



Division of Water Quality (DWQ) UPDES Program

UPDES Industrial Permit Application

Part I. General Information (40 CFR 122.21(j)(1) and (9))

Permit Status: ☐ Renewal ☒ New Permit

UPDES Permit No.: NA New Permit; UPDES Permit # Not Available

Facility Name: Waterleaf Great Salt Lake Phase 1 Lithium Extraction Project

Facility Location: Western Slope Promontory Mountains (Unincorp Box Elder Co.)

City _____ State Ut Zip _____

Facility Mailing Address: 9350 South 150 East, Suite # 710

City Sandy State Ut Zip 84070

Facility Contact: Steve Morrey

Title: Project Manager

Phone Number: 801-694-2245

Email Address: steve.morrey@lilacsolutions.

Name of Signatory: Nicholas Goldberg

Title: Authorized Person, Waterleaf Phase 1

Is the applicant the facility owner, operator or both? (check only one response.)

☒ Owner

☐ Operator

☐ Both

Indicate below any existing environmental permits. (Check all that apply and type the corresponding permit number for each.)

☐ RCRA (hazardous waste)

☐ UIC (underground injection control)

☐ PSD (air emissions)

☐ Nonattainment program (CAA)

☒ NESHAPs (CAA)

☒ Dredge or fill (CWA Section 404)

TBD

TBD

☒ Other (specify)

DWQ GSL Mineral Extraction Oper

Nature of Business CFR (40 CFR 122.21(f)(8))

Describe the nature of your business

Waterleaf Resources proposes to build and operate a Great Salt Lake (GSL) Phase 1 Lithium Extraction Project (Commercial Plant) which will extract lithium from Gunnison Bay (North Arm) brine water, GSL and discharge depleted brine to Gunnison Bay, GSL. This facility will utilize non-evaporative ion-exchange technology to produce battery-grade lithium products. This new facility will be constructed along the western slope of Promontory Mountains, Box Elder County, Utah and include with intake and discharge infrastructure located in Gunnison Bay.



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Part II. Facility Information

Design and Actual Flow Rates

Provide design and actual flow rates in designated spaces.

Design Flow Rate	
20	mgd

Annual Average Flow Rates (Actual) Demonstration Plant actual flow

Five Years Ago		Four Years Ago		Three Years Ago	
NA	mgd	NA	mgd	NA	mgd
Two Years Ago		Last Year		Current Year	
NA	mgd	NA	mgd	.006	mgd

Maximum Daily Flow Rates (Actual) From Demonstration plant

Five Years Ago		Four Years Ago		Three Years Ago	
NA	mgd	NA	mgd	NA	mgd
Two Years Ago		Last Year		Current Year	
NA	mgd	NA	mgd	.006	mgd

Describe the treatment for each outfall*

	Outfall Number	002	Outfall Number	NA	Outfall Number	NA
Level of Treatment						
Primary	Treatment Unit	Raw Brine Filtr	Treatment Unit	NA	Treatment Unit	NA
	Size	NA	Size	NA	Size	NA
	Flow rate	20	Flow rate	NA	Flow rate	NA
	Retention time	NA	Retention time	NA	Retention time	NA
	Other	NA	Other	NA	Other	NA
Equivalent to secondary	Treatment Unit	Periodic pH ad	Treatment Unit	NA	Treatment Unit	NA
	Size	NA	Size	NA	Size	NA
	Flow rate	20	Flow rate	NA	Flow rate	NA
	Retention time	NA	Retention time	NA	Retention time	NA
	Other	NA	Other	NA	Other	NA



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Part II. Facility Information *continued*

Describe the treatment for each outfall* *continued*

	Outfall #	002	Outfall #		Outfall #	
Secondary	Treatment Unit	Groundwater I	Treatment Unit	NA	Treatment Unit	NA
	Size	NA	Size	NA	Size	NA
	Flow rate	0.216	Flow rate	NA	Flow rate	NA
	Retention time	NA	Retention time	NA	Retention time	NA
Advanced	Other	NA	Other	NA	Other	NA
	Treatment Unit	Mn Treatment	Treatment Unit	NA	Treatment Unit	NA
	Size	NA	Size	NA	Size	NA
	Flow rate	20	Flow rate	NA	Flow rate	NA
Other (specify)	Retention time	NA	Retention time	NA	Retention time	NA
	Other	NA	Other	NA	Other	NA
	Treatment Unit	Solids Manage	Treatment Unit	NA	Treatment Unit	NA
	Size	NA	Size	NA	Size	NA
	Flow rate	NA	Flow rate	NA	Flow rate	NA
	Retention time	NA	Retention time	NA	Retention time	NA
	Other	NA	Other	NA	Other	NA

* The data can be entered in the section above or an excel spreadsheet. Attached additional sheets if needed.

Production

Outfall Number	Operation, Product, or Material	Quantity per day	Unit of Measure
002	Lithium Carbonate Equip	1.7 LCE	Metric Tons

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Part II. Facility Information *continued*

BLUEPRINT: Attach a line drawing that shows the water flow through your facility with a water balance.

☒ Blueprint Attached

MAP: Attach a USGS topographic map or aerial photo extending one mile beyond the property boundaries of the site, the facility or activity boundaries, any treatment area(s), outfall(s), major drainage patterns, and the receiving surface waters stated above.

☒ Map Attached

Are improvements to the facility scheduled?

☒ YES If YES, explain below.

☐ NO If NO, Skip to Part III

Briefly list and describe the schedule improvements.

1.	See Level II ADR
2.	
3.	
4.	

Provide scheduled or actual dates of completion for improvements.

Scheduled or Actual Dates of Completion for Improvements

	Scheduled Improvement (from above)	Affected Outfalls (list outfall number)	Begin Construction (MM/DD/YYYY)	End Construction (MM/DD/YYYY)	Begin Discharge (MM/DD/YYYY)	Attainment of Operational Level (MM/DD/YYYY)
1.	Phase 1	002	06/2026	06/2027	06/2027	06/2027
2.						
3.						
4.						



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Part III. Sampling Information

See Final Monitoring Report, *Great Salt Lake Lithium extraction demo plant project*

Provide all parameter sampling data with analytical results, reporting limit and any laboratory flags on an Excel spreadsheet. *An Excel Spreadsheet will be provided upon request.*

Has WET testing been conducted during the last 5 years? ☐ YES ☒ NO

Indicate the acute and chronic WET tests (PASS or FAIL) results for the past 5 years. If no WET testing for the quarter, then leave blank (e.g., for semi-annual or annual testing or missed testing events).

Year	Outfall No. _____		Outfall No. _____		Outfall No. _____							
	Acute	Chronic	Acute	Chronic	Acute	Chronic						
	Qtr 1	☐ PASS ☐ FAIL	Qtr 1	☐ PASS ☐ FAIL	Qtr 1	☐ PASS ☐ FAIL	Qtr 1	☐ PASS ☐ FAIL	Qtr 1	☐ PASS ☐ FAIL	Qtr 1	☐ PASS ☐ FAIL
	Qtr 2	☐ PASS ☐ FAIL	Qtr 2	☐ PASS ☐ FAIL	Qtr 2	☐ PASS ☐ FAIL	Qtr 2	☐ PASS ☐ FAIL	Qtr 2	☐ PASS ☐ FAIL	Qtr 2	☐ PASS ☐ FAIL
	Qtr 3	☐ PASS ☐ FAIL	Qtr 3	☐ PASS ☐ FAIL	Qtr 3	☐ PASS ☐ FAIL	Qtr 3	☐ PASS ☐ FAIL	Qtr 3	☐ PASS ☐ FAIL	Qtr 3	☐ PASS ☐ FAIL
	Qtr 4	☐ PASS ☐ FAIL	Qtr 4	☐ PASS ☐ FAIL	Qtr 4	☐ PASS ☐ FAIL	Qtr 4	☐ PASS ☐ FAIL	Qtr 4	☐ PASS ☐ FAIL	Qtr 4	☐ PASS ☐ FAIL
	Qtr 1	☐ PASS ☐ FAIL	Qtr 1	☐ PASS ☐ FAIL	Qtr 1	☐ PASS ☐ FAIL	Qtr 1	☐ PASS ☐ FAIL	Qtr 1	☐ PASS ☐ FAIL	Qtr 1	☐ PASS ☐ FAIL
	Qtr 2	☐ PASS ☐ FAIL	Qtr 2	☐ PASS ☐ FAIL	Qtr 2	☐ PASS ☐ FAIL	Qtr 2	☐ PASS ☐ FAIL	Qtr 2	☐ PASS ☐ FAIL	Qtr 2	☐ PASS ☐ FAIL
	Qtr 3	☐ PASS ☐ FAIL	Qtr 3	☐ PASS ☐ FAIL	Qtr 3	☐ PASS ☐ FAIL	Qtr 3	☐ PASS ☐ FAIL	Qtr 3	☐ PASS ☐ FAIL	Qtr 3	☐ PASS ☐ FAIL
	Qtr 4	☐ PASS ☐ FAIL	Qtr 4	☐ PASS ☐ FAIL	Qtr 4	☐ PASS ☐ FAIL	Qtr 4	☐ PASS ☐ FAIL	Qtr 4	☐ PASS ☐ FAIL	Qtr 4	☐ PASS ☐ FAIL
	Qtr 1	☐ PASS ☐ FAIL	Qtr 1	☐ PASS ☐ FAIL	Qtr 1	☐ PASS ☐ FAIL	Qtr 1	☐ PASS ☐ FAIL	Qtr 1	☐ PASS ☐ FAIL	Qtr 1	☐ PASS ☐ FAIL
	Qtr 2	☐ PASS ☐ FAIL	Qtr 2	☐ PASS ☐ FAIL	Qtr 2	☐ PASS ☐ FAIL	Qtr 2	☐ PASS ☐ FAIL	Qtr 2	☐ PASS ☐ FAIL	Qtr 2	☐ PASS ☐ FAIL
	Qtr 3	☐ PASS ☐ FAIL	Qtr 3	☐ PASS ☐ FAIL	Qtr 3	☐ PASS ☐ FAIL	Qtr 3	☐ PASS ☐ FAIL	Qtr 3	☐ PASS ☐ FAIL	Qtr 3	☐ PASS ☐ FAIL
	Qtr 4	☐ PASS ☐ FAIL	Qtr 4	☐ PASS ☐ FAIL	Qtr 4	☐ PASS ☐ FAIL	Qtr 4	☐ PASS ☐ FAIL	Qtr 4	☐ PASS ☐ FAIL	Qtr 4	☐ PASS ☐ FAIL
	Qtr 1	☐ PASS ☐ FAIL	Qtr 1	☐ PASS ☐ FAIL	Qtr 1	☐ PASS ☐ FAIL	Qtr 1	☐ PASS ☐ FAIL	Qtr 1	☐ PASS ☐ FAIL	Qtr 1	☐ PASS ☐ FAIL
	Qtr 2	☐ PASS ☐ FAIL	Qtr 2	☐ PASS ☐ FAIL	Qtr 2	☐ PASS ☐ FAIL	Qtr 2	☐ PASS ☐ FAIL	Qtr 2	☐ PASS ☐ FAIL	Qtr 2	☐ PASS ☐ FAIL
	Qtr 3	☐ PASS ☐ FAIL	Qtr 3	☐ PASS ☐ FAIL	Qtr 3	☐ PASS ☐ FAIL	Qtr 3	☐ PASS ☐ FAIL	Qtr 3	☐ PASS ☐ FAIL	Qtr 3	☐ PASS ☐ FAIL
	Qtr 4	☐ PASS ☐ FAIL	Qtr 4	☐ PASS ☐ FAIL	Qtr 4	☐ PASS ☐ FAIL	Qtr 4	☐ PASS ☐ FAIL	Qtr 4	☐ PASS ☐ FAIL	Qtr 4	☐ PASS ☐ FAIL
	Qtr 1	☐ PASS ☐ FAIL	Qtr 1	☐ PASS ☐ FAIL	Qtr 1	☐ PASS ☐ FAIL	Qtr 1	☐ PASS ☐ FAIL	Qtr 1	☐ PASS ☐ FAIL	Qtr 1	☐ PASS ☐ FAIL
	Qtr 2	☐ PASS ☐ FAIL	Qtr 2	☐ PASS ☐ FAIL	Qtr 2	☐ PASS ☐ FAIL	Qtr 2	☐ PASS ☐ FAIL	Qtr 2	☐ PASS ☐ FAIL	Qtr 2	☐ PASS ☐ FAIL
	Qtr 3	☐ PASS ☐ FAIL	Qtr 3	☐ PASS ☐ FAIL	Qtr 3	☐ PASS ☐ FAIL	Qtr 3	☐ PASS ☐ FAIL	Qtr 3	☐ PASS ☐ FAIL	Qtr 3	☐ PASS ☐ FAIL
	Qtr 4	☐ PASS ☐ FAIL	Qtr 4	☐ PASS ☐ FAIL	Qtr 4	☐ PASS ☐ FAIL	Qtr 4	☐ PASS ☐ FAIL	Qtr 4	☐ PASS ☐ FAIL	Qtr 4	☐ PASS ☐ FAIL

Describe any cause(s) of toxicity:

Were the above WET analysis submitted to Utah DWQ?

☐ YES

☐ NO



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Part IV. Compliance Information *See Final Monitoring Report, Great Salt Lake Lithium Extraction Demo Plant Project*

Has the facility had and parameter exceedances over the past five years? ☐ YES ☒ NO

If Yes, provide the below information:

Parameter	Exceedance	Month/Year	Cause



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Please provide the past ~~five years~~ ^{plant project} of all parameters required to be monitored in the UPDES permit. The data can be entered in the section below or an excel spreadsheet. Attached additional sheets if needed.

[illegible]

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Part V. Outfalls and Receiving Water(s)

Provide the latitude and longitude to the nearest second for each dewatering outfall. The specified location should be after all treatment and before release to the receiving water. Provide the name of the initial receiving water. If the initial receiving water is unnamed, please also indicate the closed named drainage the receiving water flows into (i.e. unnamed tributary of City Creek). Attach additional sheets if necessary for more outfalls.

Each outfall to a different receiving water segment is subject to additional application fees and annual fees.

Outfall No.	Average daily flow rate	Latitude	Longitude	Receiving Surface Waters (Name)
002	20 mgd	41° 26' 41.47"	-112° 42' 25.25"	Gunnison Bay, GSL
	mgd	° ' "	° ' "	
	mgd	° ' "	° ' "	

Do any of the outfalls described above have a season or periodic discharges?

☐ YES ☒ NO

If so, provide the following information for each applicable outfall.

	Outfall No.	NA	Outfall No.	NA	Outfall No.	NA
Number of times per year discharges occurs	NA		NA		NA	
Average duration of each discharge (specify units)	NA		NA		NA	
Average flow of each discharge	NA	mgd	NA	mgd	NA	mgd
Months in which discharge occurs	NA		NA		NA	



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Part VI. Effluent and Intake Characteristics

Table A. Conventional and Non-Conventional Pollutants

Are you requesting a waiver for one or more pollutants listed Table A for any of your outfalls? ☐ YES ☒ NO

If yes, indicate the applicable outfalls below. Attach the waiver request and other required information to the application.

Outfall Number	002	Outfall Number		Outfall Number	
----------------	-----	----------------	--	----------------	--

Have you completed monitoring for all Table A pollutants at each of your outfalls for which a waiver has not been requested and attached the results to this application?
☐ YES ☒ NO; a waiver has been requested for all pollutants at all outfalls

Table B. Toxic Metals, Cyanide, Total Phenols, and Organic Toxic Pollutants

Do any of the facility's processes that contribute wastewater fall into one or more of the primary industry categories listed in Appendix A?
☒ YES ☐ NO ☐ Not applicable

Have you checked "Testing Required" for all toxic metals, cyanide, and total phenols in Section 1 of Table B?
☐ YES ☒ NO

List the applicable primary industry categories and check the boxes indicating the required Gas Chromatography/Mass Spectrometry (GS/MS) Fraction(s) identified in Appendix A.

Primary Industry Category	Required Gas Chromatography/Mass Spectrometry (GS/MS) Fraction(s)
15- Inorganic Chemical Extraction	☒ Volatile ☒ Acid ☒ Base/Neutral ☐ Pesticide
	☐ Volatile ☐ Acid ☐ Base/Neutral ☐ Pesticide
	☐ Volatile ☐ Acid ☐ Base/Neutral ☐ Pesticide

Have you checked "Testing Required" for all required pollutants in Sections 2 through 5 of Table B for each of the GC/MS fractions?
☒ YES ☐ NO

Have you checked "Believe Present" or Believed Absent" for all pollutants listed in Sections 1 through 5 of Table B where testing is not required?
☒ YES ☐ NO

Have you provided (1) quantitative data for those Section 1, Table B, pollutants for which you have indicated testing is required or (2) quantitative data or other required information for those Section 1, Table B, pollutants that you have indicated are "Believe Present" in your discharge?
☒ YES ☐ NO

Have you provided (1) quantitative data for those Sections 2 through 5, Table B, pollutants for which you have determined testing is required or (2) quantitative data or an explanation for those Sections 2 through 5, Table B, pollutants you have indicated are "Believed Present" in your discharge?
☒ YES ☐ NO



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Part VI. Effluent and Intake Characteristics *continued*

Table C. Certain Conventional and Non-Conventional Pollutants

Have you indicated whether pollutants are "Believed Present" or "Believed Absent" for all pollutants listed on Table C for all outfalls?

☒ YES ☐ NO

Have you completed Table C by providing (1) quantitative data for those pollutants that are limited either directly or indirectly in an Effluent Limitation Guidelines and/or (2) quantitative data or an explanation for those pollutants for which you have indicated "Believe Present"?

☒ YES ☐ NO

Table D. Certain Hazardous Substances and Asbestos

Have you indicated whether pollutants are "Believed Present" or "Believed Absent" for all pollutants listed on Table D for all outfalls?

☒ YES ☐ NO

Have you completed Table D by (1) describing the reasons the applicable pollutants are expected to be discharged and (2) by providing quantitative data, if available?

☒ YES ☐ NO

Table E. 2,3,7,8-Tetrachlorodibenzo-p-Dioxin (2,3,7,8-TCDD)

Does the facility use or manufacture one or more of the 2,3,7,8-TCDD congeners listed below:

- ☐ 2,4,5-trichlorophenoxy acetic acid (2,4,5-T)
- ☐ 2-(2,4,5-trichlorophenoxy) propanoic acid (Silvex, 2,4,5-TP)
- ☐ 2-(2,4,5-trichlorophenoxy) ethyl 2,2-dichloro-propionate (Erbon)
- ☐ 0,0-dimethyl 0-(2,4,5-trichlorophenyl) phosphorothioate (Rannel)
- ☐ 2,4,5,-trichlorophenol (TCP)
- ☐ hexachlorophene (HCP).
- ☐ Or do you know of have reason to believe that TCDD is or may be present in the effluent?

☐ YES, Complete Table E ☒ NO, Skip to Part VII

Have you completed Table E by reporting qualitative data for TCDD?

☐ YES ☒ NO

Were any of the analyses reported in this section performed by a contract laboratory or consulting firm?

☒ YES ☐ NO, Skip to Part VII

Provide information for each contract laboratory or consulting firm below.

	Laboratory Number 1	Laboratory Number 2	Laboratory Number 3
Name of laboratory/firm	Chemtech Ford	NA	NA
Laboratory address	9632 South 500 West S		
Phone Number	801-262-7299		
Pollutant(s) analyzed	See Demonstration Plant Final Monitoring Report, Waterleaf P		



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Part VII. Used or Manufactured Toxics

Is any pollutant listed in Table B a substance or a component of a substance used or manufactured at your facility as an intermediate or final product or byproduct?

☐ YES ☒ NO, Skip to Part VIII

List the pollutants below.

1. NA	4.	7.
2.	5.	8.
3.	6.	9.



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Part IX. Biosolids Information **Not Applicable to this application. No Biosolids produced**

Was the Biosolids Annual Report submitted? ☐ YES ☐ NO

☐ Attach a Biosolids Management Plan with application

Serve Connections?

Provide the total dry metric tons per the latest 365-day period of sewage sludge generated, treated, used and disposed of:

Practice	Dry Metric Tons per 365-day Period
Amount generated at the facility	
Amount treated at the facility	
Amount used (i.e., received from offsite) at the facility	
Amount disposed of at the facility	

Treatment Provided at Your Facility

Identify the treatment process(es) used at your facility to reduce pathogens in sewage sludge

- | | |
|--|---|
| ☐ Preliminary operations (e.g., sludge grinding and degritting) | ☐ Thickening (concentration) |
| ☐ Stabilization | ☐ Anaerobic digestion |
| ☐ Composting | ☐ Conditioning |
| ☐ Disinfection | ☐ Dewatering (e.g. centrifugation, sludge drying beds, sludge lagoons) |
| ☐ Heat drying | ☐ Thermal reduction |
| ☐ Methane or biogas capture and recovery | |

Sewage Sludge Disposal Method

Land Application of Bulk Sewage Sludge

Is sewage sludge from your facility applied to the land? ☐ YES ☐ NO If No, Skip to next section

Total dry metric tons per 365-day period of sewage sludge applied to all land sites: _____

Surface Disposal

Is sewage sludge from your facility placed on a surface disposal site?

☐ YES ☒ NO If No, Skip to next section

Total dry metric tons of sewage sludge from your facility placed on all surface disposal sites per 365-day period: _____

Do you own or operate all surface disposal sites to which you send sewage sludge for disposal?

☐ YES ☐ NO If No, complete the below information

Surface disposal site *you do not operate*

Site name _____

Mailing address _____

City _____ State _____ Zip _____

Contact Name _____ Title _____

Phone Number _____ Email Address _____



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Part IX. Biosolids Information *continued* **Not Applicable to this application. No Biosolids produced**

Incineration

Is sewage sludge from your facility fired in a sewage sludge incinerator?

☐ YES ☐ NO If No, Skip to next section

Total dry metric tons of sewage sludge from your facility fired in all sewage sludge incinerators per 365-day period: _____

Do you own or operate all sewage sludge incinerators in which sewage sludge from facility is fired?

☐ YES ☐ NO If No, complete the below information

Incinerator location *you do not operate*

Site name _____

Mailing address _____

City _____ State _____ Zip _____

Contact Name _____

Title _____

Phone Number _____

Email Address _____

Disposal in a Municipal Solid Waste Landfill

Is sewage sludge from your facility placed on a municipal solid waste landfill?

☐ YES ☐ NO If No, Skip to next section

Total dry metric tons of sewage sludge from your facility placed in this municipal solid waste landfill per 365-day period: _____

Do you own or operate the municipal solid waste landfill in which sewage sludge is disposed?

☐ YES ☐ NO If No, complete the below information

Municipal Solid Waste Landfill *you do not operate*

Site name _____

Mailing address _____

City _____ State _____ Zip _____

Contact Name _____

Title _____

Phone Number _____

Email Address _____



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Part X. Reuse Information Not Applicable to this application. No water reuse is proposed

Is wastewater applied to land?

☐ YES ☐ NO If YES, complete the below information.

Land Application Site and Discharge Data			
Location	Size	Average Daily Volume Applied	How often
	NA acres	gpd	☐ Seasonal ☐ Continuous ☐ Intermittent
	acres	gpd	☐ Seasonal ☐ Continuous ☐ Intermittent
	acres	gpd	☐ Seasonal ☐ Continuous ☐ Intermittent

Seasonal land application.

Indicate months of seasonal land application

☐ January	☐ April	☐ July	☐ October
☐ February	☐ May	☐ August	☐ November
☐ March	☐ June	☐ September	☐ December

Where is the Reuse water distributed

- ☐ Residential irrigation
- ☐ Urban uses
 - ☐ Non-residential landscape irrigation
 - ☐ Golf course irrigation
 - ☐ Toilet flushing
 - ☐ Fire protection
- ☐ Irrigation of food crops (direct contact with edible part) – spray irrigation
- ☐ Irrigation of food crops (Non direct contact with edible part) – no spray irrigation
- ☐ Irrigation
 - ☐ Sod farms
 - ☐ Silviculture
 - ☐ Limited access highway rights of way
 - ☐ Other areas where human access is restrict or unlikely to occur
- ☐ Irrigation of animal feed crops other than pasture for milking animals
- ☐ Impoundment of wastewater where direct human contact is not allowed or is unlikely to occur
- ☐ Cooling water
- ☐ Soil compaction or duct control in construction areas
- ☐ Other

☐ **Attached an updated Reuse Project Plan**

An updated Reuse Project Plan is required during every permit renewal.

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Part X. Antidegradation Review

The objective of antidegradation rules and policies is to protect existing high quality waters and set forth a process for determining where and how much degradation is allowable for socially and/or economically important reasons. In accordance with Utah Administrative Code (UAC R317-2-3), an antidegradation review (ADR) is a permit requirement for any project that will increase the level of pollutants in waters of the state. The rule outlines requirements for both Level I and Level II ADRs, as well as public comment procedures. This review form is intended to assist the applicant and Division of Water Quality (DWQ) staff in complying with the rule but is not a substitute for the complete rule in R317-2-3.5. Additional details can be found in the *Utah Antidegradation Implementation Guidance* and relevant sections of the guidance are cited in this review form.

ADRs should be among the first steps of an application for a UPDES permit because the review helps establish treatment expectations. The level of effort and amount of information required for the ADR depends on the nature of the project and the characteristics of the receiving water. To avoid unnecessary delays in permit issuance, DWQ recommends that the process be initiated at least one year prior to the date a final approved permit is required.

DWQ will determine if the project will impair beneficial uses (Level I ADR) using information provided by the applicant and whether a Level II ADR is required. The applicant is responsible for conducting the Level II ADR. For the permit to be approved, the Level II ADR must document that all feasible measures have been undertaken to minimize pollution for socially, environmentally or economically beneficial projects resulting in an increase in pollution to waters of the state.

For permit requiring a Level II ADR, this antidegradation form must be completed and approved by DWQ before any UPDES permit can be issued. Typically, the ADR form is completed in an iterative manner in consultation with DWQ. The applicant should first complete the statement of social, environmental and economic importance (SEEI) in Section C and determine the parameters of concern (POC) in Section D. Once the POCs' are agreed upon by DWQ, the alternatives analysis and selection of preferred alternative Section E can be conducted based on minimizing degradation resulting from discharge of the POCs. Once the applicant and DWQ agree upon the preferred alternative, the review is considered complete, and the form is submitted to DWQ.

What are the designated uses of the receiving water (R317-2-6)?

- ☐ Domestic Water Supply
- ☐ Recreation
- ☐ Aquatic Life
- ☐ Agricultural Water Supply
- ☒ Great Salt Lake

Antidegradation Category 1, 2 or 3 of receiving water
(R317-2-3.2, -3.3, and -3.4):

ADR Category 3

Designated uses 5B,5E



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Part X. Antidegradation Review *continued*

Effluent flow reviewed: *typically, this should be the maximum daily discharge at the design capacity of the facility. Exceptions should be noted.*

20 MGD maximum flow.

What is the application for? (Check all that apply)

- ☐ A UPDES permit for a new facility, project, or outfall.
- ☒ A UPDES permit renewal with an expansion or modification of an existing wastewater treatment works.
- ☐ A UPDES permit renewal requiring limits for a pollutant not covered by the previous permit and/or an increase to existing permit limits.
- ☐ A UPDES permit renewal with no changes in facility operations.

Section B. Is a Level II ADR required?

This section of the form is intended to help applicants determine if a Level II ADR is required for specific permitted activities. In addition, the Executive Secretary may require a Level II ADR for an activity with the potential for major impact on the quality of waters of the state (R317-2-3.5a.1).

B1. The UPDES permit is new or is being renewed and the proposed effluent concentration and loading limits are higher than the concentration and loading limits in the previous permit and any previous antidegradation review(s).

- ☒ YES – (Proceed to B3 of the Form)
- ☐ NO – No Level II ADR is required and there is no need to proceed further with the review questions.
Continue to the Certification Statement and Signature page.

B2. Will any pollutants use assimilative capacity of the receiving water, i.e. do the pollutant concentrations in the effluent exceed those in the receiving waters at critical conditions? For most pollutants, effluent concentrations that are higher than the ambient concentrations require an antidegradation review? For a few pollutants such as dissolved oxygen, and antidegradation review is required if the effluent concentrations are less than the ambient concentrations in the receiving water. (Section 3.3.3 of Implementation Guidance)

- ☐ YES – (Proceed to B4 of the Form)
- ☒ NO – No Level II ADR is required and there is no need to proceed further with the review questions.
Continue to the Certification Statement and Signature page.

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Part X. Antidegradation Review *continued*

B3. Are water quality impacts of the proposed project temporary and limited (Section 3.3.4 of Implementation Guidance)? Proposed projects that will have temporary and limited effects on water quality can be exempted from a Level II ADR.

- ☐ YES – Identify the reason used to justify this determination in B4.1 and proceed to Section G. No Level II ADR is required.
- ☒ NO – A Level II ADR is required (Proceed to Section C)

B3.1 Complete this question only if the applicant is requesting a Level II review exclusion for temporary and limited projects (See R317-2-3.5(b)(3) and R317-2-3.5(b)(4)). For projects requesting a temporary and limited exclusion please indicate the factor(s) used to justify this determination (check all that apply and provide details as appropriate) (Section 3.3.4 of Implementation Guidance):

- ☐ Water quality impacts will be temporary and related exclusively to sediment or turbidity and fish spawning will not be impaired.

Factors to be considered in determining whether water quality impacts will be temporary and limited:

- a) The length of time during which water quality will be lowered:
- b) The percent change in ambient concentrations of pollutants:
- c) Pollutants affected:
- d) Likelihood for long-term water quality benefits:
- e) Potential for any residual long-term influences on existing uses:
- f) Impairment of fish spawning, survival and development of aquatic fauna excluding fish removal efforts:

Additional justification, as needed:

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Part X. Antidegradation Review *continued*

Level II ADR

Section C, D, E, and F of the form constitute the Level II ADR Review. The applicant must provide as much detail as necessary for DWQ to perform the antidegradation review. Questions are provided for the convenience of applicants; however, for more complex permits it may be more effective to provide the required information in a separate report. Applicants that prefer a separate report should record the report name here and proceed to Section G of the form.

Option Report Name: See Waterleaf Resources Level II ADR

Section C. Is the degradation from the project socially and economically necessary to accommodate important social or economic development in the area in which the waters are located? *The applicant must provide as much detail as necessary for DWQ to concur that the project is socially and economically necessary when answering the questions in the section. More information is available in Section 6.2 of the Implementation Guidance.*

C1. Describe the social and economic benefits that would be realized through the proposed project, including the number and nature of jobs created and anticipated tax revenues.

See Waterleaf Resources Level II ADR

C2. Describe any environmental benefits to be realized through implementation of the proposed project.

See Waterleaf Resources Level II ADR

C3. Describe any social and economic losses that may result from the project, including impacts to recreation or commercial development.

See Waterleaf Resources Level II ADR

C4. Summarize any supporting information from the affected communities on preserving assimilative capacity to support future growth and development.

See Waterleaf Resources Level II ADR



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Part X. Antidegradation Review *continued*

C5. Please describe any structures or equipment associated with the project that will be placed within or adjacent to the receiving water.

See Waterleaf Resources Level II ADR

C6. Will the discharge potentially impact a drinking water source, e.g., Class 1C waters? Depending upon the locations of the discharge and its proximity to downstream drinking water diversions, additional treatment or more stringent effluent limits or additional monitoring, beyond that which may otherwise be required to meet minimum technology standards or in stream water quality standards, may be required by the Director in order to adequately protect public health and the environment (R317-2-3.5 d.).

☐ YES

☒ NO

Section D. Identify and rank (from increasing to decreasing potential threat to designated uses) the parameters of concern. Parameters of concern are parameters in the effluent at concentrations greater than ambient concentrations in the receiving water. The applicant is responsible for identifying parameter concentrations in the effluent and DWQ will provide parameter concentrations for the receiving water. More information is available in Section 3.3.3 of the Implementation Guidance.

Parameters of Concern:

Rank	Pollutant	Ambient Concentration	Effluent Concentration
1. See Level II ADR			
2.			
3.			
4.			
5.			



Division of Water Quality (DWQ) UPDES Program

UPDES Industrial Permit Application

Part X. Antidegradation Review *continued*

Pollutants Evaluated that are not Considered Parameters of Concern:

Pollutant	Ambient Concentration	Effluent Concentration	Justification
1.			
2.			
3.			
4.			
5.			

Section E. Alternative Analysis Requirements of Level II Antidegradation Review. *Level II ADRs require the applicant to determine whether there are feasible less-degrading alternatives to the proposed project. More information is available in Section 5.5 and 5.6 of the Implementation Guidance.*

E1. The UPDES permit is being renewed without any changes to flow or concentrations. Alternative treatment and discharge options including changes to operations and maintenance were considered and compared to the current processes. NO economically feasible treatment or discharge alternatives were identified that were not previously considered for any previous antidegradation review(s).

☐ YES – (Proceed to Section F)

☒ NO or Does Not Apply (Proceed to E2)

E2. Attach as an appendix to this form a report that describes that following factors for all alternative treatment options (see 1) a technical descriptions of the treatment process, including construction costs and continued operation and maintenance expenses, 2) the mass and concentration of discharge constituents, and 3) a description of the reliability of the system, including the frequency where recurring operation and maintenance may lead to temporary increases in discharged pollutants. Most of this information is typically available from a Facility Plan, if available.

Report Name: See Waterleaf Resources Level II ADR

E3. Describe the proposed method and cost of the baseline treatment alternative. The baseline treatment alternative is the minimum treatment required to meet water quality based effluent limits (WQBEL) as determined by the preliminary or final wasteload analysis (WLC) and any secondary or categorical effluent limits.

Not applicable

Division of Water Quality (DWQ) UPDES Program

UPDES Industrial Permit Application

Part X. Antidegradation Review *continued*

E4. Were any of the following alternatives feasible and affordable?

Alternative	Feasible	Reason Not Feasible/Affordable
Pollutant Trading	☐ YES ☐ NO	See Level II ADR
Water Recycling/Reuse	☐ YES ☐ NO	
Land Application	☐ YES ☐ NO	
Connection to Other Facilities	☐ YES ☐ NO	
Upgrade to Existing Facility	☐ YES ☐ NO	
Total Containment	☐ YES ☐ NO	
Improved O&M of Existing Systems	☐ YES ☐ NO	
Seasonal or Controlled Discharge	☐ YES ☐ NO	
New Construction	☐ YES ☐ NO	
No Discharge	☐ YES ☐ NO	

E5. From the applicant's perspective, what is the preferred treatment option?

See Level II ADR



UPDES Industrial Permit Application

Part X. Antidegradation Review *continued*

E6. Is the preferred option also the least polluting feasible alternative?

☒ YES ☐ NO

If No, what were less degrading feasible alternative(s)?

If No, provide a summary of the justification for not selecting the least polluting feasible alternative and if appropriate, provide a more detailed justification as an attachment.

Section F. Optional Information

F1. Does the applicant want to conduct optional public review(s) in addition to the mandatory public review? Level II ADRs are public noticed for a thirty day comment period. More information is available in Section 3.7.1 of the Implementation Guidance.

☐ YES ☒ NO

F2. Does the project include an optional mitigation plan to compensate for the proposed water quality degradation?

☐ YES ☒ NO

Report Name:

Level II Antidegradation Review
Waterleaf Resources, Great Salt Lake Commercial Plant Project
UPDES Industrial Permit Application
Box Elder County, Utah



Division of Water Quality (DWQ) UPDES Program

UPDES Industrial Permit Application

Part XI. Certification Statement and Signature

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment of knowing violations.

Nicholas Goldberg

**PRINT Signatory
Authority**

Signature

Authorized Person, Water Quality

Title

05/08/26

Date

The Division of Water Quality may request additional information.

Important: The UPDES Permit Application will not be considered complete unless you answer every question. If an item does not apply to you, enter "Not Applicable" to show that you considered the question.

The UPDES Permit Application, must be signed as follows:

- 1) For a corporation, a responsible corporate officer shall sign the NOT, a responsible corporate officer means:
 - a. A President, secretary, treasurer, or vice-president of the corporation in charge of a principal business function, or any other person who performs similar policy- or decision-making functions for the corporation; or
 - b. The manager of one or more manufacturing, production, or operating facilities, if
 - i. The manager is authorized to make management decisions that govern the operation of the regulated facility, including having the explicit or implicit duty of making major capital investment recommendations, and initiating and directing other comprehensive measures to assure long term environmental compliance with environmental statutes and regulations;
 - ii. The manager can ensure that the necessary systems are established or actions taken to gather complete and accurate information for permit application requirements; and
 - iii. Authority to sign documents has been assigned or delegated to the manager in accordance with corporate procedures.
- 2) For a partnership or sole proprietorship, the general partner or the proprietor, respectively; or
- 3) For a municipality, state or other public agency, either a principal executive officer or ranking elected official shall sign the application; in this subsection, a principal executive officer of any agency means:
 - a. The chief executive officer of the agency; or
 - b. A senior executive officer having responsibility for the overall operations of a principal geographic unit or division of the agency.

Where to File the UPDES Permit Application form:

Please submit the original form with a signature in ink to the below address. Remember to retain a copy for your records.

UPDES sent by mail:

**Division of Water Quality
195 North 1950 West
PO Box 144870
Salt Lake City, UT 84114-4870**

OFFICE USE ONLY

Date received: / /

Received by: _____

Document No: _____

via: ☐ Email ☐ Fax ☐ Webportal ☐ Mail ☐ Hand Delivery



Division of Water Quality (DWQ) UPDES Program

UPDES Industrial Permit Application

Appendix A. Testing Requirements for Organic Toxic Pollutants Industry Categories*

Industry Category		Volatile	Gas Chromatography/Mass Spectrometry (GS/MS) Fraction(s)†		Pesticide
			Acid	Base/Neutral	
1.	Adhesives and sealants	X	X	X	☐
2.	Aluminum forming	X	X	X	☐
3.	Auto and other laundries	X	X	X	X
4.	Battery manufacturing	X	☐	X	☐
5.	Coal mining	☐	☐	☐	☐
6.	Coil coating	X	X	X	☐
7.	Copper forming	X	X	X	☐
8.	Electric and electronic compounds	X	X	X	X
9.	Electroplating	X	X	X	☐
10.	Explosives manufacturing	☐	X	X	☐
11.	Foundries	X	X	X	☐
12.	Gum and wood chemicals (all subparts except D and F)	X	X	☐	☐
13.	Gum and wood chemicals, Subpart D (tall oil rosin)	X	X	X	☐
14.	Gum and wood chemicals, Subpart F (rosin-based derivatives)	X	X	X	☐
15.	Inorganic chemicals manufacturing	X	X	X	☐
16.	Iron and steel manufacturing	X	X	X	☐
17.	Leather tanning and finishing	X	X	X	☐
18.	Mechanical products manufacturing	X	X	X	☐
19.	Nonferrous metals manufacturing	X	X	X	X
20.	Ore mining, Subpart B (base and precious metals)	☐	X	☐	☐
21.	Organic chemicals manufacturing	X	X	X	X
22.	Paint and ink formulation	X	X	X	☐
23.	Pesticides	X	X	X	X
24.	Petroleum refining	X	☐	☐	☐
25.	Pharmaceutical preparations	X	X	X	☐
26.	Photographic equipment and supplies	X	X	X	☐
27.	Plastic and synthetic materials manufacturing	X	X	X	X
28.	Plastic processing	X	☐	☐	☐
29.	Printing and publishing	X	X	X	X
30.	Pulp and paperboard mills	X	X	X	X
31.	Rubber processing	X	X	X	☐
32.	Soap and detergent manufacturing	X	X	X	☐
33.	Steam electric power plants	X	X	☐	☐
34.	Textile mills (except Subpart C, Greige Mills)	X	X	X	☐
35.	Timber products processing	X	X	X	X

Key

- * See note at conclusion of 40 CFR 122, Appendix D (1983) for explanation of effect of suspensions on testing requirements for primary industry categories
- † The pollutants in each fraction are listed in Table B
- X Testing is required
- ☐ Testing is not required

TABLE A**Conventional and Non-Conventional Pollutants**



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UPDES Program

UPDES Industrial Permit Application

UPDES Permit No.	UT0026280	Facility Name	Waterleaf GSL Phase 1Lithium Extraction Project	Outfall Number	002
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Table A. Conventional and Non-Conventional Pollutants ¹									
	Pollutant	Waiver Requested (if applicable)	Units (specify)	Effluent				Intake (optional)	
				Maximum Daily Discharge (required)	Maximum Monthly Discharge (if available)	Long-Term Average Daily Discharge (if available)	Number of Analyses	Long-Term Average	Number of Analyses
☐	Check here if you have applied to Utah DWQ for a waiver for all of the pollutants listed on this table for the noted outfall.								
1.	Biochemical oxygen demand (BOD ₅)	☐	Concentration	☐					
			Mass	☐					
2.	Chemical oxygen demand (COD)	☐	Concentration	☐					
			Mass	☐					
3.	Total organic carbon (TOC)	☒	Concentration	☐					
			Mass	☐					
4.	Total suspended solids (TSS)	☐	Concentration	☒					
			Mass	☐					
5.	Ammonia (as N)	☒	Concentration	☐					
			Mass	☐					
6.	Flow	☐	Rate	☐					
7.	Temperature (winter)	☐	Fahrenheit	☒					
	Temperature (summer)	☐	Fahrenheit	☒					
8.	pH (minimum)	☐	Standard units	SU					
	pH (maximum)	☐	Standard units	SU					

¹ Sampling shall be conducted according to sufficiently sensitive test procedures (i.e., methods) approved under 40 CFR 136 for the analysis of pollutants or pollutant parameters or required 40 CFR chapter I, subchapter N or O.

TABLE B

Toxic Metals, Cyanide, Total Phenols, and
Organic Toxic Pollutants



Division of Water Quality (DWQ)

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UPDES Permit No.	UT0026280	Facility Name	Waterleaf Phase 1 GSL Lithium Extraction Project	Outfall Number	002
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Table B. Toxic Metals, Cyanide, Total Phenols, and Organic Toxic Pollutants ¹												
	Pollutant/Parameter (and CAS Number, if available)	Testing Required	Presence or Absence (check one)		Units (specify)	Effluent				Intake (optional)		
			Believed Present	Believed Absent		Maximum Daily Discharge (required)	Maximum Monthly Discharge (if available)	Long-Term Average Daily Discharge (if available)	Number of Analyses	Long-Term Average	Number of Analyses	
Section 1. Toxic Metals, Cyanide, and Total Phenols												
1.	Antimony, Total (7440-36-0)	☐	☐	☒	Concentration	☐						
					Mass	☐						
2.	Arsenic, Total (7440-38-0)	☒	☒	☐	Concentration	☐						
					Mass	☐						
3.	Beryllium, Total (7440-41-7)	☐	☐	☒	Concentration	☐						
					Mass	☐						
4.	Cadmium, Total (7440-43-9)	☒	☒	☐	Concentration	☐						
					Mass	☐						
5.	Chromium, Total (7440-47-3)	☒	☒	☐	Concentration	☐						
					Mass	☐						
6.	Copper, Total (7440-50-8)	☒	☒	☐	Concentration	☐						
					Mass	☐						
7.	Lead, Total (7439-92-1)	☒	☒	☐	Concentration	☐						
					Mass	☐						

¹ Sampling shall be conducted according to sufficiently sensitive test procedures (i.e., methods) approved under 40 CFR 136 for the analysis of pollutants or pollutant parameters or required 40 CFR chapter I, subchapter N or O.



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Table B. Toxic Metals, Cyanide, Total Phenols, and Organic Toxic Pollutants ¹												
	Pollutant/Parameter (and CAS Number, if available)	Testing Required	Presence or Absence (check one)		Units (specify)		Effluent				Intake (optional)	
			Believed Present	Believed Absent			Maximum Daily Discharge (required)	Maximum Monthly Discharge (if available)	Long-Term Average Daily Discharge (if available)	Number of Analyses	Long-Term Average	Number of Analyses
Section 1. Toxic Metals, Cyanide, and Total Phenols <i>continued</i>												
8.	Mercury, Total (7439-97-6)	☒	☒	☐	Concentration	☐						
					Mass	☐						
9.	Nickel, Total (7440-02-0)	☒	☒	☐	Concentration	☐						
					Mass	☐						
10.	Selenium, Total (7782-49-2)	☒	☒	☐	Concentration	☐						
					Mass	☐						
11.	Silver, Total (7440-22-4)	☒	☒	☐	Concentration	☐						
					Mass	☐						
12.	Thallium, Total (7440-28-0)	☐	☐	☒	Concentration	☐						
					Mass	☐						
13.	Zinc, Total (7440-66-6)	☒	☒	☐	Concentration	☐						
					Mass	☐						
14.	Cyanide, Total (57-12-5)	☒	☒	☐	Concentration	☐						
					Mass	☐						
15.	Phenols, Total	☐	☐	☒	Concentration	☐						
					Mass	☐						

¹ Sampling shall be conducted according to sufficiently sensitive test procedures (i.e., methods) approved under 40 CFR 136 for the analysis of pollutants or pollutant parameters or required 40 CFR chapter I, subchapter N or O.



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Table B. Toxic Metals, Cyanide, Total Phenols, and Organic Toxic Pollutants ¹												
	Pollutant/Parameter (and CAS Number, if available)	Testing Required	Presence or Absence (check one)		Units (specify)		Effluent				Intake (optional)	
			Believed Present	Believed Absent			Maximum Daily Discharge (required)	Maximum Monthly Discharge (if available)	Long-Term Average Daily Discharge (if available)	Number of Analyses	Long-Term Average	Number of Analyses
Section 2. Organic Toxic Pollutants (GC/MS Fraction – Volatile Compounds)												
1.	Acrolein (107-02-8)	☐	☐	☒	Concentration	☐						
					Mass	☐						
2.	Acrylonitrile (107-13-1)	☐	☐	☒	Concentration	☐						
					Mass	☐						
3.	Benzene (71-43-2)	☐	☐	☒	Concentration	☐						
					Mass	☐						
4.	Bromoform (75-25-2)	☐	☐	☒	Concentration	☐						
					Mass	☐						
5.	Carbon tetrachloride (56-23-5)	☐	☐	☒	Concentration	☐						
					Mass	☐						
6.	Chlorobenzene (108-90-7)	☐	☐	☒	Concentration	☐						
					Mass	☐						
7.	Chlorodibrompmethane (124-48-1)	☐	☐	☒	Concentration	☐						
					Mass	☐						
8.	Chloroethane (75-00-3)	☐	☐	☒	Concentration	☐						
					Mass	☐						

¹ Sampling shall be conducted according to sufficiently sensitive test procedures (i.e., methods) approved under 40 CFR 136 for the analysis of pollutants or pollutant parameters or required 40 CFR chapter I, subchapter N or O.



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Table B. Toxic Metals, Cyanide, Total Phenols, and Organic Toxic Pollutants ¹												
	Pollutant/Parameter (and CAS Number, if available)	Testing Required	Presence or Absence (check one)		Units (specify)	Effluent				Intake (optional)		
			Believed Present	Believed Absent		Maximum Daily Discharge (required)	Maximum Monthly Discharge (if available)	Long-Term Average Daily Discharge (if available)	Number of Analyses	Long-Term Average	Number of Analyses	
Section 2. Organic Toxic Pollutants (GC/MS Fraction – Volatile Compounds) <i>continued</i>												
9.	2-chloroethylvinyl either (110-75-80)	☐	☐	☒	Concentration	☐						
					Mass	☐						
10.	Chloroform (67-66-3)	☐	☐	☒	Concentration	☐						
					Mass	☐						
11.	Dichlorobromomethane (75-27-4)	☐	☐	☒	Concentration	☐						
					Mass	☐						
12.	1,1-dichloroethane (75-34-3)	☐	☐	☒	Concentration	☐						
					Mass	☐						
13.	1,2-dichloroethane (78-875)	☐	☐	☒	Concentration	☐						
					Mass	☐						
14.	1,1-dichloroethylene (75-35-4)	☐	☐	☒	Concentration	☐						
					Mass	☐						
15.	1,2-dichloropropane (78-87-5)	☐	☐	☒	Concentration	☐						
					Mass	☐						
16.	1,3-dichloropropylene (542-75-6)	☐	☐	☒	Concentration	☐						
					Mass	☐						

¹ Sampling shall be conducted according to sufficiently sensitive test procedures (i.e., methods) approved under 40 CFR 136 for the analysis of pollutants or pollutant parameters or required 40 CFR chapter I, subchapter N or O.



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Table B. Toxic Metals, Cyanide, Total Phenols, and Organic Toxic Pollutants ¹												
	Pollutant/Parameter (and CAS Number, if available)	Testing Required	Presence or Absence (check one)		Units (specify)	Effluent				Intake (optional)		
			Believed Present	Believed Absent		Maximum Daily Discharge (required)	Maximum Monthly Discharge (if available)	Long-Term Average Daily Discharge (if available)	Number of Analyses	Long-Term Average	Number of Analyses	
Section 2. Organic Toxic Pollutants (GC/MS Fraction – Volatile Compounds) <i>continued</i>												
17.	Ethylbenzene (100-41-4)	☐	☐	☒	Concentration	☐						
					Mass	☐						
18.	Methyl bromide (74-83-9)	☐	☐	☒	Concentration	☐						
					Mass	☐						
19.	Methyl chloride (74-87-3)	☐	☐	☒	Concentration	☐						
					Mass	☐						
20.	Methylene chloride (75-09-2)	☐	☐	☒	Concentration	☐						
					Mass	☐						
21.	1,1,2,2- tetrachloroethane (79-34-5)	☐	☐	☒	Concentration	☐						
					Mass	☐						
22.	Tetrachloroethlyne (127-18-4)	☐	☐	☒	Concentration	☐						
					Mass	☐						
23.	Toluene (108-88-3)	☐	☐	☒	Concentration	☐						
					Mass	☐						
24.	1,2-trans- dichloroethylene (156-60-5)	☐	☐	☒	Concentration	☐						
					Mass	☐						

¹ Sampling shall be conducted according to sufficiently sensitive test procedures (i.e., methods) approved under 40 CFR 136 for the analysis of pollutants or pollutant parameters or required 40 CFR chapter I, subchapter N or O.



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Table B. Toxic Metals, Cyanide, Total Phenols, and Organic Toxic Pollutants ¹												
	Pollutant/Parameter (and CAS Number, if available)	Testing Required	Presence or Absence (check one)		Units (specify)		Effluent				Intake (optional)	
			Believed Present	Believed Absent			Maximum Daily Discharge (required)	Maximum Monthly Discharge (if available)	Long-Term Average Daily Discharge (if available)	Number of Analyses	Long-Term Average	Number of Analyses
Section 2. Organic Toxic Pollutants (GC/MS Fraction – Volatile Compounds) <i>continued</i>												
25.	1,1,1-trichloroethane (71-55-6)	☐	☐	☒	Concentration	☐						
					Mass	☐						
26.	1,1,2-trichloroethane (79-00-5)	☐	☐	☒	Concentration	☐						
					Mass	☐						
27.	Trichloroethylene (79-01-6)	☐	☐	☒	Concentration	☐						
					Mass	☐						
28.	Vinyl chloride (75-01-4)	☐	☐	☒	Concentration	☐						
					Mass	☐						

¹ Sampling shall be conducted according to sufficiently sensitive test procedures (i.e., methods) approved under 40 CFR 136 for the analysis of pollutants or pollutant parameters or required 40 CFR chapter I, subchapter N or O.

Continue to Section 3



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Table B. Toxic Metals, Cyanide, Total Phenols, and Organic Toxic Pollutants ¹												
	Pollutant/Parameter (and CAS Number, if available)	Testing Required	Presence or Absence (check one)		Units (specify)	Effluent				Intake (optional)		
			Believed Present	Believed Absent		Maximum Daily Discharge (required)	Maximum Monthly Discharge (if available)	Long-Term Average Daily Discharge (if available)	Number of Analyses	Long-Term Average	Number of Analyses	
Section 3. Organic Toxic Pollutants (Gas Chromatography/Mass Spectrometry (GS/MS) Fraction – Acid Compounds)												
1.	2-chlorophenol (95-57-8)	☐	☐	☒	Concentration	☐						
					Mass	☐						
2.	2,4-dichlorophenol (120-83-2)	☐	☐	☒	Concentration	☐						
					Mass	☐						
3.	2,4-dimethylphenol (105-67-9)	☐	☐	☒	Concentration	☐						
					Mass	☐						
4.	4,6-dinitro-o-cresol (534-52-1)	☐	☐	☒	Concentration	☐						
					Mass	☐						
5.	2,4-dinitrophenol (51-28-5)	☐	☐	☒	Concentration	☐						
					Mass	☐						
6.	2-nitrophenol (88-75-5)	☐	☐	☒	Concentration	☐						
					Mass	☐						
7.	4-nitrophenol (100-02-7)	☐	☐	☒	Concentration	☐						
					Mass	☐						
8.	p-chloro-m-cresol (59-50-7)	☐	☐	☒	Concentration	☐						
					Mass	☐						

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Table B. Toxic Metals, Cyanide, Total Phenols, and Organic Toxic Pollutants ¹												
	Pollutant/Parameter (and CAS Number, if available)	Testing Required	Presence or Absence (check one)		Units (specify)	Effluent				Intake (optional)		
			Believed Present	Believed Absent		Maximum Daily Discharge (required)	Maximum Monthly Discharge (if available)	Long-Term Average Daily Discharge (if available)	Number of Analyses	Long-Term Average	Number of Analyses	
Section 3. Organic Toxic Pollutants (Gas Chromatography/Mass Spectrometry (GS/MS) Fraction – Acid Compounds) <i>continued</i>												
9.	Pentachlorophenol (87-86-5)	☐	☐	☒	Concentration	☐						
					Mass	☐						
10.	Phenol (108-95-2)	☐	☐	☒	Concentration	☐						
					Mass	☐						
11.	2,4,6-trichlorophenol (88-05-2)	☐	☐	☒	Concentration	☐						
					Mass	☐						

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Table B. Toxic Metals, Cyanide, Total Phenols, and Organic Toxic Pollutants ¹												
	Pollutant/Parameter (and CAS Number, if available)	Testing Required	Presence or Absence (check one)		Units (specify)	Effluent				Intake (optional)		
			Believed Present	Believed Absent		Maximum Daily Discharge (required)	Maximum Monthly Discharge (if available)	Long-Term Average Daily Discharge (if available)	Number of Analyses	Long-Term Average	Number of Analyses	
Section 4. Organic Toxic Pollutants (Gas Chromatography/Mass Spectrometry (GS/MS) Fraction – Base/Neutral Compounds)												
1.	Acenaphthene (83-32-9)	☐	☐	☒	Concentration	☐						
					Mass	☐						
2.	Acenaphthylene (208-96-8)	☐	☐	☒	Concentration	☐						
					Mass	☐						
3.	Anthracene (120-12-7)	☐	☐	☒	Concentration	☐						
					Mass	☐						
4.	Benzidine (92-97-5)	☐	☐	☒	Concentration	☐						
					Mass	☐						
5.	Benzo (a) anthracene (56-55-3)	☐	☐	☒	Concentration	☐						
					Mass	☐						
6.	Benzo (a) pyrene (50-32-8)	☐	☐	☒	Concentration	☐						
					Mass	☐						
7.	3,4-benzofluoranthene (205-99-2)	☐	☐	☒	Concentration	☐						
					Mass	☐						
8.	Benzo (ghi) perylene (191-24-2)	☐	☐	☒	Concentration	☐						
					Mass	☐						

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Table B. Toxic Metals, Cyanide, Total Phenols, and Organic Toxic Pollutants ¹												
	Pollutant/Parameter (and CAS Number, if available)	Testing Required	Presence or Absence (check one)		Units (specify)	Effluent				Intake (optional)		
			Believed Present	Believed Absent		Maximum Daily Discharge (required)	Maximum Monthly Discharge (if available)	Long-Term Average Daily Discharge (if available)	Number of Analyses	Long-Term Average	Number of Analyses	
Section 4. Organic Toxic Pollutants (Gas Chromatography/Mass Spectrometry (GS/MS) Fraction – Base/Neutral Compounds) <i>continued</i>												
9.	Benzo (k) fluoranthene (207-08-9)	☐	☐	☒	Concentration	☐						
					Mass	☐						
10.	Bis (2-chloroethoxy) methane (111-91-1)	☐	☐	☒	Concentration	☐						
					Mass	☐						
11.	Bis (2-chloroethyl) ether (111-44-4)	☐	☐	☒	Concentration	☐						
					Mass	☐						
12.	Bis (2-chloroisopropyl) ether (102-80-1)	☐	☐	☒	Concentration	☐						
					Mass	☐						
13.	Bis (2-ethylhexyl) phthalate (85-68-7)	☐	☐	☒	Concentration	☐						
					Mass	☐						
14.	4-bromophenyl phenyl ether (101-55-3)	☐	☐	☒	Concentration	☐						
					Mass	☐						
15.	Butyl benzyl phthalate (85-68-7)	☐	☐	☒	Concentration	☐						
					Mass	☐						
16.	2-chlorophthalene (91-58-7)	☐	☐	☒	Concentration	☐						
					Mass	☐						

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Table B. Toxic Metals, Cyanide, Total Phenols, and Organic Toxic Pollutants ¹												
	Pollutant/Parameter (and CAS Number, if available)	Testing Required	Presence or Absence (check one)		Units (specify)	Effluent				Intake (optional)		
			Believed Present	Believed Absent		Maximum Daily Discharge (required)	Maximum Monthly Discharge (if available)	Long-Term Average Daily Discharge (if available)	Number of Analyses	Long-Term Average	Number of Analyses	
Section 4. Organic Toxic Pollutants (Gas Chromatography/Mass Spectrometry (GS/MS) Fraction – Base/Neutral Compounds) <i>continued</i>												
17.	4-chlorophenyl phenyl ether (7005-72-3)	☐	☐	☒	Concentration	☐						
					Mass	☐						
18.	Chrysene (218-01-9)	☐	☐	☒	Concentration	☐						
					Mass	☐						
19.	Dibenzo (a,h) anthracene (53-70-3)	☐	☐	☒	Concentration	☐						
					Mass	☐						
20.	1,2-dichlorobenzene (95-50-1)	☐	☐	☒	Concentration	☐						
					Mass	☐						
21.	1,3-dichlorobenzene (541-73-1)	☐	☐	☒	Concentration	☐						
					Mass	☐						
22.	1,4-dichlorobenzene (106-46-7)	☐	☐	☒	Concentration	☐						
					Mass	☐						
23.	3,3-dichlorobenzidine (91-94-1)	☐	☐	☒	Concentration	☐						
					Mass	☐						
24.	Diethyl phthalate (84-66-2)	☐	☐	☒	Concentration	☐						
					Mass	☐						

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Table B. Toxic Metals, Cyanide, Total Phenols, and Organic Toxic Pollutants ¹												
	Pollutant/Parameter (and CAS Number, if available)	Testing Required	Presence or Absence (check one)		Units (specify)	Effluent				Intake (optional)		
			Believed Present	Believed Absent		Maximum Daily Discharge (required)	Maximum Monthly Discharge (if available)	Long-Term Average Daily Discharge (if available)	Number of Analyses	Long-Term Average	Number of Analyses	
Section 4. Organic Toxic Pollutants (Gas Chromatography/Mass Spectrometry (GS/MS) Fraction – Base/Neutral Compounds) <i>continued</i>												
25.	Dimethyl phthalate (131-11-3)	☐	☐	☒	Concentration	☐						
					Mass	☐						
26.	Di-n-butyl phthalate (84-74-2)	☐	☐	☒	Concentration	☐						
					Mass	☐						
27.	2,4-dinitrotoluene (121-14-2)	☐	☐	☒	Concentration	☐						
					Mass	☐						
28.	2,6-dinitrotoluene (121-14-2)	☐	☐	☒	Concentration	☐						
					Mass	☐						
29.	Di-n-octyl phthalate (117-84-0)	☐	☐	☒	Concentration	☐						
					Mass	☐						
30.	1,2-Diphenylhydrazine (as azobenzene) (122-66-7)	☐	☐	☒	Concentration	☐						
					Mass	☐						
31.	Fluoranthene (206-44-0)	☐	☐	☒	Concentration	☐						
					Mass	☐						
32.	Fluorene (86-37-7)	☐	☐	☒	Concentration	☐						
					Mass	☐						

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Table B. Toxic Metals, Cyanide, Total Phenols, and Organic Toxic Pollutants ¹												
	Pollutant/Parameter (and CAS Number, if available)	Testing Required	Presence or Absence (check one)		Units (specify)	Effluent				Intake (optional)		
			Believed Present	Believed Absent		Maximum Daily Discharge (required)	Maximum Monthly Discharge (if available)	Long-Term Average Daily Discharge (if available)	Number of Analyses	Long-Term Average	Number of Analyses	
Section 4. Organic Toxic Pollutants (Gas Chromatography/Mass Spectrometry (GS/MS) Fraction – Base/Neutral Compounds) <i>continued</i>												
33.	Hexachlorobenzene (118-74-1)	☐	☐	☒	Concentration	☐						
					Mass	☐						
34.	Hexachlorobutadiene (87-68-3)	☐	☐	☒	Concentration	☐						
					Mass	☐						
35.	Hexachlorocyclopentadiene (77-47-4)	☐	☐	☒	Concentration	☐						
					Mass	☐						
36.	Hexachloroethane (67-72-1)	☐	☐	☒	Concentration	☐						
					Mass	☐						
37.	Indeno (1,2,3-cd) pyrene (193-39-5)	☐	☐	☒	Concentration	☐						
					Mass	☐						
38.	Isophorone (78-59-1)	☐	☐	☒	Concentration	☐						
					Mass	☐						
39.	Naphthalene (91-20-3)	☐	☐	☒	Concentration	☐						
					Mass	☐						
40.	Nitrobenzene (98-95-3)	☐	☐	☒	Concentration	☐						
					Mass	☐						

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Table B. Toxic Metals, Cyanide, Total Phenols, and Organic Toxic Pollutants ¹												
	Pollutant/Parameter (and CAS Number, if available)	Testing Required	Presence or Absence (check one)		Units (specify)	Effluent				Intake (optional)		
			Believed Present	Believed Absent		Maximum Daily Discharge (required)	Maximum Monthly Discharge (if available)	Long-Term Average Daily Discharge (if available)	Number of Analyses	Long-Term Average	Number of Analyses	
Section 4. Organic Toxic Pollutants (Gas Chromatography/Mass Spectrometry (GS/MS) Fraction – Base/Neutral Compounds) <i>continued</i>												
41.	N-nitrosodimethylamine (62-75-9)	☐	☐	☒	Concentration	☐						
					Mass	☐						
42.	N-nitrosodi-n-propylamine (621-64-7)	☐	☐	☒	Concentration	☐						
					Mass	☐						
43.	N-nitrosodiphenylamine (86-30-6)	☐	☐	☒	Concentration	☐						
					Mass	☐						
44.	Phenanthrene (85-01-8)	☐	☐	☒	Concentration	☐						
					Mass	☐						
45.	Pyrene (129-00-0)	☐	☐	☒	Concentration	☐						
					Mass	☐						
46.	1,2,4-trichlorobenzene (120-82-1)	☐	☐	☒	Concentration	☐						
					Mass	☐						

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Table B. Toxic Metals, Cyanide, Total Phenols, and Organic Toxic Pollutants ¹												
	Pollutant/Parameter (and CAS Number, if available)	Testing Required	Presence or Absence (check one)		Units (specify)	Effluent				Intake (optional)		
			Believed Present	Believed Absent		Maximum Daily Discharge (required)	Maximum Monthly Discharge (if available)	Long-Term Average Daily Discharge (if available)	Number of Analyses	Long-Term Average	Number of Analyses	
Section 5. Organic Toxic Pollutants (Gas Chromatography/Mass Spectrometry (GS/MS) Fraction – Pesticides) <i>continued</i>												
1.	Aldrin (309-00-2)	☐	☐	☒	Concentration	☐						
					Mass	☐						
2.	α-BHC (319-84-6)	☐	☐	☒	Concentration	☐						
					Mass	☐						
3.	β-BHC (319-85-7)	☐	☐	☒	Concentration	☐						
					Mass	☐						
4.	γ-BHC (58-89-9)	☐	☐	☒	Concentration	☐						
					Mass	☐						
5.	δ-BHC (319-86-8)	☐	☐	☒	Concentration	☐						
					Mass	☐						
6.	Chlorodane (57-74-9)	☐	☐	☒	Concentration	☐						
					Mass	☐						
7.	4,4'-DDT (50-29-3)	☐	☐	☒	Concentration	☐						
					Mass	☐						
8.	4,4'-DDE (72-55-9)	☐	☐	☒	Concentration	☐						
					Mass	☐						

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Table B. Toxic Metals, Cyanide, Total Phenols, and Organic Toxic Pollutants ¹												
	Pollutant/Parameter (and CAS Number, if available)	Testing Required	Presence or Absence (check one)		Units (specify)	Effluent				Intake (optional)		
			Believed Present	Believed Absent		Maximum Daily Discharge (required)	Maximum Monthly Discharge (if available)	Long-Term Average Daily Discharge (if available)	Number of Analyses	Long-Term Average	Number of Analyses	
Section 5. Organic Toxic Pollutants (Gas Chromatography/Mass Spectrometry (GS/MS) Fraction – Pesticides) <i>continued</i>												
9.	4,4'-DDD (72-54-8)	☐	☐	☒	Concentration	☐						
					Mass	☐						
10.	Dieldrin (60-57-1)	☐	☐	☒	Concentration	☐						
					Mass	☐						
11.	α-endosulfan (115-29-7)	☐	☐	☒	Concentration	☐						
					Mass	☐						
12.	β-endosulfan (115-29-7)	☐	☐	☒	Concentration	☐						
					Mass	☐						
13.	Endosulfan sulfate (1031-07-8)	☐	☐	☒	Concentration	☐						
					Mass	☐						
14.	Endrin (72-20-8)	☐	☐	☒	Concentration	☐						
					Mass	☐						
15.	Endrin aldehyde (7421-93-4)	☐	☐	☒	Concentration	☐						
					Mass	☐						
16.	Heptachlor (76-44-8)	☐	☐	☒	Concentration	☐						
					Mass	☐						

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Table B. Toxic Metals, Cyanide, Total Phenols, and Organic Toxic Pollutants ¹												
	Pollutant/Parameter (and CAS Number, if available)	Testing Required	Presence or Absence (check one)		Units (specify)	Effluent				Intake (optional)		
			Believed Present	Believed Absent		Maximum Daily Discharge (required)	Maximum Monthly Discharge (if available)	Long-Term Average Daily Discharge (if available)	Number of Analyses	Long-Term Average	Number of Analyses	
Section 5. Organic Toxic Pollutants (Gas Chromatography/Mass Spectrometry (GS/MS) Fraction – Pesticides) <i>continued</i>												
17.	Heptachlor epoxide (1024-57-3)	☐	☐	☒	Concentration	☐						
					Mass	☐						
18.	PCB-1242 (53469-21-9)	☐	☐	☒	Concentration	☐						
					Mass	☐						
19.	PCB-1254 (11097-69-1)	☐	☐	☒	Concentration	☐						
					Mass	☐						
20.	PCB-1221 (11104-28-2)	☐	☐	☒	Concentration	☐						
					Mass	☐						
21.	PCB-1232 (11141-16-5)	☐	☐	☒	Concentration	☐						
					Mass	☐						
22.	PCB-1248 (12672-29-6)	☐	☐	☒	Concentration	☐						
					Mass	☐						
23.	PCB-1260 (11096-82-5)	☐	☐	☒	Concentration	☐						
					Mass	☐						
24.	PCB-1016 (12674-11-2)	☐	☐	☒	Concentration	☐						
					Mass	☐						

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Table B. Toxic Metals, Cyanide, Total Phenols, and Organic Toxic Pollutants ¹												
	Pollutant/Parameter (and CAS Number, if available)	Testing Required	Presence or Absence (check one)		Units (specify)	Effluent				Intake (optional)		
			Believed Present	Believed Absent		Maximum Daily Discharge (required)	Maximum Monthly Discharge (if available)	Long-Term Average Daily Discharge (if available)	Number of Analyses	Long-Term Average	Number of Analyses	
Section 5. Organic Toxic Pollutants (Gas Chromatography/Mass Spectrometry (GS/MS) Fraction – Pesticides) <i>continued</i>												
25.	Toxaphene (8001-35-2)	☐	☐	☒	Concentration	☐						
					Mass	☐						

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TABLE C
Certain Conventional and Non-Conventional Pollutants



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Table C. Certain Conventional and Non-Conventional Pollutants ¹										
	Pollutant/Parameter (and CAS Number, if available)	Presence or Absence (check one)		Units (specify)	Effluent				Intake (optional)	
		Believed Present	Believed Absent		Maximum Daily Discharge (required)	Maximum Monthly Discharge (if available)	Long-Term Average Daily Discharge (if available)	Number of Analyses	Long-Term Average	Number of Analyses
☐	Check here if you believe all pollutants on Table C to be <u>present</u> in your discharge from the noted outfall. You need <u>not</u> complete the "Presence or Absence" column of Table C for <i>each pollutant</i> .									
☐	Check here if you believe all pollutants on Table C to be <u>absent</u> in your discharge from the noted outfall. You need <u>not</u> complete the "Presence or Absence" column of Table C for <i>each pollutant</i> .									
1.	Bromide (24959-67-9)	☒	☐	Concentration	☐					
				Mass	☐					
2.	Chlorine, total residual	☐	☒	Concentration	☐					
				Mass	☐					
3.	Color	☐	☒	Concentration	☐					
				Mass	☐					
4.	E.coli	☐	☒	Concentration	☐					
				Mass	☐					
5.	Fluoride (16984-48-8)	☐	☒	Concentration	☐					
				Mass	☐					
6.	Nitrate	☐	☒	Concentration	☐					
				Mass	☐					
7.	Nitrite	☐	☒	Concentration	☐					
				Mass	☐					
8.	Nitrogen, total organic (as N)	☐	☒	Concentration	☐					
				Mass	☐					

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Table C. Certain Conventional and Non-Conventional Pollutants ¹ <i>continued</i>											
	Pollutant/Parameter (and CAS Number, if available)	Presence or Absence (check one)		Units (specify)		Effluent				Intake (optional)	
		Believed Present	Believed Absent			Maximum Daily Discharge (required)	Maximum Monthly Discharge (if available)	Long-Term Average Daily Discharge (if available)	Number of Analyses	Long-Term Average	Number of Analyses
9.	Oil and Grease	☐	☒	Concentration	☐						
				Mass	☐						
10.	Phosphorus (as P), total (7723-14-0)	☐	☒	Concentration	☐						
				Mass	☐						
11.	Sulfate (as SO ₄) (14808-798-)	☒	☐	Concentration	☐						
				Mass	☐						
12.	Sulfide (as S)	☐	☒	Concentration	☐						
				Mass	☐						
13.	Sulfite (as SO ₃) (14265-45-3)	☐	☒	Concentration	☐						
				Mass	☐						
14.	Surfactants	☐	☒	Concentration	☐						
				Mass	☐						
15.	Aluminum, total (7429-90-5)	☒	☐	Concentration	☐						
				Mass	☐						
16.	Barium, total (7440-39-3)	☒	☐	Concentration	☐						
				Mass	☐						
17.	Boron, total (7440-42-8)	☒	☐	Concentration	☐						
				Mass	☐						

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Table C. Certain Conventional and Non-Conventional Pollutants ¹ <i>continued</i>											
	Pollutant/Parameter (and CAS Number, if available)	Presence or Absence (check one)		Units (specify)		Effluent				Intake (optional)	
		Believed Present	Believed Absent			Maximum Daily Discharge (required)	Maximum Monthly Discharge (if available)	Long-Term Average Daily Discharge (if available)	Number of Analyses	Long-Term Average	Number of Analyses
18.	Cobalt, total (7440-48-4)	☐	☒	Concentration	☐						
				Mass	☐						
19.	Iron, total (7439-89-6)	☒	☐	Concentration	☐						
				Mass	☐						
20.	Magnesium, total (7439-95-4)	☒	☐	Concentration	☒						
				Mass	☐						
21.	Molybdenum, total (7439-95-4)	☒	☐	Concentration	☒						
				Mass	☐						
22.	Manganese, total (7439-95-5)	☒	☐	Concentration	☐						
				Mass	☐						
23.	Tin, total (7440-31-5)	☐	☒	Concentration	☐						
				Mass	☐						
24.	Titanium, total (7440-32-6)	☐	☒	Concentration	☐						
				Mass	☐						

¹ Sampling shall be conducted according to sufficiently sensitive test procedures (i.e., methods) approved under 40 CFR 136 for the analysis of pollutants or pollutant parameters or required 40 CFR chapter I, subchapter N or O.



Division of Water Quality (DWQ) UPDES Program

UPDES Industrial Permit Application

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Table C. Certain Conventional and Non-Conventional Pollutants ¹ <i>continued</i>											
	Pollutant/Parameter (and CAS Number, if available)	Presence or Absence (check one)		Units (specify)		Effluent				Intake (optional)	
		Believed Present	Believed Absent			Maximum Daily Discharge (required)	Maximum Monthly Discharge (if available)	Long-Term Average Daily Discharge (if available)	Number of Analyses	Long-Term Average	Number of Analyses
25.	Radioactivity										
	Alpha, total	☐	☒	Concentration	☐						
				Mass	☐						
	Beta, total	☐	☒	Concentration	☐						
				Mass	☐						
	Radium, total	☐	☒	Concentration	☐						
				Mass	☐						
	Radium 226, total	☐	☒	Concentration	☐						
				Mass	☐						

¹ Sampling shall be conducted according to sufficiently sensitive test procedures (i.e., methods) approved under 40 CFR 136 for the analysis of pollutants or pollutant parameters or required 40 CFR chapter I, subchapter N or O.

TABLE D

Certain Hazardous Substances and Asbestos



Division of Water Quality (DWQ)

UPDES Program

UPDES Industrial Permit Application

UPDES Permit No.	UT0026280	Facility Name	Waterleaf Phase 1 GSL Lithium Extraction Project	Outfall Number	002
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Table D. Certain Hazardous Substances and Asbestos¹					
	Pollutant/Parameter (and CAS Number, if available)	Presence or Absence (check one)		Reason Pollutant Believed Present in Discharge	Available Quantitative Data (specify units)
		Believed Present	Believed Absent		
1.	Asbestos	☐	☒		
2.	Acetaldehyde	☐	☒		
3.	Allyl alcohol	☐	☒		
4.	Allyl chloride	☐	☒		
5.	Amyl acetate	☐	☒		
6.	Aniline	☐	☒		
7.	Benzonitrile	☐	☒		
8.	Benzyl chloride	☐	☒		
9.	Butyl acetate	☐	☒		
10.	Butylamine	☐	☒		
11.	Captan	☐	☒		
12.	Carbaryl	☐	☒		
13.	Carbofuran	☐	☒		
14.	Carbon disulfide	☐	☒		
15.	Chlorpyrifos	☐	☒		
16.	Coumaphos	☐	☒		
17.	Cresol	☐	☒		
18.	Crotonaldehyde	☐	☒		
19.	Cyclohexane	☐	☒		

¹ Sampling shall be conducted according to sufficiently sensitive test procedures (i.e., methods) approved under 40 CFR 136 for the analysis of pollutants or pollutant parameters or required 40 CFR chapter I, subchapter N or O.



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UPDES Permit No.	UT0026280	Facility Name	Waterleaf Phase 1 GSL Lithium Extraction Project	Outfall Number	002
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Table D. Certain Hazardous Substances and Asbestos¹ continued					
	Pollutant/Parameter (and CAS Number, if available)	Presence or Absence (check one)		Reason Pollutant Believed Present in Discharge	Available Quantitative Data (specify units)
		Believed Present	Believed Absent		
20.	24-D (2,4-dichlorophenoxyacetic acid)	☐	☒		
21.	Diazinon	☐	☒		
22.	Dicamba	☐	☒		
23.	Dichlobenil	☐	☒		
24.	Dichlone	☐	☒		
25.	2,2-dichloropropionic acid	☐	☒		
26.	Dichlorvos	☐	☒		
27.	Diethyl amine	☐	☒		
28.	Dimethyl amine	☐	☒		
29.	Dinitrobenzene	☐	☒		
30.	Diquat	☐	☒		
31.	Disulfoton	☐	☒		
32.	Diuron	☐	☒		
33.	Epichlorohydrin	☐	☒		
34.	Ethion	☐	☒		
35.	Ethylene diamine	☐	☒		
36.	Ethylene dibromide	☐	☒		
37.	Formaldehyde	☐	☒		
38.	Furfural	☐	☒		

¹ Sampling shall be conducted according to sufficiently sensitive test procedures (i.e., methods) approved under 40 CFR 136 for the analysis of pollutants or pollutant parameters or required 40 CFR chapter I, subchapter N or O.



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Table D. Certain Hazardous Substances and Asbestos ¹ continued					
	Pollutant/Parameter (and CAS Number, if available)	Presence or Absence (check one)		Reason Pollutant Believed Present in Discharge	Available Quantitative Data (specify units)
		Believed Present	Believed Absent		
39.	Guthion	☐	☒		
40.	Isoprene	☐	☒		
41.	Isopropanolamine	☐	☒		
42.	Kelthane	☐	☒		
43.	Kepone	☐	☒		
44.	Malathion	☐	☒		
45.	Mercaptodimethur	☐	☒		
46.	Methoxychlor	☐	☒		
47.	Methyl mercaptan	☐	☒		
48.	Methyl methacrylate	☐	☒		
49.	Methyl parathion	☐	☒		
50.	Mevinphos	☐	☒		
51.	Mexacarbate	☐	☒		
52.	Monoethyl amine	☐	☒		
53.	Monomethyl amine	☐	☒		
54.	Naled	☐	☒		
55.	Naphthenic acid	☐	☒		
56.	Nitrotoluene	☐	☒		
57.	Parathion	☐	☒		

¹ Sampling shall be conducted according to sufficiently sensitive test procedures (i.e., methods) approved under 40 CFR 136 for the analysis of pollutants or pollutant parameters or required 40 CFR chapter I, subchapter N or O.



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UPDES Industrial Permit Application

UPDES Permit No.	UT0026280	Facility Name	Waterleaf Phase 1 GSL Lithium Extraction Project	Outfall Number	002
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Table D. Certain Hazardous Substances and Asbestos¹ continued					
	Pollutant/Parameter (and CAS Number, if available)	Presence or Absence (check one)		Reason Pollutant Believed Present in Discharge	Available Quantitative Data (specify units)
		Believed Present	Believed Absent		
58.	Phenolsulfonate	☐	☒		
59.	Phosgene	☐	☒		
60.	Propargite	☐	☒		
61.	Propylene oxide	☐	☒		
62.	Pyrethrins	☐	☒		
63.	Quinoline	☐	☒		
64.	Resorcinol	☐	☒		
65.	Strontium	☐	☒		
66.	Strychnine	☐	☒		
67.	Styrene	☐	☒		
68.	2,4,5-T (2,4,5-trichlorophenoxyacetic acid)	☐	☒		
69.	TDE (tetrachlorodiphenyl ethane)	☐	☒		
70.	2,4,5-TP [2-(2,4,5-trichlorophenoxy) propanoic acid]	☐	☒		
71.	Trichlorofon	☐	☒		
72.	Triethanolamine	☐	☒		
73.	Triethylamine	☐	☒		
74.	Trimethylamine	☐	☒		
75.	Uranium	☐	☒		

¹ Sampling shall be conducted according to sufficiently sensitive test procedures (i.e., methods) approved under 40 CFR 136 for the analysis of pollutants or pollutant parameters or required 40 CFR chapter I, subchapter N or O.



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Table D. Certain Hazardous Substances and Asbestos¹ continued					
	Pollutant/Parameter (and CAS Number, if available)	Presence or Absence (check one)		Reason Pollutant Believed Present in Discharge	Available Quantitative Data (specify units)
		Believed Present	Believed Absent		
76.	Vandium	☐	☒		
77.	Vinyl acetate	☐	☒		
78.	Xylene	☐	☒		
79.	Xylenol	☐	☒		
80.	Zioconium	☐	☒		

¹ Sampling shall be conducted according to sufficiently sensitive test procedures (i.e., methods) approved under 40 CFR 136 for the analysis of pollutants or pollutant parameters or required 40 CFR chapter I, subchapter N or O.

Division of Water Quality (DWQ) UPDES Program

UPDES Industrial Permit Application

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Hazardous Substances

1. Acetaldehyde	54. Benzoyl chloride	105. 2,4-D esters (2,4-dichlorophenoxyacetic acid esters)	155. Hydrogen sulfide	207. Phosgene	255. 2,4,5-T esters (2,4,5-trichlorophenoxy acetic acid esters)
2. Acetic acid	55. Benzyl chloride	106. DDT	156. Isoprene	208. Phosphoric acid	256. 2,4,5-T salts (2,4,5-trichlorophenoxy acetic acid salts)
3. Acetic anhydride	56. Beryllium chloride	107. Diazinon	157. Isopropanolamine	209. Phosphorus	257. 2,4,5-TP acid (2,4,5-trichlorophenoxy propanoic acid)
4. Acetone cyanohydrin	57. Beryllium fluoride	108. Dicamba	dodecylbenzenesulfonate	210. Phosphorus oxychloride	258. 2,4,5-TP acid esters (2,4,5-trichlorophenoxy propanoic acid esters)
5. Acetyl bromide	58. Beryllium nitrate	109. Dichlobenil	158. Kelthane	211. Phosphorus pentasulfide	259. TDE (tetrachlorodiphenyl ethane)
6. Acetyl chloride	59. Butylacetate	110. Dichlone	159. Kepone	212. Phosphorus trichloride	260. Tetraethyl lead
7. Acrolein	60. n-butylphthalate	111. Dichlorobenzene	160. Lead acetate	213. Polychlorinated biphenyls (PCB)	261. Tetraethyl pyrophosphate
8. Acrylonitrile	61. Butylamine	112. Dichloropropane	161. Lead arsenate	214. Potassium arsenate	262. Thallium sulfate
9. Adipic acid	62. Butyric acid	113. Dichloropropene	162. Lead chloride	215. Potassium arsenite	263. Toluene
10. Aldrin	63. Cadmium acetate	114. Dichloropropene-dichloropropane mix	163. Lead fluoborate	216. Potassium bichromate	264. Toxaphene
11. Allyl alcohol	64. Cadmium bromide	115. 2,2-dichloropropionic acid	164. Lead fluorite	217. Potassium chromate	265. Trichlorofon
12. Allyl chloride	65. Cadmium chloride	116. Dichlorvos	165. Lead iodide	218. Potassium cyanide	266. Trichloroethylene
13. Aluminum sulfate	66. Calcium arsenate	117. Dieldrin	166. Lead nitrate	219. Potassium hydroxide	267. Trichlorophenol
14. Ammonia	67. Calcium arsenite	118. Diethylamine	167. Lead stearate	220. Potassium permanganate	268. Triethanolamine
15. Ammonium acetate	68. Calcium carbide	119. Dimethylamine	168. Lead sulfate	221. Propargite	dodecylbenzenesulfonate
16. Ammonium benzoate	69. Calcium chromate	120. Dinitrobenzene	169. Lead sulfide	222. Propionic acid	269. Triethylamine
17. Ammonium bicarbonate	70. Calcium cyanide	121. Dinitrophenol	170. Lead thiocyanate	223. Propionic anhydride	270. Trimethylamine
18. Ammonium bichromate	71. Calcium dodecylbenzenesulfonate	122. Dinitrotoluene	171. Lindane	224. Propylene oxide	271. Uranyl acetate
19. Ammonium bifluoride	72. Calcium hypochlorite	123. Diquat	172. Lithium chromate	225. Pyrethrins	272. Uranyl nitrate
20. Ammonium bisulfite	73. Captan	124. Disulfoton	173. Malathion	226. Quinoline	273. Vanadium pentoxide
21. Ammonium carbamate	74. Carbaryl	125. Diuron	174. Maleic acid	227. Resorcinol	274. Vanadyl sulfate
22. Ammonium carbonate	75. Carbofuran	126. Dodecylbenzenesulfonic acid	175. Maleic anhydride	228. Selenium oxide	275. Vinyl acetate
23. Ammonium chloride	76. Carbon disulfide	127. Endosulfan	176. Mercaptodimethur	229. Silver nitrate	276. Vinylidene chloride
24. Ammonium chromate	77. Carbon tetrachloride	128. Endrin	177. Mercuric cyanide	230. Sodium	277. Xylene
25. Ammonium citrate	78. Chlordane	129. Epichlorohydrin	178. Mercuric nitrate	231. Sodium arsenate	278. Xylenol
26. Ammonium fluoroborate	79. Chlorine	130. Ethion	179. Mercuric sulfate	232. Sodium arsenite	279. Zinc acetate
27. Ammonium fluoride	80. Chlorobenzene	131. Ethylbenzene	180. Mercuric thiocyanate	233. Sodium bichromate	280. Zinc ammonium chloride
28. Ammonium hydroxide	81. Chloroform	132. Ethylenediamine	181. Mercurous nitrate	234. Sodium bifluoride	281. Zinc borate
29. Ammonium oxalate	82. Chloropyrifos	133. Ethylene dibromide	182. Methoxychlor	235. Sodium bisulfite	282. Zinc bromide
30. Ammonium silicofluoride	83. Chlorosulfonic acid	134. Ethylene dichloride	183. Methyl mercaptan	236. Sodium chromate	283. Zinc carbonate
31. Ammonium sulfamate	84. Chromic acetate	135. Ethylene diaminetetracetic acid (EDTA)	184. Methyl methacrylate	237. Sodium cyanide	284. Zinc chloride
32. Ammonium sulfide	85. Chromic acid	136. Ferric ammonium citrate	185. Methyl parathion	238. Sodium dodecylbenzenesulfonate	285. Zinc cyanide
33. Ammonium sulfite	86. Chromic sulfate	137. Ferric ammonium oxalate	186. Mevinphos	239. Sodium fluoride	286. Zinc fluoride
34. Ammonium tartrate	87. Chromous chloride	138. Ferric chloride	187. Mexacarbate	240. Sodium hydrosulfide	287. Zinc formate
35. Ammonium thiocyanate	88. Cobaltous bromide	139. Ferric fluoride	188. Monoethylamine	241. Sodium hydroxide	288. Zinc hydrosulfite
36. Ammonium thiosulfate	89. Cobaltous formate	140. Ferric nitrate	189. Monomethylamine	242. Sodium hypochlorite	289. Zinc nitrate
37. Amyl acetate	90. Cobaltous sulfamate	141. Ferric sulfate	190. Naled	243. Sodium methylate	290. Zinc phenolsulfonate
38. Aniline	91. Coumaphos	142. Ferrous ammonium sulfate	191. Naphthalene	244. Sodium nitrite	291. Zinc phosphide
39. Antimony pentachloride	92. Cresol	143. Ferrous chloride	192. Naphtheneic acid	245. Sodium phosphate (dibasic)	292. Zinc silicofluoride
40. Antimony potassium tartrate	93. Crotonaldehyde	144. Ferrous sulfate	193. Nickel ammonium sulfate	246. Sodium phosphate (tribasic)	293. Zinc sulfate
41. Antimony tribromide	94. Cupric acetate	145. Formaldehyde	194. Nickel chloride	247. Sodium selenite	294. Zirconium nitrate
42. Antimony trichloride	95. Cupric acetoarsenite	146. Formic acid	195. Nickel hydroxide	248. Strontium chromate	295. Zirconium potassium fluoride
43. Antimony trifluoride	96. Cupric chloride	147. Fumaric acid	196. Nickel nitrate	249. Strychnine	296. Zirconium sulfate
44. Antimony trioxide	97. Cupric nitrate	148. Furfural	197. Nickel sulfate	250. Styrene	297. Zirconium tetrachloride
45. Arsenic disulfide	98. Cupric oxalate	149. Guthion	198. Nitric acid	251. Sulfuric acid	
46. Arsenic pentoxide	99. Cupric sulfate	150. Heptachlor	199. Nitrobenzene	252. Sulfur monochloride	
47. Arsenic trichloride	100. Cupric sulfate ammoniated	151. Hexachlorocyclopentadiene	200. Nitrogen dioxide	253. 2,4,5-T acid (2,4,5-trichlorophenoxyacetic acid)	
48. Arsenic trioxide	101. Cupric tartrate	152. Hydrochloric acid	201. Nitrophenol	254. 2,4,5-T amines (2,4,5-trichlorophenoxy acetic acid amines)	
49. Arsenic trisulfide	102. Cyanogen chloride	153. Hydrofluoric acid	202. Nitrotoluene		
50. Barium cyanide	103. Cyclohexane	154. Hydrogen cyanide	203. Paraformaldehyde		
51. Benzene	104. 2,4-D acid (2,4-dichlorophenoxyacetic acid)		204. Parathion		
52. Benzoic acid			205. Pentachlorophenol		
53. Benzonitrile			206. Phenol		

TABLE E

2,3,7,8 Tetrachlorodibenzo P Dioxin (2,3,7,8 TCDD)



Division of Water Quality (DWQ)
UPDES Program

UPDES Industrial Permit Application

UPDES Permit No.	UT0026280	Facility Name	Waterleaf Phase 1 GSL Lithium Extraction Project	Outfall Number	002
Table E. 2,3,7,8 Tetrachlorodibenzo P Dioxin (2,3,7,8 TCDD)					
	Pollutant	TCDD Congeners Used or Manufactured	Presence or Absence (check one)		Results of Screening Procedure
			Believed Present	Believed Absent	
1.	2,3,7,8-TCDD	☐	☐	☒	

ATTACHMENT 1

Groundwater Source Memo

Memo

Date:	Tuesday, August 19, 2025
Project:	Waterleaf GSL Lithium Extraction Commercial Plant
To:	File
From:	Nate Nichols, Karen Nichols, HDR
Subject:	Water Quality analysis of ground water source, existing well @ 41.466255, -112.646907 Waterleaf Resources GSL Phase 1 Lithium Extraction Project

This Memo provides details to support Waterleaf Resources Great Salt Lake (GSL) Lithium Extraction Commercial plant CWA 402 Utah Pollution Discharge Elimination Systems (UPDES permit #0026280 modification application and Anti Degradation Review (ADR). This memo provides water quality data from the proposed groundwater source that is planned to provide process make up water during the operation of the Commercial Plant.

Groundwater Source

Waterleaf Resources provides the following groundwater quality data from the existing agricultural groundwater well located at 41.466255, -112.646907. Water samples were collected from this well by HDR staff on 6/24/2025. Staff performed field calibration for pH, Conductivity and Turbidity. Temp and DO meters were calibrated and verified before entering the field. The Horiba U-52-2 field water quality meter was utilized to monitor flow of the well until the temperature and pH stabilized during a flow- through technique, after which the sample was collected.

Density readings were collected using an Anton-Parr density meter, which was calibrated and field verified using laboratory grade de-ionized water as a reference.

HDR Staff collected grab samples once the team was confident that the well casing had been flushed and the flow was representative of groundwater conditions. Samples were delivered to Chemtech -ford in Sandy Utah within all required hold times.

Water Quality Results

Table 1 below shows both laboratory results, methodology and Minimum Detection Limit for constituents, as well as field collected measurements.

Table 1. Groundwater Quality Results

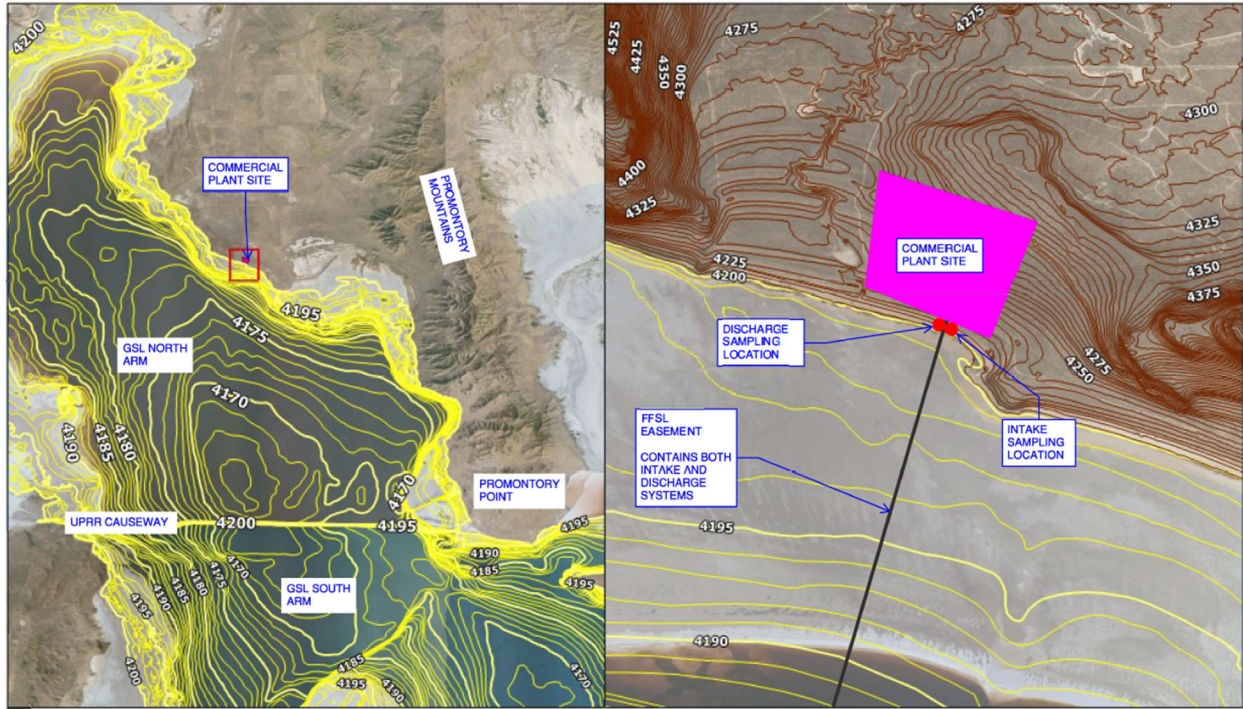
Constituent	Method	Concentration	Minimum Detection Limit (mg/L unless otherwise noted)
Mercury, Total	EPA 1631	<0.4 ng/L	0.4 (ng/L)
Aluminum, Total	EPA 200.7	<0.05	0.05
Boron, Total	EPA 200.7	0.39	0.02
Barium, Total	EPA 200.7	0.078	0.002
Iron, Total	EPA 200.7	<0.02	0.02
Lithium, Total	EPA 200.7	0.378	0.016
Potassium, Total	EPA 200.7	48.1	0.3
Silica, (as SiO ₂) Total	EPA 200.7	34.9	0.2
Sodium, Total	EPA 200.7	688	6.9
Arsenic, Total	EPA 200.8	0.0043	0.0002
Cadmium, Total	EPA 200.8	<0.00005	0.00005
Chromium, Total	EPA 200.8	0.0048	0.0002
Copper, Total	EPA 200.8	0.0023	0.0007
Lead, Total	EPA 200.8	<0.0003	0.0003
Manganese, Total	EPA 200.8	0.0028	0.0006
Molybdenum, Total	EPA 200.8	0.0017	0.0002
Nickel, Total	EPA 200.8	0.0013	0.0004
Selenium, Total	EPA 200.8	0.00778	0.00057
Silver, Total	EPA 200.8	<0.0003	0.0003
Zinc, Total	EPA 200.8	0.05	0.002
Chemical Oxygen Demand	Hach 8000	<6	6
Total Dissolved Solids (TDS)	SM 2540 C	3830	20
Total Suspended Solids (TSS)	SM 2540 D	<3	3
Biochemical Oxygen Demand	SM 5210 B	<2	2
Field collected parameters			
pH	Horiba U-52-2	8.15	N/A
Temp	Horiba U-52-2	16.59 C	N/A
Dissolved Oxygen	Horiba U-52-2	21.06 mg/L	N/A
Conductivity	Horiba U-52-2	4.23 ms/cm	N/A
Turbidity	Horiba U-52-2	0.000 NTU	N/A
Density	Anton-Parr density meter	0.9906 g/cm ³	N/A

ATTACHMENT 2

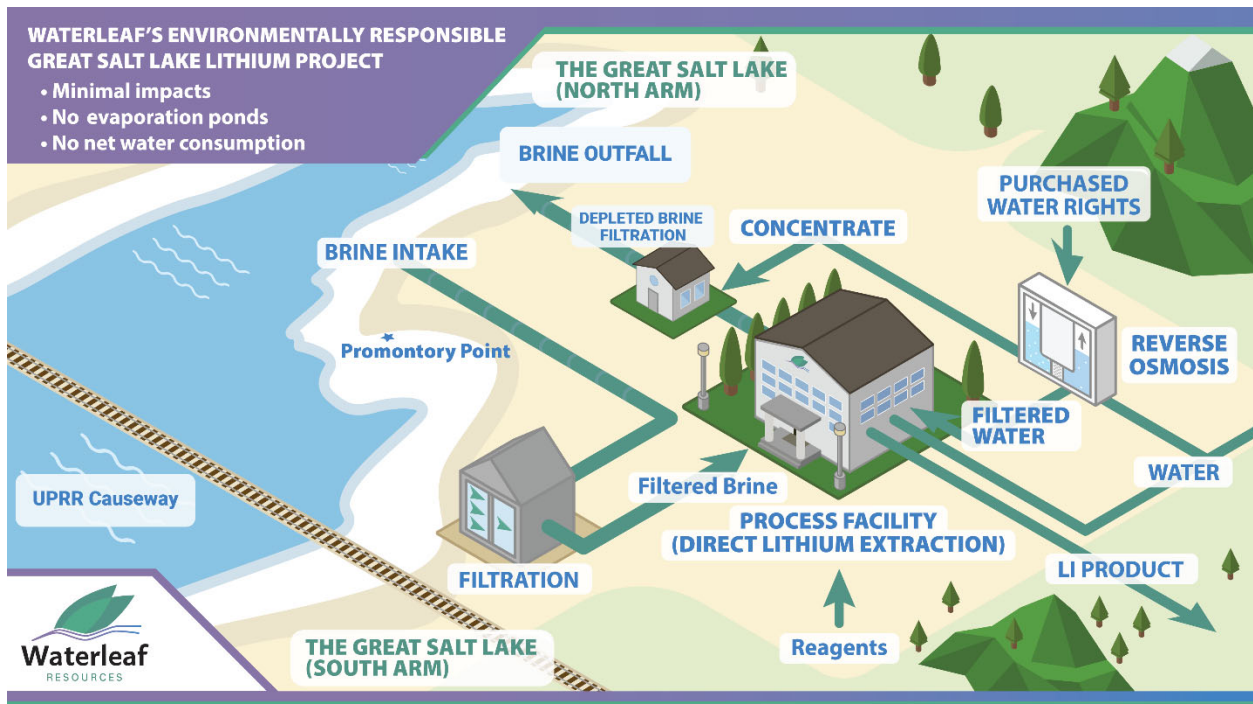
UPDES Permit Additional Information

Waterleaf Phase1 Great Salt Lake Lithium Extraction Facility (Commercial Plant)— Additional Information

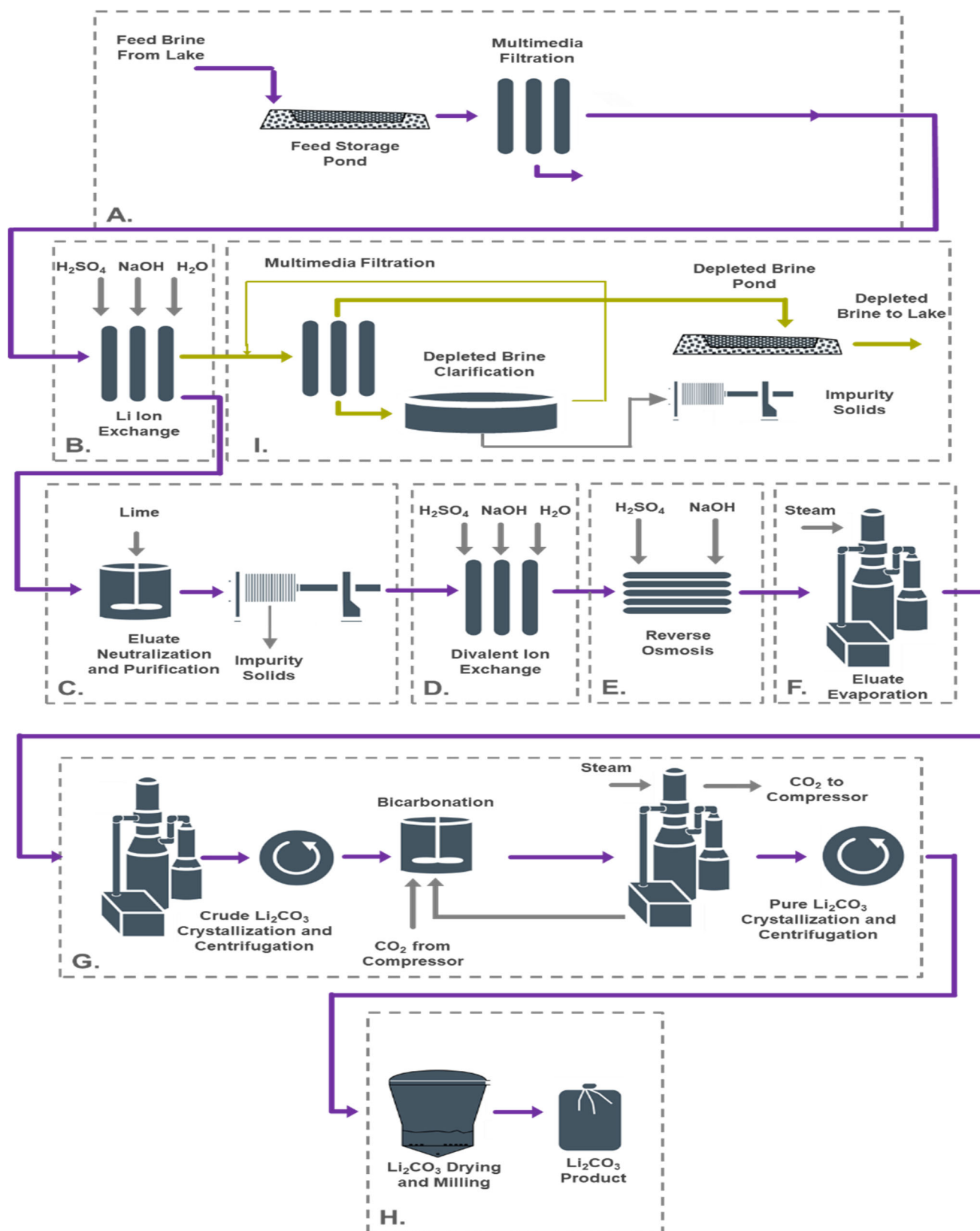
Facility Location Map



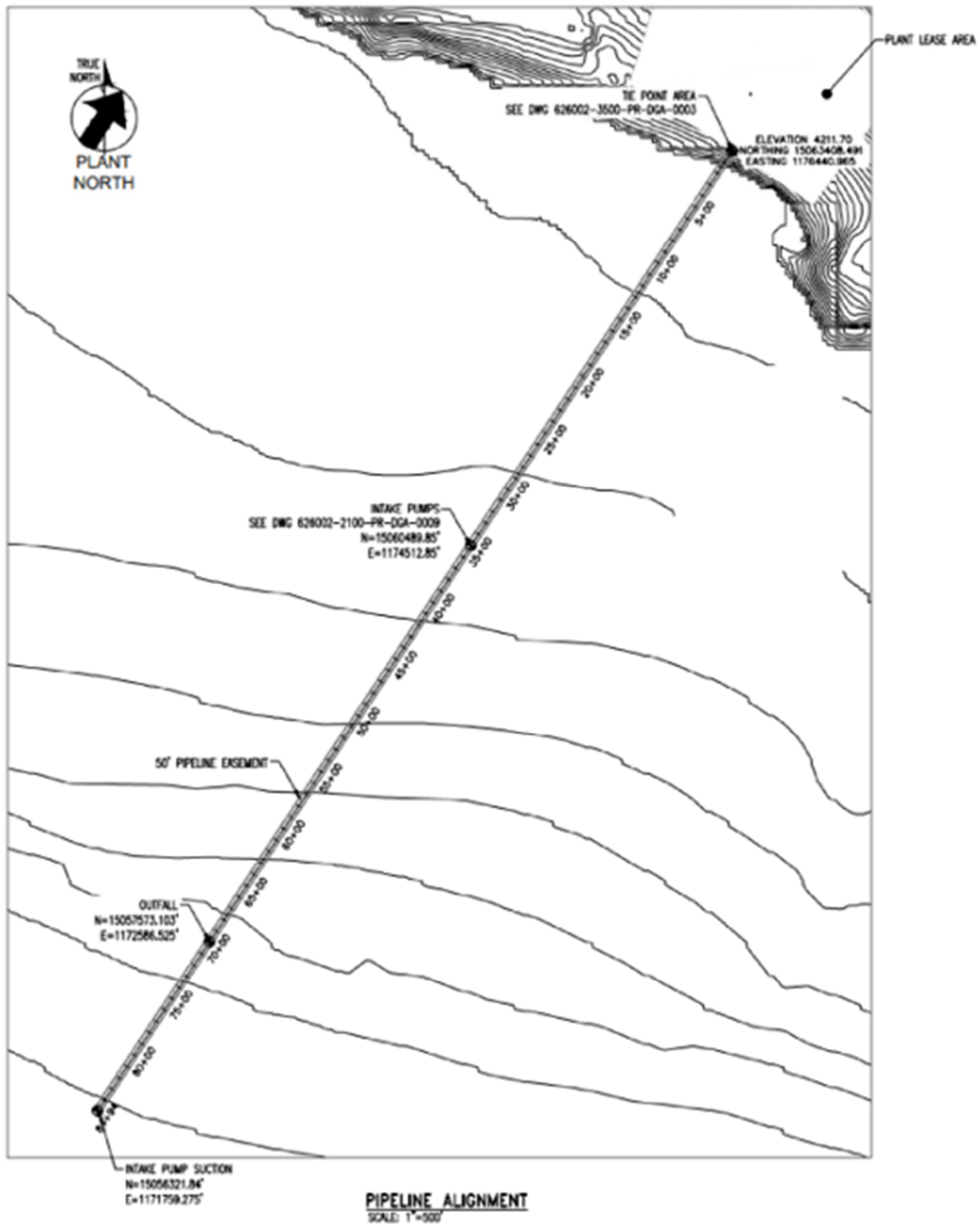
Facility Plan



Facility Process Schematic Diagram



Intake and Outfall Infrastructure



Constituent	Influent		Discharge	
	Average Concentration ^a (mg/L)	Min/Max	Average Concentration ^a (mg/L)	Min/Max
Alkalinity	572.6	526.0/599.0	294.6	119.0/492.0
Aluminum	1.65	ND (<1.20)/5.20	1.49	1.60/5.10
Arsenic	0.51	0.36/0.61	0.36	0.26/0.48
Barium	0.20	0.14/0.34	0.18	0.13/0.29
Bicarbonate	572.6	526.0/599.0	294.6	119.0/492.0
BOD	5.13	ND (<2.0)/12.0	7.42	ND (<2.0)/13.0
Boron	61.97	56.9/64.1	59.50	55.6/60.2
Bromide	177.9	140.0/201.0	166.2	139.0/186.0
Cadmium,	ND (<0.0012)	NA	ND (<0.0012)	NA
Calcium	308.64	277.0/327.0	300.2 ^b	NA
Carbonate	ND (<0.2)	NA	ND (<0.2)	NA
COD	1,516.89	ND (<617)/2,800	1,096.63	ND (<617)/2,800
Chloride	183,942 ^b	NA	182,006 ^b	NA
Chromium	0.10	ND (<0.1)/0.25	0.10 ^b	NA
Copper	0.035	ND (<0.02)/0.080	0.035 ^b	0.030/0.060
Cyanide	ND (<0.022)	NA	ND (<0.022)	NA
Hardness	60,996.14	55,900/64,900	58,874.2	54,700/59,900
Hydroxide	ND (<0.2)	NA	ND (<0.2)	NA
Iron	ND (<0.57)	NA	0.567 ^b	NA
Lead	ND (<0.0087)	NA	ND (<0.0087)	NA
Lithium	68.0	61.9/70.9	14.2 ^b	NA
Magnesium	14,633	13,400/15,600	14,462 ^b	NA
Manganese	0.036	0.030/0.040	0.036 ^b	NA
Mercury	39.35 ng/L	21.8/211.0 ng/L	30.48 ng/L	24.9/51.0 ng/L
Molybdenum	0.14	0.11/0.22	0.13	0.050/0.31
Nickel	0.035	ND (<0.01)/0.110	0.035 ^b	NA
Nitrate	ND (<6.64)	NA	ND (<6.64)	NA
Nitrite	ND (<0.01)	NA	ND (<0.01)	NA
Oil and grease	ND (<5.0)	NA	ND (<5.0)	NA
Potassium	8,720.58	8,050/9,650	8,626 ^b	NA
Selenium	0.54	0.10/0.91	0.53	0.10/0.93
Silica	6.06	ND (<4.2)/7.70	7.01	ND (<4.2)/9.20
Silicon	2.69	ND (<2.0)/3.60	3.15	ND (<2.0)/4.30
Silver	ND (<0.008)	NA	ND (<0.008)	NA
Sodium	98,464.32	93,200/112,000	97,742 ^b	NA
Sulfate	26,975.6	24,300/28,100	27,202 ^b	NA
TDS	333,938.22 ^b	NA	330,782 ^b	NA
TSS	38.19	ND (<3.0)/395	35.3	6.00/175.0

Commercial Plant Influent and Discharge Characteristics

05/08/2026

Constituent	Influent		Discharge	
	Average Concentration ^a (mg/L)	Min/Max	Average Concentration ^a (mg/L)	Min/Max
Zinc	ND (<0.5)	NA	ND (<0.5)	NA

Definitions: BOD = biological oxygen demand; COD = chemical oxygen demand; kafy = thousand acre-feet per year; lb = pounds; MDL = minimum detection limit; mg/L = milligrams per liter; NA = not analyzed (influent and discharge concentrations are nondetect); ND = nondetect (not detected above MDL); TDS = total dissolved solids; TSS = total suspended solids

^a Average influent and discharge concentration based on flow-weighted concentrations during the Demonstration Plant's optimal period, weeks 16–28.

^b Anticipated average concentrations based on facility mass balance analyses.

ATTACHMENT 3
Final Monitoring Report



Final Monitoring Report

Waterleaf Resources Great Salt Lake
Lithium Extraction Demonstration
Plant

Prepared for
Waterleaf Resources

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October 25, 2025

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Appendices

- A. UPDES Permit
- B. Laboratory Data Results
- C. Biota Monitoring Report

Abbreviations

°C	degrees Celsius
af	acre-feet
Demonstration Plant	Great Salt Lake Lithium Extraction Demonstration Plant
DLE	direct lithium extraction
DMR	discharge monitoring report
DNA	deoxyribonucleic acid
DO	dissolved oxygen
EPA	U.S. Environmental Protection Agency
g/cm ³	grams per cubic centimeter
g/L	grams per liter
g/mL	grams per milliliter
g/mol	grams per mole
GSL	Great Salt Lake
IQR	interquartile range
ITS	internal transcribed spacer
IX	ion exchange
lb	pounds
maf	million acre-feet
MDL	minimum detection limit
mg/L	milligrams per liter
mL	milliliter
NA	not applicable
NetDMR	Network Discharge Monitoring Report
NVGD 1929	National Geodetic Vertical Datum of 1929
No.	number
rRNA	ribosomal ribonucleic acid
Si	silicon
SiO ₂	silica (silicon dioxide)
UAC	Utah Administrative Code
UDFFSL	Utah Division of Forestry, Fire and State Lands
UDWQ	Utah Division of Water Quality
UGS	Utah Geological Survey
UPDES	Utah Pollutant Discharge Elimination System
USGS	U.S. Geological Survey
Waterleaf	Waterleaf Resources
WSE	water surface elevation

1 Introduction

Waterleaf Resources (Waterleaf) prepared this final monitoring report to present data and data analysis related to chemistry, flow, and biota data obtained during the operation of the Great Salt Lake (GSL) Lithium Extraction Demonstration Plant (Demonstration Plant).

The chemistry and flow data were collected, analyzed, and reported pursuant to Utah Pollutant Discharge Elimination System (UPDES) Permit No. UT0026280, which was issued to Waterleaf by the Utah Division of Water Quality (UDWQ) on February 4, 2025 (UDWQ 2025a). The Demonstration Plant's discharge of effluent to the GSL was authorized by the UPDES permit, which is provided in Appendix A, *UPDES Permit*. The UPDES permit also authorized the operation of the GSL lithium extraction facility, by certification by rule, under Utah Administrative Code (UAC) R317-16.

Summaries of the laboratory chemistry results and continuous flow monitoring data are provided in Appendix B, *Laboratory Test Results*.

The microbial diversity (biota) report (Baxter 2025; Appendix C, *Biota Monitoring Report*) is summarized in this final monitoring report. The biota report provides additional data that characterize the biota in the North Arm of the GSL and in the discharge flow of the Demonstration Plant. The UPDES permit did not require an assessment of the North Arm biota data.

1.1 Purpose

This report is being provided to support the applications for authorizations required to operate Waterleaf's GSL Phase 1 Lithium Extraction Commercial Plant. These applications are the UDWQ UPDES Permit UT0026280 modification, the UDWQ GSL Mineral Extraction Facility Operator Certification (Operator Certification) (UAC R317-16-5(4)), and Utah Division of Forestry, Fire and State Lands (UDFFSL) agreements.

The information in this report and appendices includes summaries of UPDES compliance monitoring data, continuous flow data, North Arm habitat identification, and additional data collected to characterize North Arm biota.

Demonstration Plant discharges are evaluated to determine that there would be no negative impacts to the GSL, as defined by UDWQ R317-16-16 and as supported by chemical monitoring results review and analysis, flow monitoring results, North Arm habitat inventory, and a North Arm biota monitoring study.

1.2 Background

The Waterleaf Resources Demonstration Plant operated from February 2025 through August 2025. The Demonstration Plant, a temporary facility, was operated to validate Waterleaf's proprietary ion-exchange (IX) direct lithium extraction (DLE) process. This proprietary technology is a nonconsumptive and nonevaporative process to extract lithium from GSL North Arm brine. GSL North Arm brine was conveyed to the plant, processed through the IX DLE equipment, and discharged back into the GSL with no brine depletion. Intake and outfall (influent and discharge) infrastructure was located in the open water of the North Arm of the GSL, and the Demonstration Plant's equipment and offices were located on the western slope of the Promontory Mountains in Box Elder County, Utah.

The North Arm (Gunnison Bay) of the GSL is classified as a Class 5B water of the state. It is protected by UDWQ for infrequent primary and secondary contact recreation, waterfowl, and shorebirds and other water-oriented wildlife including their necessary food chain (UAC R317-2-6.5). Numeric water quality standards for the North Arm are not established but narrative standards apply.

Influent brine and discharge water chemistry data, flow data, and biota data were collected during operation of the Demonstration Plant. Operation activities spanned 28 weeks during the winter, spring, and summer. The data collected reflect seasonal changes in GSL North Arm water surface levels, brine temperature, brine chemistry, salinity, and biota growth.

The influent and discharge chemistry weekly monitoring events summarized in this report were conducted and reported in accordance with the UPDES permit and UAC R317-16. The UPDES compliance monitoring data results, which were submitted electronically, can be accessed through the U.S. Environmental Protection Agency's (EPA) ECHO website for facility UT0026280.¹

¹ U.S. Environmental Protection Agency, Enforcement and Compliance History Online (ECHO) website, National Pollutant Discharge Elimination System (NPDES) Monitoring Data Download page, <https://echo.epa.gov/trends/loading-tool/get-data/monitoring-data-download>.

2 Summary of Monitoring Means and Methods

This section summarizes the monitoring methods and means that were used to collect data during the Demonstration Plant's operation.

- **Water quality monitoring.** HDR conducted weekly composite water quality sampling and analysis on influent and discharge flows on behalf of Waterleaf.
- **Flow monitoring.** Waterleaf conducted continuous flow monitoring at the intake and outfall systems.
- **Biota monitoring.** Dr. Bonnie Baxter of Westminster University conducted biota monitoring on behalf of Waterleaf. Three biota monitoring events were conducted in 2025.

2.1 Water Quality Monitoring

HDR conducted the required water quality monitoring on behalf of Waterleaf. Required water quality monitoring occurred during the Demonstration Plant's operation in accordance with the UPDES permit (UDWQ 2025a). The data results were reported electronically via EPA's Network Discharge Monitoring Report (NetDMR) system. This section summarizes the means and methods that were used to collect water quality samples and perform the laboratory analyses.

2.1.1 Field and Laboratory Parameters and Methods

HDR collected weekly water quality samples, which were composited for laboratory analysis. Discrete samples were collected every 2 hours over a 6-hour duration. Instantaneous flow rates were measured and used to prepare the flow-weighted composites for chemical analysis by a state-certified analytical laboratory. Chemtech-Ford Laboratory in Salt Lake City, Utah, conducted all water chemistry laboratory analyses.

Silicon (Si) concentrations were calculated by using the UDWQ equation (UDWQ 2025b), using silica concentrations and a molar mass conversion equation:

$$\begin{aligned} [\text{Si}] * (\text{SiO}_2 \text{ molar mass} / \text{Si molar mass}) &= [\text{SiO}_2] \\ [\text{Si}] &= [\text{SiO}_2] / (\text{SiO}_2 \text{ molar mass} / \text{Si molar mass}) \\ [\text{Si}] &= [\text{SiO}_2] / (60.08 \text{ g/mol} / 28.09 \text{ g/mol}) \\ \mathbf{[\text{Si}] = [\text{SiO}_2] / 2.139} \end{aligned}$$

Where: Si = Silicon concentration, mg/L
SiO₂ = Silica concentration, mg/L

In addition to the laboratory chemical analyses, field measurements were taken and reported for pH, dissolved oxygen, and temperature using a Horiba U-53-2 handheld multimeter. Field measurements for density were made using an Anton-Paar density meter. Table 1 lists the constituents and methods that were used for the water quality analysis.

Table 1. Water Quality Monitoring Laboratory Methods

Analysis Method	Constituents
Metals (Total)	
EPA 200.7, Metals in Water by ICP-AES	Boron, calcium, lithium, potassium, silica ¹ , sodium
EPA 200.8, Metals in Water by ICP/MS	Aluminum, arsenic, barium, cadmium, chromium, copper, iron, lead, magnesium, manganese, molybdenum, nickel, selenium, silver, zinc
EPA 1631, Mercury in Water by CVAFS	Mercury
Inorganic Nonmetals	
EPA 300.0, Determination of Inorganic Anions by Ion Chromatography	Bromide, chloride, nitrate, sulfate
EPA 335.4, Determination of Total Cyanide by Semi-automated Colorimetry	Cyanide
SM 2320 B, Alkalinity by Titration	Alkalinity, bicarbonate, carbonate, hardness, hydroxide
SM 4500 NO ₂ B, Nitrite by Colorimetry	Nitrite
SM 5210 B, 5-Day BOD Test	Biochemical oxygen demand (BOD)
Hach 8000, EPA Reactor Digestion Method	Chemical oxygen demand (COD)
APHA Standard Method 2540 C, Total Dissolved Solids Dried at 180°C	Total dissolved solids (TDS)
APHA Standard Method 2540 D, Total Suspended Solids Dried at 103–105°C	Total suspended solids (TSS)
Other Methods	
Field Measurement – Instantaneous	Dissolved oxygen, pH, water temperature, density, flow
Visual Observations	Unnatural deposits, floating debris, oil, scum, or other nuisances such as color or odor
Grab Sample	Oil and grease
Continuous Monitoring	Influent and discharge flows

Definitions: °C = degrees Celsius; AES = atomic emission spectroscopy; APHA = American Public Health Association; BOD = biochemical oxygen demand; CVAFS = cold vapor atomic fluorescence spectroscopy; EPA = U.S. Environmental Protection Agency; ICP = inductively coupled plasma; MS = mass spectrometry; NO₂ = nitrogen dioxide; SM = Standard Method

1. Silica data have been used to calculate silicon values.

2.1.2 Quality Assurance

Water quality data were analyzed in accordance with the UPDES permit requirements; these requirements include constituents analyzed, frequency, and laboratory minimum detection limits (MDLs). Additional UDWQ Director's requirements were included in the UPDES permit, including providing laboratory Level IV data quality packages. Level IV data quality packages were submitted electronically with the discharge monitoring reports (DMRs).

As a result of this process, Waterleaf observed the following:

- **Precision**
 - Field duplicate samples were collected by UDWQ staff during February and March 2025 as required by UPDES permit UT0026280 and were analyzed to validate Waterleaf's sample results.
 - The precision of the water quality results is documented in the Level IV data quality packages, which include equipment calibration and validation.
- **Accuracy and Bias**
 - Field instrument calibration met manufacturers' requirements.
 - Laboratory quality assurance/quality control (QA/QC) met each laboratory's internal method requirements.
 - Trace-level mercury was not detected in field blank samples when analyzed during the May 1, 2025, monitoring event.
- **Representativeness**
 - All field measurements and samples were collected from locations and on a frequency as required by UPDES permit UT0026280.
 - Weekly compliance monitoring events were conducted when the Demonstration Plant discharged to the GSL (February through August 2025). During the Demonstration Plant's operation, discharges to the GSL were suspended for three 1-week periods, so compliance monitoring was not conducted during those three 1-week periods.
- **Completeness**
 - Field and laboratory completeness requirements were met.
- **Comparability**
 - Field conditions were within the range of the selected in-situ meter and probe capabilities.
 - Laboratory method detection limits were sufficient to meet UPDES requirements and data quality objectives (Waterleaf 2025a).

Detailed Level IV laboratory quality control and quality assurance documentation was submitted electronically via EPA's NetDMR system. This documentation can be accessed through EPA's ECHO website, as discussed in Section 1.2, *Background*.

2.2 Flow Monitoring

Waterleaf conducted continuous and instantaneous flow monitoring on influent and discharge flows during the Demonstration Plant's operation.

Continuous flow monitoring was conducted using Krohne Optiflux 4300 and Rosemount Magnetic flow meters installed in the Demonstration Plant's intake and outfall infrastructure, respectively. Influent flow monitoring occurred before GSL brine entered the intake holding tank; discharge flow monitoring occurred after brine was discharged from the outfall holding tank. Inline flow meters were installed to continuously monitor the influent flows from the GSL and discharges to the GSL.

Instantaneous flow monitoring was conducted by HDR during water chemistry monitoring events. For each discrete water quality sample, an instantaneous flow measurement was recorded. These instantaneous flow measurements were used to prepare the flow-weighted composite sample for laboratory analysis. Instantaneous flows were recorded from the Waterleaf continuous flow meters.

2.3 Biota Monitoring

Waterleaf contracted with Dr. Bonnie Baxter of Westminster University to study the microbial biomass and community (bacteria, archaea, algae, and fungi) in the influent to and discharge from the Demonstration Plant, which was located on the eastern shore of the North Arm of the GSL (Baxter 2025). The goals of the study were to characterize the biota community in the influent flow and evaluate whether the discharge from the Demonstration Plant affected the biota community of the North Arm.

The following data collection and analysis were conducted to evaluate the influent and discharge characteristics during the Demonstration Plant's operation:

- Identify the biota cells present to estimate cell density and measure biomass.
- Extract and sequence DNA associated with bacteria, archaea, algae, and fungi to determine their abundance and presence.
- Inoculate samples to determine cell growth rate for three conditions: influent, discharge, and a mix (50:50) of influent and discharge.

To identify the presence or absence of biota cells, Dr. Baxter collected water samples from the raw brine intake tank and the Demonstration Plant's discharge tank and pumped the samples through a sterile polyvinylidene fluoride (PVDF) membrane pressure filter unit with a pore size of 0.22 micrometer (μm) to analyze the accumulated biomass. The filter media were frozen on site with liquid nitrogen to preserve the samples and were transported to the lab frozen on dry ice. In the lab, the samples were run through a centrifuge and dried to create a pellet of the cells, and the dry weight of the cell pellet was measured. Using a hemacytometer (which provides a grid and special cover glass to control the distributed volume), the cell density in each of the samples was estimated. The presence of cells in the influent and discharge flows was then verified and further analyzed through biosignatures (DNA sequencing).

To identify microbial diversity, the filter samples were sent to an external laboratory to conduct the DNA sequencing, which establishes the species of life present. The lab

extracted the biota DNA from filters and then amplified the specific genes associated with bacteria, archaea, algae, and fungi. Evaluations were conducted on the DNA sequencing results to determine the presence and relative abundance of microbial taxa present in the influent and discharge water samples. The genetic data were examined and assembled by relative abundance, meaning that the abundance of species can be compared within a specific sample but not to other sample results.

Water samples were inoculated by Dr. Baxter, and biota and observations were logged over 24 days to document growth rates. Four water samples were inoculated: sterile, influent (raw brine), discharge brine, and a 50:50 mix of influent and discharge. The 50:50 mix represents North Arm brine mixed with discharge brine to determine whether the biota would grow that environment.

3 Water Quality Results

The results of each water quality compliance monitoring event were submitted electronically to EPA's NetDMR website in accordance with the UPDES permit requirements. Analytical laboratory data quality Level IV packages were submitted electronically. Laboratory results are provided in Appendix B, *Laboratory Data Results*. A summary of those results is provided below.

Influent and discharge samples were collected and analyzed weekly during the Demonstration Plant's operation. Table 2 lists the dates of the water quality compliance monitoring events annotated with a description of Demonstration Plant operation phases.

Table 2. Dates of Water Quality Compliance Monitoring Events

Week	Sampling Date	Influent Sampling	Discharge Sampling	Notes
1	2/6/25	✓	✓	Start-up operations
2	2/13/25	✓	✓	Start-up operations
3	2/20/25	—	—	No discharge
4	2/26/25	✓	✓	Start-up operations
5	3/4/25	✓	✓	Start-up operations
6	3/13/25	✓	✓	Equipment validation
7	3/18/25	✓	✓	Equipment validation
8	3/25/25	✓	✓	Equipment validation
9	4/2/25	✓	✓	Equipment validation
10	4/8/25	✓	✓	Equipment validation
11	4/15/25	✓	✓	Equipment validation
12	4/22/25	✓	✓	Equipment validation
13	5/1/25	✓	✓	Equipment validation
14	5/6/25	✓	✓	Equipment validation
15	5/12/25	—	—	No discharge
16	5/20/25	✓	✓	Performance run
17	5/29/25	✓	✓	Performance run
18	6/03/25	✓	✓	Performance run
19	6/12/25	✓	✓	Equipment validation
20	6/17/25	✓	✓	Equipment validation
21	6/24/25	✓	✓	Equipment validation
22	7/1/25	✓	✓	Equipment validation
23	7/10/25	✓	✓	Equipment validation
24	7/15/25	✓	✓	Equipment validation
25	7/22/25	—	—	No discharge
26	7/29/25	✓	✓	Equipment validation
27	8/7/25	✓	✓	Equipment validation
28	8/12/25	✓	✓	Equipment validation

3.1 Visual Observation Results

Observations of water quality covered by state narrative water quality standards were made and documented during compliance monitoring. These observations targeted unnatural deposits, floating debris, oil, scum, or other nuisances such as color or odor, that are specifically identified in the narrative standards. No floating debris, oil, scum, or odor were observed in the influent and discharge samples that were evaluated.

The color of the influent and discharge varied throughout the Demonstration Plant's operation; no color was observed early in the plant's operation (February and March), and color was increasingly observed in the influent for the remainder of the plant's operation (April through August). The color of the influent increasingly became pinker as the North Arm's brine temperatures rose and the presence of biota increased. This observation is normal and is supported by the biota monitoring that was conducted (see Appendix C, *Biota Monitoring Report*).

During the first several weeks of the Demonstration Plant's operation, steel rust flakes were observed in the discharge samples. The source of the rust flakes was determined to be corrosion from the intake and outfall steel holding tanks and other carbon steel equipment throughout the Demonstration Plant. Waterleaf observed that the steel holding tanks were corroding and that rust was flaking off the tank interiors as the brine levels fluctuated in the holding tanks and the exposed steel discolored and began to disintegrate.

After the observations were made, Waterleaf modified operation of the Demonstration Plant to minimize the change in water level in the tanks, thereby reducing the exposure of the steel tanks' interiors. The rust flakes were observed and recorded during the February biota monitoring event along with the presence of biota. The biota monitoring report concluded that the corrosion of the holding tanks was not adversely affecting the microorganisms in the discharge (Appendix C, *Biota Monitoring Report*). Rust flakes were not observed after week 5 of the Demonstration Plant's operation.

3.2 Chemistry Monitoring Results

The influent and discharge flows were sampled and analyzed in compliance with the UPDES permit and the Operator Certification. In all, 25 monitoring events were conducted at the Demonstration Plant during its 28-week operation (there was no discharge during 3 of the 28 weeks). A summary of all laboratory analytical results and laboratory MDLs is provided in Table 3 for each constituent in alphabetical order. Field measurements (density, dissolved oxygen, pH, and temperature) are discussed in Section 3.4, *Field Chemistry Results* including a discussion on salinity characteristics of the influent and discharge.

Additionally, as required by UDFFSL rules, a performance run period occurred during weeks 16 through 18 of operation (May 20 through June 10, 2025). During the performance run of the Demonstration Plant, equipment operations were optimized and maintained to measure certain performance metrics (Waterleaf 2025b). Table 4 summarizes average influent and discharge concentrations for this period.

In this section, Waterleaf examines the influent and discharge chemical data in context with laboratory MDLs and uncertainty or error. Also, the chemical data were evaluated for outliers based on interquartile range (IQR) outlier analysis.

During the 28-week operation of the Demonstration Plant, the plant operated in three phases: start-up operations, equipment validation, and performance run (see Table 2 for the duration of each phase). During start-up operations, spikes in some metal constituents and rust flakes were observed, as discussed above in Section 3.1. Data results during start-up are discussed in Section 3.3.3 and summarized in Table 6 for the specific metal constituents that had data spikes during start-up.

To assess whether Demonstration Plant mass loads changed North Arm background mass, loads for metals, salt, and manganese are compared in Table 7, Table 8, and Table 9.

Lithium concentrations and mass loading are provided in Table 10.

In addition to the chemical laboratory analyzes reported in this section, UPDES required the reporting of silicon. Waterleaf used the UDWQ molar mass equation, using silica laboratory results, including the MDL value for nondetect values. Using the UDWQ molar mass equation and the silica data results, the silicon data are:

- Influent characteristics:
 - Average concentration: 2.5 mg/L
 - Minimum concentration: 2.0 mg/L
 - Maximum concentration: 3.6 mg/L
- Discharge characteristics:
 - Average concentration: 2.7 mg/L
 - Minimum concentration: 2.0 mg/L
 - Maximum concentration: 4.3 mg/L

Table 3. Summary of All Laboratory Analytical Results (Weeks 1–28)

Constituent	Influent Average (min/max)	Discharge Average (min/max)	Minimum Detection Limit (mg/L)	UPDES Specified Minimum Detection Limit (mg/L)
Alkalinity	569 (526/599)	360 (119/504)	0.2	NA
Aluminum, total	1.7 (ND/5.2)	1.6 (ND/5.1)	1.2	NA
Arsenic, total	0.477 (0.361/0.620)	0.322 (0.054/0.483)	0.0044	0.180 ¹
Barium, total	0.190 (ND/0.342)	0.169 (ND/0.322)	0.057	NA
Bicarbonate	569 (526/599)	360 (119/504)	0.2	NA
Biological oxygen demand	7.4 (ND/16)	6.7 (ND/13)	2.0	NA
Boron, total	60.3 (50.6/65.5)	56.7 (46.7/62.8)	0.61 ²	NA
Bromide	174 (140/201)	160 (132/186)	0.5 ³	NA
Cadmium, total	ND	ND	0.0012 ⁴	0.0052
Calcium, dissolved	302 (277/327)	288 (258/318)	0.7 ⁵	NA
Carbonate	ND	ND	0.2	NA
Chemical oxygen demand (COD)	2,420 (ND/7,020)	1,617 (ND/4,300)	617.0 ⁶	NA
Chloride	181,400 (159,000/194,00)	168,360 (144,000/181,000)	180.0	NA
Chromium, total	0.072 (0.014/0.250)	0.069 (ND/0.236)	0.0062 ⁷	0.0166
Copper, total	0.0391 (0.0182/0.0759)	0.0470 (0.0052/0.1360)	0.0182 ⁸	0.067
Cyanide, total	ND	ND	0.022 ⁹	0.0093
Hardness	59,692 (55,400/67,100)	56,256 (48,600/62,700)	11.7 ¹⁰	NA
Hydroxide	ND	ND	0.2	NA
Iron, total	0.58 (ND/0.80)	1.57 (ND/16.4)	0.57	NA
Lead, total	ND	ND ¹¹	0.0087 ¹¹	0.0465
Lithium, total	67.7 (55.1/81.6)	30.8 (9.33/54.8)	0.403 ¹²	NA
Magnesium, total	14,312 (13,300/16,100)	13,480 (11,600/15,000)	2.4 ¹³	NA
Manganese, total	0.0411 (0.0264/0.0794)	0.2385 (0.0554/0.91)	0.0159 ¹⁴	NA
Mercury, total	33.2 ng/L (ND/211 ng/L)	39.9 ng/L (ND/109 ng/L)	9 ng/L ¹⁵	0.000022
Molybdenum, total	0.136 (0.111/0.218)	0.111 (0.0169/0.312)	0.038 ¹⁶	NA
Nickel, total	0.049 (0.011/0.29)	0.052 (0.009/0.279)	0.0112 ¹⁷	0.376
Nitrate	ND	ND	6.64 ¹⁸	NA
Nitrite	ND	ND	0.01	NA
Oil and grease	ND	ND	5	NA
Potassium, total	8,662 (8,050/9,650)	8,138 (6,860/9,000)	8.6 ¹⁹	NA
Selenium, total	0.308 (0.074/0.908)	0.301 (0.012/0.933)	0.0141 ²⁰	0.0079

Table 3. Summary of All Laboratory Analytical Results (Weeks 1–28)

Constituent	Influent Average (min/max)	Discharge Average (min/max)	Minimum Detection Limit (mg/L)	UPDES Specified Minimum Detection Limit (mg/L)
Silica, total	5.3 (ND/7.7)	5.7 (ND/9.2)	4.2	NA
Silver, total	ND	ND	0.008 ²¹	0.0899
Sodium, dissolved	92,920 (79,000/112,000)	86,568 (61,400/110,000)	343 ²²	NA
Sulfate, dissolved	24,220 (10,200/28,100)	22,400 (12,600/28,200)	49.4 ²³	NA
Total dissolved solids (TDS)	340,040 (311,000/363,000)	312,640 (259,000/362,000)	1,000 ²⁴	NA
Total suspended solids (TSS)	111 (ND/530)	106 (6/454)	3 ²⁵	NA
Zinc, total	ND	ND	0.05 ²⁶	0.675

Definitions: max = maximum; MDL = minimum detection limit; mg/L = milligrams per liter; min = minimum; NA = not applicable; ND=nondetect (not detected above MDL); ng/L = nanograms per liter

- MDL for arsenic was reported as 0.0088 mg/L for week 1 and 0.022 mg/L for week 24.
- MDL for boron was reported as 12.1 mg/L for week 9.
- MDL for bromide varied between 0.5 and 4.7 mg/L.
- MDL for cadmium was reported as 0.0061 mg/L for week 24.
- MDL for calcium was reported as 14.6 mg/L for week 24.
- MDL for COD was reported as 154 mg/L for weeks 1 through 11, 308 mg/L for week 12, and 617 mg/L for weeks 13 through 28.
- MDL for chromium varied between 0.0062 and 0.0618 mg/L.
- MDL for copper was reported as 0.0364 mg/L for week 1 and 0.0036 mg/L for week 5.
- MDL for cyanide varied between 0.004 and 0.132 mg/L.
- MDL for hardness varied between 11.7 and 234 mg/L.
- MDL for lead was reported as 0.0174 mg/L for week 1 and 0.0435 mg/L for week 24; discharge value was reported at 0.015 mg/L for week 20.
- MDL for lithium was reported as 8.07 mg/L for week 8.
- MDL for magnesium was reported as 48 mg/L for weeks 8, 14, 15, 18, and 24, and 4.8 mg/L for week 4.
- MDL for manganese was reported as 0.0318 mg/L for week 1.
- MDL for mercury was reported as 44.9 ng/L for week 1 and 70 ng/L for week 27.
- MDL for molybdenum was reported as 0.0075 mg/L for week 1 and 0.0188 mg/L for week 24.
- MDL for nickel was reported as 0.0223 mg/L for week 1 and 0.112 mg/L for week 17.
- MDL for nitrate was reported as 33.2 mg/L for week 10.
- MDL for potassium was reported as 171 mg/L for weeks 8, 16, 18, and 24.
- MDL for selenium was reported as 0.0283 mg/L for week 1 and 0.0707 mg/L for week 24.
- MDL for silver was reported as 0.017 mg/L for week 1 and 0.042 mg/L for week 24.
- MDL for sodium was reported as 172 mg/L for week 6.
- MDL for sulfate was reported as 247 mg/L for weeks 1, 7, 9, 10, 12, 17–20, 23, and 26–28.
- MDL for TDS was reported as 20 mg/L for week 4.
- MDL for TSS varied between 0.8 and 8 mg/L.
- MDL for zinc was reported as 0.09 mg/L for week 1.

Table 4. Summary of Performance Run Laboratory Analytical Results (Weeks 16–18)

Constituent	Influent Average (Min/Max) (mg/L)	Discharge Average (Min/Max) (mg/L)
Alkalinity	560 (552/569)	373 (312/414)
Aluminum, total	2.7 (1.2/5.2)	2.5 (1.2/5.1)
Arsenic, total	0.43 (0.39/0.48)	0.31 (0.31/0.32)
Barium, total	0.19 (0.18/0.20)	0.16 (0.15/0.18)
Bicarbonate	560 (552/569)	373 (312/414)
Biological oxygen demand	10 (9/11)	9 (7/10)
Boron, total	60.2 (59.3/61.0)	58.0 (57.4/58.6)
Bromide	173 (140/201)	156 (139/170)
Cadmium, total	ND (ND/ND)	ND (ND/ND)
Calcium, dissolved	291 (277/300)	284 (270/293)
Calculated silicon ¹	2.5 (2.3/2.7)	3.1 (2.9/3.4)
Carbonate	ND (ND/ND)	ND (ND/ND)
Chemical oxygen demand (COD)	1,006 (617/1200)	845 (617/1,300)
Chloride	182,333 (177,000/187,000)	173,333 (166,000/181,000)
Chromium, total	0.048 (0.021/0.062)	0.051 (0.030/0.062)
Copper, total	0.039 (0.030/0.052)	0.040 (0.032/0.054)
Cyanide, total	ND (ND/ND)	ND (ND/ND)
Hardness	58,800 (58,100/59,600)	56,833 (55,500/57,900)
Hydroxide	ND (ND/ND)	ND (ND/ND)
Iron, total	ND (ND/ND)	1.72 (1.30/2.40)
Lead, total	ND (ND/ND)	ND (ND/ND)
Lithium, total	67.4 (66.1/69.6)	16.0 (14.4/18.8)
Magnesium, total	14,100 (13,900/14,300)	13,633 (13,300/13,900)
Manganese, total	0.038 (0.030/0.043)	0.163 (0.141/0.182)
Mercury, total	25.3 (23.3/27.2)	28.6 (24.9/31.4)
Molybdenum, total	0.126 (0.122/0.132)	0.081 (0.055/0.122)
Nickel, total	0.052 (0.015/ND)	.0512 (ND/ND)
Nitrate	ND (ND/ND)	ND (ND/ND)
Nitrite	ND (ND/ND)	ND (ND/ND)
Oil and grease	ND (ND/ND)	ND (ND/ND)
Potassium, total	8,423 (8,280/8,600)	8,137 (7,880/8,480)
Selenium, total	0.185 (0.101/0.238)	0.242 (0.121/0.342)
Silica, total	5.4 (5.0/5.8)	6.7 (6.3/7.3)
Silver, total	ND (ND/ND)	ND (ND/ND)
Sodium, dissolved	95,100 (94,200/96,700)	92,500 (90,300/93,600)
Sulfate, dissolved	25,400 (24,300/26,700)	25,167 (25,000/25,300)
Total dissolved solids (TDS)	341,667 (335,000/349,000)	328,667 (326,000/332,000)
Total suspended solids (TSS)	127 (62/228)	112 (64/175)
Zinc, total	ND (ND/ND)	ND (ND/ND)

Definitions: max = maximum; MDL = minimum detection limit; mg/L = milligrams per liter; min = minimum; NA = not applicable; ND=nondetect (not detected above MDL); ng/L = nanograms per liter

1. This is a calculated value based on silica data.

3.3 Chemistry Monitoring Results Discussion and Graphs

This section reviews the results Demonstration Plant weekly laboratory analyses and summarizes the monitoring results for metals, salts, manganese, and lithium. The metal constituents reviewed are aluminum, arsenic, barium, boron, cadmium, chromium, copper, iron, lead, mercury, molybdenum, nickel, selenium, silver, and zinc, and the salts constituents reviewed are calcium, chloride, magnesium, potassium, sodium, and sulfate. Metals and salts, as well as other constituents (manganese and lithium), are required to be analyzed and reported by the UPDES permit and GSL Mineral Extraction Facility Operator Certification rules.

Data results for all constituents are summarized in Table 3 above, and laboratory results spreadsheets are attached in Appendix B, *Laboratory Data Results*.

To evaluate whether changes in metals, salts, and minerals (manganese and lithium) discharge concentrations (as compared to intake concentrations) result in a change in chemistry in the North Arm of the GSL. Waterleaf uses various lines of evidence, which consist of the following,

- MDLs and uncertainty of data
- Lack of comparable historic North Arm chemistry data and numeric water quality standards
- Relative increase or decrease in average concentrations (Table 3 above) as compared to MDLs and uncertainty
- Relative increase or decrease in average concentrations during the performance run (Table 4 above)
- Outlier analysis (Table 5 below)
- Relative increase or decrease in normal operations average concentrations (removing the first 5 weeks of start-up operations; see Table 6 below)
- Total change in mass loadings (discharge load subtracted from influent load) based on average concentrations, as compared to North Arm mass, at current water surface elevations (WSE) (Table 7, Table 8, and Table 9 below)
- Biota study results

3.3.1 Minimum Detection Limits and Uncertainty

Chemical analyses on the GSL brine samples and specifically North Arm brine samples are difficult to perform because of the high density, high salinity, and other unique characteristics of GSL brine. These characteristics interfere with laboratory means and methods. Due to these interferences, data results can often have various MDLs, various dilution rates, and large spike recovery ranges, all of which create a level of error and uncertainty. Although this error and uncertainty exists, the individual laboratory test results met data quality criteria and equipment precision ranges.

Overall, the MDLs for the analyzed constituents were consistent and met UPDES requirements. The laboratory data quality packages reported a few cases in which the MDL for selenium was not met. Level IV laboratory data quality results also documented dilution rates and spike recovery rates to meet quality control and assurance requirements.

Waterleaf also uses context when reviewing the data. Some constituents were analyzed at MDLs that were less than designated by the UPDES, as shown in Table 3 above. For example, copper was analyzed with an MDL of 0.0182 mg/L, which is below the UPDES stated MDL of 0.067 mg/L. So, when the influent and discharge average values are calculated at 0.0391 mg/L and 0.0470mg/L, respectively, they are below the UPDES stated MDL and might be considered comparable. Very low MDLs can bias the review of the data by detecting increases and decreases in concentration that are insignificant compared to other data sets.

Error and uncertainty (lab interference) need to be considered when reviewing the data. The heavy brine requires that samples are diluted to effectively be analyzed by equipment that is normally processing fresh water samples. The dilution rates for analyses ranged from undiluted (rate of 1) to 6, 20, and 50 up to a high of 100. Also, all samples were analyzed independently, so the intake and discharge samples for the same day might be diluted differently. Laboratory method accuracy is measured by percent recovery, and these percent recoveries vary for the different methods used for this project. For example, salts generally have a $\pm 20\%$ recovery, while metals have a $\pm 15\%$ recovery. The Utah Geological Survey has estimated that, for most GSL data, a minimum error of about 10% could be attributed to the challenges of processing the brine, based on conversations with the analytical laboratory (UGS 2025).

Waterleaf did report all data to UDWQ consistent with UPDES compliance monitoring requirements. That being said, the laboratory chemical analyses and results provided are adequate to meet the data quality objectives of the monitoring, which are to characterize the chemistry of the North Arm raw brine that is used as influent water to the lithium extraction process and to characterize the discharge of the lithium-depleted brine back to the North Arm.

3.3.2 Outlier Analyses

As with any data set, results often include concentrations that are unusually high or low—or in other words, outside the normal or expected range. To evaluate the impact of outliers on the Demonstration Plant data set, an outlier analysis was performed to identify whether outliers occurred extensively throughout the data set. Waterleaf determined that they did not. Therefore, Waterleaf included all data in the calculation of average, minimum, and maximum. Below is a summary of the outlier analyses and the results.

An IQR outlier analysis was conducted on the laboratory data results for each constituent's influent and discharge data. This analysis requires calculating the upper-quartile boundaries and then comparing the data to this threshold. Data points above this threshold are considered outliers.

In all, of the 1,900 data points analyzed for 38 constituents, 18 constituents were determined to have 59 data exceedances; that is, 59 data points were above the upper-quartile boundary. Of these 59 data points, 34 were influent outlier points and 25 were discharge outlier points. The results of the outlier analyses for those constituents with data exceedances are shown in Table 5 below.

Of note, outlier analyses were not conducted on the 10 constituents with nondetected concentrations. Also, the lower-quartile boundary analyses were not completed due to the presence of nondetection concentrations.

This analysis provides further evidence that the significant variations in data results are limited—using the IQR analytical methodology, about 3.1% of the data reported are considered outliers (outside the upper-quartile boundary).

Based on the IQR outlier analyses for all constituents analyzed, Waterleaf determined that the outliers did not occur extensively. Therefore, all data are included in the calculation of average, minimum, and maximum concentrations.

Table 5. Summary of Outlier Analyses

Constituent	Influent Outliers			Discharge Outliers		
	Influent Average (mg/L)	Upper Boundary (mg/L)	Number of Exceedances	Discharge Average (mg/L)	Upper Boundary (mg/L)	Number of Exceedances
Aluminum, total	1.7	3.0	1	1.6	2.5	2
Barium, total	0.190	0.238	3	0.169	0.248	2
Bromide	0.173	200.5	1	160.1	192.5	0
COD	2,420	4,450	4	1,1617	4,650	0
Chromium, total	0.072	0.196	2	0.069	0.176	2
Copper, total	0.0391	0.0661	2	0.0470	0.0753	2
Hardness	59,692	64,100	2	56,256	65,200	0
Iron, total	0.58	0.57	1	1.57	2.4	2
Lead, total	0.0104	0.0087	0	0.0107	0.0087	1
Lithium, total	67.7	73.0	2	30.6	91.7	0
Magnesium, total	14,312	15,400	2	13,480	15,600	0
Manganese, total	0.0411	0.0550	2	0.239	0.511	1
Mercury, total	33.2	33.7	2	39.9	52.8	3
Molybdenum, total	0.136	0.163	1	0.111	0.178	4
Nickel, total	0.049	0.091	4	0.052	0.087	3
Potassium, total	8,662.4	9,535	1	8,138	9,455	0
Sodium, dissolved	92,920	108,100	1	86,568	114,300	0
TSS	110.9	278.5	3	105.6	264.0	3

Definitions: COD = chemical oxygen demand; mg/L = milligrams per liter; TSS = total suspended solids

3.3.3 Metals Discussion

In this section, Waterleaf reviews the laboratory data results for metal constituents. Metals are often the focus of review due to their potential toxicity and their regulation by the Clean Water Act. Metal MDLs and loads were specific components of the UPDES permit. As stated in Section 1.2, *Background*, the North Arm is protected for recreation and wildlife use; however, numeric water quality standards have not been established.

The metal constituents discussed below are aluminum, arsenic, barium, boron, cadmium, chromium, copper, iron, lead, mercury, molybdenum, nickel, selenium, silver, and zinc.

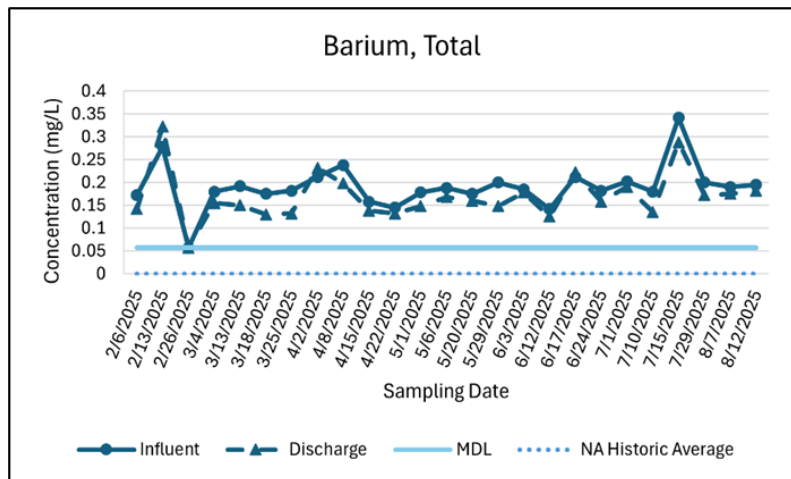
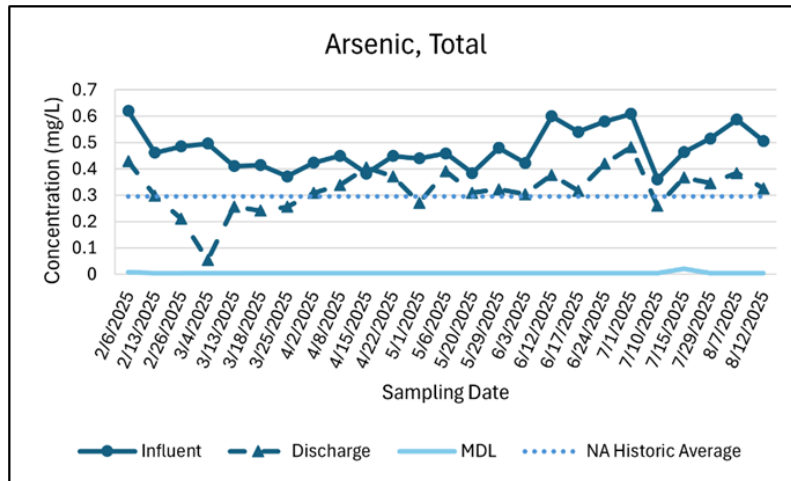
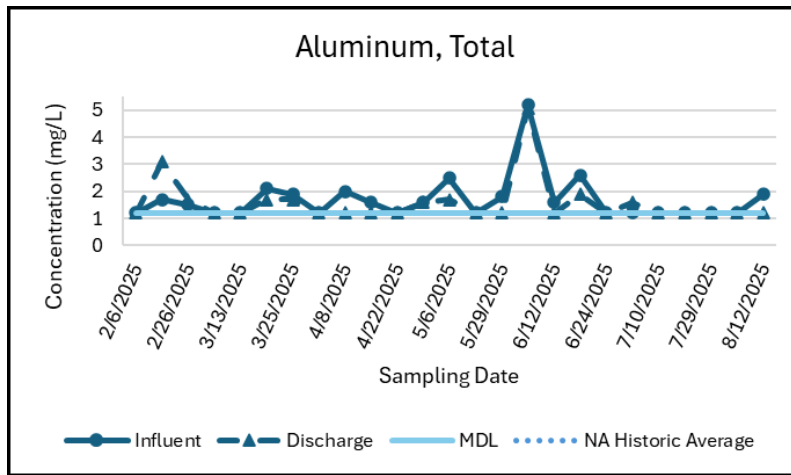
Metals That Were Not Detected. The data results reported four metal constituents (cadmium, lead, silver, and zinc) as nondetected for both influent and discharge concentrations for the entire 28-week operation of the Demonstration Plant, including the start-up and performance run periods (Table 3 above).

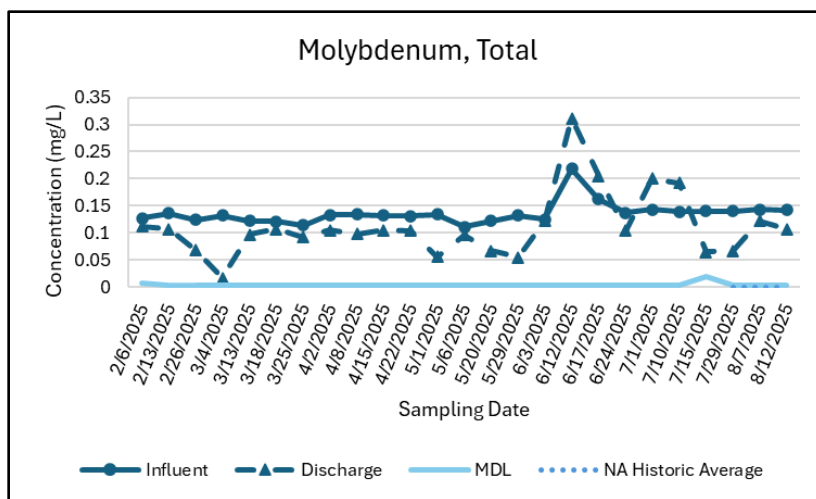
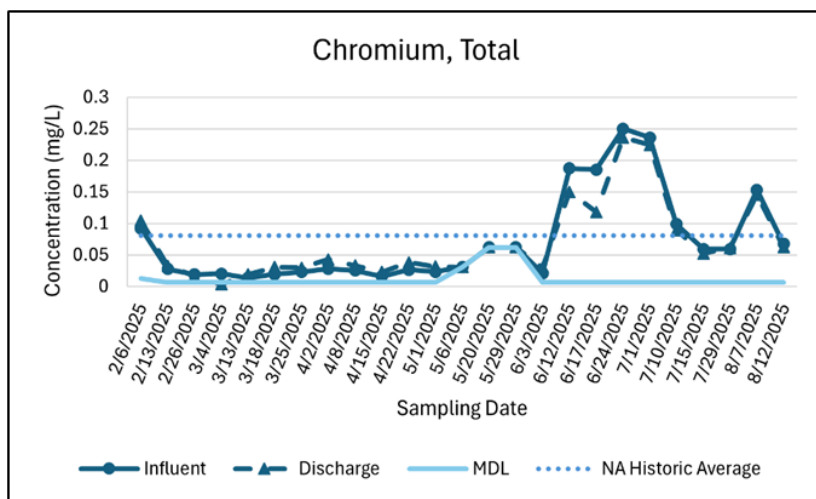
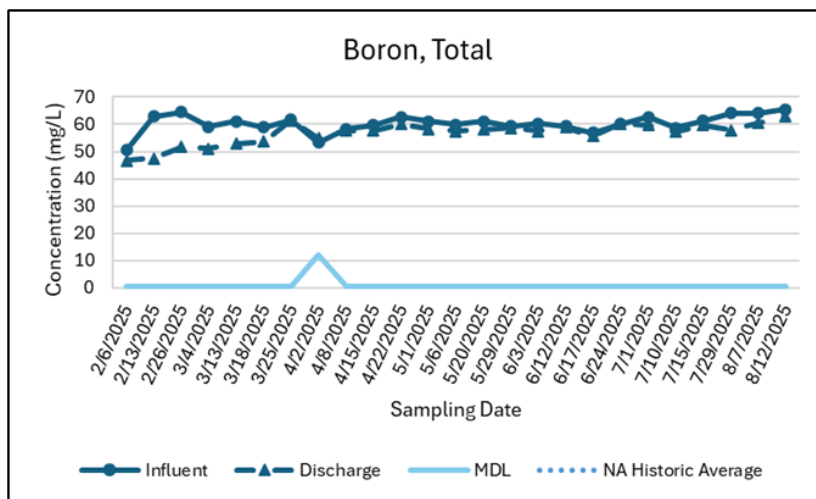
Metals with Lower Discharge Concentrations. Seven metal constituents (aluminum, arsenic, barium, boron, chromium, molybdenum, and selenium) were reported with lower average discharge concentrations than average influent concentrations during the Demonstration Plant's operation. Weekly laboratory data for influent and discharge concentrations are graphically shown below in Figure 1 for these seven constituents along with laboratory MDLs and North Arm historical averages. North Arm historical averages were determined by analyzing the UDWQ water quality database, North Arm monitoring locations, and reported values (HDR 2023). For some constituents, historical data were not available.

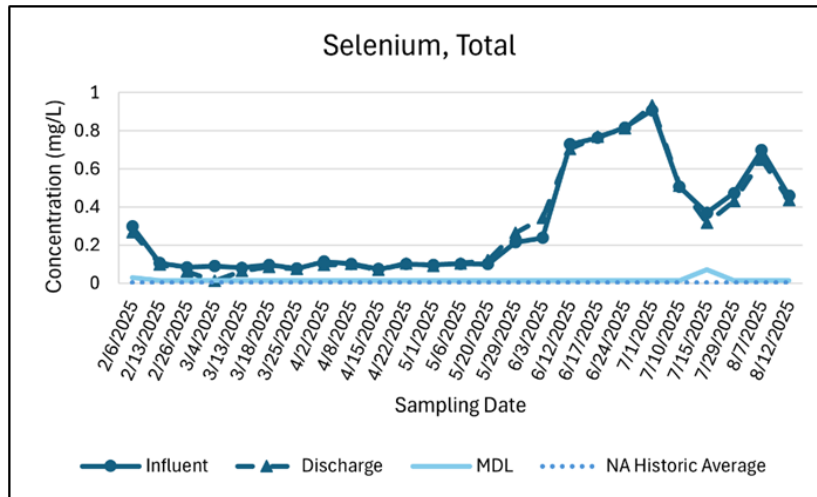
The data for the entire 28-week operation indicate the following decreases in average discharge concentrations compared to average influent concentrations: aluminum (decrease of 7%), arsenic (decrease of 32%), barium (decrease of 11%), boron (decrease of 6%), chromium (decrease of 4%), molybdenum (decrease of 18%), and selenium (decrease of 2%).

These constituents also showed average decreased concentrations compared to intake concentrations during the performance run (weeks 16–18) (Table 4 above), with the exception of chromium and selenium, for which average discharge concentrations increased above average intake concentrations. If the uncertainty estimate of 10% is taken into perspective, the decreases for aluminum, boron, chromium, and selenium are within this error range.

Figure 1. Graphs of Metal Constituents with Lower Average Discharge Concentrations



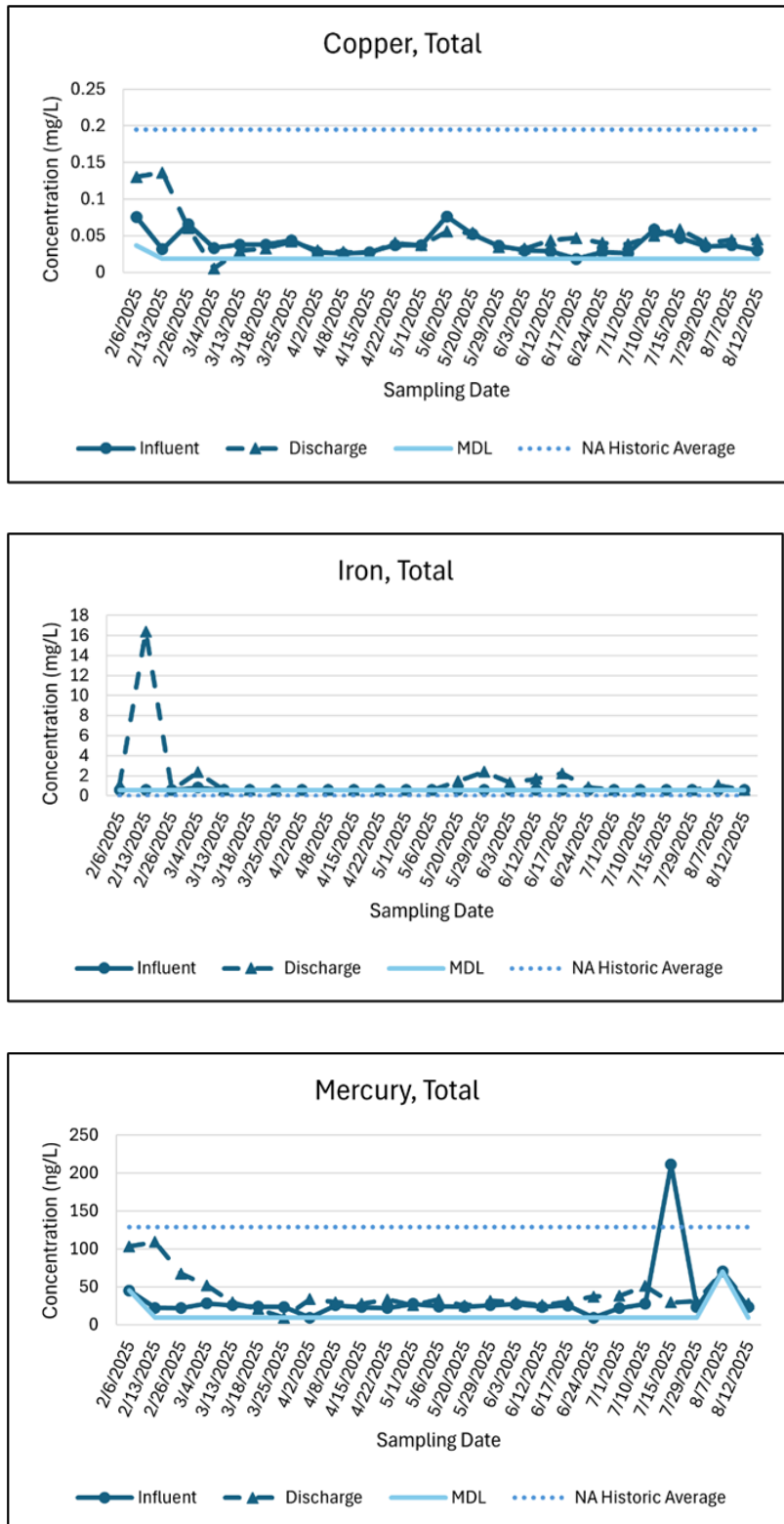


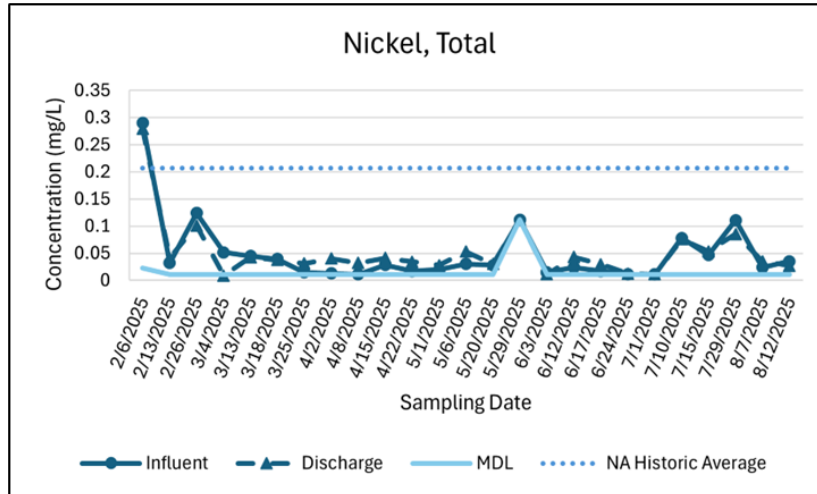


Metals with Higher Discharge Concentrations. Four metal constituents (copper, iron, mercury, and nickel) were reported with higher average discharge concentrations than average influent concentrations during the Demonstration Plant's operation. Weekly laboratory data for influent and discharge concentrations are graphically shown below in Figure 2 for these four constituents along with laboratory MDLs and North Arm historical averages. North Arm historical averages were determined by analyzing the UDWQ water quality database, North Arm monitoring locations, and reported values (HDR 2023).

The increases in average discharge concentrations compared to the average influent concentrations are: copper (increase of 20%), iron (increase of 272%), mercury (increase of 20%), and nickel (increase of 6%). Based on a review of the graphs and the data, it is apparent that, during the Demonstration Plant's start-up period, discharge concentrations for these metals were higher than during the following weeks. Waterleaf conducted further review of the data and operations during this start-up period to determine the cause of the data spikes. Waterleaf determined that, during start-up operations (weeks 1–5), processes and equipment were the cause of the data spikes for certain metal constituents, because these four constituents are not a component of the DLE process.

Figure 2. Graphs of Metal Constituents with Higher Average Discharge Concentrations





The increases in discharge concentrations (compared to influent concentrations) for copper, iron, mercury, and nickel during the start-up period can be partially attributed to the Demonstration Plant's equipment being made from carbon steel, stainless steel, and other corrodible materials. Equipment becomes corroded from exposure to the high-saline North Arm brine and exposure to oxygen. Evidence of corrosion consisted of higher concentrations of four metals (copper and iron, plus mercury and nickel) during the first 5 weeks, which was the Demonstration Plant's start-up period of operation, as well as visual observations of rust flakes in the discharge. During investigations to identify the source of the rust flakes in the discharge, observations were made confirming that the carbon steel frac tanks being used to store raw brine and depleted brine were in fact showing signs of corrosion.

After the initial start-up period of 5 weeks, rust flakes were not observed, and the discharge concentrations became more consistent. Table 6 compares the average influent and discharge results for the start-up period (weeks 1–5) and regular operations (weeks 6–28). As the data indicate, average discharge concentrations drastically reduced after the initial plant start-up process. After start-up, mercury and nickel average discharge concentrations decreased compared to average influent concentrations. Copper and iron results reported an increase in average discharge concentrations compared to average influent concentrations.

Table 6. Metal Concentration Data Comparison of Start-up and Regular Operations

Constituent	Start-up (Weeks 1–5)		Operation (Weeks 6–28)	
	Influent Average (mg/L)	Discharge Average (mg/L)	Influent Average (mg/L)	Discharge Average (mg/L)
Copper, total	0.0513	0.0829	0.0368	0.0401
Iron, total	0.628	5.10	ND (<0.57)	0.902
Mercury, total	29.2 ng/L	82.8 ng/L	34.0 ng/L	31.7 ng/L
Nickel, total	0.124	0.108	0.0348	0.0412

Definitions: mg/L = milligrams per liter; ND = nondetect; ng/L = nanograms per liter

These four constituents, along with chromium and selenium, had increased discharge concentrations compared to influent concentrations during the performance run period.

Waterleaf noticed that iron discharge concentrations increased during a 6-week period during regular operations and conducted further analyses. Most of the iron intake and discharge concentration results were reported nondetect, except during start-up operations and during a 6-week period (weeks 16–22). The increased discharge concentrations during start-up were discussed above. The increased discharge concentrations for weeks 16–22 followed a period of no discharge (week 15). During week 15, the plant experienced equipment failures and did not operate. When the plant was brought back online with replacement equipment operating, increases in iron discharges occurred until the process recovered (week 22). Iron discharge concentrations were reported nondetect during the remainder of operation (weeks 22–28).

Metal Load Analyses. To help determine impacts to North Arm chemistry due to operation of the Demonstration Plant, mass loads for the metal constituents were reviewed. Demonstration Plant mass loads were determined using all the laboratory data during operations (28 weeks), including outliers, compared to North Arm mass. Demonstration Plant loads were calculated by subtracting average influent concentration and influent volume from average discharge concentrations and discharge volume. North Arm mass was calculated using the average influent concentration and the North Arm volume at a WSE of 4,192 feet. The resulting mass load due to Demonstration Plant operation is shown in Table 7.

Table 7. Metals Load Comparison of Demonstration Plant Operations and North Arm

Constituent	Influent Average (mg/L)	Influent Load ¹ (lb)	Discharge Average (mg/L)	Discharge Load ² (lb)	Load to North Arm (lb)	North Arm Mass ³ (lb)
Aluminum, total	1.7	15.49	1.6	15.13	–0.36	14,978,200
Arsenic, total	0.477	4.35	0.322	3.04	–1.3	4,202,700
Barium, total	0.190	1.73	0.169	1.60	–0.13	1,674,000
Boron, total	60.3	549.3	56.7	536.1	–13.2	531,286,700
Chromium, total	0.072	0.66	0.069	0.65	–0.01	634,400
Copper, total	0.0391	0.36	0.0470	0.44	0.09	344,500
Iron, total	0.58	5.28	1.57	14.84	9.56	5,110,200
Mercury, total	0.0000332	1.65	0.0000399	2.0	0.35	290
Molybdenum, total	0.136	1.24	0.111	1.05	–0.19	1,198,300
Nickel, total	0.049	0.45	0.052	0.49	0.04	431,700
Selenium, total	0.308	2.81	0.301	2.85	0.04	2,713,700

Definitions: af = acre-feet; lb = pounds; mg/L = milligrams per liter; WSE = water surface elevation

1. Based on a Demonstration Plant total intake volume of 3.35 af
2. Based on a Demonstration Plant total discharge volume of 3.47 af
3. North Arm Mass based on WSE of 4,192 feet and volume of 3,240,000 af and average influent concentrations

In considering the mass decreases in the North Arm for aluminum, arsenic, barium, boron, chromium, and molybdenum discharges (Table 7 above), mass decreases due to

Demonstration Plant operations are in the range of 0.000002% to 0.00003% compared to North Arm total mass and are considered by Waterleaf to be *de minimis*.

In considering the mass load increases to the North Arm from the Demonstration Plant (Table 7 above), increases for copper (0.00002%), nickel (0.000009%) and selenium (0.0000015%) are considered by Waterleaf to be *de minimis*. The mass increase of iron to the North Arm is estimated at 9.6 pounds (lb), compared to 5.11 million pounds, or an increase of 0.0002%, which is also considered by Waterleaf to be *de minimis*.

The mercury data indicate that the mass load to the North Arm resulted in a 0.35-lb increase, compared to a North Arm mass of 290 lb, or an increase of 0.12%, which is considered by Waterleaf to be not significant. The bulk of this mass load occurred during the start-up period (Figure 2 and Table 6 above). Although mercury concentrations in the discharge during start-up operations were higher than in the influent, subsequently, during the remainder of the Demonstration Plant's operation, average discharge concentrations were less than average influent concentrations.

A review of the start-up comparison (Table 6 above) and investigation into the source of the corrosion revealed conditions specific to the Demonstration Plant's equipment. Comparing the data collected during remainder of the operations and performance run data run (Table 4 above), the temporary discharge of mercury mass load to the North Arm, due to start-up operations, is considered by Waterleaf to be not significant.

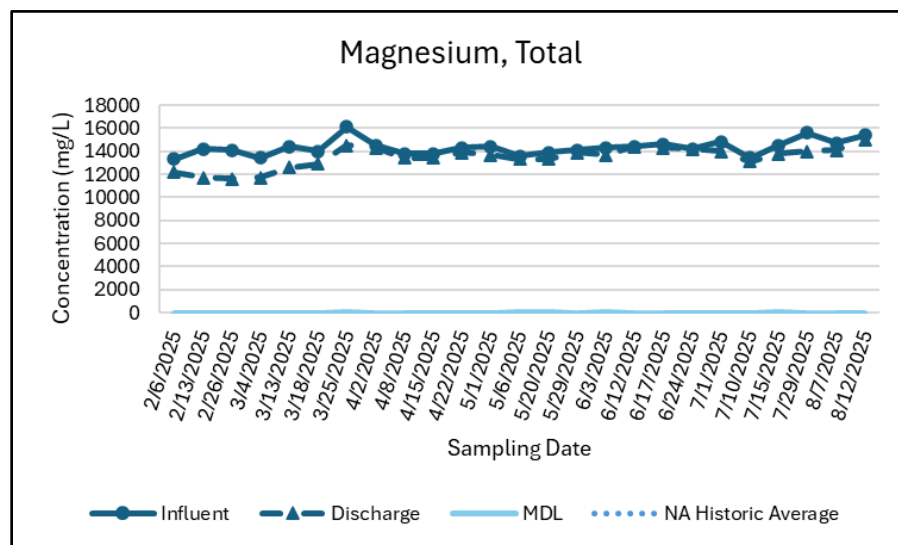
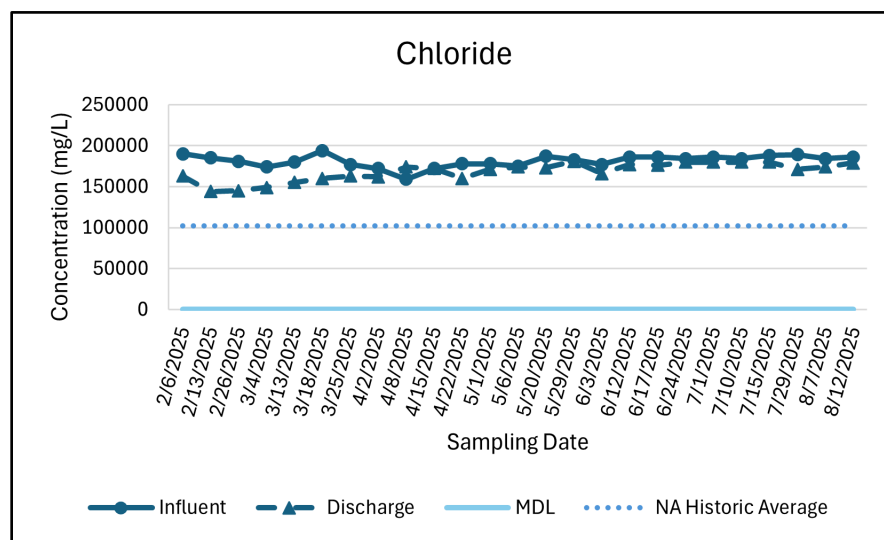
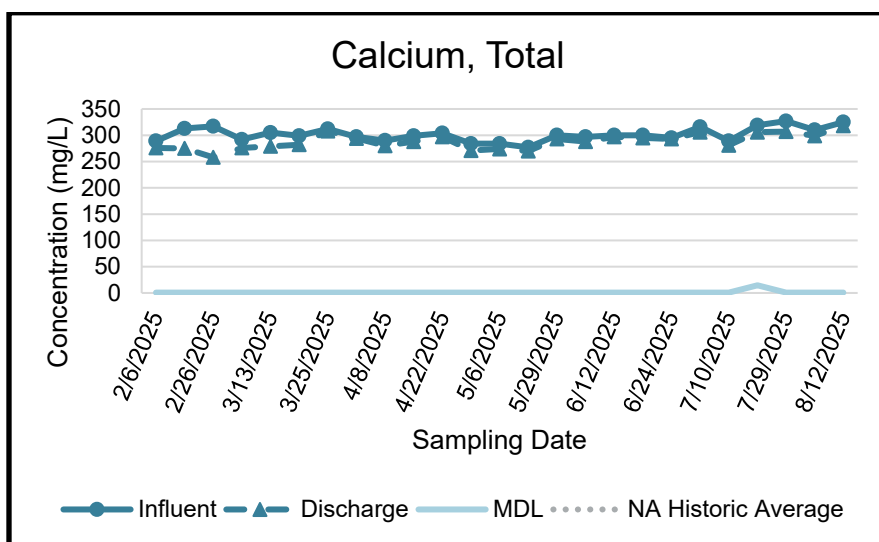
3.3.4 Salts Discussion

In this section, Waterleaf reviews the laboratory data results for salt constituents. GSL salts are important because they support the mineral extraction industry.

All salt cations and anions were reported with lower discharge concentrations than influent concentrations. These salt constituents are calcium, chloride, magnesium, potassium, sodium, and sulfate. The monitoring data for these constituents are graphed in Figure 3 below. Salt constituents' average discharge concentrations decreased in the range of 4.6% to 7.5% compared to average influent concentrations. This range is comparable to the average discharge concentration decrease in TDS of 8% compared to the average influent concentration.

To help determine impacts to North Arm chemistry due to operation of the Demonstration Plant, mass loads for the salt constituents were reviewed. Demonstration Plant mass loads were determined using all the laboratory data during operations (28 weeks). Demonstration Plant mass loads were calculated by subtracting average influent concentration and influent volume from average discharge concentrations and discharge volume. North Arm mass was calculated using the average influent concentration and the North Arm volume at a WSE of 4,192 feet. The result indicates that the Demonstration Plant reduced the salt constituents mass in the North Arm. The mass load comparison is shown in Table 8 below.

Figure 3. Graphs of Salt Constituents



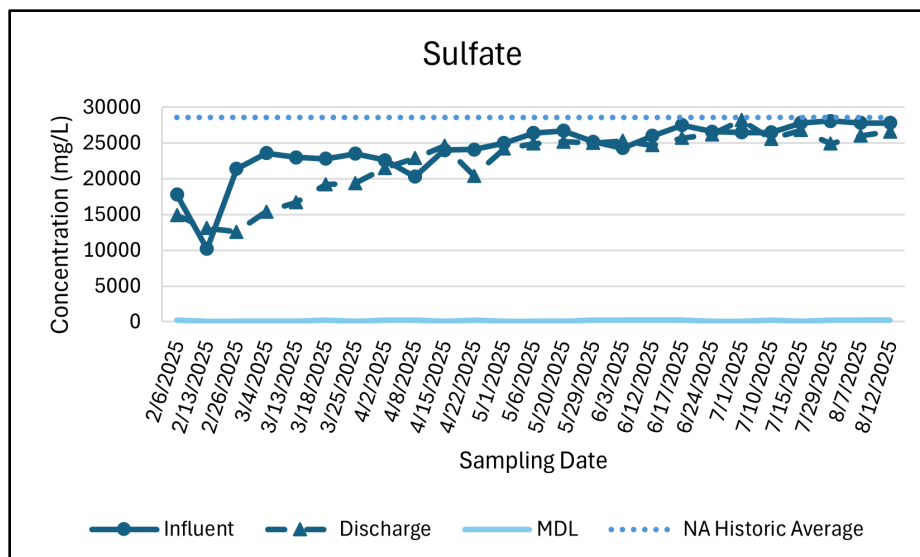
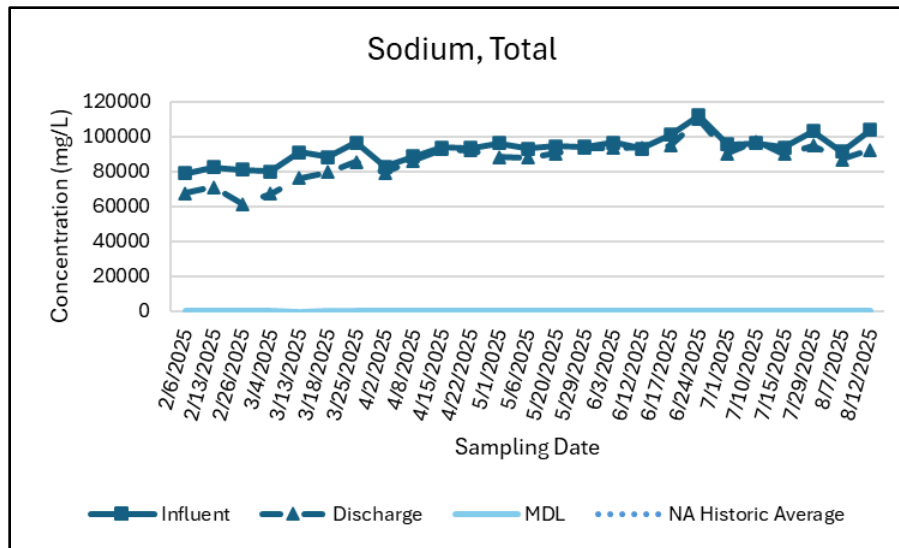
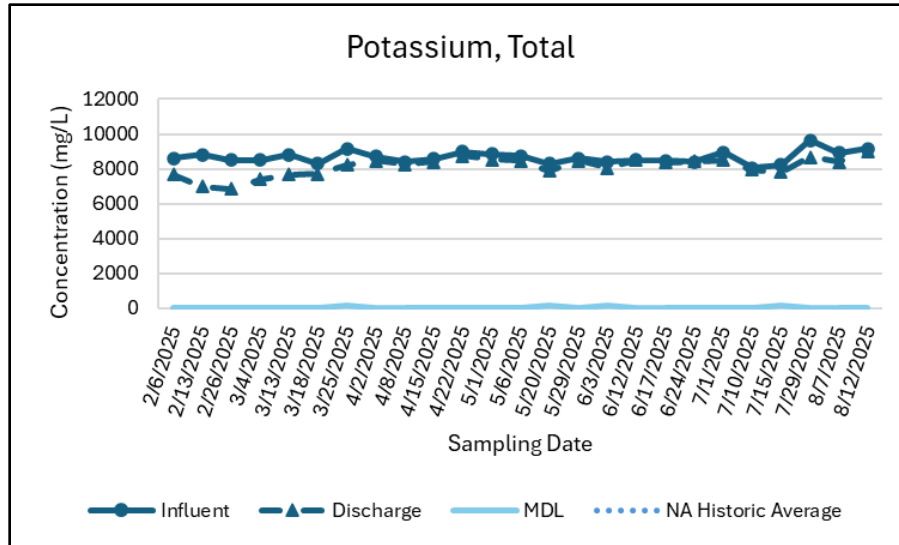


Table 8. Salt Load Comparison of Demonstration Plant Operations and North Arm

Constituent	Influent Average (mg/L)	Influent Load ¹ (lb)	Discharge Average (mg/L)	Discharge Load ² (lb)	Load to North Arm (lb)	North Arm Mass ³ (lb)
Calcium	302	2,750	288	2,720	-30	2,657,315,000
Chloride	181,400	1,652,500	168,400	1,591,900	-60,600	1,598,265,596,000
Magnesium	14,312	130,400	13,480	127,500	-2,900	126,099,103,000
Potassium	8,662	78,900	8,138	76,900	-2,000	76,322,028,000
Sodium	92,920	846,500	86,568	818,500	-28,000	818,692,609,000
Sulfate	24,220	220,600	22,400	211,800	-8,800	213,395,770,000

Definitions: af = acre-feet; lb = pounds; mg/L = milligrams per liter; WSE = water surface elevation

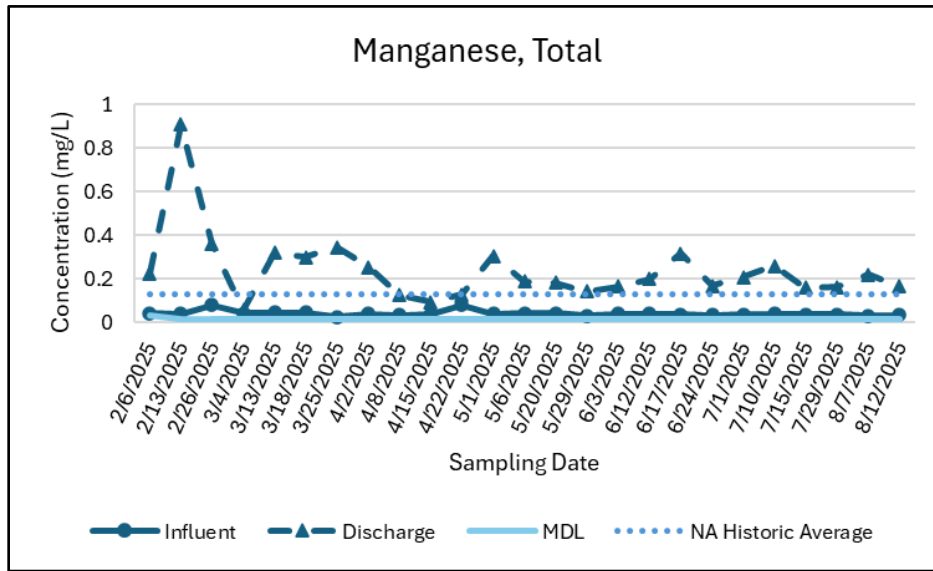
1. Based on a Demonstration Plant total intake volume of 3.35 af
2. Based on a Demonstration Plant total discharge volume of 3.47 af
3. North Arm Mass based on WSE of 4,192 feet and volume of 3,240,000 af with average influent concentrations

In assessing the mass decreases in the North Arm for salt constituents due to the Demonstration Plant's operation, mass decreases are considered by Waterleaf to be *de minimis*.

3.3.5 Manganese

Manganese is identified as a component of the DLE process and is discharged from the Demonstration Plant. This is the only constituent that resulted in higher concentrations in the discharge compared to the influent concentrations because of the DLE process. Figure 4 below shows the results of the weekly influent and discharge compliance sampling for manganese.

Figure 4. Graph of Manganese Influent and Discharge Data



Average discharge concentrations are reported higher than average influent concentrations over the entire duration of the Demonstration Plant's operation, including the start-up and performance run periods.

To help determine impacts to North Arm chemistry due to operation of the Demonstration Plant, the increase of the North Arm manganese mass was reviewed. Demonstration Plant manganese mass load was determined using all the laboratory data during operations (28 weeks). Demonstration Plant mass load was calculated by subtracting average influent concentration and influent volume from average discharge concentrations and discharge volume. North Arm mass was calculated using the average influent concentration and the North Arm volume at a WSE of 4,192 feet. The result indicates that the Demonstration Plant added about 1.88 lb of manganese to the mass in the North Arm, or, in other words, the mass of the North Arm increased by about 0.00052%. This increase in North Arm manganese mass due to the operation of the Demonstration Plant is considered by Waterleaf to be *de minimis*. The mass load comparison for manganese is shown in Table 9.

Table 9. Manganese Load Comparison of Demonstration Plant Operations and North Arm

Constituent	Influent Average (mg/L)	Influent Load ¹ (lb)	Discharge Average (mg/L)	Discharge Load ² (lb)	Load to North Arm (lb)	North Arm Mass ³ (lb)
Manganese	0.0411	0.37	0.2385	2.26	1.88	362,100

Definitions: af = acre-feet; lb = pounds; mg/L = milligrams per liter; WSE = water surface elevation

1. Based on a Demonstration Plant total intake volume of 3.35 af
2. Based on a Demonstration Plant total discharge volume of 3.47 af
3. North Arm Mass based on WSE of 4,192 feet and volume of 3,240,000 af with average influent concentrations

Waterleaf conducted additional data review related to the discharge of manganese. There are no federal or state water quality standards for manganese levels for

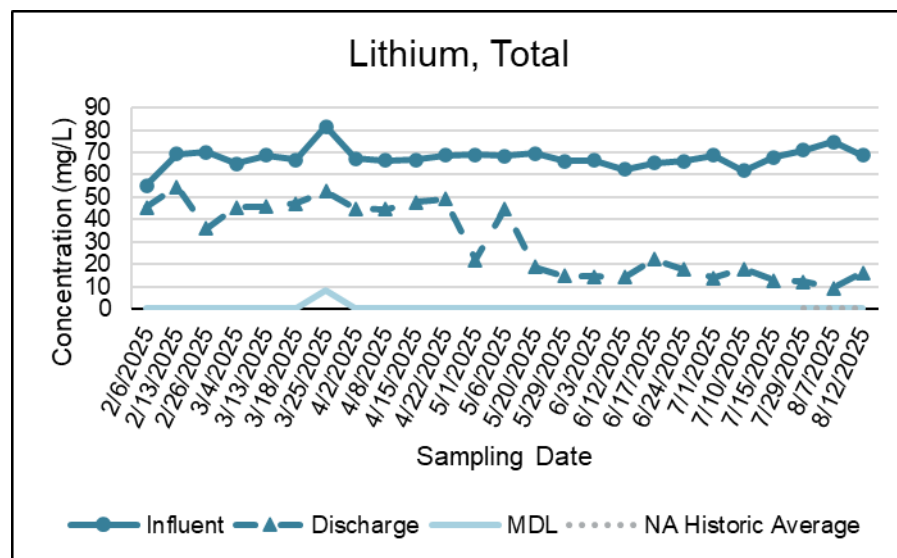
recreational exposures. Manganese is a mineral that exists naturally in the GSL and other freshwater bodies. Federal guidelines are published for dermal exposure to manganese during showering with tap water (drinking water) (HDR 2025). Waterleaf asserts that the manganese in the North Arm and in the depleted brine discharge is in solution and will not precipitate. This review determined that the increase in manganese discharged to the GSL due to the Demonstration Plant was not significant compared to existing standards and guidelines, existing North Arm loads, and protection of existing beneficial uses.

3.3.6 Lithium

Lithium is the targeted mineral for extraction by the Demonstration Plant. As a result, average discharge concentrations are less than average influent concentrations over the entire duration of the Demonstration Plant's operation, including the start-up and performance run periods. The extraction of lithium from the GSL is overseen by UDFSL, and royalties are paid by Waterleaf in accordance with GSL mineral extraction facility rules.

Figure 5 shows the results of the weekly influent and discharge compliance sampling for lithium.

Figure 5. Graph of Lithium Influent and Discharge Data



To help determine impacts to North Arm chemistry due to operation of the Demonstration Plant, the decrease of the North Arm lithium mass was reviewed. Demonstration Plant lithium mass load was determined using all the laboratory data during operations (28 weeks). Demonstration Plant mass load was calculated by subtracting average influent concentration and influent volume from average discharge concentrations and discharge volume. North Arm mass was calculated using the average influent concentration and the North Arm volume at a WSE of 4,192 feet. The result indicates that the Demonstration Plant reduced the North Arm lithium mass by about 326 lb, or, in other words, the mass of the North Arm decreased by about 0.000055%. This decrease in North Arm lithium mass due to the operation of the Demonstration Plant is

considered by Waterleaf to be *de minimis*. The mass load comparison for lithium is shown in Table 10.

Table 10. Lithium Load Comparison of Demonstration Plant Operations and North Arm

Constituent	Influent Average (mg/L)	Influent Load ¹ (lb)	Discharge Average (mg/L)	Discharge Load ² (lb)	Load to North Arm (lb)	North Arm Mass ³ (lb)
Lithium	67.7	617	30.8	291	-326	594,724,000

Definitions: af = acre=feet; lb = pounds; mg/L = milligrams per liter; WSE = water surface elevation

1. Based on a Demonstration Plant total intake volume of 3.35 af
2. Based on a Demonstration Plant total discharge volume of 3.47 af
3. North Arm Mass based on WSE of 4,192 feet and volume of 3,240,000 af with average influent concentrations

3.4 Field Chemistry Results

As identified in Table 1 above, field measurements were taken during the compliance monitoring events for influent and discharge flows. These field measurements are density, dissolved oxygen, pH, and temperature.

Table 11 summarizes the field measurements. Parameter-specific discussions follow the table.

Table 11. Summary of Field Measurements

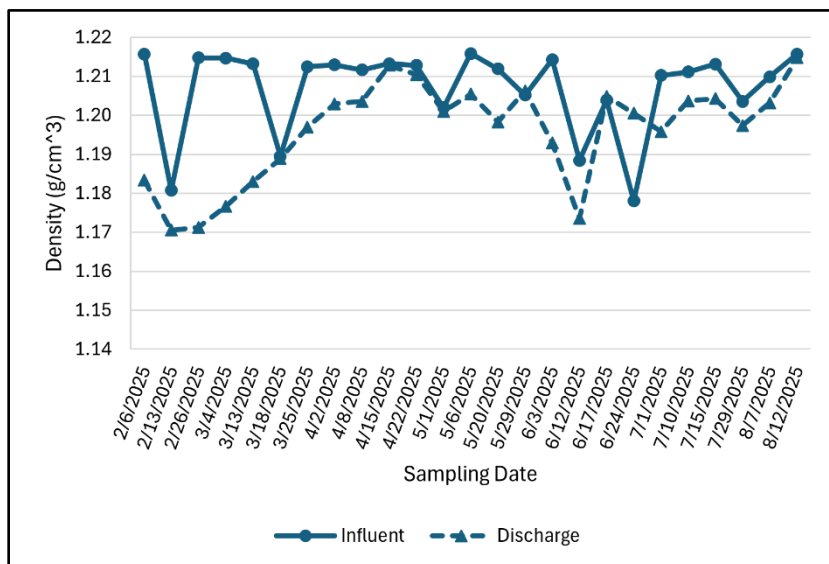
Field Parameter	Influent Average	Discharge Average	UPDES Limit
Density, g/cm ³	1.21	1.20	NA
Dissolved oxygen, mg/L	7.12	6.44	NA
pH	7.52	7.40	6.5–9
Temperature, °C	NA	NA	NA

Definitions: °C = degrees Celsius; g/cm³ = grams per cubic centimeter; mg/L = milligrams per liter; NA = not applicable; UPDES = Utah Pollutant Discharge Elimination System

3.4.1 Density

Influent density was relatively consistent, ranging between 1.21 and 1.22 grams per cubic centimeter (g/cm³). The influent density dipped on several occasions, and these dips were reasoned to be due to environmental conditions, specifically recent rainfall and the shallowness of the intake infrastructure (Figure 6 below).

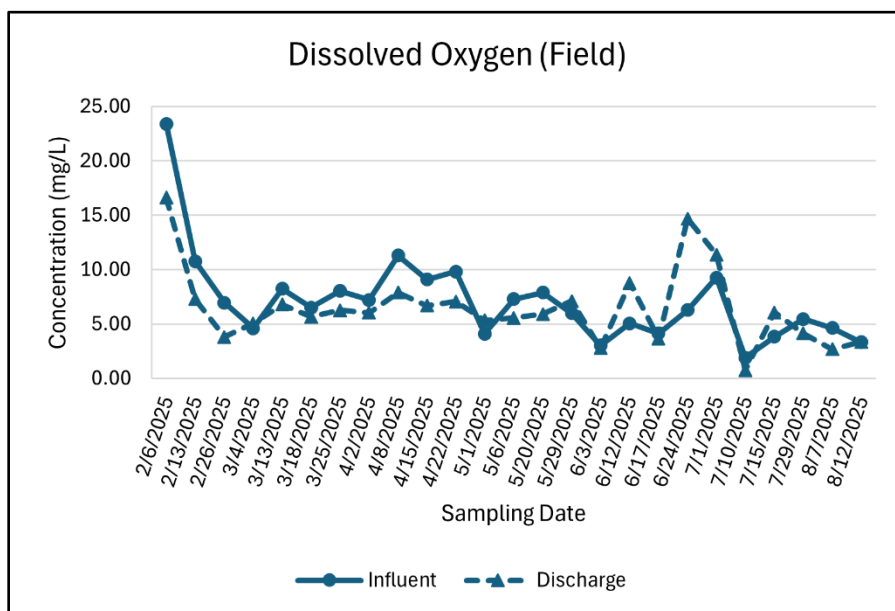
Figure 6. Density Graph



3.4.2 Dissolved Oxygen

Generally, the discharge dissolved oxygen (DO) measurements were less than the influent DO measurements. At the start of the Demonstration Plant's operation, more groundwater than North Arm brine was processed, resulting in higher DO levels (Figure 7).

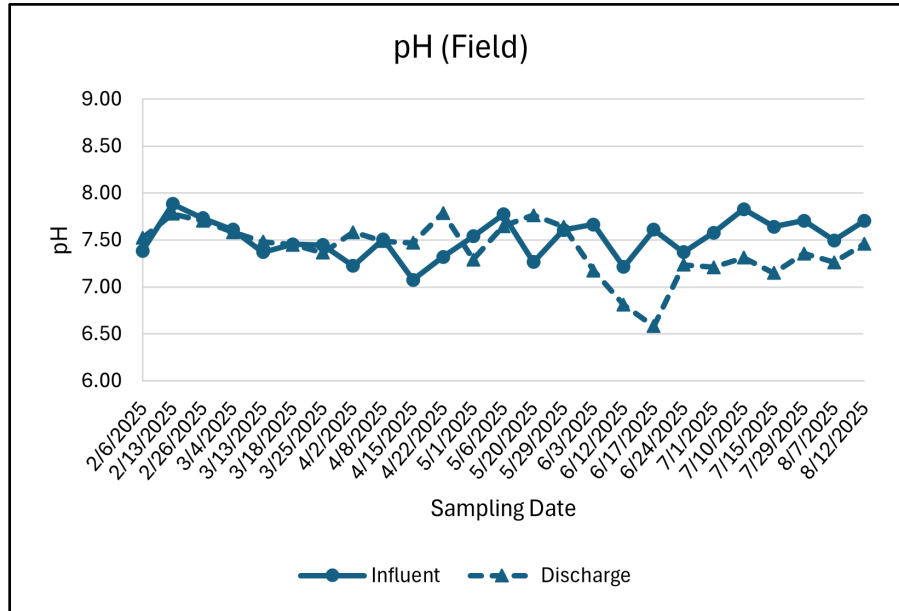
Figure 7. Dissolved Oxygen Graph



3.4.3 pH

Field measurements of pH for both the influent and discharge flows met the UPDES permit limit range of 6.5–9 (Figure 8).

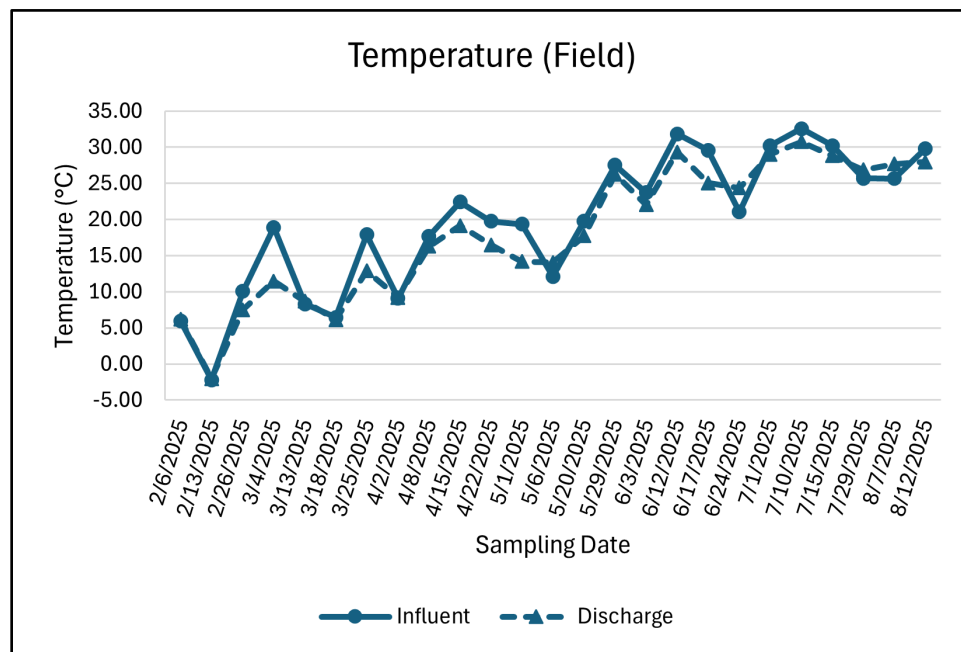
Figure 8. pH Graph



3.4.4 Temperature

Influent and discharge flow temperature measurements rose over the operation of the Demonstration Plant, following the expected seasonal warming of North Arm brine between February and August (Figure 9).

Figure 9. Temperature Graph



3.4.5 Influent and Discharge Water Salinity

HDR collected and reported the density at the intake and outfall locations during the Demonstration Plant's operation. These measurements were taken using an Anton Paar density meter. Per UDWQ rules, the Demonstration Plant cannot negatively alter the salinity of the North Arm of the GSL (UAC R317-16-2(16)(a)).

The GSL's salinity values were calculated using the formula below and documented in Open-File Report 0728, *Standard Operating Procedure – Great Salt Lake Water Density Measurement and Salinity Calculation* (UGS 2020).

$$S = \frac{\left(\sqrt{((1.04708 - (0.00112 * T))^2) - (4 * 0.000314721 * (-(\rho * 1000) + (\rho^0 * 1000) + (0.00199 * T^2) - (1.21061 * T) + 184.01602)))} \right)}{(2 * 0.000314721)}$$

ρ = density of GSL water (g/cm^3) ρ^0 = density of pure water (g/cm^3)
 S = salinity (g/L) T = water temperature ($^\circ\text{K}$)

However, as described in Open-File Report 0728, this salinity calculation is specific to typical South Arm densities, or salinity values up to about 18‰. For salinity values above 18‰, the result “shall be noted as outside the salinity range used to develop the GSL Equation of State” (UGS 2020). In 2023, the U.S. Geological Survey (USGS) published a data release that increased the upper boundary of the GSL salinity equation to 1.214.

Because the North Arm densities exceed this upper boundary, the equation is not validated to calculate North Arm salinity values (USGS 2023). Therefore, the salinity values were not calculated for this report, and Waterleaf compared density values as a surrogate value for salinity. This analysis is provided to support the determination that the Demonstration Project did not negatively alter the salinity (density) of the GSL.

Density profile data are shown in Figure 6 above for the influent and discharge flows for each monitoring event. Table 12 on the following page shows the influent and discharge density values as measured. Waterleaf asserts that the discharge from the Demonstration Plant did not affect the overall density of the North Arm. This is based on (1) the density measurements made and (2) a comparison of the total volume of discharge (3.48 acre-feet [af]) to the total volume of the North Arm of about 3.25 million acre-feet (maf), at an average WSE of 4,192 feet mean sea level during the Demonstration Plant's operation (USGS 2006), as shown in Figure 10 below.

Figure 10. North Arm Volume

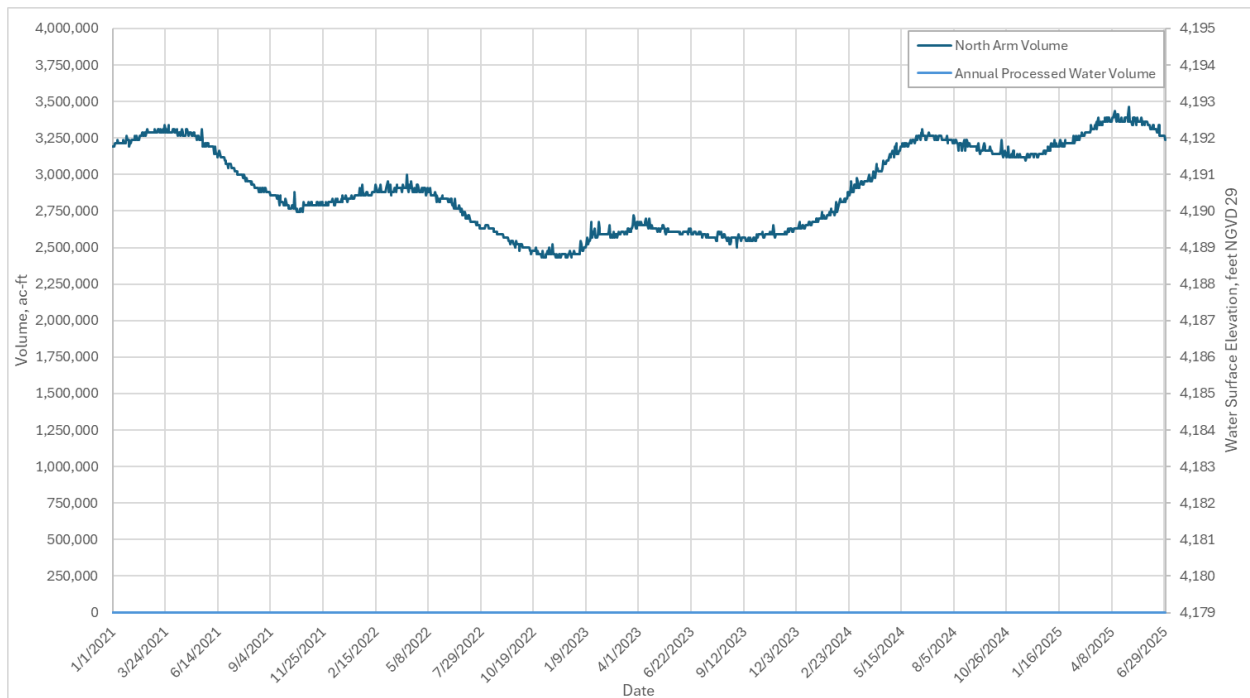


Table 12. Influent and Discharge
Density Results

Date	Influent Density	Discharge Density
2/6/25	1.216	1.183
2/13/25	1.181	1.171
2/20/25	No discharge	
2/26/25	1.215	1.171
3/4/25	1.215	1.177
3/13/25	1.213	1.183
3/18/25	1.190	1.189
3/25/25	1.213	1.197
4/2/25	1.213	1.203
4/8/25	1.212	1.204
4/15/25	1.213	1.213
4/22/25	1.213	1.210
5/1/25	1.202	1.201
5/6/25	1.213	1.205
5/12/25	No discharge	
5/20/25	1.212	1.198
5/29/25	1.205	1.206
6/03/25	1.214	1.193
6/12/25	1.188	1.174
6/17/25	1.204	1.205
6/24/25	1.178	1.201
7/1/25	1.210	1.196
7/10/25	1.211	1.204
7/15/25	1.213	1.204
7/22/25	No discharge	
7/29/25	1.204	1.197
8/7/25	1.210	1.203
8/12/25	1.216	1.215

4 Flow Monitoring Results

In accordance with the UPDES permit requirements, continuous influent and discharge flow monitoring results were used to determine average weekly and monthly maximum and average flows. These data were used to calculate average weekly and annual loads. These flow values were used to calculate monthly volumes for the influent and discharge.

Instantaneous flow monitoring results are documented on weekly field data sheets and were used to determine flow-weighted composite sampling.

In addition, groundwater added to the process was recorded.

4.1 Monthly Volume Results

Continuous flow monitoring during the Demonstration Plant's operation recorded a final influent volume of 3.35 af and a final discharge volume of 3.48 af. Monthly average flows and volumes are shown in Table 13.

Table 13. Demonstration Plant Influent and Discharge Flow Volume

Month	Total Volume (af)	
	Influent	Discharge
February 2025	0.306	0.238
March 2025	0.201	0.237
April 2025	0.662	0.694
May 2025	0.427	0.431
June 2025	0.644	0.627
July 2025	0.730	0.781
August 2025	0.385	0.470
Total	3.355	3.477

Definitions: af = acre-feet

4.2 Total Water Balance

Total water is defined as sum of the brine and externally sourced water (UAC R317-16-2(21)). The Demonstration Plant's total water balance is provided below based on data from the intake and outfall continuous flow meters. The discharge volume includes the flow from the externally sourced groundwater.

- North Arm brine influent volume: 3.355 af
- Externally sourced groundwater: 0.265 af
- Discharge volume to North Arm: 3.477 af

The water balance shows that about 4% of the brine and groundwater flow is not discharged. This residual water was retained in the lithium sulfate product, which is a liquid. The lithium sulfate was shipped off site for further processing into the lithium carbonate equivalent product, which is a powder.

Based on USGS bathymetric and topographic data, the North Arm's volumes at WSEs of 4,190 and 4,198 feet (NVGD 1929) are 2.7 maf and 4.9 maf, respectively (USGS 2006). As of June 25, 2025, the North Arm's WSE was about 4,192.1 feet, and the North Arm had a volume of 3,241,855 af (USGS 2025).

5 Biota Monitoring Results

Three monitoring events were conducted by Dr. Bonnie Baxter of Westminster University during the Demonstration Plant's operation (Baxter 2025). By design, the first monitoring event occurred during the first month of operation, and the second monitoring event occurred 2 months later. The third monitoring event was added during the summer as the algae community began to grow as a result of the warmer brine temperatures. The first monitoring event occurred on February 28, 2025, during week 4 of operation; the second on April 24, 2025, during week 12 of operation; and the third on June 23, 2025, during week 21 of operation. The study design captured seasonal biota presence in the North Arm and the plant's discharge during its operation. This section summarizes the biota monitoring report, which is provided as Appendix C, *Biota Monitoring Report*.

In summary, North Arm biota were present in both the influent and discharge flows collected during all monitoring events, and the abundance and diversity of biota in the samples varied seasonally, as anticipated. The growth rates of biota in the influent, discharge, and mixed samples were similar. The study provides evidence that the Demonstration Plant's DLE process does not harm North Arm biota.

5.1 Presence of Biota

A hemacytometer (which provides a grid and special cover glass to control the distributed volume) was used to estimate the cell density in each of the influent and discharge samples. The results are shown in Table 14. The first samples, from February, demonstrated a robust cell density in the influent sample, but the discharge sample (with observed rust flakes) had few if any visible cells. The April samples had comparable numbers of cells in the discharge as in the influent, and the cells-per-milliliter counts were in the billions. The June samples had more cells in the influent than in the discharge. This decrease is mostly due to the presence of algae (which was not present in February and April) in the influent and reduced numbers in the discharge due to filtration. By comparing influent and discharge samples, this analysis provides evidence that the Demonstration Plant's DLE process does not reduce biota cell count for archaea, bacteria, or fungi; algae reductions, when they occurred, were due to filtration.

Table 14. Biota Cell Counts and Dry Weight

Month	Number of Cells Observed via Hemacytometer (cells per mL)		Dry Weight of Biota (g/L)	
	Influent	Discharge	Influent	Discharge
February 2025	2.8×10^8	None observed ¹	Not analyzed	
April 2025	3.6×10^9	4.6×10^9	3.7	4.5
June 2025	8.1×10^9	5.3×10^9	5.2	4.2

Definitions: g/L = grams per liter; mL = milliliters

- Although no cells were observed using the hemacytometer, DNA sequencing revealed the presence and abundance of archaea, bacteria, and fungi in the discharge sample.

5.2 Biota Diversity

To document the species of biota that are present in both the influent and discharge flows, a consulting laboratory was contracted for DNA sequencing. The laboratory amplified DNA genes (16S rRNA, 18S rRNA, or ITS) associated with bacteria, archaea, algae, or fungi. The DNA is very specific to communities that might be present in North Arm brine. For the February and April monitoring events, archaea, bacteria, and fungi were present and abundant, but algae was not present. This is to be expected because the colder temperatures of North Arm brine in February and April do not support algae communities. Algae communities were observed in samples from the June monitoring event.

This analysis provides the relative abundance of the specific biota. It is important to note that the abundance is relative to other species in the influent or discharge samples, but no comparison of the influent to the discharge is valid. The abundance of archaea, bacteria, and fungi for the April monitoring event is shown in Figure 11. The abundance of archaea and bacteria (prokaryotes) and algae (eukaryotes) for the June monitoring event is shown in Figure 12.

By comparing influent and discharge (effluent) flow samples, this analysis provides evidence that the Demonstration Plant's DLE process does not reduce biota cell diversity in the North Arm of the GSL for archaea, bacteria, and fungi species. These biota are not affected by the DLE processes, including filtration, due to the small size (1–2 microns) of the individual organisms. When algae species are present during the warm summer months, the number of species is reduced by the filtration process due to the larger size (10–20 microns) of the individual organisms.

Figure 11. April 2025 Biota Abundance Graphs

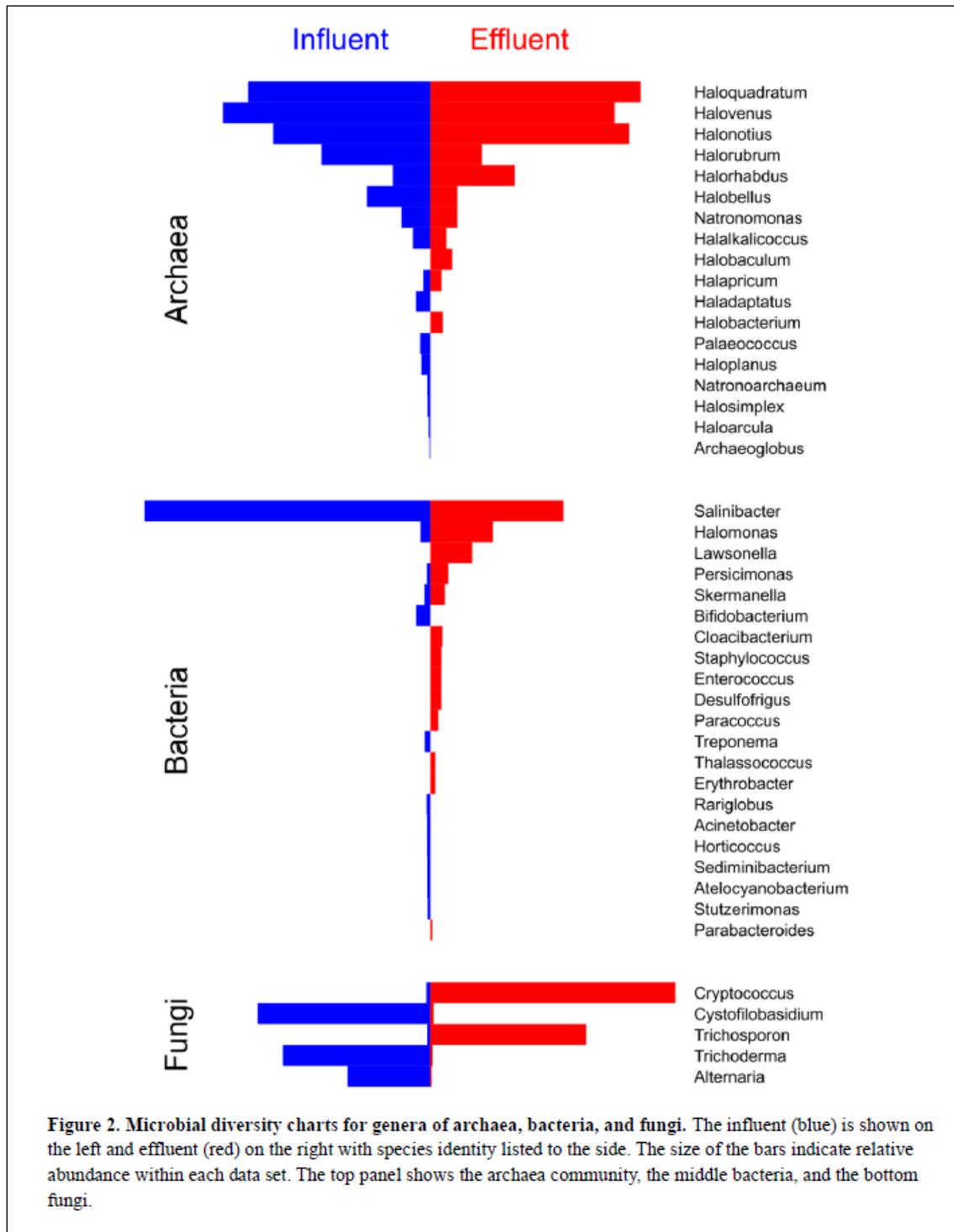
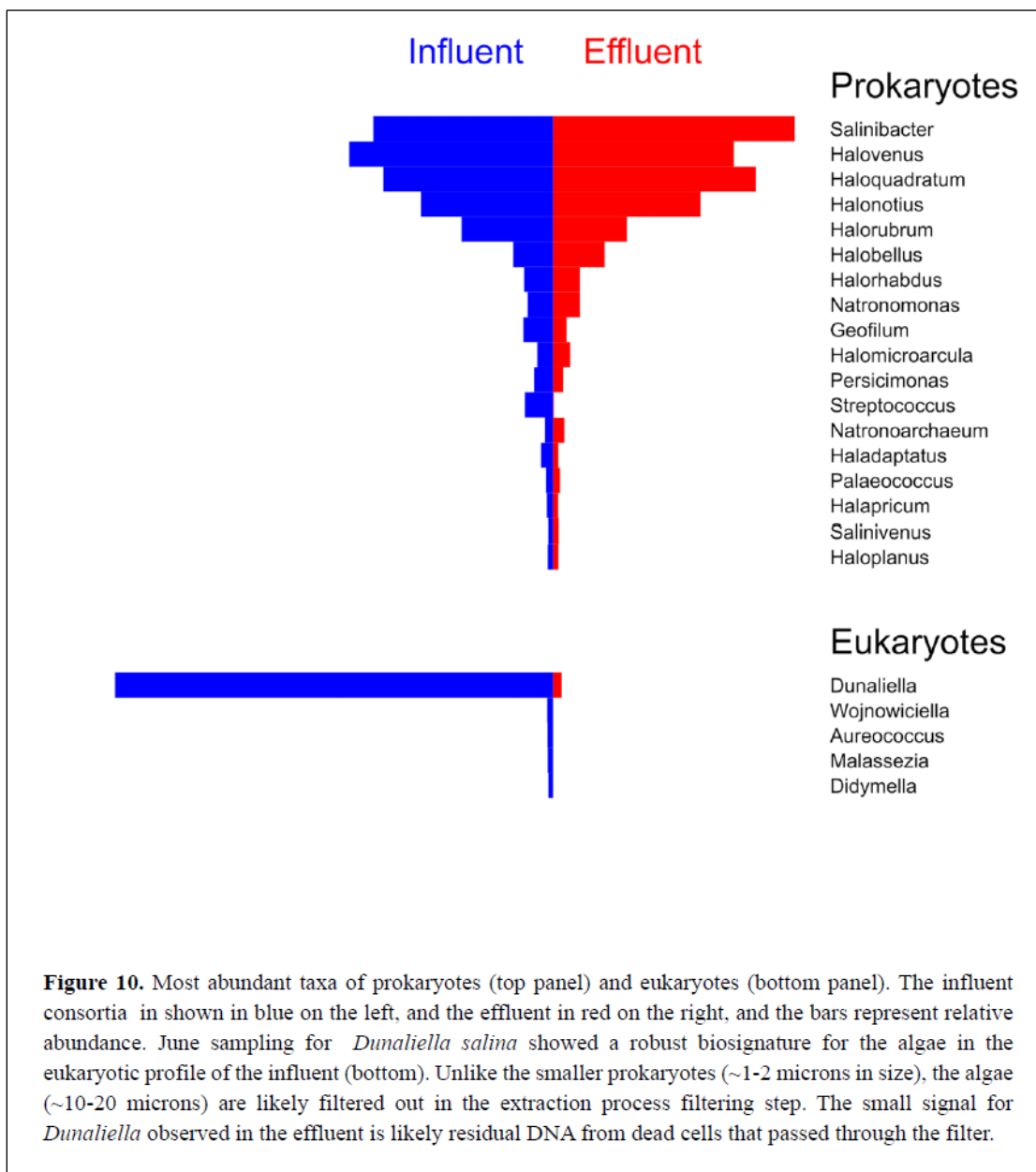


Figure 12. June 2025 Biota Abundance Graphs

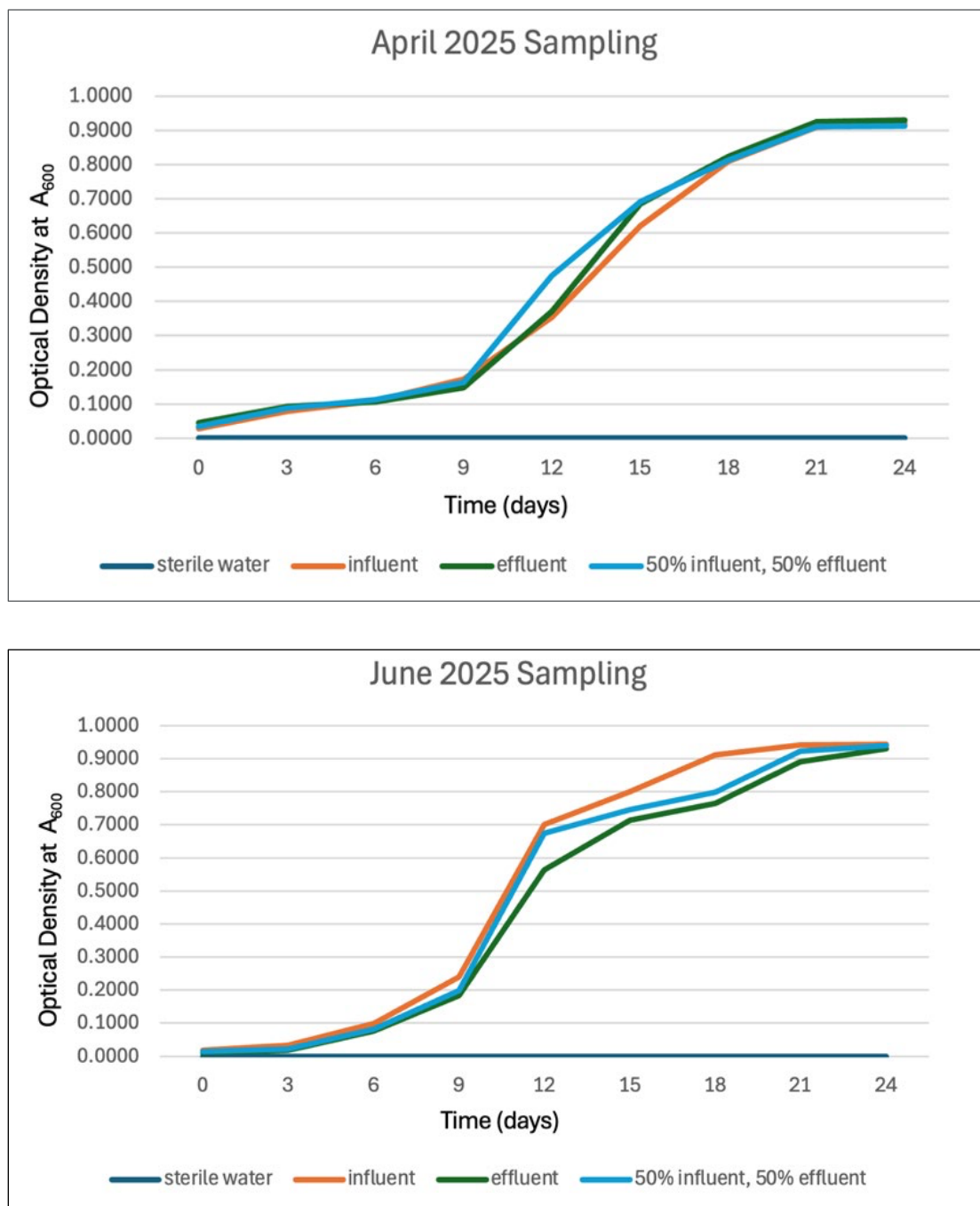


5.3 Biota Growth in Discharge

To understand the effects of discharges into the North Arm on biota growth, a time course growth experiment was conducted on influent, discharge, or a mix of the influent and discharge (representing North Arm brine after discharge). The protocol that was used consisted of inoculating 9 milliliters (mL) of 23% salt modified growth media (Dyall-Smith 2009) with 1 mL of sample. The inoculated samples consisted of (1) sterile deionized water serving as a control, (2) influent flow, (3) discharge (effluent) flow, and (4) a 50:50 mix of influent and discharge, which represents the in-lake mixture of discharge and brine.

Figure 13 shows the growth curves of the samples collected during the April and June monitoring events. All samples follow a standard growth curve. The microbial communities appear to have reached a stationary growth phase over this period of study. This is expected of healthy cultures. Also note that the sample representing the North Arm brine mixed with the discharge flow did not visibly affect growth of the biota. By comparing influent, discharge, and mixture sample results, this analysis provides evidence that the Demonstration Plant's DLE process does not prevent biota cell growth in the North Arm of the GSL.

Figure 13. April and June 2025 Biota Growth Results



6 Evaluation of No Negative Impact on the GSL from Demonstration Plant Operation

Waterleaf evaluated the results of the chemistry and biota analyses to determine whether negative impacts on the North Arm's chemistry and biota occurred during the operation of the Demonstration Plant.

Negative impact is defined by UDWQ R317-16-16 to include the following evaluation criteria:

Negative impact includes any activity or action that:

- Causes pollution, or negatively alters the salinity or other aspects of water chemistry in Great Salt Lake;
- Negatively alters the volume or timing of water flows to Great Salt Lake, or water levels in Great Salt Lake or Great Salt Lake wetlands;
- Reduces, degrades, or otherwise negatively alters habitat in and around Great Salt Lake; or
- Results in harmful physiological impacts to Great Salt Lake biota, including disruptions to survival, reproduction, or growth.

Waterleaf asserts no negative impacts on the North Arm of the GSL based on the above criteria. These evaluation criteria are discussed below.

6.1 Impacts on North Arm Salinity or Water Quality Chemistry

Waterleaf asserts that there were no negative impacts on North Arm salinity or water quality chemistry from operation of the Demonstration Plant, based on the results, analysis and review provided in Section 3.3, *Chemistry Monitoring Results Discussion and Graphs*. This assertion is based on the following:

- Compliance monitoring met the requirements of the UPDES permit for protecting the beneficial uses of the North Arm of the GSL. No water quality standards were exceeded.
- The incremental decrease in volume discharged (0.142 af; influent and groundwater volume subtracted from discharge volume) compared to the total volume of the North Arm of the GSL (3.24 maf) indicates that the Demonstration Plant's retained volume is *de minimis* and would not impact North Arm salinity or water quality.
- The Demonstration Plant's operation was temporary (7 months).
- The results of the compliance monitoring analysis, comparing average discharge concentrations to average influent concentrations and MDLs, uncertainty and error consideration, association of specific monitoring results due to operational phases, comparison of the mass load to the North Arm from Demonstration Plant operations to existing North Arm mass loads, and results of the biota monitoring study provide evidence that the Demonstration Plant did not harm North Arm water quality.

- Manganese, a component of the DLE process, had higher average discharge concentrations compared to the average influent concentrations. Examination of federal and state standards for lake recreational contact revealed that no standards or guidelines exist. Discharge concentrations are well below federal guidelines for dermal exposure due to showering in drinking water.
- The density of the North Arm discharge did not vary significantly from the density of the influent. This data shows that the density (salinity) of the North Arm was not changed due to the operation of the Demonstration Plant.

6.2 Impacts on North Arm Volume, Flows, or Water Levels

Waterleaf asserts that there were no negative impacts on North Arm volume, flows, or water levels from operation of the Demonstration Plant. This assertion is based on continuous flow monitoring data collected during operation of the Demonstration Plant. The flow monitoring data documented that the influent and discharge flows were comparable during operation. The Demonstration Plant diverted raw brine directly from the open waters of the GSL and discharged depleted brine back to the open waters of the GSL. The processing time from when the raw brine was diverted to when the depleted brine was discharged was less than 8 hours. The Demonstration Plant did not divert any surface water flows for its operation.

The results of the flow monitoring events are summarized in Section 4, *Flow Monitoring Results*.

Based on the Demonstration Plant's flow monitoring and the final water balance, the volume of North Arm raw brine diverted and groundwater added was documented to be discharged back to the North Arm, less water lost to processing the product. The amount of water (about 0.142 af) used to produce the liquid product is considered by Waterleaf to be *de minimis* compared to the 3.24 maf in the North Arm (at a WSE of 4,192 feet). Because no surface waters were diverted, the Demonstration Plant did not alter the timing of water flows to the North Arm of the GSL.

Waterleaf asserts that the Demonstration Plant did not alter the volume or timing of water flows to the GSL or the water levels in the GSL or GSL wetlands.

6.3 Impacts on North Arm Habitat

Waterleaf asserts that there were no negative impacts on North Arm habitat. This assertion is based on evaluating the presence of microbialites that could be present or could grow in and along the open waters of the GSL. Based on the survey conducted on the intake and outfall pipe easements before construction of the Demonstration Plant, no microbialite structures were identified (HDR 2024).

Therefore, Waterleaf asserts that the Demonstration Plant did not reduce, degrade, or otherwise negatively alter habitat in and around the North Arm of the GSL.

6.4 Impacts on North Arm Biota

To evaluate impacts on North Arm biota, Waterleaf contracted with Dr. Bonnie Baxter of Westminster University to conduct biota monitoring during operation of the Demonstration Plant (Baxter 2025). The biota monitoring documented the presence and abundance of biota (archaea, bacteria, algae, and fungi) in the influent to and the discharge from the Demonstration Plant during its operation. The study also investigated whether biota could reproduce and grow in the discharge water from the Demonstration Plant.

The results of the biota analyses are summarized in Section 5, *Biota Monitoring Results*, and the complete report is provided as Appendix C, *Biota Monitoring Report*.

Based on the biota monitoring study and results, North Arm biota were documented to be present and abundant in the raw brine influent and Demonstration Plant discharge water during its operation. Biota were also documented to grow and reproduce in the discharge water from the Demonstration Plant. Therefore, Waterleaf asserts that the Demonstration Plant did not disrupt survival, reproduction, or growth of North Arm biota (archaea, algae, bacteria, and fungi) and did not have a negative impact on the biota of the North Arm of the GSL.

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APPENDIX A

UPDES Permit

STATE OF UTAH
DIVISION OF WATER QUALITY
DEPARTMENT OF ENVIRONMENTAL QUALITY
SALT LAKE CITY, UTAH

UTAH POLLUTANT DISCHARGE ELIMINATION SYSTEM (UPDES) PERMITS

Minor Industrial Permit No. **UT0026280**

In compliance with provisions of the Utah *Water Quality Act, Title 19, Chapter 5, Utah Code* (the “Act”),

WATERLEAF RESOURCES, LLC (Permittee),

is hereby authorized to discharge from

GREAT SALT LAKE LITHIUM PROJECT (Facility),

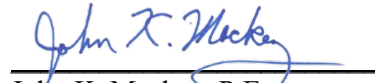
to receiving waters named **GUNNISON BAY, THE GREAT SALT LAKE,**

in accordance with specific limitations, outfalls, and other conditions set forth herein.

This permit shall become effective on **February 4th, 2025.**

This permit expires at midnight on **February 4th, 2028.**

Signed this **fourth day of February 2025.**



John K. Mackey, P.E.
Director

DWQ-2024-000479

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PART I
DISCHARGE PERMIT NO. UT0026280
WASTEWATER

I. DISCHARGE LIMITATIONS AND REPORTING REQUIREMENTS

- A. Description of Discharge Points. The authorization to discharge wastewater provided under this part is limited to those outfalls specifically designated below as discharge locations. Discharges at any location not authorized under a UPDES permit are violations of the *Act* and may be subject to penalties under the *Act*. Knowingly discharging from an unauthorized location or failing to report an unauthorized discharge may be subject to criminal penalties as provided under the *Act*.

Outfall Number
001

Location of Discharge Outfall
Discharge to Gunnison Bay, Great Salt Lake.
Located at latitude 41° 26' 44.16" and longitude
112° 41' 36.04".

- B. Narrative Standard. It shall be a violation of this permit, for Permittee to discharge effluent or place any waste, pollutant, or other substance into Waters of the State in such a way as will be or may become offensive such as unnatural deposits, floating debris, oil, scum, or other nuisances such as color, odor or taste, or cause conditions which produce undesirable aquatic life, objectionable tastes in edible aquatic organisms; or result in concentrations or combinations of substances which produce undesirable physiological responses in desirable resident fish, or other desirable aquatic life, or undesirable human health effects, as determined by a bioassay or other tests performed in accordance with standard procedures.

C. Specific Limitations and Self-Monitoring Requirements.

1. Effective immediately, and lasting through the life of this permit, there shall be no acute or chronic toxicity in Outfall 001 as defined in *Part VIII*.
2. Discharge Limitations and Reporting Requirements:
 - a. The limitations specified in this section shall be applied on a net basis, unless otherwise noted, if the source of the applicant's water supply is the same body of water into which the discharge is made. With the exception of calcium, there shall be no discharge of process wastewater pollutants into navigable waters. See Fact Sheet Statement of Basis for more information.
 - b. Permittee must notify the Division of Water Quality (DWQ) fourteen (14) days prior to discharge. From the date the Permittee begins discharge, Permittee will be authorized to discharge from Outfall 001 for twelve (12) consecutive months only.
 - c. Such discharges shall be limited and monitored by the Permittee as specified below:

Parameter	Effluent Limitations *a				
	Maximum Weekly Avg	Annual Load	Weekly Load	Daily Minimum	Daily Maximum
Total Flow *b, *c, *d Demonstration Plant	0.06	--	--	--	0.12
Temperature *d	Report	--	--	--	Report
pH, Standard Units	--	--	--	6.5	9
Oil & Grease	--	--	--	--	10.0
Total Alkalinity, *d	Report	--	--	--	Report
Total Dissolved Solids *d	Report	--	--	--	Report
Total Suspended Solids *d	Report	--	--	--	Report

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WASTEWATER

Sulfate *d	Report	--	--	--	Report
Nitrate *d	Report	--	--	--	Report
Nitrite *d	Report	--	--	--	Report
Carbonate *d	Report	--	--	--	Report
Hydroxide *d	Report	--	--	--	Report
Chemical Oxygen Demand *d	Report	--	--	--	Report
Biological Oxygen Demand *d	Report	--	--	--	Report
Silica *d	Report	--	--	--	Report
Sodium *d	Report	--	--	--	Report
Calcium *d *e	Report	--	--	--	Report
Potassium *d	Report	--	--	--	Report
Boron *d	Report	--	--	--	Report
Bromine *d	Report	--	--	--	Report
Silicon *d	Report	--	--	--	Report
Total Lithium *d	Report	--	--	--	Report
Total Arsenic *d, *f	--	*g	*h	--	--
Total Cadmium *d, *f	--	*g	*h	--	--
Total Chromium *d, *f	--	*g	*h	--	--
Total Copper *d, *f	--	*g	*h	--	--
Total Lead *d, *f	--	*g	*h	--	--
Total Molybdenum *d, *f	--	*g	*h	--	--
Total Nickel *d, *f	--	*g	*h	--	--
Total Selenium *d, *f	--	*g	*h	--	--
Total Silver *d, *f	--	*g	*h	--	--
Total Zinc *d, *f	--	*g	*h	--	--
Total Cyanide *d, *f	--	*g	*h	--	--
Total Mercury *d, *f	--	*g	*h	--	--

Self-Monitoring and Reporting Requirements *a			
Parameter	Frequency	Sample Type	Units
Total Flow *b, *c, *d	Continuous	Recorder	MGD
pH	Weekly	Instantaneous	SU
DO	Weekly	Instantaneous	mg/L
Temperature *d	Weekly	Instantaneous	mg/L
Oil & Grease *i	Weekly	Grab	mg/L
Total Alkalinity, *d	Weekly	Composite	mg/L
Total Dissolved Solids *d	Weekly	Composite	mg/L
Total Suspended Solids *d	Weekly	Composite	mg/L
Sulfate *d	Weekly	Composite	mg/L
Nitrate *d	Weekly	Composite	mg/L
Nitrite *d	Weekly	Composite	mg/L
Carbonate *d	Weekly	Composite	mg/L
Hydroxide *d	Weekly	Composite	mg/L
Chemical Oxygen Demand *d	Weekly	Composite	mg/L
Biological Oxygen Demand *d	Weekly	Composite	mg/L
Silica *d	Weekly	Composite	mg/L
Sodium *d	Weekly	Composite	mg/L
Calcium *d, *e	Weekly	Composite	mg/L
Potassium *d	Weekly	Composite	mg/L
Boron *d	Weekly	Composite	mg/L

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Bromine *d	Weekly	Composite	mg/L
Silicon *d	Weekly	Composite	mg/L
Total Lithium *d	Weekly	Composite	mg/L
Total Arsenic	Weekly	Composite	mg/L, kg/day
Total Cadmium	Weekly	Composite	mg/L, kg/day
Total Chromium	Weekly	Composite	mg/L, kg/day
Total Copper	Weekly	Composite	mg/L, kg/day
Total Lead	Weekly	Composite	mg/L, kg/day
Total Molybdenum	Weekly	Composite	mg/L, kg/day
Total Nickel	Weekly	Composite	mg/L, kg/day
Total Selenium	Weekly	Composite	mg/L, kg/day
Total Silver	Weekly	Composite	mg/L, kg/day
Total Zinc	Weekly	Composite	mg/L, kg/day
Total Cyanide	Weekly	Composite	mg/L, kg/day
Total Arsenic	Yearly	Composite	kg/year
Total Cadmium	Yearly	Composite	kg/year
Total Chromium	Yearly	Composite	kg/year
Total Copper	Yearly	Composite	kg/year
Total Lead	Yearly	Composite	kg/year
Total Molybdenum	Yearly	Composite	kg/year
Total Nickel	Yearly	Composite	kg/year
Total Selenium	Yearly	Composite	kg/year
Total Silver	Yearly	Composite	kg/year
Total Zinc	Yearly	Composite	kg/year
Total Cyanide	Yearly	Composite	kg/year

*a See Definitions, *Part VIII*, for definition of terms.

*b Flow measurements of influent/effluent volume shall be made in such a manner that Permittee can affirmatively demonstrate that representative values are being obtained.

*c If the rate of discharge is controlled, the rate and duration of discharge shall be reported.

*d In addition to monitoring the final discharge, influent samples shall be taken and analyzed for this constituent at the same frequency as required for this constituent in the discharge.

*e Discharge of calcium is allowed as a process wastewater pollutant. See Fact Sheet Statement of Basis for more information.

*f The minimum detection limit (MDL) of the test method used for analysis must be below this limit in mg/L. If a test method is not available, Permittee must submit documentation to the Director regarding the method that will be used. Total Arsenic 0.180 mg/L, Total Cadmium 0.0052 mg/L, Total Chromium 0.0166 mg/L, Total Copper 0.067 mg/L, Total Lead 0.0465 mg/L, Total Molybdenum NA, Total Nickel 0.376 mg/L, Total Selenium 0.0079 mg/L, Total Silver 0.0899 mg/L, Total Zinc 0.675 mg/L, Total Cyanide 0.0093 mg/L, Total Mercury 0.000022 mg/L.

*g The average annual load for this parameter in the final discharge shall not exceed +10% of the load in the intake water as reported in kg/year.

*h The average weekly load for this parameter in the final discharge shall not exceed +10% of the load in the intake water as reported in kg/day.

*i Oil & Grease sampled when sheen is present or visible. If no sheen is present or visible, report NA.

d. As authorized in Part VII.E.:

(1) Permittee shall establish laboratory quality performance for the Great Salt Lake North Arm matrix as soon as possible, and present and review the laboratory quality performance with the Director.

(a) Based on the laboratory quality performance, Permittee shall work with the Director to define suitable data quality objectives for the Demonstration Plant, that evidence protection of Great Salt Lake

PART I
DISCHARGE PERMIT NO. UT0026280
WASTEWATER

chemistry and biota. Following the work with the Director, Permittee shall formalize the recommended data quality objectives, in writing, and submit to the Director prior to completion of testing at the Demonstration Plant.

- (2) Permittee shall submit a Level IV data quality package with each compliance sample.
- (3) Permittee shall coordinate with DWQ on the collection and delivery of a split sample for each compliance sample taken. Permittee shall handle and deliver split samples using proper chain of custody procedures as described in 40 C.F.R. § 136.

D. Reporting of Monitoring Results.

- 1. Reporting of Wastewater Monitoring Results Monitoring results obtained by the Permittee during the previous month shall be summarized for each month and reported to DWQ on a Discharge Monitoring Report Form (EPA No. 3320-1) * or by NetDMR, post-marked or entered into NetDMR no later than 28 days after the last day of the reporting period. The first report is due on **March 28, 2025**. If no discharge occurs during the reporting period, “no discharge” shall be reported. Legible copies of these, and all other reports including whole effluent toxicity (WET) test reports required herein, shall be signed and certified in accordance with the requirements of *Signatory Requirements (see Part VII.G)*, and submitted by NetDMR, or to the Division of Water Quality at the following address:

Department of Environmental Quality
Division of Water Quality
PO Box 144870
Salt Lake City, Utah 84114-4870

* Starting January 1, 2017 monitoring results must be submitted using NetDMR unless Permittee has successfully petitioned for an exception.

PART II
DISCHARGE PERMIT NO. UT0026280
PRETREATMENT

II. PRETREATMENT REQUIREMENTS

A. Definitions. For this section, the following definitions shall apply:

1. *Indirect Discharge* means the introduction of pollutants into a publicly-owned treatment works (POTW) from any non-domestic source regulated under section 307 (b), (c) or (d) of the CWA.
2. *Interference* means a discharge which, alone or in conjunction with a discharge or discharges from other sources, both:
 - a. Inhibits or disrupts the POTW, its treatment processes or operations, or its sludge processes, use or disposal; and
 - b. Therefore is a cause of a violation of any requirement of the POTW's NPDES permit (including an increase in the magnitude or duration of a violation) or of the prevention of sewage sludge use or disposal in compliance with the following statutory provisions and regulations or permits issued thereunder (or more stringent State or local regulations): Section 405 of the Clean Water Act, the Solid Waste Disposal Act (SWDA) (including title II, more commonly referred to as the Resource Conservation and Recovery Act (RCRA), and including State regulations contained in any State sludge management plan prepared pursuant to subtitle D of the SWDA), the Clean Air Act, the Toxic Substances Control Act, and the Marine Protection, Research and Sanctuaries Act.
3. *Pass Through means* a Discharge which exits the POTW into waters of the United States in quantities or concentrations which, alone or in conjunction with a discharge or discharges from other sources, is a cause of a violation of any requirement of the POTW's NPDES permit (including an increase in the magnitude or duration of a violation).
4. *Publicly Owned Treatment Works or POTW* means a treatment works, as defined by section 212 of the CWA, which is owned by a State or municipality (as defined by section 502(4) of the CWA). This definition includes any devices and systems used in the storage, treatment, recycling and reclamation of municipal sewage or industrial wastes of a liquid nature. It also includes sewers, pipes and other conveyances only if they convey wastewater to a POTW Treatment Plant. The term also means the municipality, as defined in section 502(4) of the CWA, which has jurisdiction over the Indirect Discharges to and the discharges from such a treatment works.
5. *Significant Industrial User (SIU)* is defined as an Industrial User discharging to a POTW that satisfies any of the following:
 - a. Has a process wastewater flow of 25,000 gallons or more per average work day;
 - b. Has a flow greater than five percent of the flow carried by the municipal system receiving the waste;
 - c. Is subject to Categorical Pretreatment Standards, or
 - d. Has a reasonable potential for adversely affecting the operation of the POTW or violating any pretreatment standard or requirement.
6. *User or Industrial User (IU)* means a source of Indirect Discharge.

PART II
DISCHARGE PERMIT NO. UT0026280
PRETREATMENT

- B. Discharge to POTW. Any wastewaters discharged to a Publicly Owned Treatment Works (POTW), either as an Indirect Discharge or as a hauled waste, are subject to Federal, State and local pretreatment regulations. Pursuant to Section 307 of The Water Quality Act of 1987, Permittee shall comply with all applicable federal General Pretreatment Regulations promulgated at 40 CFR 403, the State Pretreatment Requirements at Utah Administrative Code (UAC) R317-8-8, and any specific local discharge limitations developed by the POTW accepting the wastewaters. At a minimum, the discharge into a POTW must meet the requirements of Part II. C., D. and E. of the permit.
- C. Hazardous Waste Notification. Permittee must notify the POTW, the EPA Regional Waste Management Director, the Director and the State hazardous waste authorities in writing if they discharge any substance into a POTW that, if otherwise disposed of, would be considered a hazardous waste under 40 CFR 261. This notification must include the name of the hazardous waste, the EPA hazardous waste number, and the type of discharge (continuous or batch).
- D. General and Specific Prohibitions.
1. General Prohibitions. Permittee may not introduce into a POTW any pollutant(s) which cause Pass Through or Interference. These general prohibitions and the specific prohibitions in II. D. 2. of this section apply to the introducing pollutants into a POTW whether or not Permittee is subject to other National Pretreatment Standards or any national, State, or local Pretreatment Requirements.
 2. Specific Prohibitions. The following pollutants shall not be introduced into a POTW:
 - a. Pollutants which create a fire or explosion hazard in the publicly owned treatment works (POTW), including, but not limited to, wastestreams with a closed cup flashpoint of less than 140°F (60°C);
 - b. Pollutants, which will cause corrosive structural damage to the POTW, but in no case, discharges with a pH lower than 5.0;
 - c. Solid or viscous pollutants in amounts which will cause obstruction to the flow in the POTW resulting in Interference;
 - d. Any pollutant, including oxygen demanding pollutants (BOD, etc.), released in a discharge at such volume or strength as to cause Interference in the POTW;
 - e. Heat in amounts, which will inhibit biological activity in the POTW, resulting in Interference, but in no case, heat in such quantities that the influent to the sewage treatment works exceeds 104°F (40°C));
 - f. Petroleum oil, nonbiodegradable cutting oil, or products of mineral oil origin in amounts that will cause Interference or Pass Through;
 - g. Pollutants, which result in the presence of toxic gases, vapor, or fumes within the POTW in a quantity that may cause worker health or safety problems;
 - h. Any trucked or hauled pollutants, except at discharge points designated by the POTW;
or
 - i. Any pollutant that causes Pass Through or Interference at the POTW.

PART II
DISCHARGE PERMIT NO. UT0026280
PRETREATMENT

- j. Any specific pollutant which exceeds any Local Limitation established by the POTW.
- E. Categorical Standards. In addition to the general and specific limitations expressed in *Part II. D.* of this section, applicable National Categorical Pretreatment Standards must be met by all Industrial Users discharging into a POTW. These standards are published in the federal regulations at *40 CFR 405 through 471*.

III. BIOSOLIDS REQUIREMENTS

- A. Biosolids Treatment and Disposal. UAC R317-8-1.10 regulates the disposal of sewage sludge (biosolids), which incorporates the federal standards found in 40 CFR Part 503 by reference. However, this is an industrial facility that does not regularly produce regulated biosolids. Therefore, R317-8-1.10 does not apply at this time.
- B. Biosolids – Reopener Provision. This permit may be reopened and modified (following proper administrative procedures) to include the appropriate biosolids limitations (and compliance schedule, if necessary), management practices, other appropriate requirements to protect public health and the environment, or if there have been substantial changes (or such changes are planned) in biosolids use or disposal practices; applicable management practices or numerical limitations for pollutants in biosolids have been promulgated which are more stringent than the requirements in this permit; and/or it has been determined that Permittee's biosolids use or land application practices do not comply with existing applicable state or federal regulations.

PART IV
STORM WATER PERMIT

IV. STORM WATER REQUIREMENTS.

- A. Industrial Storm Water Permit. Based on the type of industrial activities occurring at the Permitted Facility, Permittee is required to maintain separate coverage or an appropriate exclusion under the Multi-Sector General Permit (MSGP) for Storm Water Discharges Associated with Industrial Activities (UTR000000). If the Permitted Facility is not already covered, Permittee has thirty (30) days from when this permit is issued to submit the appropriate Notice of Intent (NOI) for the MSGP or exclusion documentation.
- B. Construction Storm Water Permit. Any construction at the Permitted Facility that disturbs an acre or more of land, including less than an acre if it is part of a common plan of development or sale, is required to obtain coverage under the UPDES Construction General Storm Water Permit (UTRC000000). Permittee must obtain permit coverage prior to land disturbance. If the site qualifies, the Permittee may submit a Low Erosivity Waiver (LEW) Certification instead of permit coverage.

PART V
DISCHARGE PERMIT NO. UT0026280
MONITORING & REPORTING

V. MONITORING, RECORDING & GENERAL REPORTING REQUIREMENTS

- A. Representative Sampling. Permittee shall collect samples in compliance with the monitoring requirements established under *Part I* from the effluent stream prior to discharge into the receiving waters. Samples and measurements shall be representative of the volume and nature of the monitored discharge. Samples of biosolids shall be collected at a location representative of the quality of biosolids immediately prior to the use-disposal practice.
- B. Monitoring Procedures. Monitoring must be conducted according to test procedures approved under UAC R317-2-10, UAC R317-8-4.1(10)(d), and/or 40 CFR § 503 utilizing sufficiently sensitive test methods unless other test procedures have been specified in this permit. Monitoring must be conducted according to the test procedures listed above unless another method is required under 40 CFR Chapter I subchapters N or O. Sufficiently sensitive test method means: (1) The method minimum level (ML) is at or below the level of the effluent limit established in the permit for the measured pollutant or pollutant parameter; or (2) The method has the lowest ML of the analytical methods approved under 40 CFR part 136 or required under 40 CFR chapter I, subchapter N or O for the measured pollutant or pollutant parameter as per 40 CFR 122.44(i)(1)(iv)(A).
- C. Penalties for Tampering. Utah Code § 19-5-115(4) of the Act provides that any person who falsifies, tampers with, or knowingly renders inaccurate, any monitoring device or method required to be maintained under this permit shall, upon conviction, be punished by a fine of not more than \$10,000 per day of violation, or by imprisonment for not more than six (6) months per violation, or by both.
- D. Compliance Schedules. Reports of compliance or noncompliance with, or any progress reports on, interim and final requirements contained in any Compliance Schedule of this permit shall be submitted no later than fourteen (14) days following each schedule date.
- E. Additional Monitoring by the Permittee. If Permittee monitors any parameter more frequently than required by this permit, using test procedures approved under Permit Part V.B., the results of this monitoring shall be included in the calculation and reporting of the data submitted in the DMR or the Biosolids Report Form.
- F. Records Contents. Records of monitoring information shall include:
1. The date, exact place, and time of sampling or measurements;
 2. The individual(s) who performed the sampling or measurements;
 3. The date(s) and time(s) analyses were performed;
 4. The individual(s) who performed the analyses;
 5. The analytical techniques or methods used; and,
 6. The results of such analyses.
- G. Retention of Records. Permittee shall retain records of all monitoring information, including all calibration and maintenance records and all original strip chart recordings for continuous monitoring instrumentation, copies of all reports required by this permit, and records of all data used to complete the application for this permit, for a period of at least five (5) years from the date of the sample, measurement, report or application. This period may be extended by request of the Director at any time. A copy of this UPDES permit must be maintained on site during the duration of activity at the permitted location
- H. Twenty-four (24) Hour Notice of Noncompliance Reporting.

PART V
DISCHARGE PERMIT NO. UT0026280
MONITORING & REPORTING

1. In accordance with UAC R317-8-4, Permittee shall (orally) report any noncompliance which may endanger health or the environment, including transportation accidents, spills, and uncontrolled runoff from biosolids transfer or land application sites which may seriously endanger health or environment, as soon as possible, but no later than twenty-four (24) hours from the time Permittee first became aware of circumstances. The report shall be made to the DWQ via the 24-hour answering service (801) 536-4123.
 2. The following occurrences of noncompliance shall initially be reported by telephone to the DWQ via the 24-hour answering service as soon as possible but no later than twenty-four (24) hours from the time Permittee becomes aware of the circumstances:
 - a. Any noncompliance which may endanger health or the environment;
 - b. Any unanticipated bypass, which exceeds any effluent limitation in the permit (See *Part VI.G, Bypass of Treatment Facilities.*);
 - c. Any Upset which exceeds any effluent limitation in the permit (See *Part VI.H, Upset Conditions.*);
 - d. Violation of a daily discharge limitation for any of the pollutants listed in the permit. For other permit violations which will not endanger health or the environment, DWQ may otherwise be notified during business hours (801) 536-4300; or,
 - e. Violation of any of the Table 3 metals limits, the pathogen limits, the vector attraction reduction limits or the management practices for biosolids that have been sold or given away.
 3. A written submission shall also be provided within five (5) days of the time that Permittee becomes aware of the circumstances. The written submission shall contain:
 - a. A description of the noncompliance and its cause;
 - b. The period of noncompliance, including exact dates and times;
 - c. The estimated time noncompliance is expected to continue if it has not been corrected;
 - d. Steps taken or planned to reduce, eliminate, and prevent reoccurrence of the noncompliance; and,
 - e. Steps taken, if any, to mitigate the adverse impacts on the environment and human health during the noncompliance period.
 4. The Director may waive the written report on a case-by-case basis if the oral report has been received within twenty-four (24) hours by the Division of Water Quality, (801) 536-4300.
 5. Reports shall be submitted to the addresses in *Part I.D, Reporting of Monitoring Results.*
- I. Other Noncompliance Reporting. Instances of noncompliance not required to be reported within twenty-four (24) hours shall be reported at the time that monitoring reports for *Part I.D* are submitted. The reports shall contain the information listed in *Part V.H.3.*

PART V
DISCHARGE PERMIT NO. UT0026280
MONITORING & REPORTING

- J. Inspection and Entry Permittee shall allow the Director, or an authorized representative (including an authorized contractor acting as a representative of the Director) upon the presentation of agency credentials and other documents as may be required by law, to:
1. Enter upon Permittee's premises where a regulated facility or activity is located or conducted, or where records must be kept under the conditions of the permit;
 2. Have access to and copy, at reasonable times, any records that must be kept under the conditions of this permit;
 3. Inspect at reasonable times any facilities, equipment (including monitoring and control equipment), practices, or operations regulated or required under this permit, including but not limited to, biosolids treatment, collection, storage facilities or area, transport vehicles and containers, and land application sites;
 4. Sample or monitor at reasonable times, for the purpose of assuring permit compliance or as otherwise authorized by the *Act*, any substances or parameters at any location, including, but not limited to, digested biosolids before dewatering, dewatered biosolids, biosolids transfer or staging areas, any ground or surface waters at the land application sites or biosolids, soils, or vegetation on the land application sites; and,
 5. The Permittee shall obtain permission or clearance from the landowner or leaseholder, if the landowner is someone other than the Permittee, to permit the Director, or authorized representative, to access the permitted facilities and activities for entry and inspection. The Permittee shall make necessary arrangements with any legally interested parties so as to permit the Director, or authorized representative, to enter and inspect without delay.

PART VI
DISCHARGE PERMIT NO. UT0026280
COMPLIANCE

VI. COMPLIANCE RESPONSIBILITIES

- A. Duty to Comply. Permittee must comply with all conditions of this permit. Any permit noncompliance constitutes a violation of *the Act* and is grounds for administrative and civil enforcement action; for permit termination, revocation and reissuance, or modification; or for denial of a permit renewal application. Permittee shall give sufficient advance notice to the Director of any planned changes in the Permitted Facility or activity, which may result in noncompliance with permit requirements so as to provide the Director with adequate time to review the changes and potentially appropriate remedies.
- B. Penalties for Violations of Permit Conditions. Utah Code § 19-5-115 of the *Act* provides that any person who violates a permit condition, rule, or order implementing provisions of the *Act* is subject to a civil penalty not to exceed \$10,000 per day of such violation. Except as provided at *Part VI.G, Bypass of Treatment Facilities* and *Part VI.H, Upset Conditions*, nothing in this permit shall be construed to relieve Permittee of the civil or criminal penalties for noncompliance.
- C. Need to Halt or Reduce Activity not a Defense. It shall not be a defense for a permittee in an enforcement action that it would have been necessary to halt or reduce the permitted activity in order to maintain compliance with the conditions of this permit.
- D. Duty to Mitigate. Permittee shall take all reasonable steps to minimize or prevent any discharge in violation of this permit, which has a reasonable likelihood of adversely affecting human health or the environment. Permittee shall also take all reasonable steps to minimize or prevent any land application in violation of this permit.
- E. Proper Operation and Maintenance. Permittee shall at all times properly operate and maintain all facilities and systems of treatment and control (and related appurtenances) which are installed or used by Permittee to achieve compliance with the conditions of this permit. Proper operation and maintenance also includes adequate laboratory controls and quality assurance procedures. This provision requires the operation of back-up or auxiliary facilities or similar systems, which are installed by a permittee only when the operation is necessary to achieve compliance with the conditions of the permit.
- F. Removed Substances. Collected screening, grit, solids, sludge, or other pollutants removed in the course of treatment shall be disposed of in such a manner so as to prevent any pollutant from entering any waters of the state or creating a health hazard. Sludge/digester supernatant and filter backwash shall not directly enter either the final effluent or waters of the state by any other direct route.
- G. Bypass of Treatment Facilities.
 - 1. Bypass Not Exceeding Limitations. Permittee may allow any bypass to occur which does not cause Permittee to exceed its permitted effluent limitations, but only if it also is for essential maintenance to assure efficient operation. These bypasses are not subject to paragraph 2 and 3 of this section.
 - 2. Prohibition of Bypass.
 - a. In accordance with Utah Admin. Code R317-8-4.1, bypass is prohibited, and the Director may take enforcement action against Permittee for bypass, unless:

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- (1) Bypass was unavoidable to prevent loss of human life, personal injury, or Severe Property Damage;
 - (2) There were no feasible alternatives to bypass, such as the use of auxiliary treatment facilities, retention of untreated wastes, or maintenance during normal periods of equipment downtime. This condition is not satisfied if adequate backup equipment should have been installed in the exercise of reasonable engineering judgement to prevent a bypass which occurred during normal periods of equipment downtime or preventive maintenance, and
 - (3) Permittee submitted notices as required under *Part VI.G.3*.
 - b. The Director may approve an anticipated bypass, after considering its adverse effects, if the Director determines that it will meet the three conditions listed in *Parts VI.G.2.a (1), (2) and (3)*.
3. Notice.
- a. *Anticipated bypass.* Except as provided above in *Part VI.G.2* and below in *Part VI.G.3.b*, if Permittee knows in advance of the need for a bypass, it shall submit prior notice, at least ninety (90) days before the date of bypass. The prior notice shall include the following unless otherwise waived by the Director:
 - (1) Evaluation of alternative to bypass, including cost-benefit analysis containing an assessment of anticipated resource damages;
 - (2) A specific bypass plan describing the work to be performed including scheduled dates and times. Permittee must notify the Director in advance of any changes to the bypass schedule;
 - (3) Description of specific measures to be taken to minimize environmental and public health impacts;
 - (4) A notification plan sufficient to alert all downstream users, the public and others reasonably expected to be impacted by the bypass;
 - (5) A water quality assessment plan to include sufficient monitoring of the receiving water before, during and following the bypass to enable evaluation of public health risks and environmental impacts; and,
 - (6) Any additional information requested by the Director.
 - b. *Emergency Bypass.* Where ninety (90) days advance notice is not possible, Permittee must notify the Director, and the director of the Department of Natural Resources, as soon as it becomes aware of the need to bypass and provide to the Director the information in *Part VI.G.3.a.(1) through (6)* to the extent practicable.
 - c. *Unanticipated bypass.* Permittee shall submit notice of an unanticipated bypass to the Director as required under *Part IV.H*, Twenty-Four Hour Reporting. Permittee shall also immediately notify the director of the Department of Natural Resources,

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the public and downstream users through means reasonably calculated to provide adequate advance notice of the unanticipated bypass and shall implement measures to minimize impacts to public health, safety, and environment to the extent practicable.

H. Upset Conditions.

1. Effect of an Upset. An Upset constitutes an affirmative defense to an action brought for noncompliance with technology-based permit effluent limitations if the requirements of paragraph 2 of this section are met. Director's administrative determination regarding a claim of Upset cannot be judiciously challenged by Permittee until such time as an action is initiated for noncompliance.
2. Conditions necessary for a demonstration of Upset. A permittee who wishes to establish the affirmative defense of Upset shall demonstrate, through properly signed, contemporaneous operating logs, or other relevant evidence that:
 - a. An Upset occurred and that the permittee can identify the cause(s) of the Upset;
 - b. The permitted Facility was at the time being properly operated;
 - c. The permittee submitted notice of the Upset as required under *Part V.H, Twenty-four Hour Notice of Noncompliance Reporting*; and,
 - d. The permittee complied with any remedial measures required under *Part VI.D, Duty to Mitigate*.
3. Burden of proof. In any enforcement proceeding, the permittee seeking to establish the occurrence of an Upset has the burden of proof.

I. Toxic Pollutants. Permittee shall comply with effluent standards or prohibitions established under 33 U.S.C. § 1317,)(Section 307(a), *The Water Quality Act of 1987*) for toxic pollutants within the time provided in the regulations that establish those standards or prohibitions, even if the permit has not yet been modified to incorporate the requirement.

J. Changes in Discharge of Toxic Substances. Permittee shall provide notice to the Director as soon as Permittee knows of, or has reason to believe:

1. That any activity has occurred or will occur which would result in the discharge, on a routine or frequent basis, of any toxic pollutant which is not limited in the permit, if that discharge will exceed the highest of the following "notification levels":
 - a. One hundred micrograms per liter (100 ug/L);
 - b. Two hundred micrograms per liter (200 ug/L) for acrolein and acrylonitrile; five hundred micrograms per liter (500 ug/L) for 2,4-dinitrophenol and for 2-methyl-4, 6-dinitrophenol; and one milligram per liter (1 mg/L) for antimony;
 - c. Five (5) times the maximum concentration value reported for that pollutant in the permit application in accordance with *UAC R317-8-3.4(7)* or (10); or,

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- d. The level established by the Director in accordance with *UAC R317-8-4.2(6)*.
- 2. That any activity has occurred or will occur which would result in any discharge, on a non-routine or infrequent basis, of a toxic pollutant which is not limited in the permit, if that discharge will exceed the highest of the following "notification levels":
 - a. Five hundred micrograms per liter (500 ug/L);
 - b. One milligram per liter (1 mg/L) for antimony;
 - c. Ten (10) times the maximum concentration value reported for that pollutant in the permit application in accordance with *UAC R317-8-3.4(9)*; or,
 - d. The level established by the Director in accordance with *UAC R317-8-4.2(6)*.

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VII. GENERAL REQUIREMENTS

- A. Planned Changes. Permittee shall give notice to the Director as soon as possible of any planned physical alterations or additions to the Permitted Facility. Notice is required only when:
1. The alteration or addition to a Permitted Facility may meet one of the criteria for determining whether a facility is a new source in 122.29(b); or
 2. The alteration or addition could significantly change the nature or increase the quantity of pollutants discharged. This notification applies to pollutants which are subject neither to effluent limitations in the permit nor to notification requirements under Utah Admin. Code R317-8-4.1(15).
 3. The alteration or addition results in a significant change in Permittee's sludge use or disposal practices, and such alteration, addition, or change may justify the application of permit conditions that are different from or absent in the existing permit, including notification of additional use or disposal sites not reported during the permit application process or not reported pursuant to an approved land application plan. Permittee shall give notice to the Director of any planned changes at least 30 days prior to their implementation.
- B. Anticipated Noncompliance. Permittee shall give advance notice to the Director of any planned changes to the Permitted Facility or activity, which may result in noncompliance with permit requirements.
- C. Permit Actions. This permit may be modified, revoked and reissued, or terminated for cause. The filing of a request by Permittee for a permit modification, revocation and reissuance, or termination, or a notification of planned changes or anticipated noncompliance, does not stay any permit condition.
- D. Duty to Reapply. If Permittee wishes to continue an activity regulated by this permit after the expiration date of this permit, Permittee shall apply for and obtain a new permit. The application shall be submitted at least 180 days before the expiration date of this permit.
- E. Duty to Provide Information. Permittee shall furnish to the Director, within a reasonable time, any information which the Director may request to determine whether cause exists for modifying, revoking and reissuing, or terminating this permit, or to determine compliance with this permit. Permittee shall also furnish to the Director, upon request, copies of records required to be kept by this permit.
- F. Other Information. When Permittee becomes aware that it failed to submit any relevant facts in a permit application, or submitted incorrect information in a permit application or any report to the Director, it shall promptly submit such facts or information.
- G. Signatory Requirements. All applications, reports or information submitted to the Director shall be signed and certified.
1. All permit applications shall be signed by either a principal executive officer, ranking elected official or duly authorized representative of the signatory. A person is a duly authorized representative only if:

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- a. The authorization is made in writing by a person described above and submitted to the Director, and,
 - b. The authorization specifies either an individual or a position having responsibility for the overall operation of the Permitted Facility, such as the position of plant manager, superintendent, position of equivalent responsibility, or an individual or position having overall responsibility for environmental matters. A duly authorized representative may thus be either a named individual or any individual occupying a named position.
 - (1) For a corporation. By a responsible corporate officer. For the purpose of this section, a responsible corporate officer means:
 - (a) A president, secretary, treasurer, vice-president or officer of the corporation in charge of a principal business function, or any other person who performs similar policy- or decision-making functions for the corporation, or
 - (b) the manager of one or more manufacturing, production, or operating facilities, provided, the manager is authorized to make management decisions which govern the operation of the Permitted Facility including having the explicit or implicit duty of making major capital investment recommendations, and initiating and directing other comprehensive measures to assure long term environmental compliance with environmental laws and regulations; the manager can ensure that the necessary systems are established or actions taken to gather complete and accurate information for permit application requirements; and where authority to sign documents has been assigned or delegated to the manager in accordance with corporate procedures.
 - (2) For a partnership or sole proprietorship. By a general partner or the proprietor, respectively; or
 - (3) For a municipality, State, Federal, or other public agency. By either a principal executive officer or ranking elected official. For purposes of this section, a principal executive officer of a Federal agency includes:
 - (a) The chief executive officer of the agency, or
 - (b) a senior executive officer having responsibility for the overall operations of a principal geographic unit of the agency (e.g., Regional Administrators of EPA).
2. All reports required by the permit and other information requested by the Director shall be signed by a person described above or by a duly authorized representative of that person.
 3. Changes to authorization. If an authorization under *Part VII.G.2* is no longer accurate because a different individual or position has responsibility for the overall operation of the Permitted Facility, a new authorization satisfying the requirements of *Part VII.G.2* must be submitted to the Director prior to or together with any reports, information, or applications to be signed by an authorized representative.
 4. Certification. Any person signing a document under this section shall make the following certification:

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"I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant administrative, criminal and civil penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

- H. Penalties for Falsification of Reports. Section 19-5-115(4) of the *Act* provides that any person who knowingly makes any false statement, representation, or certification in any record or other document submitted or required to be maintained under this permit, including monitoring reports or reports of compliance or noncompliance shall, upon conviction be punished by a fine of not more than \$10,000.00 per day of violation, or by imprisonment for not more than six months per violation, or by both.
- I. Availability of Reports. Except for data determined to be confidential under *UAC R317-8-3.2*, all reports prepared in accordance with the terms of this permit shall be available for public inspection at the office of Director. As required by the *Act*, permit applications, permits and effluent data shall not be considered confidential.
- J. Oil and Hazardous Substance Liability. Nothing in this permit shall be construed to preclude Permittee of any legal action or relieve Permittee from any responsibilities, liabilities, or penalties to which Permittee is or may be subject under the *Act*.
- K. Property Rights. The issuance of this permit does not convey any property rights of any sort, or any exclusive privileges, nor does it authorize any injury to private property or any invasion of personal rights, nor any infringement of federal, state or local laws or regulations.
- L. Severability. The provisions of this permit are severable, and if any provisions of this permit, or the application of any provision of this permit to any circumstance, is held invalid, the application of such provision to other circumstances, and the remainder of this permit, shall not be affected thereby.
- M. Transfers. This permit may be automatically transferred to a new permittee if:
 - 1. The current permittee notifies the Director at least 20 days in advance of the proposed transfer date;
 - 2. The notice includes a written agreement between the existing and new permittee's containing a specific date for transfer of permit responsibility, coverage, and liability between them; and,
 - 3. The Director does not notify the existing permittee and the proposed new permittee of his or her intent to modify, or revoke and reissue the permit. If this notice is not received, the transfer is effective on the date specified in the agreement mentioned in paragraph 2 above.
- N. State or Federal Laws. Nothing in this permit shall be construed to preclude the institution of any legal action or relieve Permittee from any responsibilities, liabilities, or penalties established pursuant to any applicable state law or regulation under authority preserved by

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Sections 19-5-117 and 510 of the Clean Water Act or any applicable Federal or State transportation regulations, such as but not limited to the Department of Transportation regulations.

- O. Water Quality - Reopener Provision. This permit may be reopened and modified (following proper administrative procedures) to include the appropriate effluent limitations and compliance schedule, if necessary, if one or more of the following events occurs:
1. Water Quality Standards for the receiving water(s) to which Permittee discharges are modified in such a manner as to require different effluent limits than contained in this permit.
 2. A final wasteload allocation is developed and approved by the State and/or EPA for incorporation in this permit.
 3. Revisions to the current CWA § 208 areawide treatment management plans or promulgations/revisions to TMDLs (40 CFR 130.7) approved by the EPA and adopted by DWQ which calls for different effluent limitations than contained in this permit.
- P. Toxicity Limitation - Reopener Provision. Use the following paragraph if WET testing is required at the Permitted Facility:

This permit may be reopened and modified (following proper administrative procedures) to include, whole effluent toxicity (WET) limitations, a compliance date, a compliance schedule, a change in the whole effluent toxicity (biomonitoring) protocol, additional or modified numerical limitations, or any other conditions related to the control of toxicants if one or more of the following events occur;

1. Toxicity is detected, as per *Part I.C.4.a/b* of this permit, during the duration of this permit.
2. The TRE results indicate that the toxicant(s) represent pollutant(s) or pollutant parameter(s) that may be controlled with specific numerical limits, and the Director concludes that numerical controls are appropriate.
3. Following the implementation of numerical control(s) of toxicant(s), the Director agrees that a modified biomonitoring protocol is necessary to compensate for those toxicants that are controlled numerically.
4. The TRE reveals other unique conditions or characteristics, which in the opinion of the permit issuing authority justify the incorporation of unanticipated special conditions in the permit.

Use the following paragraph if there is no WET testing is required at the Permitted Facility:

This permit may be reopened and modified (following proper administrative procedures) to include WET testing, a WET limitation, a compliance schedule, a compliance date, additional or modified numerical limitations, or any other conditions related to the control of toxicants if toxicity is detected during the life of this permit.

VIII. DEFINITIONS

A. Wastewater.

1. The “7-day (and weekly) average”, other than for *E. coli* bacteria, fecal coliform bacteria, and total coliform bacteria, is the arithmetic average of all samples collected during a consecutive 7-day period or calendar week, whichever is applicable. Geometric means shall be calculated for *E. coli* bacteria, fecal coliform bacteria, and total coliform bacteria. The 7-day and weekly averages are applicable only to those effluent characteristics for which there are 7-day average effluent limitations. The calendar week, which begins on Sunday and ends on Saturday, shall be used for purposes of reporting self-monitoring data on discharge monitoring report forms. Weekly averages shall be calculated for all calendar weeks with Saturdays in the month. If a calendar week overlaps two months (i.e., the Sunday is in one month and the Saturday in the following month), the weekly average calculated for that calendar week shall be included in the data for the month that contains Saturday.
2. The "30-day (and monthly) average," other than for *E. coli* bacteria, fecal coliform bacteria and total coliform bacteria, is the arithmetic average of all samples collected during a consecutive 30-day period or calendar month, whichever is applicable. Geometric means shall be calculated for *E. coli* bacteria, fecal coliform bacteria and total coliform bacteria. The calendar month shall be used for purposes of reporting self-monitoring data on discharge monitoring report forms.
3. "Average annual discharge limit" means maximum allowable average of monthly discharges over a calendar year, calculated as the sum of all monthly discharges measured during a calendar year divided by the number of monthly discharges measured during the year. The timeframe is defined as from January 1st to December 31st.
4. “Act,” means the *Utah Water Quality Act*.
5. “Acute toxicity” occurs when 50 percent or more mortality is observed for either test species at any effluent concentration (lethal concentration or “LC₅₀”).
6. “Bypass,” means the diversion of waste streams from any portion of a treatment facility.
7. “Chronic toxicity” occurs when the IC₂₅ < XX% effluent. The XX% effluent is the concentration of the effluent in the receiving water, at the end of the mixing zone expressed as per cent effluent.
8. "IC₂₅" is the concentration of toxicant (given in % effluent) that would cause a 25% reduction in mean young per female, or a 25% reduction in overall growth for the test population.
9. “Composite Samples” shall be flow proportioned. The composite sample shall, as a minimum, contain at least four (4) samples collected over the compositing period. Unless otherwise specified, the time between the collection of the first sample and the last sample shall not be less than six (6) hours nor more than 24 hours. Acceptable methods for preparation of composite samples are as follows:

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- a. Constant time interval between samples, sample volume proportional to flow rate at time of sampling;
 - b. Constant time interval between samples, sample volume proportional to total flow (volume) since last sample. For the first sample, the flow rate at the time the sample was collected may be used;
 - c. Constant sample volume, time interval between samples proportional to flow (i.e., sample taken every "X" gallons of flow); and,
 - d. Continuous sample volume, with sample collection rate proportional to flow rate.
10. "CWA" means *The Federal Water Pollution Control Act*, as amended, by *The Clean Water Act of 1987*.
11. "Daily Maximum" (Daily Max.) is the maximum value allowable in any single sample or instantaneous measurement.
12. "EPA," means the United States Environmental Protection Agency.
13. "Director," means Director of the Division of Water Quality.
14. A "grab" sample, for monitoring requirements, is defined as a single "dip and take" sample collected at a representative point in the discharge stream.
15. An "instantaneous" measurement, for monitoring requirements, is defined as a single reading, observation, or measurement.
16. "Severe Property Damage," means substantial physical damage to property, damage to the treatment facilities which causes them to become inoperable, or substantial and permanent loss of natural resources which can reasonably be expected to occur in the absence of a bypass. Severe property damage does not mean economic loss caused by delays in production.
17. "Upset," means an exceptional incident in which there is unintentional and temporary noncompliance with technology-based permit effluent limitations because of factors beyond the reasonable control of the permittee. An Upset does not include noncompliance to the extent caused by operational error, improperly designed treatment facilities, inadequate treatment facilities, lack of preventative maintenance, or careless or improper operation.

APPENDIX B

Laboratory Data Results

CLIENT	PROJECT	PROG/CNTR	Latitude	SAMPLE/NAME	LAB/ANALYST	HATCH	SP/INSTR	SAMPLE	PREP/DATE	ANALYST	BATCH	INTERLOCUTOR	METHOD/NAME	ANALYTE	CAD/NUMBER	SUBSTRATE	Result	SL	UNC	UNITS	REF/VAL	BASIS	DILUTION	SPIKE/LEVEL	RECOVERY	UPPER/L	LOWER/L	ANALYSIS/	TTW
LiAc Solutions	Deep Hinery	GL,DL,Pt Plant	Chernobyl-Fac, Inc	Intake	Grab			208110-01	Water	02/19/2015 16:30:00	02/19/2015 11:10:00	02/19/2015 14:40:00	8206747 OMO	EP-16648	NO PREP	Oil & Grease (HEM)	71215	FALSE	NO	5	mg/L	FALSE	NA	1				TFW	
LiAc Solutions	Deep Hinery	GL,DL,Pt Plant	Chernobyl-Fac, Inc	Intake	Grab			208110-02	Water	02/19/2015 16:30:00	02/19/2015 11:10:00	02/19/2015 14:40:00	8206747 OMO	EP-16648	NO PREP	Oil & Grease (HEM)	71215	FALSE	NO	5	mg/L	FALSE	NA	1				TFW	
LiAc Solutions	Deep Hinery	GL,DL,Pt Plant	Chernobyl-Fac, Inc	Intake	Grab			208110-03	Water	02/19/2015 16:30:00	02/19/2015 11:10:00	02/19/2015 14:40:00	8206747 OMO	EP-16648	NO PREP	Oil & Grease (HEM)	71215	FALSE	NO	5	mg/L	FALSE	NA	1				TFW	
LiAc Solutions	Deep Hinery	GL,DL,Pt Plant	Chernobyl-Fac, Inc	Intake	Grab			208110-04	Water	02/19/2015 16:30:00	02/19/2015 11:10:00	02/19/2015 14:40:00	8206747 OMO	EP-16648	NO PREP	Oil & Grease (HEM)	71215	FALSE	NO	5	mg/L	FALSE	NA	1				TFW	
LiAc Solutions	Deep Hinery	GL,DL,Pt Plant	Chernobyl-Fac, Inc	Intake	Grab			208110-05	Water	02/19/2015 16:30:00	02/19/2015 11:10:00	02/19/2015 14:40:00	8206747 OMO	EP-16648	NO PREP	Oil & Grease (HEM)	71215	FALSE	NO	5	mg/L	FALSE	NA	1				TFW	
LiAc Solutions	Deep Hinery	GL,DL,Pt Plant	Chernobyl-Fac, Inc	Intake	Grab			208110-06	Water	02/19/2015 16:30:00	02/19/2015 11:10:00	02/19/2015 14:40:00	8206747 OMO	EP-16648	NO PREP	Oil & Grease (HEM)	71215	FALSE	NO	5	mg/L	FALSE	NA	1				TFW	
LiAc Solutions	Deep Hinery	GL,DL,Pt Plant	Chernobyl-Fac, Inc	Intake	Grab			208110-07	Water	02/19/2015 16:30:00	02/19/2015 11:10:00	02/19/2015 14:40:00	8206747 OMO	EP-16648	NO PREP	Oil & Grease (HEM)	71215	FALSE	NO	5	mg/L	FALSE	NA	1				TFW	
LiAc Solutions	Deep Hinery	GL,DL,Pt Plant	Chernobyl-Fac, Inc	Intake	Grab			208110-08	Water	02/19/2015 16:30:00	02/19/2015 11:10:00	02/19/2015 14:40:00	8206747 OMO	EP-16648	NO PREP	Oil & Grease (HEM)	71215	FALSE	NO	5	mg/L	FALSE	NA	1				TFW	
LiAc Solutions	Deep Hinery	GL,DL,Pt Plant	Chernobyl-Fac, Inc	Intake	Grab			208110-09	Water	02/19/2015 16:30:00	02/19/2015 11:10:00	02/19/2015 14:40:00	8206747 OMO	EP-16648	NO PREP	Oil & Grease (HEM)	71215	FALSE	NO	5	mg/L	FALSE	NA	1				TFW	
LiAc Solutions	Deep Hinery	GL,DL,Pt Plant	Chernobyl-Fac, Inc	Intake	Grab			208110-10	Water	02/19/2015 16:30:00	02/19/2015 11:10:00	02/19/2015 14:40:00	8206747 OMO	EP-16648	NO PREP	Oil & Grease (HEM)	71215	FALSE	NO	5	mg/L	FALSE	NA	1				TFW	
LiAc Solutions	Deep Hinery	GL,DL,Pt Plant	Chernobyl-Fac, Inc	Intake	Grab			208110-11	Water	02/19/2015 16:30:00	02/19/2015 11:10:00	02/19/2015 14:40:00	8206747 OMO	EP-16648	NO PREP	Oil & Grease (HEM)	71215	FALSE	NO	5	mg/L	FALSE	NA	1				TFW	
LiAc Solutions	Deep Hinery	GL,DL,Pt Plant	Chernobyl-Fac, Inc	Intake	Grab			208110-12	Water	02/19/2015 16:30:00	02/19/2015 11:10:00	02/19/2015 14:40:00	8206747 OMO	EP-16648	NO PREP	Oil & Grease (HEM)	71215	FALSE	NO	5	mg/L	FALSE	NA	1				TFW	
LiAc Solutions	Deep Hinery	GL,DL,Pt Plant	Chernobyl-Fac, Inc	Intake	Grab			208110-13	Water	02/19/2015 16:30:00	02/19/2015 11:10:00	02/19/2015 14:40:00	8206747 OMO	EP-16648	NO PREP	Oil & Grease (HEM)	71215	FALSE	NO	5	mg/L	FALSE	NA	1				TFW	
LiAc Solutions	Deep Hinery	GL,DL,Pt Plant	Chernobyl-Fac, Inc	Intake	Grab			208110-14	Water	02/19/2015 16:30:00	02/19/2015 11:10:00	02/19/2015 14:40:00	8206747 OMO	EP-16648	NO PREP	Oil & Grease (HEM)	71215	FALSE	NO	5	mg/L	FALSE	NA	1				TFW	
LiAc Solutions	Deep Hinery	GL,DL,Pt Plant	Chernobyl-Fac, Inc	Intake	Grab			208110-15	Water	02/19/2015 16:30:00	02/19/2015 11:10:00	02/19/2015 14:40:00	8206747 OMO	EP-16648	NO PREP	Oil & Grease (HEM)	71215	FALSE	NO	5	mg/L	FALSE	NA	1				TFW	
LiAc Solutions	Deep Hinery	GL,DL,Pt Plant	Chernobyl-Fac, Inc	Intake	Grab			208110-16	Water	02/19/2015 16:30:00	02/19/2015 11:10:00	02/19/2015 14:40:00	8206747 OMO	EP-16648	NO PREP	Oil & Grease (HEM)	71215	FALSE	NO	5	mg/L	FALSE	NA	1				TFW	
LiAc Solutions	Deep Hinery	GL,DL,Pt Plant	Chernobyl-Fac, Inc	Intake	Grab			208110-17	Water	02/19/2015 16:30:00	02/19/2015 11:10:00	02/19/2015 14:40:00	8206747 OMO	EP-16648	NO PREP	Oil & Grease (HEM)	71215	FALSE	NO	5	mg/L	FALSE	NA	1				TFW	
LiAc Solutions	Deep Hinery	GL,DL,Pt Plant	Chernobyl-Fac, Inc	Intake	Grab			208110-18	Water	02/19/2015 16:30:00	02/19/2015 11:10:00	02/19/2015 14:40:00	8206747 OMO	EP-16648	NO PREP	Oil & Grease (HEM)	71215	FALSE	NO	5	mg/L	FALSE	NA	1				TFW	
LiAc Solutions	Deep Hinery	GL,DL,Pt Plant	Chernobyl-Fac, Inc	Intake	Grab			208110-19	Water	02/19/2015 16:30:00	02/19/2015 11:10:00	02/19/2015 14:40:00	8206747 OMO	EP-16648	NO PREP	Oil & Grease (HEM)	71215	FALSE	NO	5	mg/L	FALSE	NA	1				TFW	
LiAc Solutions	Deep Hinery	GL,DL,Pt Plant	Chernobyl-Fac, Inc	Intake	Grab			208110-20	Water	02/19/2015 16:30:00	02/19/2015 11:10:00	02/19/2015 14:40:00	8206747 OMO	EP-16648	NO PREP	Oil & Grease (HEM)	71215	FALSE	NO	5	mg/L	FALSE	NA	1				TFW	
LiAc Solutions	Deep Hinery	GL,DL,Pt Plant	Chernobyl-Fac, Inc	Intake	Grab			208110-21	Water	02/19/2015 16:30:00	02/19/2015 11:10:00	02/19/2015 14:40:00	8206747 OMO	EP-16648	NO PREP	Oil & Grease (HEM)	71215	FALSE	NO	5	mg/L	FALSE	NA	1				TFW	
LiAc Solutions	Deep Hinery	GL,DL,Pt Plant	Chernobyl-Fac, Inc	Intake	Grab			208110-22	Water	02/19/2015 16:30:00	02/19/2015 11:10:00	02/19/2015 14:40:00	8206747 OMO	EP-16648	NO PREP	Oil & Grease (HEM)	71215	FALSE	NO	5	mg/L	FALSE	NA	1				TFW	
LiAc Solutions	Deep Hinery	GL,DL,Pt Plant	Chernobyl-Fac, Inc	Intake	Grab			208110-23	Water	02/19/2015 16:30:00	02/19/2015 11:10:00	02/19/2015 14:40:00	8206747 OMO	EP-16648	NO PREP	Oil & Grease (HEM)	71215	FALSE	NO	5	mg/L	FALSE	NA	1				TFW	
LiAc Solutions	Deep Hinery	GL,DL,Pt Plant	Chernobyl-Fac, Inc	Intake	Grab			208110-24	Water	02/19/2015 16:30:00	02/19/2015 11:10:00	02/19/2015 14:40:00	8206747 OMO	EP-16648	NO PREP	Oil & Grease (HEM)	71215	FALSE	NO	5	mg/L	FALSE	NA	1				TFW	
LiAc Solutions	Deep Hinery	GL,DL,Pt Plant	Chernobyl-Fac, Inc	Intake	Grab			208110-25	Water	02/19/2015 16:30:00	02/19/2015 11:10:00	02/19/2015 14:40:00	8206747 OMO	EP-16648	NO PREP	Oil & Grease (HEM)	71215	FALSE	NO	5	mg/L	FALSE	NA	1				TFW	
LiAc Solutions	Deep Hinery	GL,DL,Pt Plant	Chernobyl-Fac, Inc	Intake	Grab			208110-26	Water	02/19/2015 16:30:00	02/19/2015 11:10:00	02/19/2015 14:40:00	8206747 OMO	EP-16648	NO PREP	Oil & Grease (HEM)	71215	FALSE	NO	5	mg/L	FALSE	NA	1				TFW	
LiAc Solutions	Deep Hinery	GL,DL,Pt Plant	Chernobyl-Fac, Inc	Intake	Grab			208110-27	Water	02/19/2015 16:30:00	02/19/2015 11:10:00	02/19/2015 14:40:00	8206747 OMO	EP-16648	NO PREP	Oil & Grease (HEM)	71215	FALSE	NO	5	mg/L	FALSE	NA	1				TFW	
LiAc Solutions	Deep Hinery	GL,DL,Pt Plant	Chernobyl-Fac, Inc	Intake	Grab			208110-28	Water	02/19/2015 16:30:00	02/19/2015 11:10:00	02/19/2015 14:40:00	8206747 OMO	EP-16648	NO PREP	Oil & Grease (HEM)	71215	FALSE	NO	5	mg/L	FALSE	NA	1				TFW	
LiAc Solutions	Deep Hinery	GL,DL,Pt Plant	Chernobyl-Fac, Inc	Intake	Grab			208110-29	Water	02/19/2015 16:30:00	02/19/2015 11:10:00	02/19/2015 14:40:00	8206747 OMO	EP-16648	NO PREP	Oil & Grease (HEM)	71215	FALSE	NO	5	mg/L	FALSE	NA	1				TFW	
LiAc Solutions	Deep Hinery	GL,DL,Pt Plant	Chernobyl-Fac, Inc	Intake	Grab			208110-30	Water	02/19/2015 16:30:00	02/19/2015 11:10:00	02/19/2015 14:40:00	8206747 OMO	EP-16648	NO PREP	Oil & Grease (HEM)	71215	FALSE	NO	5	mg/L	FALSE	NA	1				TFW	
LiAc Solutions	Deep Hinery	GL,DL,Pt Plant	Chernobyl-Fac, Inc	Intake	Grab			208110-31	Water	02/19/2015 16:30:00	02/19/2015 11:10:00	02/19/2015 14:40:00	8206747 OMO	EP-16648	NO PREP	Oil & Grease (HEM)	71215	FALSE	NO	5	mg/L	FALSE	NA	1				TFW	
LiAc Solutions	Deep Hinery	GL,DL,Pt Plant	Chernobyl-Fac, Inc	Intake	Grab			208110-32	Water	02/19/2015 16:30:00	02/19/2015 11:10:00	02/19/2015 14:40:00	8206747 OMO	EP-16648	NO PREP	Oil & Grease (HEM)	71215	FALSE	NO	5	mg/L	FALSE	NA	1				TFW	
LiAc Solutions	Deep Hinery	GL,DL,Pt Plant	Chernobyl-Fac, Inc	Intake	Grab			208110-33	Water	02/19/2015 16:30:00	02/19/2015 11:10:00	02/19/2015 14:40:00	8206747 OMO	EP-16648	NO PREP	Oil & Grease (HEM)	71215	FALSE	NO	5	mg/L	FALSE	NA	1				TFW	
LiAc Solutions	Deep Hinery	GL,DL,Pt Plant	Chernobyl-Fac, Inc	Intake	Grab			208110-34	Water	02/19/2015 16:30:00	02/19/2015 11:10:00	02/19/2015 14:40:00	8206747 OMO	EP-16648	NO PREP	Oil & Grease (HEM)	71215	FALSE	NO	5	mg/L	FALSE	NA	1				TFW	
LiAc Solutions	Deep Hinery	GL,DL,Pt Plant	Chernobyl-Fac, Inc	Intake	Grab			208110-35	Water	02/19/2015 16:30:00	02/19/2015 11:10:00	02/19/2015 14:40:00	8206747 OMO	EP-16648	NO PREP	Oil & Grease (HEM)	71215	FALSE	NO	5	mg/L	FALSE	NA	1				TFW	
LiAc Solutions	Deep Hinery	GL,DL,Pt Plant	Chernobyl-Fac, Inc	Intake	Grab			208110-36	Water	02/19/2015 16:30:00	02/19/2015 11:10:00	02/19/2015 14:40:00	8206747 OMO	EP-16648	NO PREP	Oil & Grease (HEM)	71215	FALSE	NO	5	mg/L	FALSE	NA	1				TFW	
LiAc Solutions	Deep Hinery	GL,DL,Pt Plant	Chernobyl-Fac, Inc	Intake	Grab			208110-37	Water	02/19/2015 16:30:00	02/19/2015 11:10:00	02/19/2015 14:40:00	8206747 OMO	EP-16648	NO PREP	Oil & Grease (HEM)	71215	FALSE	NO	5	mg/L	FALSE	NA	1				TFW	
LiAc Solutions	Deep Hinery	GL,DL,Pt Plant	Chernobyl-Fac, Inc	Intake	Grab			208110-38	Water	02/19/2015 16:30:00	02/19/2015 11:10:00	02/19/2015 14:40:00	8206747 OMO	EP-16648	NO PREP	Oil & Grease (HEM)	71215	FALSE	NO	5	mg/L	FALSE	NA	1				TFW	
LiAc Solutions	Deep Hinery	GL,DL,Pt Plant	Chernobyl-Fac, Inc	Intake	Grab			208110-39	Water	02/19/2015 16:30:00	02/19/2015 11:10:00	02/19/2015 14:40:00	8206747 OMO	EP-16648	NO PREP	Oil & Grease (HEM)	71215	FALSE	NO	5	mg/L	FALSE	NA	1				TFW	
LiAc Solutions	Deep Hinery	GL,DL,Pt Plant	Chernobyl-Fac, Inc	Intake	Grab			208110-40	Water	02/19/2015 16:30:00	02/19/2015 11:10:00	02/19/2015 14:40:00	8206747 OMO	EP-16648	NO PREP	Oil & Grease (HEM)	71215	FALSE	NO	5	mg/L	FALSE	NA	1				TFW	
LiAc Solutions	Deep Hinery	GL,DL,Pt Plant	Chernobyl-Fac, Inc	Intake	Grab			208110-41	Water	02/19/2015 16:30:00	02/19/2015 11:10:00	02/19/2015 14:40:00	8206747 OMO	EP-16648	NO PREP	Oil & Grease (HEM)	71215	FALSE	NO	5	mg/L	FALSE	NA	1				TFW	
LiAc Solutions	Deep Hinery	GL,DL,Pt Plant	Chernobyl-Fac, Inc	Intake	Grab			208110-42	Water	02/19/2015 16:30:00	02/19/2015 11:10:00	02/19/2015 14:40:00	8206747 OMO	EP-16648	NO PREP	Oil & Grease (HEM)	71215	FALSE	NO	5	mg/L	FALSE	NA	1				TFW	
LiAc Solutions	Deep Hinery	GL,DL,Pt Plant	Chernobyl-Fac, Inc	Intake	Grab			208110-43	Water	02/19/2015 16:30:00	02/19/2015 11:10:00	02/19/2015 14:40:00	8206747 OMO	EP-16648	NO PREP	Oil & Grease (HEM)	71215	FALSE	NO	5	mg/L	FALSE	NA	1				TFW	
LiAc Solutions	Deep Hinery	GL,DL,Pt Plant	Chernobyl-Fac, Inc	Intake	Grab			208110																					

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BCO-8L

CLIENT	PROJECT	PROJECT/NAME	LAB/NAME	SAMPLE/NAME	ANALYST	WASTEN	W/TYPE/NAME	SAMPLE/DATE	PROPOSED	ANALYST	BATCH	HYDROCODE	METHOD/NAME	PREF/NAME	ANALYTE	CADSWHER	SUBSTRATE	Result	CL	Units	REF/NAME	BASE	SOLUTION	SP/LEVEL/RECOVERY	UPPER/L	LOWER/L	ANALYST/NAME
UIC Solutions	Stoney Henry	Great Salt Lake D/L Pilot Plant	Chemtech-Ford, Inc	Outfall - Grab	261846-01	Water	Water	05/20/2025 09:40:00	05/22/2025 11:58:00	05/22/2025 14:27:00	B21111_O&G	EA 18448	NO PREP	EA 18448	Oil & Gas (HEM)	CT212689	FALSE	FALSE	0	5	mgt.	FALSE	NA				WP
UIC Solutions	Stoney Henry	Great Salt Lake D/L Pilot Plant	Chemtech-Ford, Inc	Outfall - Grab	261846-02	Water	Water	05/20/2025 09:50:00	05/22/2025 15:58:00	05/23/2025 14:27:00	B21111_O&G	EA 18448	NO PREP	EA 18448	Oil & Gas (HEM)	CT212689	FALSE	FALSE	0	5	mgt.	FALSE	NA				WP
UIC Solutions	Stoney Henry	Great Salt Lake D/L Pilot Plant	Chemtech-Ford, Inc	Outfall - Grab	261846-03	Water	Water	05/20/2025 14:10:00	05/22/2025 15:58:00	05/23/2025 14:11:00	B21111_O&G	EA 18448	NO PREP	EA 18448	Oil & Gas (HEM)	CT212689	FALSE	FALSE	0	23.3	mgt.	FALSE	NA				WP
UIC Solutions	Stoney Henry	Great Salt Lake D/L Pilot Plant	Chemtech-Ford, Inc	Outfall - Grab	261846-04	Water	Water	05/20/2025 14:10:00	05/22/2025 15:58:00	05/23/2025 14:11:00	B21111_O&G	EA 18448	NO PREP	EA 18448	Oil & Gas (HEM)	CT212689	FALSE	FALSE	0	1.2	15	mgt.	FALSE	NA			WP
UIC Solutions	Stoney Henry	Great Salt Lake D/L Pilot Plant	Chemtech-Ford, Inc	Outfall - Grab	261846-05	Water	Water	05/20/2025 14:10:00	05/22/2025 15:58:00	05/23/2025 14:11:00	B21111_O&G	EA 18448	NO PREP	EA 18448	Oil & Gas (HEM)	CT212689	FALSE	FALSE	0	1.2	15	mgt.	FALSE	NA			WP
UIC Solutions	Stoney Henry	Great Salt Lake D/L Pilot Plant	Chemtech-Ford, Inc	Outfall - Grab	261846-06	Water	Water	05/20/2025 14:10:00	05/22/2025 15:58:00	05/23/2025 14:11:00	B21111_O&G	EA 18448	NO PREP	EA 18448	Oil & Gas (HEM)	CT212689	FALSE	FALSE	0	1.2	15	mgt.	FALSE	NA			WP
UIC Solutions	Stoney Henry	Great Salt Lake D/L Pilot Plant	Chemtech-Ford, Inc	Outfall - Grab	261846-07	Water	Water	05/20/2025 14:10:00	05/22/2025 15:58:00	05/23/2025 14:11:00	B21111_O&G	EA 18448	NO PREP	EA 18448	Oil & Gas (HEM)	CT212689	FALSE	FALSE	0	1.2	15	mgt.	FALSE	NA			WP
UIC Solutions	Stoney Henry	Great Salt Lake D/L Pilot Plant	Chemtech-Ford, Inc	Outfall - Grab	261846-08	Water	Water	05/20/2025 14:10:00	05/22/2025 15:58:00	05/23/2025 14:11:00	B21111_O&G	EA 18448	NO PREP	EA 18448	Oil & Gas (HEM)	CT212689	FALSE	FALSE	0	1.2	15	mgt.	FALSE	NA			WP
UIC Solutions	Stoney Henry	Great Salt Lake D/L Pilot Plant	Chemtech-Ford, Inc	Outfall - Grab	261846-09	Water	Water	05/20/2025 14:10:00	05/22/2025 15:58:00	05/23/2025 14:11:00	B21111_O&G	EA 18448	NO PREP	EA 18448	Oil & Gas (HEM)	CT212689	FALSE	FALSE	0	1.2	15	mgt.	FALSE	NA			WP
UIC Solutions	Stoney Henry	Great Salt Lake D/L Pilot Plant	Chemtech-Ford, Inc	Outfall - Grab	261846-10	Water	Water	05/20/2025 14:10:00	05/22/2025 15:58:00	05/23/2025 14:11:00	B21111_O&G	EA 18448	NO PREP	EA 18448	Oil & Gas (HEM)	CT212689	FALSE	FALSE	0	1.2	15	mgt.	FALSE	NA			WP
UIC Solutions	Stoney Henry	Great Salt Lake D/L Pilot Plant	Chemtech-Ford, Inc	Outfall - Grab	261846-11	Water	Water	05/20/2025 14:10:00	05/22/2025 15:58:00	05/23/2025 14:11:00	B21111_O&G	EA 18448	NO PREP	EA 18448	Oil & Gas (HEM)	CT212689	FALSE	FALSE	0	1.2	15	mgt.	FALSE	NA			WP
UIC Solutions	Stoney Henry	Great Salt Lake D/L Pilot Plant	Chemtech-Ford, Inc	Outfall - Grab	261846-12	Water	Water	05/20/2025 14:10:00	05/22/2025 15:58:00	05/23/2025 14:11:00	B21111_O&G	EA 18448	NO PREP	EA 18448	Oil & Gas (HEM)	CT212689	FALSE	FALSE	0	1.2	15	mgt.	FALSE	NA			WP
UIC Solutions	Stoney Henry	Great Salt Lake D/L Pilot Plant	Chemtech-Ford, Inc	Outfall - Grab	261846-13	Water	Water	05/20/2025 14:10:00	05/22/2025 15:58:00	05/23/2025 14:11:00	B21111_O&G	EA 18448	NO PREP	EA 18448	Oil & Gas (HEM)	CT212689	FALSE	FALSE	0	1.2	15	mgt.	FALSE	NA			WP
UIC Solutions	Stoney Henry	Great Salt Lake D/L Pilot Plant	Chemtech-Ford, Inc	Outfall - Grab	261846-14	Water	Water	05/20/2025 14:10:00	05/22/2025 15:58:00	05/23/2025 14:11:00	B21111_O&G	EA 18448	NO PREP	EA 18448	Oil & Gas (HEM)	CT212689	FALSE	FALSE	0	1.2	15	mgt.	FALSE	NA			WP
UIC Solutions	Stoney Henry	Great Salt Lake D/L Pilot Plant	Chemtech-Ford, Inc	Outfall - Grab	261846-15	Water	Water	05/20/2025 14:10:00	05/22/2025 15:58:00	05/23/2025 14:11:00	B21111_O&G	EA 18448	NO PREP	EA 18448	Oil & Gas (HEM)	CT212689	FALSE	FALSE	0	1.2	15	mgt.	FALSE	NA			WP
UIC Solutions	Stoney Henry	Great Salt Lake D/L Pilot Plant	Chemtech-Ford, Inc	Outfall - Grab	261846-16	Water	Water	05/20/2025 14:10:00	05/22/2025 15:58:00	05/23/2025 14:11:00	B21111_O&G	EA 18448	NO PREP	EA 18448	Oil & Gas (HEM)	CT212689	FALSE	FALSE	0	1.2	15	mgt.	FALSE	NA			WP
UIC Solutions	Stoney Henry	Great Salt Lake D/L Pilot Plant	Chemtech-Ford, Inc	Outfall - Grab	261846-17	Water	Water	05/20/2025 14:10:00	05/22/2025 15:58:00	05/23/2025 14:11:00	B21111_O&G	EA 18448	NO PREP	EA 18448	Oil & Gas (HEM)	CT212689	FALSE	FALSE	0	1.2	15	mgt.	FALSE	NA			WP
UIC Solutions	Stoney Henry	Great Salt Lake D/L Pilot Plant	Chemtech-Ford, Inc	Outfall - Grab	261846-18	Water	Water	05/20/2025 14:10:00	05/22/2025 15:58:00	05/23/2025 14:11:00	B21111_O&G	EA 18448	NO PREP	EA 18448	Oil & Gas (HEM)	CT212689	FALSE	FALSE	0	1.2	15	mgt.	FALSE	NA			WP
UIC Solutions	Stoney Henry	Great Salt Lake D/L Pilot Plant	Chemtech-Ford, Inc	Outfall - Grab	261846-19	Water	Water	05/20/2025 14:10:00	05/22/2025 15:58:00	05/23/2025 14:11:00	B21111_O&G	EA 18448	NO PREP	EA 18448	Oil & Gas (HEM)	CT212689	FALSE	FALSE	0	1.2	15	mgt.	FALSE	NA			WP
UIC Solutions	Stoney Henry	Great Salt Lake D/L Pilot Plant	Chemtech-Ford, Inc	Outfall - Grab	261846-20	Water	Water	05/20/2025 14:10:00	05/22/2025 15:58:00	05/23/2025 14:11:00	B21111_O&G	EA 18448	NO PREP	EA 18448	Oil & Gas (HEM)	CT212689	FALSE	FALSE	0	1.2	15	mgt.	FALSE	NA			WP
UIC Solutions	Stoney Henry	Great Salt Lake D/L Pilot Plant	Chemtech-Ford, Inc	Outfall - Grab	261846-21	Water	Water	05/20/2025 14:10:00	05/22/2025 15:58:00	05/23/2025 14:11:00	B21111_O&G	EA 18448	NO PREP	EA 18448	Oil & Gas (HEM)	CT212689	FALSE	FALSE	0	1.2	15	mgt.	FALSE	NA			WP
UIC Solutions	Stoney Henry	Great Salt Lake D/L Pilot Plant	Chemtech-Ford, Inc	Outfall - Grab	261846-22	Water	Water	05/20/2025 14:10:00	05/22/2025 15:58:00	05/23/2025 14:11:00	B21111_O&G	EA 18448	NO PREP	EA 18448	Oil & Gas (HEM)	CT212689	FALSE	FALSE	0	1.2	15	mgt.	FALSE	NA			WP
UIC Solutions	Stoney Henry	Great Salt Lake D/L Pilot Plant	Chemtech-Ford, Inc	Outfall - Grab	261846-23	Water	Water	05/20/2025 14:10:00	05/22/2025 15:58:00	05/23/2025 14:11:00	B21111_O&G	EA 18448	NO PREP	EA 18448	Oil & Gas (HEM)	CT212689	FALSE	FALSE	0	1.2	15	mgt.	FALSE	NA			WP
UIC Solutions	Stoney Henry	Great Salt Lake D/L Pilot Plant	Chemtech-Ford, Inc	Outfall - Grab	261846-24	Water	Water	05/20/2025 14:10:00	05/22/2025 15:58:00	05/23/2025 14:11:00	B21111_O&G	EA 18448	NO PREP	EA 18448	Oil & Gas (HEM)	CT212689	FALSE	FALSE	0	1.2	15	mgt.	FALSE	NA			WP
UIC Solutions	Stoney Henry	Great Salt Lake D/L Pilot Plant	Chemtech-Ford, Inc	Outfall - Grab	261846-25	Water	Water	05/20/2025 14:10:00	05/22/2025 15:58:00	05/23/2025 14:11:00	B21111_O&G	EA 18448	NO PREP	EA 18448	Oil & Gas (HEM)	CT212689	FALSE	FALSE	0	1.2	15	mgt.	FALSE	NA			WP
UIC Solutions	Stoney Henry	Great Salt Lake D/L Pilot Plant	Chemtech-Ford, Inc	Outfall - Grab	261846-26	Water	Water	05/20/2025 14:10:00	05/22/2025 15:58:00	05/23/2025 14:11:00	B21111_O&G	EA 18448	NO PREP	EA 18448	Oil & Gas (HEM)	CT212689	FALSE	FALSE	0	1.2	15	mgt.	FALSE	NA			WP
UIC Solutions	Stoney Henry	Great Salt Lake D/L Pilot Plant	Chemtech-Ford, Inc	Outfall - Grab	261846-27	Water	Water	05/20/2025 14:10:00	05/22/2025 15:58:00	05/23/2025 14:11:00	B21111_O&G	EA 18448	NO PREP	EA 18448	Oil & Gas (HEM)	CT212689	FALSE	FALSE	0	1.2	15	mgt.	FALSE	NA			WP
UIC Solutions	Stoney Henry	Great Salt Lake D/L Pilot Plant	Chemtech-Ford, Inc	Outfall - Grab	261846-28	Water	Water	05/20/2025 14:10:00	05/22/2025 15:58:00	05/23/2025 14:11:00	B21111_O&G	EA 18448	NO PREP	EA 18448	Oil & Gas (HEM)	CT212689	FALSE	FALSE	0	1.2	15	mgt.	FALSE	NA			WP
UIC Solutions	Stoney Henry	Great Salt Lake D/L Pilot Plant	Chemtech-Ford, Inc	Outfall - Grab	261846-29	Water	Water	05/20/2025 14:10:00	05/22/2025 15:58:00	05/23/2025 14:11:00	B21111_O&G	EA 18448	NO PREP	EA 18448	Oil & Gas (HEM)	CT212689	FALSE	FALSE	0	1.2	15	mgt.	FALSE	NA			WP
UIC Solutions	Stoney Henry	Great Salt Lake D/L Pilot Plant	Chemtech-Ford, Inc	Outfall - Grab	261846-30	Water	Water	05/20/2025 14:10:00	05/22/2025 15:58:00	05/23/2025 14:11:00	B21111_O&G	EA 18448	NO PREP	EA 18448	Oil & Gas (HEM)	CT212689	FALSE	FALSE	0	1.2	15	mgt.	FALSE	NA			WP
UIC Solutions	Stoney Henry	Great Salt Lake D/L Pilot Plant	Chemtech-Ford, Inc	Outfall - Grab	261846-31	Water	Water	05/20/2025 14:10:00	05/22/2025 15:58:00	05/23/2025 14:11:00	B21111_O&G	EA 18448	NO PREP	EA 18448	Oil & Gas (HEM)	CT212689	FALSE	FALSE	0	1.2	15	mgt.	FALSE	NA			WP
UIC Solutions	Stoney Henry	Great Salt Lake D/L Pilot Plant	Chemtech-Ford, Inc	Outfall - Grab	261846-32	Water	Water	05/20/2025 14:10:00	05/22/2025 15:58:00	05/23/2025 14:11:00	B21111_O&G	EA 18448	NO PREP	EA 18448	Oil & Gas (HEM)	CT212689	FALSE	FALSE	0	1.2	15	mgt.	FALSE	NA			WP
UIC Solutions	Stoney Henry	Great Salt Lake D/L Pilot Plant	Chemtech-Ford, Inc	Outfall - Grab	261846-33	Water	Water	05/20/2025 14:10:00	05/22/2025 15:58:00	05/23/2025 14:11:00	B21111_O&G	EA 18448	NO PREP	EA 18448	Oil & Gas (HEM)	CT212689	FALSE	FALSE	0	1.2	15	mgt.	FALSE	NA			WP
UIC Solutions	Stoney Henry	Great Salt Lake D/L Pilot Plant	Chemtech-Ford, Inc	Outfall - Grab	261846-34	Water	Water	05/20/2025 14:10:00	05/22/2025 15:58:00	05/23/2025 14:11:00	B21111_O&G	EA 18448	NO PREP	EA 18448	Oil & Gas (HEM)	CT212689	FALSE	FALSE	0	1.2	15	mgt.	FALSE	NA			WP
UIC Solutions	Stoney Henry	Great Salt Lake D/L Pilot Plant	Chemtech-Ford, Inc	Outfall - Grab	261846-35	Water	Water	05/20/2025 14:10:00	05/22/2025 15:58:00	05/23/2025 14:11:00	B21111_O&G	EA 18448	NO PREP	EA 18448	Oil & Gas (HEM)	CT212689	FALSE	FALSE	0	1.2	15	mgt.	FALSE	NA			WP
UIC Solutions	Stoney Henry	Great Salt Lake D/L Pilot Plant	Chemtech-Ford, Inc	Outfall - Grab	261846-36	Water	Water	05/20/2025 14:10:00	05/22/2025 15:58:00	05/23/2025 14:11:00	B21111_O&G	EA 18448	NO PREP	EA 18448	Oil & Gas (HEM)	CT212689	FALSE	FALSE	0	1.2	15	mgt.	FALSE	NA			WP
UIC Solutions	Stoney Henry	Great Salt Lake D/L Pilot Plant	Chemtech-Ford, Inc	Outfall - Grab	261846-37	Water	Water	05/20/2025 14:10:00	05/22/2025 15:58:00	05/23/2025 14:11:00	B21111_O&G	EA 18448	NO PREP	EA 18448	Oil & Gas (HEM)	CT212689	FALSE	FALSE	0	1.2	15	mgt.	FALSE	NA			WP
UIC Solutions	Stoney Henry	Great Salt Lake D/L Pilot Plant	Chemtech-Ford, Inc	Outfall - Grab	261846-38	Water	Water	05/20/2025 14:10:00	05/22/2025 15:58:00	05/23/2025 14:11:00	B21111_O&G	EA 18448	NO PREP	EA 18448	Oil & Gas (HEM)	CT212689	FALSE	FALSE	0	1.2	15	mgt.	FALSE	NA			WP
UIC Solutions	Stoney Henry	Great Salt Lake D/L Pilot Plant	Chemtech-Ford, Inc	Outfall - Grab	261846-39	Water	Water	05/20/2025 14:10:00	05/22/2025 15:58:00	05/23/2025 14:11:00	B21111_O&G	EA 18448	NO PREP	EA 18448	Oil & Gas (HEM)	CT212689	FALSE	FALSE	0	1.2	15	mgt.	FALSE	NA			WP
UIC Solutions	Stoney Henry	Great Salt Lake D/L Pilot Plant	Chemtech-Ford, Inc	Outfall - Grab	261846-40	Water	Water	05/20/2025 14:10:00	05/22/2025 15:58:00	05/23/2025 14:11:00	B21111_O&G	EA 18448	NO PREP	EA 18448	Oil & Gas (HEM)	CT212689	FALSE	FALSE	0	1.2	15	mgt.	FALSE	NA			WP
UIC Solutions	Stoney Henry	Great Salt Lake D/L Pilot Plant	Chemtech-Ford, Inc	Outfall - Grab	261846-41	Water	Water	05/20/2025 14:10:00	05/22/2025 15:58:00	05/23/2025 14:11:00	B21111_O&G	EA 18448	NO PREP	EA 18448	Oil & Gas (HEM)	CT212689	FALSE	FALSE	0	1.2	15	mgt.	FALSE	NA			WP
UIC Solutions	Stoney Henry	Great Salt Lake D/L Pilot Plant	Chemtech-Ford, Inc	Outfall - Grab	261846-42	Water	Water	05/20/2025 14:10:00	05/22/2025 15:58:00	05/23/2025 14:11:00	B21111_O&G	EA 18448	NO PREP	EA 18448	Oil & Gas (HEM)	CT212689	FALSE	FALSE	0	1.2	15	mgt.	FALSE	NA			WP
UIC Solutions	Stoney Henry	Great Salt Lake D/L Pilot Plant	Chemtech-Ford, Inc	Outfall - Grab	261846-43	Water	Water	05/20/2025 14:10:00	05/22/2025 15:58:00	05/23/2025 14:11:00	B21111_O&G																

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[illegible]

CLIENT	PROJECT	PROJECTNAME	LABNAME	SAMPLENAME	LABSITE	HATCH	WPTNAME	SAMPLEDATE	PREPDATE	ANALYST	BATCH	HYDROCODE	METHNAME	PREPNAME	ANALYTE	CUSTOMER	SUBSTRATE	QC	Result	SL	RM	UNITS	PPHVAL	BASIC	DILUTION	SPINRELEV	RECOVERY	UPPERCL	LOWERCL	ANALYTES	PROBES	LOCATE	ANOTE	LATITUDE	LONGITUDE	SCHNAME	SHOTS	SHOTS2	SHOTS3	SHOTS4	SHOTS5	SHOTS6	SHOTS7	SHOTS8	SHOTS9	SHOTS10	SHOTS11	SHOTS12	SHOTS13	SHOTS14	SHOTS15	SHOTS16	SHOTS17	SHOTS18	SHOTS19	SHOTS20	SHOTS21	SHOTS22	SHOTS23	SHOTS24	SHOTS25	SHOTS26	SHOTS27	SHOTS28	SHOTS29	SHOTS30	SHOTS31	SHOTS32	SHOTS33	SHOTS34	SHOTS35	SHOTS36	SHOTS37	SHOTS38	SHOTS39	SHOTS40	SHOTS41	SHOTS42	SHOTS43	SHOTS44	SHOTS45	SHOTS46	SHOTS47	SHOTS48	SHOTS49	SHOTS50	SHOTS51	SHOTS52	SHOTS53	SHOTS54	SHOTS55	SHOTS56	SHOTS57	SHOTS58	SHOTS59	SHOTS60	SHOTS61	SHOTS62	SHOTS63	SHOTS64	SHOTS65	SHOTS66	SHOTS67	SHOTS68	SHOTS69	SHOTS70	SHOTS71	SHOTS72	SHOTS73	SHOTS74	SHOTS75	SHOTS76	SHOTS77	SHOTS78	SHOTS79	SHOTS80	SHOTS81	SHOTS82	SHOTS83	SHOTS84	SHOTS85	SHOTS86	SHOTS87	SHOTS88	SHOTS89	SHOTS90	SHOTS91	SHOTS92	SHOTS93	SHOTS94	SHOTS95	SHOTS96	SHOTS97	SHOTS98	SHOTS99	SHOTS100	SHOTS101	SHOTS102	SHOTS103	SHOTS104	SHOTS105	SHOTS106	SHOTS107	SHOTS108	SHOTS109	SHOTS110	SHOTS111	SHOTS112	SHOTS113	SHOTS114	SHOTS115	SHOTS116	SHOTS117	SHOTS118	SHOTS119	SHOTS120	SHOTS121	SHOTS122	SHOTS123	SHOTS124	SHOTS125	SHOTS126	SHOTS127	SHOTS128	SHOTS129	SHOTS130	SHOTS131	SHOTS132	SHOTS133	SHOTS134	SHOTS135	SHOTS136	SHOTS137	SHOTS138	SHOTS139	SHOTS140	SHOTS141	SHOTS142	SHOTS143	SHOTS144	SHOTS145	SHOTS146	SHOTS147	SHOTS148	SHOTS149	SHOTS150	SHOTS151	SHOTS152	SHOTS153	SHOTS154	SHOTS155	SHOTS156	SHOTS157	SHOTS158	SHOTS159	SHOTS160	SHOTS161	SHOTS162	SHOTS163	SHOTS164	SHOTS165	SHOTS166	SHOTS167	SHOTS168	SHOTS169	SHOTS170	SHOTS171	SHOTS172	SHOTS173	SHOTS174	SHOTS175	SHOTS176	SHOTS177	SHOTS178	SHOTS179	SHOTS180	SHOTS181	SHOTS182	SHOTS183	SHOTS184	SHOTS185	SHOTS186	SHOTS187	SHOTS188	SHOTS189	SHOTS190	SHOTS191	SHOTS192	SHOTS193	SHOTS194	SHOTS195	SHOTS196	SHOTS197	SHOTS198	SHOTS199	SHOTS200	SHOTS201	SHOTS202	SHOTS203	SHOTS204	SHOTS205	SHOTS206	SHOTS207	SHOTS208	SHOTS209	SHOTS210	SHOTS211	SHOTS212	SHOTS213	SHOTS214	SHOTS215	SHOTS216	SHOTS217	SHOTS218	SHOTS219	SHOTS220	SHOTS221	SHOTS222	SHOTS223	SHOTS224	SHOTS225	SHOTS226	SHOTS227	SHOTS228	SHOTS229	SHOTS230	SHOTS231	SHOTS232	SHOTS233	SHOTS234	SHOTS235	SHOTS236	SHOTS237	SHOTS238	SHOTS239	SHOTS240	SHOTS241	SHOTS242	SHOTS243	SHOTS244	SHOTS245	SHOTS246	SHOTS247	SHOTS248	SHOTS249	SHOTS250	SHOTS251	SHOTS252	SHOTS253	SHOTS254	SHOTS255	SHOTS256	SHOTS257	SHOTS258	SHOTS259	SHOTS260	SHOTS261	SHOTS262	SHOTS263	SHOTS264	SHOTS265	SHOTS266	SHOTS267	SHOTS268	SHOTS269	SHOTS270	SHOTS271	SHOTS272	SHOTS273	SHOTS274	SHOTS275	SHOTS276	SHOTS277	SHOTS278	SHOTS279	SHOTS280	SHOTS281	SHOTS282	SHOTS283	SHOTS284	SHOTS285	SHOTS286	SHOTS287	SHOTS288	SHOTS289	SHOTS290	SHOTS291	SHOTS292	SHOTS293	SHOTS294	SHOTS295	SHOTS296	SHOTS297	SHOTS298	SHOTS299	SHOTS300	SHOTS301	SHOTS302	SHOTS303	SHOTS304	SHOTS305	SHOTS306	SHOTS307	SHOTS308	SHOTS309	SHOTS310	SHOTS311	SHOTS312	SHOTS313	SHOTS314	SHOTS315	SHOTS316	SHOTS317	SHOTS318	SHOTS319	SHOTS320	SHOTS321	SHOTS322	SHOTS323	SHOTS324	SHOTS325	SHOTS326	SHOTS327	SHOTS328	SHOTS329	SHOTS330	SHOTS331	SHOTS332	SHOTS333	SHOTS334	SHOTS335	SHOTS336	SHOTS337	SHOTS338	SHOTS339	SHOTS340	SHOTS341	SHOTS342	SHOTS343	SHOTS344	SHOTS345	SHOTS346	SHOTS347	SHOTS348	SHOTS349	SHOTS350	SHOTS351	SHOTS352	SHOTS353	SHOTS354	SHOTS355	SHOTS356	SHOTS357	SHOTS358	SHOTS359	SHOTS360	SHOTS361	SHOTS362	SHOTS363	SHOTS364	SHOTS365	SHOTS366	SHOTS367	SHOTS368	SHOTS369	SHOTS370	SHOTS371	SHOTS372	SHOTS373	SHOTS374	SHOTS375	SHOTS376	SHOTS377	SHOTS378	SHOTS379	SHOTS380	SHOTS381	SHOTS382	SHOTS383	SHOTS384	SHOTS385	SHOTS386	SHOTS387	SHOTS388	SHOTS389	SHOTS390	SHOTS391	SHOTS392	SHOTS393	SHOTS394	SHOTS395	SHOTS396	SHOTS397	SHOTS398	SHOTS399	SHOTS400	SHOTS401	SHOTS402	SHOTS403	SHOTS404	SHOTS405	SHOTS406	SHOTS407	SHOTS408	SHOTS409	SHOTS410	SHOTS411	SHOTS412	SHOTS413	SHOTS414	SHOTS415	SHOTS416	SHOTS417	SHOTS418	SHOTS419	SHOTS420	SHOTS421	SHOTS422	SHOTS423	SHOTS424	SHOTS425	SHOTS426	SHOTS427	SHOTS428	SHOTS429	SHOTS430	SHOTS431	SHOTS432	SHOTS433	SHOTS434	SHOTS435	SHOTS436	SHOTS437	SHOTS438	SHOTS439	SHOTS440	SHOTS441	SHOTS442	SHOTS443	SHOTS444	SHOTS445	SHOTS446	SHOTS447	SHOTS448	SHOTS449	SHOTS450	SHOTS451	SHOTS452	SHOTS453	SHOTS454	SHOTS455	SHOTS456	SHOTS457	SHOTS458	SHOTS459	SHOTS460	SHOTS461	SHOTS462	SHOTS463	SHOTS464	SHOTS465	SHOTS466	SHOTS467	SHOTS468	SHOTS469	SHOTS470	SHOTS471	SHOTS472	SHOTS473	SHOTS474	SHOTS475	SHOTS476	SHOTS477	SHOTS478	SHOTS479	SHOTS480	SHOTS481	SHOTS482	SHOTS483	SHOTS484	SHOTS485	SHOTS486	SHOTS487	SHOTS488	SHOTS489	SHOTS490	SHOTS491	SHOTS492	SHOTS493	SHOTS494	SHOTS495	SHOTS496	SHOTS497	SHOTS498	SHOTS499	SHOTS500	SHOTS501	SHOTS502	SHOTS503	SHOTS504	SHOTS505	SHOTS506	SHOTS507	SHOTS508	SHOTS509	SHOTS510	SHOTS511	SHOTS512	SHOTS513	SHOTS514	SHOTS515	SHOTS516	SHOTS517	SHOTS518	SHOTS519	SHOTS520	SHOTS521	SHOTS522	SHOTS523	SHOTS524	SHOTS525	SHOTS526	SHOTS527	SHOTS528	SHOTS529	SHOTS530	SHOTS531	SHOTS532	SHOTS533	SHOTS534	SHOTS535	SHOTS536	SHOTS537	SHOTS538	SHOTS539	SHOTS540	SHOTS541	SHOTS542	SHOTS543	SHOTS544	SHOTS545	SHOTS546	SHOTS547	SHOTS548	SHOTS549	SHOTS550	SHOTS551	SHOTS552	SHOTS553	SHOTS554	SHOTS555	SHOTS556	SHOTS557	SHOTS558	SHOTS559	SHOTS560	SHOTS561	SHOTS562	SHOTS563	SHOTS564	SHOTS565	SHOTS566	SHOTS567	SHOTS568	SHOTS569	SHOTS570	SHOTS571	SHOTS572	SHOTS573	SHOTS574	SHOTS575	SHOTS576	SHOTS577	SHOTS578	SHOTS579	SHOTS580	SHOTS581	SHOTS582	SHOTS583	SHOTS584	SHOTS585	SHOTS586	SHOTS587	SHOTS588	SHOTS589	SHOTS590	SHOTS591	SHOTS592	SHOTS593	SHOTS594	SHOTS595	SHOTS596	SHOTS597	SHOTS598	SHOTS599	SHOTS600	SHOTS601	SHOTS602	SHOTS603	SHOTS604	SHOTS605	SHOTS606	SHOTS607	SHOTS608	SHOTS609	SHOTS610	SHOTS611	SHOTS612	SHOTS613	SHOTS614	SHOTS615	SHOTS616	SHOTS617	SHOTS618	SHOTS619	SHOTS620	SHOTS621	SHOTS622	SHOTS623	SHOTS624	SHOTS625	SHOTS626	SHOTS627	SHOTS628	SHOTS629	SHOTS630	SHOTS631	SHOTS632	SHOTS633	SHOTS634	SHOTS635	SHOTS636	SHOTS637	SHOTS638	SHOTS639	SHOTS640	SHOTS641	SHOTS642	SHOTS643	SHOTS644	SHOTS645	SHOTS646	SHOTS647	SHOTS648	SHOTS649	SHOTS650	SHOTS651	SHOTS652	SHOTS653	SHOTS654	SHOTS655	SHOTS656	SHOTS657	SHOTS658	SHOTS659	SHOTS660	SHOTS661	SHOTS662	SHOTS663	SHOTS664	SHOTS665	SHOTS666	SHOTS667	SHOTS668	SHOTS669	SHOTS670	SHOTS671	SHOTS672	SHOTS673	SHOTS674	SHOTS675	SHOTS676	SHOTS677	SHOTS678	SHOTS679	SHOTS680	SHOTS681	SHOTS682	SHOTS683	SHOTS684	SHOTS685	SHOTS686	SHOTS687	SHOTS688	SHOTS689	SHOTS690	SHOTS691	SHOTS692	SHOTS693	SHOTS694	SHOTS695	SHOTS696	SHOTS697	SHOTS698	SHOTS699	SHOTS700	SHOTS701	SHOTS702	SHOTS703	SHOTS704	SHOTS705	SHOTS706	SHOTS707	SHOTS708	SHOTS709	SHOTS710	SHOTS711	SHOTS712	SHOTS713	SHOTS714	SHOTS715	SHOTS716	SHOTS717	SHOTS718	SHOTS719	SHOTS720	SHOTS721	SHOTS722	SHOTS723	SHOTS724	SHOTS725	SHOTS726	SHOTS727	SHOTS728	SHOTS729	SHOTS730	SHOTS731	SHOTS732	SHOTS733	SHOTS734	SHOTS735	SHOTS736	SHOTS737	SHOTS738	SHOTS739	SHOTS740	SHOTS741	SHOTS742	SHOTS743	SHOTS744	SHOTS745	SHOTS746	SHOTS747	SHOTS748	SHOTS749	SHOTS750	SHOTS751	SHOTS752	SHOTS753	SHOTS754	SHOTS755	SHOTS756	SHOTS757	SHOTS758	SHOTS759	SHOTS760	SHOTS761	SHOTS762	SHOTS763	SHOTS764	SHOTS765	SHOTS766	SHOTS767	SHOTS768	SHOTS769	SHOTS770	SHOTS771	SHOTS772	SHOTS773	SHOTS774	SHOTS775	SHOTS776	SHOTS777	SHOTS778	SHOTS779	SHOTS780	SHOTS781	SHOTS782	SHOTS783	SHOTS784	SHOTS785	SHOTS786	SHOTS787	SHOTS788	SHOTS789	SHOTS790	SHOTS791	SHOTS792	SHOTS793	SHOTS794	SHOTS795	SHOTS796	SHOTS797	SHOTS798	SHOTS799	SHOTS800	SHOTS801	SHOTS802	SHOTS803	SHOTS804	SHOTS805	SHOTS806	SHOTS807	SHOTS808	SHOTS809	SHOTS810	SHOTS811	SHOTS812	SHOTS813	SHOTS814	SHOTS815	SHOTS816	SHOTS817	SHOTS818	SHOTS819	SHOTS820	SHOTS821	SHOTS822	SHOTS823	SHOTS824	SHOTS825	SHOTS826	SHOTS827	SHOTS828	SHOTS829	SHOTS830	SHOTS831	SHOTS832	SHOTS833	SHOTS834	SHOTS835	SHOTS836	SHOTS837	SHOTS838	SHOTS839	SHOTS840	SHOTS841	SHOTS842	SHOTS843	SHOTS844	SHOTS845	SHOTS846	SHOTS847	SHOTS848	SHOTS849	SHOTS850	SHOTS851	SHOTS852	SHOTS853	SHOTS854	SHOTS855	SHOTS856	SHOTS857	SHOTS858	SHOTS859	SHOTS860	SHOTS861	SHOTS862	SHOTS863	SHOTS864	SHOTS865	SHOTS866	SHOTS867	SHOTS868	SHOTS869	SHOTS870	SHOTS871	SHOTS872	SHOTS873	SHOTS874	SHOTS875	SHOTS876	SHOTS877	SHOTS878	SHOTS879	SHOTS880	SHOTS881	SHOTS882	SHOTS883	SHOTS884	SHOTS885	SHOTS886	SHOTS887	SHOTS888	SHOTS889	SHOTS890	SHOTS891	SHOTS892	SHOTS893	SHOTS894	SHOTS895	SHOTS896	SHOTS897	SHOTS898	SHOTS899	SHOTS900	SHOTS901	SHOTS902	SHOTS903	SHOTS904	SHOTS905	SHOTS906	SHOTS907	SHOTS908	SHOTS909	SHOTS910	SHOTS911	SHOTS912	SHOTS913	SHOTS914	SHOTS915	SHOTS916	SHOTS917	SHOTS918	SHOTS919	SHOTS920	SHOTS921	SHOTS922	SHOTS923	SHOTS924	SHOTS925	SHOTS926	SHOTS927	SHOTS928	SHOTS929	SHOTS930	SHOTS931	SHOTS932	SHOTS933	SHOTS934	SHOTS935	SHOTS936	SHOTS937	SHOTS938	SHOTS939	SHOTS940	SHOTS941	SHOTS942	SHOTS943	SHOTS944	SHOTS945	SHOTS946	SHOTS947	SHOTS948	SHOTS949	SHOTS950	SHOTS951	SHOTS952	SHOTS953	SHOTS954	SHOTS955	SHOTS956	SHOTS957	SHOTS958	SHOTS959	SHOTS960	SHOTS961	SHOTS962	SHOTS963	SHOTS964	SHOTS965	SHOTS966	SHOTS967	SHOTS968	SHOTS969	SHOTS970	SHOTS971	SHOTS972	SHOTS973	SHOTS974	SHOTS975	SHOTS976	SHOTS977	SHOTS978	SHOTS979	SHOTS980	SHOTS981	SHOTS982	SHOTS983	SHOTS984	SHOTS985	SHOTS986	SHOTS987	SHOTS988	SHOTS989	SHOTS990	SHOTS991	SHOTS992	SHOTS993	SHOTS994	SHOTS995	SHOTS996	SHOTS997	SHOTS998	SHOTS999	SHOTS1000
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APPENDIX C

Biota Monitoring Report

Microbial analyses at the Waterleaf Resources pilot plant, Great Salt Lake, Utah

This reports presents data from an analysis of the microbial communities in the brine flowing into the plant, “influent,” and the post-extraction brine that is in a holding tank before being released back into the lake, “effluent.” The research question at hand is: *what is the impact of introducing post-extraction effluent into the Great Salt Lake north arm.* This analysis includes microscopy, genomic surveys, and inoculation experiments to measure growth in the laboratory.

Sampling:

Influent and effluent samples were obtained at the Utah Waterleaf Lilac facility on February 28, April 24, and June 24, 2025 (Figure 1). At each timepoint, 100 ml each were collected for laboratory analysis.



Figure 1. Samples were taken from the north tank for influent brine (valve circled in yellow) and the south tank for effluent (valve circled in red).

In addition, 100 ml of brine from each sample were filtered through a sterile PVDF membrane pressure filter unit, pore size 0.22 μm , which captures all the cells present in the microbial communities of the brine. The filters were used to extract DNA and create the sequencing libraries (Figure 2).

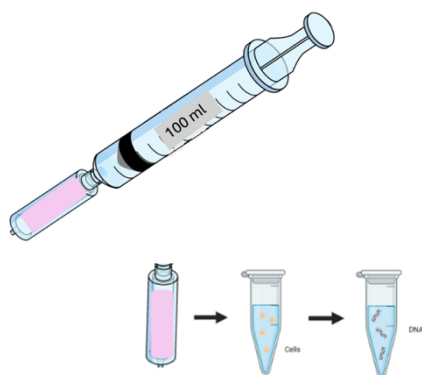


Figure 2. North arm brine from the influent tank and post-extraction effluent brine were filtered separately through a PVDF membrane cartridge to collect all cells in the sample. These filters were subsequently used to isolate DNA with a DNA extraction kit (QIAGEN, Venlo, Netherlands).

Biomass:

The relative biomass of aquatic communities can be assessed by centrifuging at high speeds to force cells to the bottom of the tube. I centrifuged 1 ml of the influent (I) sample and 1 ml of the effluent (E) sample at each sampling. These tubes were allowed to dry for two days. The dry weight was measured. I was unable to do this properly at the February sampling since I did not see a cell pellet in the effluent, only rust flakes, which likely came from corrosion of the holding tank and affected the dry weight. The other samples, however, yielded reliable data, and there were no rust flakes present. The April influent pellet was 3.7 mg of dry mass per milliliter of brine, and the effluent pellet was 4.5 mg per milliliter. The June influent pellet was 5.2 mg of dry mass per milliliter of brine, and the effluent pellet was 4.2 mg per milliliter. All were pink in color, which indicated that halophilic bacteria, archaea, and/or algae (all of which contain carotenoid pigments) were present in abundance in both (Figure 3). ***This colorful cell pellet was a good sign that there was a healthy population in the effluent.***



Figure 3. From the April samples, 1 ml of the influent (I) and effluent (E) were separately centrifuged to pellet the cells in the sample, which were both pink in color, indicating an abundance of halophiles (salt-tolerant bacteria and archaea have carotenoid pigments that make the cells pink).

Cell Counts:

Another way to assess biomass is to count the individual cells. Using a hemacytometer, which provides a grid and special cover glass to control the distributed volume, I estimated the cell density in each of the samples (e.g. Figure 4).

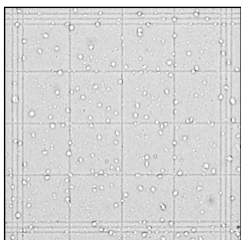


Figure 4. February influent sample on a hemacytometer. Note the grid that allows one to quantify the cells/ml. The cells are translucent but reflect light. They appear as small reflective orbs.

The results are shown in Table 1. The first samples from February demonstrated a robust cell density in the influent sample, but the effluent had very few if any visible cells. It's possible that the cell density was not zero, just low and not detectable by these methods. The April sampling had comparable numbers of cells in the effluent as the influent, the cells per milliliter counts were in the billions. The June samples also showed similar numbers for influent and effluent but higher cell counts.

Table 1. Cell counts by hemacytometer for each sampling

Sampling Date	Influent	Effluent
February 28, 2025	2×10^8 cells per ml	None detected, rust flakes present.
April 24, 2025	3.6×10^9 cells per ml	4.6×10^9 cells per ml
June 24, 2025	8.1×10^9 cells per ml	5.3×10^9 cells per ml

Note the values for April and June are higher at these warmer sampling times likely because the increased temperature supported microbial growth in the brine. The optimal temperature of GSL microorganisms is typically around the same as human cells, 37°C. ***Most importantly, the lithium extraction procedure did not reduce the cell count or have adverse effects on the cells.***

Given the intrusion of rust flakes and the results of the biomass and microscopy assays for the February sampling, I focused on the April and June samplings for addressing the question regarding impact on the extraction process on the microbial community.

Microbial Diversity:

In the GSL north arm, prior studies have revealed evidence for microorganisms in all three domains of life (Figure 5). The eukaryotes have nuclei and a higher-level organization; we typically see low levels of algae and fungi in the hypersaline brine. The prokaryotes have a simpler cell structure, such as salt thriving bacteria. The most prevalent domain in the north arm is archaea, which are abundant in all extreme environments on Earth (Baxter and Zalar, 2019; Ameida-Dalmet and Baxter, 2020).

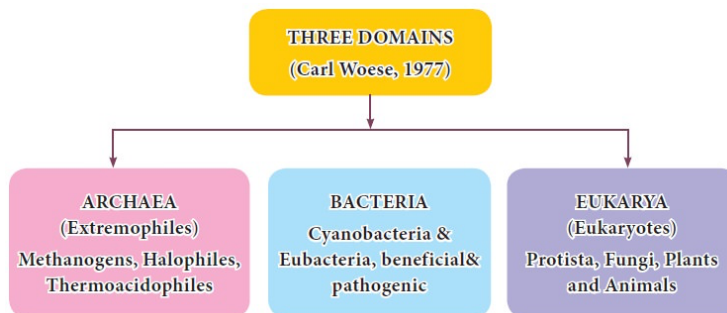


Figure 5. The three domains of life are all represented in the microbial diversity of Great Salt Lake.

To examine the microbial diversity of the influent and effluent, I wanted to sequence all the DNA from the onsite filtration described above. The microbial cells in the brine adhere to the sampling filters while the liquid is pumped through. After filtration, I froze the filters in a dry ice bath so that no degradation would occur, and the samples could be transported back to the lab for extraction. Under sterile conditions, the filter casings were cracked, and DNA was extracted from each membrane. This pool of DNA is derived from all of the life forms in the water sample. The next step is to figure out the species of life that are present. For this I used a consulting lab for

DNA sequencing. They amplify genes (16S rRNA, 18S rRNA, or ITS) associated with either bacteria, archaea, algae, or fungi. The DNA in the regions targeted is very specific, and this allows us to see “who” is present in the community and in what relative abundance. I analyzed the genetic data by first running a programming script that we developed in my lab to prune out any contaminants present in the controls and to connect to a taxonomic database to assign their phylogenetic classification. From here we can produce charts that help in visualizing the data.

Although the February effluent I analyzed did not seem to have cells (by microscopy nor a cell pellet), there were DNA signatures of microorganisms. This could be because the cells were in small numbers and therefore escaped the less sensitive methods, or it could be because there are biosignatures; the DNA from dead cells adhered to the filter but no intact cells did. A quick review of the prokaryotes in these samples indicate a similar community profile in the effluent when compared with the influent community e.g. the most prominent members of the community were common to both data sets.

The cell counts suggested that the April sampling would provide an excellent data set for sequencing analysis. I have confidence in the comparison between influent and effluent communities, and therefore, I have analyzed the April sample species composition below. The prokaryotes were split into bacteria and archaea for visual simplicity. The eukaryotic primers that would reveal algae species gave no hits (apart from plants that were blown in from the surrounding steppe), so there is no chart representing algae for April. We do know of two species that are present in the north arm, but in low numbers and only in warmer temperatures. Fungi require specific primers for reliable sequencing, so they were probed separately. Below I present the taxonomic profiles for each category of microorganisms. I have aligned the data for ease of comparison of the influent versus the effluent (Figure 6).

Archaea. Many of Earth’s extremophiles fall in the category of Archaea, simple prokaryotes that look like bacteria but are genetically distinct. These make up the bulk of the Great Salt Lake north arm microbiota as shown in past studies (Baxter and Zalar, 2019; Almeida-Dalmet and Baxter, 2020). In this experiment, ***The difference between the Waterleaf influent and effluent genera present is negligible*** (Fig. 6, top panel).

Bacteria. In past work, because archaea are more typical in extreme environments, we were surprised to find robust bacterial communities at the north arm (Almeida-Dalmet and Baxter, 2020). ***In the Waterleaf samples, the bacterial genera present were also similar between the influent and effluent*** (Fig. 6, middle panel). Note the bacteria (and archaea) that are present in small abundance, towards the bottom of the graphics, are likely small in number because they prefer more moderate salinity and are introduced by the south arm water. The north arm salinity may suppress their growth.

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Fungi. Recently my lab has explored the fungal species of the Great Salt Lake north arm (Parrott and Baxter, 2024). The Internal Transcribed Spacer (ITS) segment is widely used as a universal fungal barcode because of its variability between species. In the Waterleaf experiment, this marker revealed only a few species and different yeast taxa present in the influent and effluent (Fig. 6, bottom panel). Some of these species, in our prior study, have been associated with plants, soils or animals from the surrounding landscape. For example, *Alternaria* and *Cryptococcus* were discovered in the plant soil microbiomes. Because the spores of fungi can become airborne, wind can introduce spores to the brine. ***The differences in the fungi present in the Waterleaf influent and effluent are likely not important with regards to the ecosystem since these species do not play a role in nutrient cycling.***

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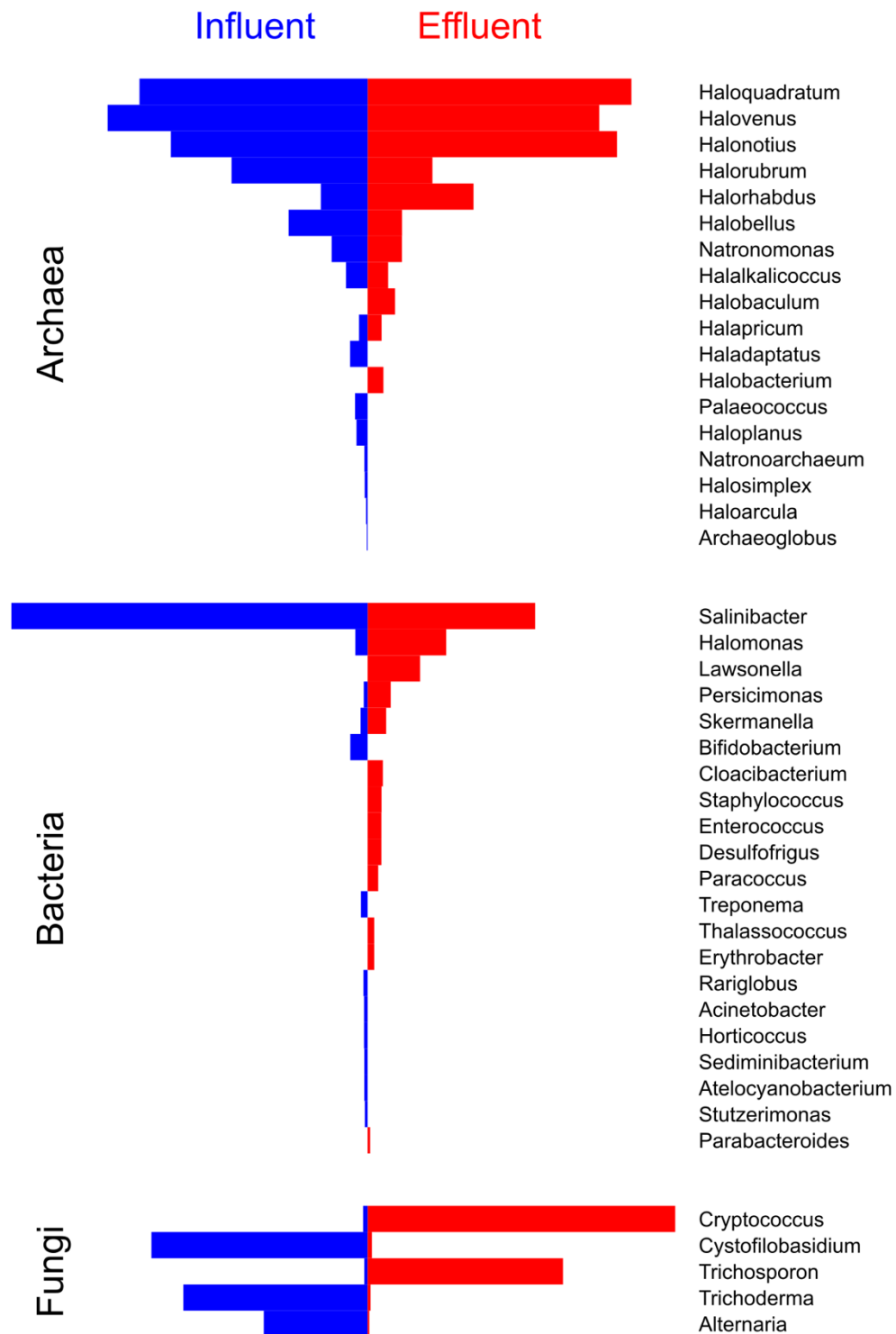


Figure 6. Microbial diversity charts for genera of archaea, bacteria, and fungi. The influent (blue) is shown on the left and effluent (red) on the right with species identity listed to the side. The size of the bars indicate relative abundance within each data set. The top panel shows the archaea community, the middle bacteria, and the bottom fungi.

Inoculation Experiment:

In order to probe more deeply into the potential impacts of discharging the effluent into the Great Salt Lake north arm, I performed a time course growth experiment, growing either influent, effluent, or a mixture. Optical density measurement at a light absorbance of 600nm (A_{600}) is a common methodology in microbiology for following growth of a culture over time (e.g. Stevenson et al. 2016). The cells absorb light at this wavelength, and so the concentration of microbes is proportional to the light absorbed. I used a spectrophotometer to measure the optical density over time, which allows us to see the growth curve of the population as the cells grow and divide. Since the initial levels of microorganisms are very low (and non-existent in the sterile water blank control), this is called the “lag phase.” As the population starts to double rapidly, you can see logarithmic growth for some species “log phase.” Beyond these phases, the bacterial population will stabilize and then decline. Figure 7 shows a standard growth curve for lab model microbes; we would expect slower growth in environmental organisms.

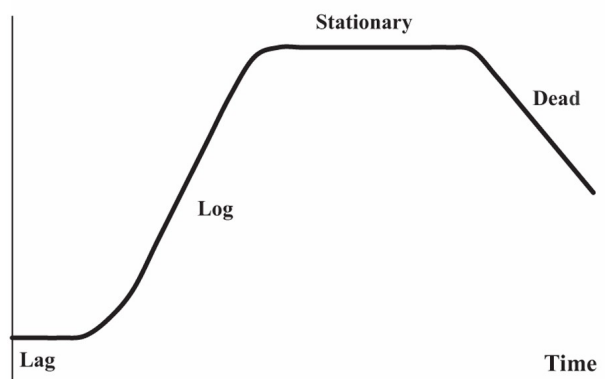


Figure 7. A textbook growth curve to show the expected phases of bacterial proliferation. My goal was to plot log phase in the samples and examine if introducing effluent to influent communities had an impact.

I attempted a couple of early trials to work out conditions, and this revealed that the experiment moved too slowly without growth media to enhance growth rates. The protocol that gave the best results for our timeframe was inoculating 9 ml of 23% salt MGM media (Dyall-Smith, 2025) with 1 ml of sample. The samples were 1) sterile deionized water serving as a control, 2) influent, 3) effluent, 4) a 50:50 mixture of effluent and influent. I did this experiment with brine from all three sampling dates. In each experiment, I used the control as a blank to set the optical density to zero. Thus, any absorbance observed was due to cells proliferating.

In Figure 8, the top panel shows growth curves featuring the February samples inoculated. The influent sample, which was rich in microorganisms, displays a typical growth curve, with a short lag phase, followed by fast growth, and then the beginnings of a plateau (orange line, top panel). The effluent (green line, top panel) by contrast, has delayed growth, but it does appear to have a low-density community that begins to take off albeit slowly. The mixture has a middle of the road growth curve (light blue line, top panel), which means that nothing in the effluent is inhibiting the growth of the microbes in the influent.

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The middle panel of Figure 8 represents the growth curves of the April samples and the bottom panel is June. *All of the samples from the April and June samplings follow a standard growth curve.* The microbial communities appear to have just reached stationary phase over this period of study. This is expected of healthy cultures. Also to note, *mixing effluent and influent had no visible impact on growth.*

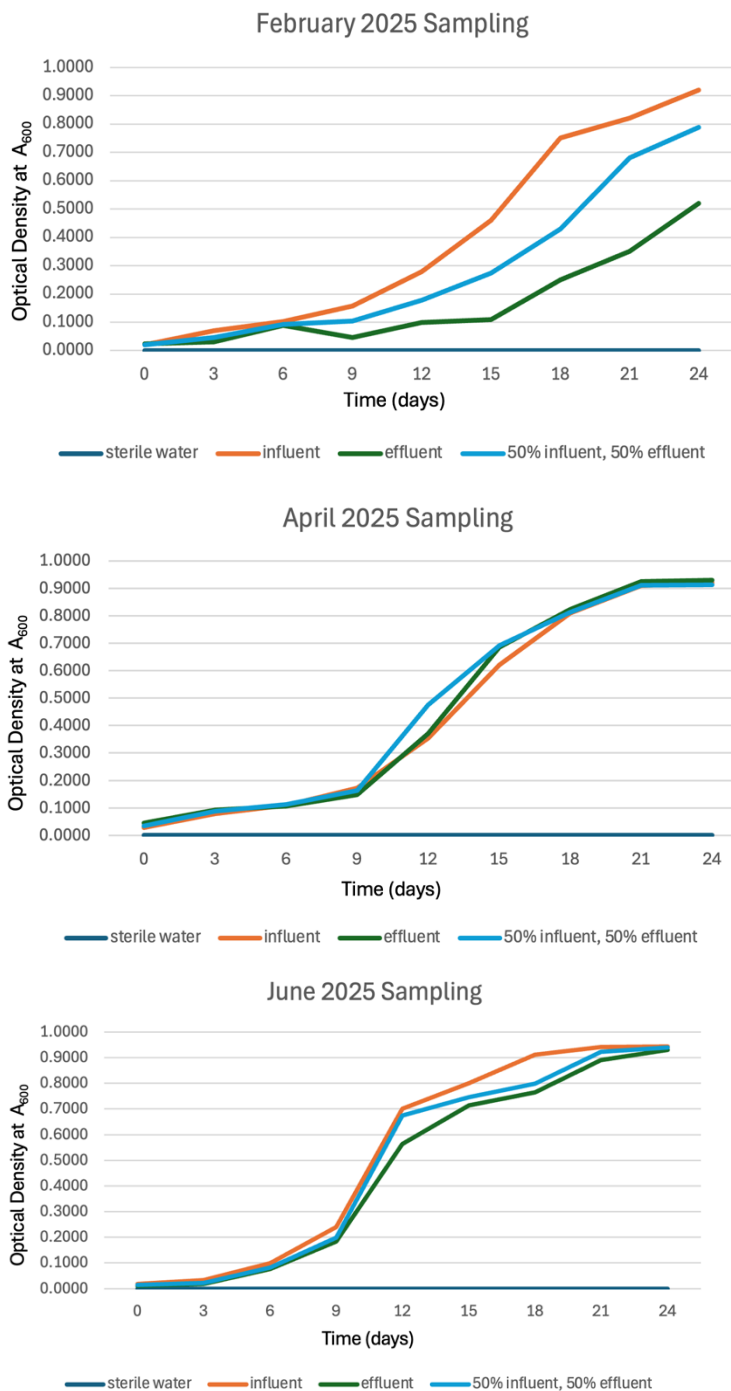


Figure 8. The top panel represents the February sampling at Waterleaf while the middle represents April and the bottom represents June. The sterile water inoculation control, dark blue, served as a blank for the optical density measurements at A₆₀₀ and showed no contamination in the experiment. The influent samples are shown in orange, the effluent in green, and the 50:50 mixture in light blue.

Algae Experiments

In the February and April samples, there was no evidence for the presence of algae. I did not see the larger distinctive cells in the microscopy examinations nor the signature for them in the DNA sequencing for microbial diversity. This is not unusual as the main algae species of the north arm, *Dunaliella salina*, blooms in the warm summer months (Baxter and Zalar, 2019). These eukaryotes do photosynthesis for the lake, accumulate glycerol to balance the inside of the cell with the outside hypersaline water, and make pigments to mediate cellular damage from the extreme environment (Figure 9). Despite being a seasonal participant, they are a key player to supplying nutrients to the north arm microbial community.

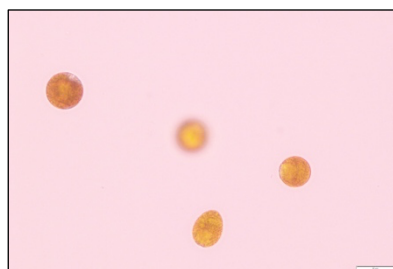


Figure 9. GSL north arm *Dunaliella salina*, a prevalent algae species in the summer months at Rozel. Beta carotene gives them the notable orangish color. A 20 micron scale bar is indicated in the lower right corner. Prokaryotes (bacteria and archaea) are typically only 1-2 microns, for comparison.

In the June sampling, I wanted to examine the impact of effluent on *Dunaliella salina* in the brine. For the DNA sequencing, I probed the broad categories of prokaryotes and eukaryotes. For this experiment, there is no need to distinguish between archaea and bacteria amongst the prokaryote signals and it was not important to track fungi separately amongst the eukaryotes. ***In future experiments for monitoring at this site, this streamlined approach would offer an option for routine checks.*** The results are shown in Figure 10.

The DNA sequencing surveys of the prokaryotes in the influent versus effluent shows the same pattern as before (Figure 6), making this a good control for standardization. The species distribution of the influent are preserved in similar abundances in the post-extraction effluent (Figure 10, top panel). These prokaryotes represent small archaea and bacteria, only ~1-2 microns, which are not filtered in the lithium extraction process. The *Dunaliella salina* algae are high in abundance in the influent as predicted for the summer season, but they are lacking in the effluent (Figure 10 bottom panel). ***These algae are much larger, ~10-20 microns, than the prokaryotes and were likely filtered in the early filtration step of the mineral extraction process.*** Note the small signal of *Dunaliella* in the effluent; this is likely from DNA released from dead cells in the environment, and these molecules would pass through filtration.

Microbial Analysis Report

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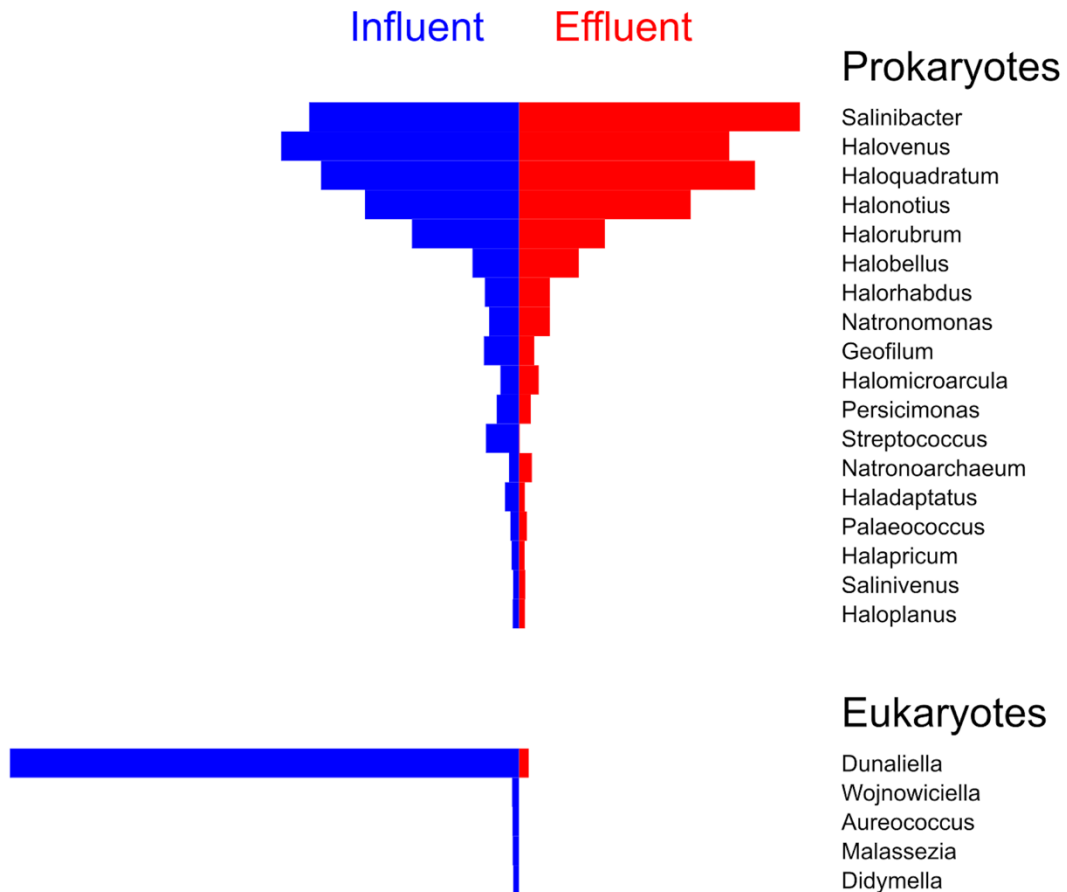


Figure 10. Most abundant taxa of prokaryotes (top panel) and eukaryotes (bottom panel). The influent consortia in shown in blue on the left, and the effluent in red on the right, and the bars represent relative abundance. June sampling for *Dunaliella salina* showed a robust biosignature for the algae in the eukaryotic profile of the influent (bottom). Unlike the smaller prokaryotes (~1-2 microns in size), the algae (~10-20 microns) are likely filtered out in the extraction process filtering step. The small signal for *Dunaliella* observed in the effluent is likely residual DNA from dead cells that passed through the filter.

Conclusions:

Is the extraction process changing the microbial community?

- The biomass analysis (Figure 3), cell counting (Table 1), and DNA sequencing (Figure 6 and 10) demonstrate that the extraction process is allowing prokaryotic microorganisms to remain in and survive in the effluent.
- The inoculation experiment (Figure 8) demonstrated that the effluent brine population is as healthy as the influent. There is no evidence of a longer lag time in the growth curves and they approach log phase at the same rate.
- The archaea and bacteria genera composition and abundance measures are remarkably similar between the influent and effluent (Figures 6 and 10), suggesting the survival/recovery of the microorganisms following the lithium extraction process.
- The fungi, however, have a different composition post extraction (Figure 6). There are only a few species that emerged in our study, but they are different in the influent versus the effluent. Since fungi have amazing dispersal mechanisms, the origin of the fungi we observed may have been introduced from the surrounding landscape, given the species present. There is no need to track fungi for surveying the health of the lake ecosystem.
- Algae were absent in both February and April samples, likely due to time of year. In the June sampling, the *Dunaliella salina* summer bloom was detected in the influent. However, filtration in the lithium extraction process appears to remove the *Dunaliella salina* as it is not present in the effluent (Figure 10).

Would the introduction of effluent to lake brine have impacts on the native biota?

- The inoculation experiment, where the influent and effluent are mixed 50:50, is a proxy for modeling the recovery of the microbial community after discharge. There is no evidence of negative impacts in the 50:50 mixed sample (Figure 8).
- Although the filtration step in the lithium extraction process may remove the *Dunaliella salina*, the absence of algae in the effluent should not be a problem when the effluent is discharged to the lake. The microbial community is not impacted by the introduction of effluent in the inoculation experiments (Figure 8).

Recommendations for future monitoring of the microbial communities:

- Fungal signatures are introduced from the environment and are not valuable for this study. Monitoring of fungi going forward is not necessary.
- Most of the microbial community in the north arm are mesophiles, meaning they are more prolific at moderately warm temperatures, optimal 20 to 45 °C (68 to 113 °F). Summer sampling is recommended for future monitoring efforts, and this approach would also allow you to see the bloom of *Dunaliella salina*.
- Continual monitoring the prokaryotes (the most prolific life forms) would give a nice benchmark for microbial communities surviving in the effluent. Any changes in process, scale up, or seasonal impacts could be followed over time.

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