
<i>Found</i>	Value of the QC Type of interest
<i>Limit</i>	Upper limit for RPD, in %.
<i>LCL</i>	Lower Control Limit, in % (except for LCSS, mg/Kg)
<i>LLD</i>	Calculated sample specific Lower Limit of Detection
<i>PCN/SCN</i>	A number assigned to reagents/standards to trace to the manufacturer's certificate of analysis
<i>PQL</i>	Practical Quantitation Limit
<i>QC</i>	True Value of the Control Sample or the amount added to the Spike
<i>Rec</i>	Amount of the true value or spike added recovered, in % (except for LCSS, mg/Kg)
<i>REr</i>	Relative Error Ratio, calculation used for Dup. QC taking into account the error factor.
<i>RPD</i>	Relative Percent Difference, calculation used for Duplicate QC Types
<i>UCL</i>	Upper Control Limit, in % (except for LCSS, mg/Kg)
<i>Sample</i>	Value of the Sample of interest

QC Sample Types

<i>DUP</i>	Sample Duplicate	<i>MS/MSD</i>	Matrix Spike/Matrix Spike Duplicate
<i>LCSS</i>	Laboratory Control Sample - Soil	<i>PBS</i>	Prep Blank - Soil
<i>LCSW</i>	Laboratory Control Sample - Water	<i>PBW</i>	Prep Blank - Water

QC Sample Type Explanations

Blanks	Verifies that there is no or minimal contamination in the prep method procedure.
Control Samples	Verifies the accuracy of the method, including the prep procedure.
Duplicates	Verifies the precision of the instrument and/or method.
Matrix Spikes	Determines sample matrix interferences, if any.

ACZ Qualifiers (Qual)

H	Analysis exceeded method hold time.
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Method Prefix Reference

M	EPA methodology, including those under SDWA, CWA, and RCRA
SM	Standard Methods for the Examination of Water and Wastewater.
D	ASTM
RP	DOE
ESM	DOE/ESM

Comments

- (1) Solid matrices are reported on a dry weight basis.
- (2) Preparation method: "Method" indicates preparation defined in analytical method.
- (3) QC results calculated from raw data. Results may vary slightly if the rounded values are used in the calculations.
- (4) An asterisk in the "XQ" column indicates there is an extended qualifier and/or certification qualifier associated with the result.

For a complete list of ACZ's Extended Qualifiers, please click:

<https://acz.com/wp-content/uploads/2019/04/Ext-Qual-List.pdf>

South32

ACZ Project ID: **L73273**

NOTE: If the Rec% column is null, the high/low limits are in the same units as the result. If the Rec% column is not null, then the high/low limits are in % Rec.

Gross Alpha, total

M900.0

Units: pCi/L

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Error	LLD	Found	Error	LLD	Rec%	Lower	Upper	RPD/RER	Limit	Qual
WG544810																
WG544810PBW	PBW	06/22/22						1.8	1.3	12			24			
WG544810LCSWA	LCSW	06/22/22	PCN65744	100				110	9	12	110	67	144			
L73541-01MSA	MS	06/22/22	PCN65744	5000	4800	630	450	8600	780	750	76	67	144			
L73811-01DUP	DUP-RER	06/22/22			1.8	1.5	6.1	2.7	1.9	5.3				0.37	2	
L73811-01DUP	DUP-RPD	06/22/22			1.8	1.5	6.1	2.7	1.9	5.3				40	20	RG

Radium 226 + Alpha Emitting Radium M903.0

Units: pCi/L

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Error	LLD	Found	Error	LLD	Rec%	Lower	Upper	RPD/RER	Limit	Qual
WG543653																
WG543653PBW	PBW	06/09/22						-0.6	0.09	0.79			1.58			
WG543653LCSW	LCSW	06/09/22	PCN65743	20				14	1.1	0.71	70	66	132			
L73273-01DUP	DUP-RER	06/09/22			0.28	0.17	0.59	.09	0.12	0.61				0.91	2	
L73273-01DUP	DUP-RPD	06/09/22			0.28	0.17	0.59	.09	0.12	0.61				103	20	RG
L73370-07MS	MS	06/09/22	PCN65743	40	-0.46	0.31	0.96	31	2	1	79	66	132			
L73370-08DUP	DUP-RPD	06/09/22			0.04	0.2	1.2	.15	0.21	1.1				116	20	RG
L73370-08DUP	DUP-RER	06/09/22			0.04	0.2	1.2	.15	0.21	1.1				0.38	2	

Radium 228, total

M904.0

Units: pCi/L

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Error	LLD	Found	Error	LLD	Rec%	Lower	Upper	RPD/RER	Limit	Qual
WG547818																
WG547818LCSW	LCSW	08/09/22	PCN64684	9.06				12	1.7	3	133	47	123			N1
WG547818PBW	PBW	08/09/22						4.1	1.6	3.8			7.6			
L74414-04DUP	DUP-RPD	08/09/22			10	4.6	10	7.2	3.2	6.9				33	20	RG
L74414-04DUP	DUP-RER	08/09/22			10	4.6	10	7.2	3.2	6.9				0.5	2	
L74671-03MS	MS	08/09/22	PCN64684	9.06	4.7	2.4	5.7	13	1.8	3.3	92	47	123			
L74671-04DUP	DUP-RPD	08/09/22			5.2	2.9	7.3	2.2	1.6	4				81	20	RG
L74671-04DUP	DUP-RER	08/09/22			5.2	2.9	7.3	2.2	1.6	4				0.91	2	

South32

ACZ Project ID: **L73273**

NOTE: If the Rec% column is null, the high/low limits are in the same units as the result. If the Rec% column is not null, then the high/low limits are in % Rec.

U-232

Eichrom ACW03

Units: %

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Error	LLD	Found	Error	LLD	Rec%	Lower	Upper	RPD/RER	Limit	Qual
WG543309																
WG543309PBW	PBW	06/07/22						78	130	30			60			
WG543309LCSW	LCSW	06/07/22	PCN65957					74	130	30						
L73182-01DUP	DUP-RPD	06/07/22			41	130	30							72	20	
L73182-01DUP	DUP-RER	06/07/22			41	130	30	87	130	30					20	
L73182-01DUP	DUP-RPD	06/07/22			41	130	30	87	130	30					20	
L73237-01MS	MS	06/07/22	PCN65957		82	130	30	72	130	30						
L73294-01DUP	DUP-RER	06/08/22			84	130	30	91	130	30					20	
L73294-01DUP	DUP-RPD	06/08/22			84	130	30	91	130	30					20	
L73294-01DUP	DUP-RPD	06/08/22			84	130	30						8		20	

U-234

Eichrom ACW03

Units: pCi/L

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Error	LLD	Found	Error	LLD	Rec%	Lower	Upper	RPD/RER	Limit	Qual
WG543309																
WG543309PBW	PBW	06/07/22						-221	1.1	2.2			4.4			
WG543309LCSW	LCSW	06/07/22	PCN65957	98.2				96.7	12	1.9	98	77	122			
L73182-01DUP	DUP-RPD	06/07/22			1.4	1.9	3.3	.31	1.1	2				127	20	RG
L73182-01DUP	DUP-RER	06/07/22			1.4	1.9	3.3	.31	1.1	2				0.5	2	
L73237-01MS	MS	06/07/22	PCN65957	98.2	5.07	1.9	2.1	98.5	13	1.9	95	77	122			
L73294-01DUP	DUP-RER	06/08/22			10.4	2.5	1.6	13.1	2.7	1.5				0.73	2	
L73294-01DUP	DUP-RPD	06/08/22			10.4	2.5	1.6	13.1	2.7	1.5				23	20	RH

South32

ACZ Project ID: **L73273**

NOTE: If the Rec% column is null, the high/low limits are in the same units as the result. If the Rec% column is not null, then the high/low limits are in % Rec.

U-235

Eichrom ACW03

Units: pCi/L

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Error	LLD	Found	Error	LLD	Rec%	Lower	Upper	RPD/RER	Limit	Qual
WG543309																
WG543309PBW	PBW	06/07/22						-278	0.67	1.7			3.4			
WG543309LCSW	LCSW	06/07/22	PCN65957	4.48				6.5	2.1	1.1	145	42	136			N1
L73182-01DUP	DUP-RER	06/07/22			-0.267	0.91	2.5	-585	0.65	1.8				0.28	2	
L73182-01DUP	DUP-RPD	06/07/22			-0.267	0.91	2.5	-585	0.65	1.8				75	20	RG
L73237-01MS	MS	06/07/22	PCN65957	4.48	-0.131	0.68	1.6	4.92	1.9	1.2	113	42	136			
L73294-01DUP	DUP-RER	06/08/22			0.266	0.52	0.98	1.17	0.78	0.59				0.96	2	
L73294-01DUP	DUP-RPD	06/08/22			0.266	0.52	0.98	1.17	0.78	0.59				126	20	RG

U-238

Eichrom ACW03

Units: pCi/L

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Error	LLD	Found	Error	LLD	Rec%	Lower	Upper	RPD/RER	Limit	Qual
WG543309																
WG543309PBW	PBW	06/07/22						.226	0.77	1.5			3			
WG543309LCSW	LCSW	06/07/22	PCN65957	97.4				98.9	13	1.5	102	87	124			
L73182-01DUP	DUP-RPD	06/07/22			1.08	1.4	2.3	.509	0.92	1.6				72	20	RG
L73182-01DUP	DUP-RER	06/07/22			1.08	1.4	2.3	.509	0.92	1.6				0.34	2	
L73237-01MS	MS	06/07/22	PCN65957	97.4	2.71	1.3	1.4	97.1	12	1.6	97	87	124			
L73294-01DUP	DUP-RPD	06/08/22			10.3	2.4	1	11.1	2.4	0.75				7	20	

South32

ACZ Project ID: **L73273**

ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
L73273-01	NG544810	Gross Alpha, total	M900.0	RG	Sample concentration is less than 5x LLD; RPD was not used for data validation. Replicate Error Ratio (RER) is less than 2. Precision judged to be in control.
	WG543653	Radium 226 + Alpha Emitting Radium Isotopes, total	M903.0	RG	Sample concentration is less than 5x LLD; RPD was not used for data validation. Replicate Error Ratio (RER) is less than 2. Precision judged to be in control.
	WG547818	Radium 228, total	M904.0 M904.0	N1	See Case Narrative.
	WG543309	Uranium 234, total	Eichrom ACW03	RH	For Radiochemistry non-drinking water samples, Replicate Error Ratio (RER) is used as the sole evaluator of precision.
		Uranium 235, total	Eichrom ACW03 Eichrom ACW03	N1	See Case Narrative.
				RG	Sample concentration is less than 5x LLD; RPD was not used for data validation. Replicate Error Ratio (RER) is less than 2. Precision judged to be in control.

South32

ACZ Project ID: **L73273**

Radiochemistry

The following parameters are not offered for certification or are not covered by AZ certificate #AZ0102.

Uranium 234, total	Eichrom ACW03
Uranium 235, total	Eichrom ACW03
Uranium 238, total	Eichrom ACW03

The following parameters are not offered for certification or are not covered by NELAC certificate #ACZ.

Uranium 234, total	Eichrom ACW03
Uranium 235, total	Eichrom ACW03
Uranium 238, total	Eichrom ACW03

Wet Chemistry

The following parameters are not offered for certification or are not covered by AZ certificate #AZ0102.

Cyanide, Free	D6888-09/OIA-1677-09
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Arizona Minerals Inc.
 4542257445

ACZ Project ID: L73273
 Date Received: 05/17/2022 10:44
 Received By:
 Date Printed: 5/18/2022

Receipt Verification

	YES	NO	NA
1) Is a foreign soil permit included for applicable samples?			X
2) Is the Chain of Custody form or other directive shipping papers present?	X		
3) Does this project require special handling procedures such as CLP protocol?		X	
4) Are any samples NRC licensable material?			X
5) If samples are received past hold time, proceed with requested short hold time analyses?	X		
6) Is the Chain of Custody form complete and accurate?	X		
7) Were any changes made to the Chain of Custody form prior to ACZ receiving the samples? A change was made in the The sample Zip Code was corrected. section prior to ACZ custody. A change was made in the The sample Zip Code was corrected. section prior to ACZ custody.	X		

Samples/Containers

	YES	NO	NA
8) Are all containers intact and with no leaks?	X		
9) Are all labels on containers and are they intact and legible?	X		
10) Do the sample labels and Chain of Custody form match for Sample ID, Date, and Time?	X		
11) For preserved bottle types, was the pH checked and within limits? ¹	X		
12) Is there sufficient sample volume to perform all requested work?	X		
13) Is the custody seal intact on all containers?			X
14) Are samples that require zero headspace acceptable?			X
15) Are all sample containers appropriate for analytical requirements?	X		
16) Is there an Hg-1631 trip blank present?			X
17) Is there a VOA trip blank present?			X
18) Were all samples received within hold time?	X		

NA indicates Not Applicable

Chain of Custody Related Remarks

Client Contact Remarks

Shipping Containers

Cooler Id	Temp (°C)	Temp Criteria (°C)	Rad (µR/Hr)	Custody Seal Intact?
635	3.7	<=6.0	15	Yes

Was ice present in the shipment container(s)?

Yes - Wet ice was present in the shipment container(s).

Arizona Minerals Inc.
4542257445

ACZ Project ID: L73273
Date Received: 05/17/2022 10:44
Received By:
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Client must contact an ACZ Project Manager if analysis should not proceed for samples received outside of their thermal preservation acceptance criteria.

¹ The preservation of the following bottle types is not checked at sample receipt: Orange (oil and grease), Purple (total cyanide), Pink (dissolved cyanide), Brown (arsenic speciation), Sterile (fecal coliform), EDTA (sulfite), HCl preserved vial (organics), Na₂S₂O₃ preserved vial (organics), and HG-1631 (total/dissolved mercury by method 1631).

